



## 2009 Scientific Session of the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) Phoenix, Arizona, USA, 22–25 April 2009

### Poster presentations

#### BARIATRIC SURGERY

22182

P020

22205

P021

##### INTUSSUSCEPTION COMPLICATING POST GASTRIC BYPASS PREGNANCY

Subhasis Misra MD, Kenneth Lee MD, Richard C Treat MD, Fairview Hospital, Cleveland Clinic Health System

**Objective:** Only 10 cases of intussusception after Roux-en-Y gastric bypass (RYGB) surgery and 11 cases of intussusception complicating pregnancy have been reported in the literature with one previous case common to both groups. We present an unusual case of intussusception complicating pregnancy following open RYGB.

**Methods:** 34-year-old female had a normal vaginal delivery at full term and on post-partum day one, she developed sudden onset of mid abdominal pain. On evaluation she had significant periumbilical tenderness but no peritoneal signs and an elevated white count. CT scan showed a large intussusception measuring 15 × 10 × 10 cm. Past surgical history significant for open RYGB five years earlier with subsequent 140-lb weight loss and normal previous pregnancies after gastric bypass. **Results:** The patient underwent exploratory laparotomy, lysis of adhesions, reduction of intussusception and resection of 180 cm of small bowel with end-to-side jejunojejunal anastomosis. Intraoperative findings included retrograde intussusception at the jejunojejunal anastomosis, with marked dilation of the Roux and biliopancreatic limb and a decompressed efferent limb. The incarcerated small intestine within the intussusception appeared to have ischemic injury. Intraoperative pathology of small bowel showed recent hemorrhage, mucosal ulceration, transmural edema and exudate formation, consistent with ischemic-related changes. Postoperative course was uneventful and the patient went home on the fourth postoperative day.

**Conclusion:** Intussusception following RYGB and during pregnancy is a rare complication. Some studies have postulated abnormal motility to be a causative factor of retrograde intussusception in gastric bypass patients. Pregnancy following RYGB is speculated to cause intussusception due to altered anatomic relationships secondary to a growing uterus. The effect of pregnancy itself on intussusception needs to be further investigated with hormonal changes possibly playing a role.

##### REVERSAL RATHER THAN REVISION OF FAILED BARIATRIC OPERATION

Muhammad E Asad MD, WAI Y CHAU MD, ROBERT E BROLIN MD, University Medical Center, Princeton, NJ

##### Reversal Rather Than Revision of Failed Bariatric Operations

Operative revision and reversal represent treatment alternatives for patients who fail primary bariatric operations. This review focuses on a small group of patients who had reversal rather than revision of their primary operation.

**Methods:** This study reviews 2532 primary and 238 revisional operations that were performed by one surgeon over a 27-year period. Primary operations were performed by other surgeons in 75 of the revision patients. The indications for revision were complications in 73 patients (31%) and weight loss failure in 165 patients (69%).

**Results:** Ten patients had reversal rather than revision including 5 who requested reversal for severe outlet stenosis after banded restrictive procedures and 5 who were recommended to have reversal due to active abuse of prescription drugs (2) or tobacco (1) and 2 with severe metabolic complications related to malabsorption. Weight regain occurred in all but one patient who was followed for > 12 months. Two patients subsequently requested another bariatric operation after regaining weight, only one of which was performed with 34% EWL post revision. One of the 10 patients had a post operative wound infection. There were no other complications or deaths in this subgroup.

**Conclusions:** Approximately 1.0% of patients who have bariatric surgery will require reversal for troublesome complications. Active substance abuse and non-Compliance with physician's recommendations contributed towards the decision to reverse rather than revise the primary operation.

22229

P022

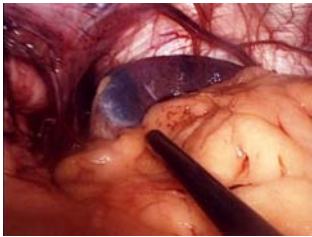
### SPLenic UPPER POLE ISCHEMIA FOLLOWING SLEEVE GASTRECTOMY: FIRST CASE REPORT

Nilesh H Bhoor MD, Michael Seger MD, Terive Duperier MD, New Dimensions Weight Loss Surgery, San Antonio, TX, Minimally Invasive Surgeons of Texas

**Introduction:** Laparoscopic Sleeve gastrectomy is relatively new surgical therapy for morbid obesity. The spleen receives its blood supply from the splenic artery and the short gastric vessels. We are reporting a first case of splenic upper pole ischemia following resection of the short gastric arteries in laparoscopic sleeve gastrectomy.

**Material and method:** Gastrectomy and related procedures require resection of the short gastric vessels either by ligation, stapling or by coagulation. Meticulous technique is followed to prevent the hemorrhage from these short gastric arteries. Our technique of laparoscopic sleeve gastrectomy begins with the opening of the gastrocolic ligament 5 cm proximal to the pylorus. A 5 mm ultrasonic scalpel device (Harmonic Scalpel) is used to separate the greater curvature of the stomach from the omentum; in doing so the branches of the gastroepiploic and short gastric arteries are divided and sealed. The gastric sleeve is then constructed with linear staples along a 30 French gastroscope. The resected stomach is then removed. At the end of the procedure we had noticed discoloration of the upper pole of the spleen. A clear line of demarcation was present across the upper pole of the spleen. The patient was observed and suffered no adverse sequelae.

**Conclusion:** The spleen is supplied blood from the splenic artery and the short gastric vessels. Division of the short gastric vessels usually has no impact on the flow to the spleen due to this dual supply. Sleeve gastrectomy is a new and increasingly popular weight loss surgery. Potential complications of this operation are considered by most to be similar to gastric bypass. As is the case with any new operation, new pitfalls frequently arise. We are reporting the first case of splenic polar ischemia after sleeve gastrectomy.



22256

P023

### COMPARISON OF THE SERUM MICRONUTRIENTS CHANGES IN PATIENTS WITH MORBID OBESITY AFTER LAPAROSCOPIC SLEEVE GASTRECTOMY (LSG) OR LAPAROSCOPIC BILIOpancreatic DIVERSION WITH DUODENAL SWITCH (LBDP/DS) SURGERY

Ke Gong MD, Michel Gagner MD, Alfons Pomp MD, Taghreed Almahmeed MD, Sergio Bardaro MD, Department of Surgery, Beijing Shijitan Hospital, Beijing, China

**Comparison of the serum micronutrients changes in patients with morbid obesity after laparoscopic sleeve gastrectomy (LSG) or laparoscopic biliopancreatic diversion with duodenal switch (LBDP/DS) surgery** Ke Gong<sup>1,2</sup>, Michel Gagner<sup>2,3</sup>, Alfons Pomp<sup>2</sup>, Taghreed Almahmeed<sup>2</sup>, Sergio J Bardaro<sup>2</sup>. 1 Department of Surgery, Beijing Shijitan Hospital, Beijing, China 100038, 2 Department of Surgery, New York Presbyterian Hospital, Weill Medical College of Cornell University, New York, NY, USA. 10021 and 3 Department of Surgery, Mount Sinai Medical Center, Miami, FL, USA. 33140  
**Objective:** The aim of our study was to evaluate the serum micronutrient changes in patients with morbid obesity after LSG or LBDP/DS. **Methods:** We retrospectively reviewed 39 patients diagnosed with morbid obesity who had LSG or LBDP/DS between June 2001 and June 2005. All patients routinely received mineral and vitamin supplements. Serum Iron (Fe), Calcium (Ca), Zinc (Zn), Selenium (Se), Vitamin A (Vit A), 25-hydroxy Vitamin D3 (Vit D), Vitamin B12 (Vit B12) and Parathormone (PTH) were measured at 6, 12 and 24 months after surgery. **Results:** Of 39 morbid obese patients, 20 had LSG (11 males and 9 females, mean age of 44 years) and 19 had LBDP/DS (7 males and 12 females, mean age of 42 years). The mean BMI prior to LSG, LBDP/DS was 62.73 +/- 8.62 kg/m<sup>2</sup> and 50.01 +/- 7.68 kg/m<sup>2</sup> respectively. The mean BMI after LSG and LBDP/DS was 47.92 +/- 9.00 kg/m<sup>2</sup> and 29.67/47.92 +/- 4.65 kg/m<sup>2</sup> respectively. The mean BMI of all patients was decreased (P < 0.001) at 6 months after surgery. Two years after surgery, the serum Fe, Ca, Zn, Se, Vit A, Vit D, Vit B12 were all at normal levels except serum Zn of patients who underwent LBDP/DS. Although the serum Vit D of some patients were decreased at 6-month after LBDP/DS, the serum level returned to normal with supplementation for more than one year. In contrast the serum PTH of all patients remained continuously at a higher than normal level.

**Conclusions:** LSG and LBDP/DS surgery are reliable and safe for patients suffering from morbid obesity. Although the LBDP/DS procedure results in a lower mean BMI than the LSG procedure, the serum Zn is decreased after LBDP/DS surgery. Serum PTH is altered in all patients following surgery. Multi-vitamin and mineral supplementations are strongly recommended in all weight loss surgery patients, especially in patients who have LBDP/DS surgery.

22361

P024

### ANASTOMOTIC LEAK AFTER GASTRIC BYPASS FOR MORBID OBESITY: LAPAROSCOPIC MANAGEMENT

VICTOR M QUINTERO MD, CARLOS A LOPERA MD, JESUS N VASQUEZ MD, JEAN P VERGNAUD MD, SERGIO DIAZ MD, University of Antioquia in Medellin, Colombia.

**INTRODUCTION:** Postoperative anastomotic leak after bariatric surgery is of low incidence but it has significant morbidity and mortality. This complication is often treated by open surgical means. We present our experience with laparoscopic management of anastomotic leak after laparoscopic Roux-en-Y gastric bypass (LGB).

**Methods and Procedures:** We retrospectively reviewed all anastomotic leak cases after LGB in our service in patients operated for morbid obesity between July 2006 and March 2008. We analyzed the outcomes after laparoscopic management.

**Results:** Among 231 patients undergoing LGB during a period of 28 months, 6 presented with postoperative anastomotic leak (2.6%). Average age was 30 years old with a mean body mass index of 48.6 Kg/m<sup>2</sup>. Intraoperative leak tests with methylene blue and routine postoperative contrast swallow X-Rays were normal in all patients. Leak was clinically apparent only after discharge from LGB in 5 patients, and in 1 case it was diagnosed during the first hospital stay. Symptoms causing suspicion of leak were, in order of frequency: abdominal pain, dyspnea, tachycardia and fever. Leak was confirmed by bedside methylene blue dye ingestion (drainage positive in 1 patient) or abdominal contrast CT (2 patients), in 3 patients the decision to reoperate was taken because of the clinical findings. All patients were managed surgically by laparoscopy; the number of procedures per patient was, in average 1.5. Their mean Intensive Care Unit stay was 10 days. Patients required mechanical ventilation for an average of 10 days and the length of stay was of 27 days. Mean duration of leak after laparoscopy was 21 days. There was no mortality.

**Conclusions:** Postoperative anastomotic leak after LGB can be successfully managed by laparoscopy. Routine leak tests by contrast X-Rays are often misleadingly normal.

22426

P025

### DOES VISCERAL FAT RESECTION GIVE AN ADDITIONAL BENEFIT TO GASTRIC BANDING

Yuichi Endo MD, Masayuki Ohta MD, Seiichiro Kai MD, Hidetoshi Eguchi MD, Teijiro Hirashita MD, Seigo Kitano MD, Department of surgery 1, Oita University Faculty of Medicine

**Background:** Although the function of visceral fat has gradually become clear, the effect of visceral fat resection is still unknown. The aim of this study is to clarify the additional effect of visceral fat resection in an obese rat model of gastric banding. **Methods:** Forty male Zucker fatty rats were followed for 8 weeks after gastric banding with or without visceral fat resection, and their body weight change, cumulative food intake, and metabolic parameters were measured. **Results:** The gastric banding rats either with or without visceral fat resection showed significant decreases in weight gain, cumulative food intake, and levels of metabolic parameters compared to control rats. There were no significant differences in weight gain and cumulative food intake between gastric banding with and without visceral fat resection. However, gastric banding with visceral fat resection induced lower tendency of plasma levels of free fatty acid and TNF-alpha compared to gastric banding alone (P < 0.1). There were no significant differences in any parameters between controls and visceral fat resection alone. **Conclusion:** Visceral fat resection may partially give an additional effect to the rat model of gastric banding.

22445

P026

### LAPAROSCOPIC SLEEVE GASTRECTOMY: EARLY OUTCOMES AT A MILITARY TRAINING CENTER

Rob D Rice MD, Jason M Seery MD, Arthur B Chasen MD, James D Frizzi MD, Yong U Choi MD, Dwight D. Eisenhower Army Medical Center

**Background:** Laparoscopic sleeve gastrectomy (LSG) has recently gained support as a single-staged and stand-alone bariatric procedure. Reports of excess weight loss of 51–83%, reduction in patient comorbidities, and decreased operative morbidity compared to laparoscopic gastric bypass have garnered support for LSG. This study represents an initial outcome analysis of LSG performed solely at a military treatment center.

**Methods:** This study is a retrospective analysis of all patients receiving LSG from the procedures initial inception at Dwight D. Eisenhower Army Medical Center from September 2007–October 2008. The patients were planned for a stand-alone procedure with conversion to a Roux-en-Y gastric bypass if there was an arrest of weight loss.

**Results:** 41 patients (76% female) received LSG over this time period with a mean BMI of  $45.5 \pm 6.2$  (Range 35.1–8.3). The average age was  $48.5 \pm 13.0$  years and 15% were classified with an American Society of Anesthesiologist physical status score of III or IV. 48% had diabetes mellitus and 68% of patients had hypertension. The mean and median length of operation was  $130 \pm 48$  and 119 minutes and resulted in an average length of hospital stay of  $2.47 \pm 0.75$  days. The mean percentage of excess weight loss was  $16.0 \pm 6.25\%$  at 1 month,  $27.5 \pm 7.6\%$  at 3 months, and  $41.2 \pm 13.9\%$  at 6 months from surgery. One or more of either preoperative diabetic or hypertensive medications were discontinued at one month postoperatively in 16.7% and 14.3%, respectively. Incidence of major complications occurred in 9.6% of patients in this study to include one death (2.4%) and three readmissions.

**Conclusion:** Early analysis of outcomes related to LSG as a single-stage bariatric procedure is promising with respect to morbidity, reduction of excess body weight and co-morbidities. As long-term outcome data is collected, the efficacy of this procedure as a sole bariatric procedure will be further characterized.

22493

P027

### A COMPARISON STUDY OF 100 CONSECUTIVE LAPAROSCOPIC ROUX-EN-Y GASTRIC BYPASSES AND 100 LAP-BANDS DURING THE LEARNING CURVE

Rodrick D McKinlay MD, Steven C Simper MD, Sherman C Smith MD, St. Mark's Hospital, Salt Lake City, Utah

The learning curve for laparoscopic gastric bypass has been estimated at 100 cases. We compared data from the first 100 consecutive laparoscopic roux-en-y gastric bypasses (LRYGB) with the first 100 consecutive laparoscopic adjustable gastric bands (LAGB) in a minimally invasive fellowship-trained surgeon's experience upon joining an established bariatric practice. **Results:** Patients undergoing LRYGB were slightly heavier (BMI 46.1 vs. 44.2,  $p < 0.05$ ), younger (mean age 39y vs. 41y,  $p < 0.05$ ), and equally likely to be men (22% vs. 23%,  $p = NS$ ). LRYGB patients experienced greater weight loss at one year (85% EWL vs. 53% EWL,  $p < 0.001$ ), but also had a higher complication rate (24% vs. 9%,  $p = 0.001$ ). The majority of LRYGB complications were anastomotic strictures (17%) successfully treated with endoscopic dilation. Excluding endoscopic dilations, the 30-day re-operation rate was 0% for LRYGB and 3% for LAGB ( $p = 0.08$ ), and the one-year re-operation rates were similar between the two groups (6% vs. 8%,  $p = NS$ ). The 30-day mortality for both groups was zero. **Conclusion:** LRYGB and LAGB can both be performed safely and effectively during the learning curve in a high-volume bariatric practice with experienced associate surgeons. Fellowship training can reduce the learning curve for advanced laparoscopic procedures.

22518

P028

### LAPAROSCOPIC GASTRIC BYPASS AT A MAJOR MILITARY MEDICAL CENTER: SAFE, EFFECTIVE, AND MORE COST EFFICIENT

M. Logan Rawlins MD, Jayson C Dock MD, Matthew I Goldblatt MD, Department of Surgery, Wright Patterson Medical Center, Boonshoft School of Medicine, Wright State University, Wright Patterson AFB, OH

**Introduction:** Morbid obesity is a major healthcare problem in the United States. Morbid obesity affects military dependents and retirees as well. Laparoscopic bariatric surgery has been performed at Wright Patterson Medical Center (WPMC) for two years. We hypothesize that laparoscopic RNY gastric bypass (LRNY) can be performed at a military medical center with equivalent outcomes to civilian programs at a lower cost.

**Methods:** We reviewed all 96 LRNY cases performed from March 2006 to February 2008 at WPMC. We specifically examined excess weight loss at each postoperative visit, resolution of co-morbidities six months after surgery (hypertension, diabetes mellitus, hyperlipidemia), and complications (operative mortality, pulmonary embolus (PE), leak rate, upper gastrointestinal bleed (UGIB), small bowel obstruction (SBO)). Our operative costs were compared to average TRICARE reimbursement for patients sent to an outside civilian provider when a surgeon was unavailable within our region.

**Results:** Average excess weight loss at 12 months was 71.1%. Diabetes resolved in 68.2%, with a drop in HbA1c from 7.6 to 6 ( $p < 0.0001$ ). Hypertension resolved in 52.8%. Hyperlipidemia resolved in 63.8% with a 42 mg/dL drop in total cholesterol ( $p < 0.0001$ ), 100 mg/dL drop in triglycerides ( $p < 0.0001$ ), and 26 mg/dL drop in LDL ( $p < 0.0001$ ). Complications were minimal: operative mortality (0%), PE (0%), leak (1%), UGIB (2%), SBO (4%). In addition, the cost of performing laparoscopic gastric bypass at our facility was \$2,069. Compared to the TRICARE payout of \$7,064, this provides a cost savings of \$4,495.

**Conclusions:** LRNY gastric bypass performed at a major military medical center can achieve or exceed weight loss goals, result in significant resolution of co-morbid conditions and be done safely with minimal complications. There is a significant cost savings to taxpayers when weight loss surgery is performed at a military medical center by qualified surgeons.

22525

P029

### VERTICAL SLEEVE GASTRECTOMY PERFORMED ON AN OUTPATIENT BASIS

Robert W Landerholm MD, Peter S Billing MD, Melanie Machado BS, Rachelle I Tomei BS, Puget Sound Surgical Center

**ABSTRACT Introduction:** Vertical Sleeve Gastrectomy (VSG) has recently been recognized as a potential stand alone operation for the treatment of obesity. Given the improvements in surgical techniques and medical management, we performed, to our knowledge, the first VSG on an outpatient basis. We will report our first 40 VSG patients done in an ambulatory surgical setting. Patient selection, instruction, pre and post operative medications, recovery protocol, follow up protocol, and complication experience will be discussed.

1. **OBJECTIVE OF THE STUDY:** The purpose of this paper is to investigate the hypothesis that Vertical Sleeve Gastrectomy (VSG) can be performed safely as an outpatient procedure and with equivalent results as an inpatient procedure.
2. **DESCRIPTION OF METHODS:** Patients with obesity were selected to undergo outpatient VSG, evaluating preoperatively their co-morbid medical conditions. Preoperative and intraoperative anti-nausea medication regimen was utilized. Operative times, recovery times, medications, and blood loss data were collected. Postoperatively patients were seen in the ambulatory surgical center the day following surgery and one week thereafter and evaluated for pain, nausea, IV fluid requirements, and any complications.
3. **PRELIMINARY RESULTS:** Preliminary results are favorable.
4. **Conclusions:** Preliminary outpatient VSG can be performed safely in select patients suffering from obesity.

22555

P030

### BARIATRIC SUPPORT LINE: A PROSPECTIVE STUDY OF TELEPHONE ACTIVITY

Kirsten A Mc Dougall RN, Segaran Ella BA, Pratik Sufi MD, Dugal I Heath MD, North London Obesity Surgery Service, Whittington Hospital, Magdala Rd, London N19 5NF, UK.

**Introduction:** It is widely reported that support is a key element affecting patient outcomes following Bariatric surgery. At NLOSS part of this support is through a telephone helpline, which is manned by the Bariatric Nurse Specialist (K McD). In this prospective study we examined the workload of the telephone helpline.

**Methods:** The phone line was staffed between 08.30 and 16.30 each weekday. Out of hours and at weekends, messages could be left on the answer phone, which were picked up on the next working day. The support line has been running since February 2008. In this study we examined the working of the support line between June and August 2008. All incoming and outgoing calls were logged and the content recorded in a diary.

**Results:** During the study period a total of 104 calls were recorded in the diary (male to female ratio 92:12). The median call duration was between 5 and 9 min (range 2 to 40 min) with the greatest number of call in August (27 in June, 29 in July and 48 in August). There was no significant difference in the call duration by month. Most calls were received on a Wednesday and fewest calls on Monday and Friday.

Seventy-five (72%) calls were related to patients who were postoperative and 28 (29%) preoperative. Gastric bypass accounted for 46 (44%) calls, 24 (23%) were pre and 22 (21%) post procedure, Gastric banding accounted for 56 (54%) calls, 51 (49%) were post and 5 (0.5%) pre procedure. Sleeve gastrectomy lead to 2 (< 1%), calls all post procedure.

The reason for the support line enquiry was General support 15 (14%), complications of surgery 26 (25%), general enquiries 27 (26%) and clinical enquiries 37 (36%).

**Conclusions:** This study had identified that the greatest need for support is in the postoperative period came from patients undergoing gastric banding and was related to enquiries regarding band inflations and complications of gastric banding. In those undergoing gastric bypass the greater need was in the pre-operative period and related to concerns about fitness for surgery. We interpret the lack of requests for support postoperatively as due to the fact that patients were complication free and achieving excellent weight loss post gastric bypass.

22632

### ENDOSCOPIC MANAGEMENT OF ERODED PROSTHESIS IN VERTICAL BANDED GASTROPLASTY PATIENTS

Shahzeer Karmali MD, Brad Snyder MD, Erik B Wilson MD, Vadim Sherman MD, Baylor College of Medicine and University of Texas-Houston

**Introduction:** One of the major complications of applying a prosthetic device to facilitate gastric partitioning has been intra-luminal erosion of the prosthesis. Removing an eroded gastric band is fraught with difficulty secondary to the extensive inflammatory response around the proximal stomach and left lobe of the liver. As a result, bariatric clinicians have attempted to apply endoscopic technology to facilitate removal of eroded gastric prostheses. Our study reports on our experience of applying endoscopic scissor transection to remove eroded gastric prostheses in a large tertiary care medical center.

**Methods:** A Retrospective chart review was conducted to identify all adult (> 18) patients managed endoscopically for removal of eroded prosthesis post-bariatric surgery at the Baylor College of Medicine Comprehensive Bariatric Surgery Center and the University of Texas-Houston Bariatric Surgery Program.

**Results:** Seven patients, mean BMI 40.5 +/-7.2, were managed endoscopically to remove eroded gastric prosthesis post vertical banded gastroplasty. All patients (7/7) reported symptoms consistent with a proximal gastric outlet obstruction and inadequate weight loss was reported by 71% (5/7). The mean time for endoscopic band removal was 26.8 +/-4.8 minutes. All eroded bands were evident at the end of the gastric pouch and were visualized with either a normal or retroflexed endoscopic view. All 7 patients were discharged the same day of their procedure. Mean follow up of the patients was 9.7 weeks (1 week-30 weeks). Three patients underwent revisional bariatric surgery following the band removal.

**Conclusions:** Our study demonstrates that endoscopic scissor transaction is a safe and effective modality in removing eroded gastric prostheses after vertical banded gastroplasty. Furthermore, this technique avoids the pitfalls associated with removing the eroded bands surgically. It also allows the patient and surgeon to make an insightful decision regarding a revisional bariatric surgical procedure, without being contingent on addressing the eroded gastric band.

P032

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P031

### VAGOTOMY VS NONVAGOTOMY IN GASTRIC BYPASS SURGERY

Constantine T Frantzides MD, Jacob E Roberts DO, George Stavropoulos MD, George Ayiomamitis MD, Mark Carlson MD, Tallal Zeni MD, Angela Jones MD, John G Zografakis MD, Chicago Institute of Minimally Invasive Surgery

**Objective:** Post bariatric symptoms related to dumping syndrome were compared in Nonvagotomized Laparoscopic Roux en Y Gastric Bypass (NVLGB) patients and Vagotomized Laparoscopic Roux en Y Gastric Bypass (VLGB) patients.

**Methods:** A questionnaire was given to patients during follow up appointments at 24 to 30 months after LRYGB treated with both NVLGB and VLGB. 48 responses were reviewed in patients who underwent VLGB. 64 responses were analyzed in NVLGB. The questionnaire addressed frequency of post bariatric symptoms related to the consumption of high caloric foods. PC SAS version 9.1.3 was used for all analyses. Fishers Exact Test or Chi-square tests were used to determine if vagotomy status and symptom episodes (categorized as none, low, mid, high, and always) were independent of each other.

**Results:** The nonvagotomized patients had significantly less symptoms than the vagotomized patients for 11 out of the 17 symptoms that were queried. There was no significant difference in symptom frequency between the vagotomized vs. nonvagotomized patients for 6/17 symptoms. NVLGB patients were less likely to experience diarrhea, abdominal cramping, nausea, flushing, dizziness, and sleepiness in association with high caloric foods compared to VLGB patients (76.6 %, 62.5 %, 54.7 %, 67.2 %, 65.6 %, 62.5 % vs. 10.4 %, 20.8 %, 18.8 %, 25 %, 27.1 %, 29.2 %). Loss of excess body weight was also compared in the 2 groups, the VLGB patients? loss 71% ± 4 of EBW, compared to 68 % ± 6 in the NVLGB patients.

**Conclusion:** This study showed that NVLGB patients are able to enjoy all types of foods and less frequently experience the unpleasant symptoms VLGB patients experience with ingestion of sweets. Dumping syndrome has been proposed by some to lead to greater weight loss in RYGB patient through negative feedback. However the association of weight loss and dumping syndrome has never been clearly linked. In our patient population there was not a significant difference in loss of excess body weight between NVGLB, and VLGB patients.

22689

P033

### MORBIDLY OBESE PATIENTS WITH POST TRAUMATIC STRESS DISORDER PERFORM AS WELL AS MATCHED CONTROLS AFTER 1 YEAR FOLLOWING ROUX-EN-Y GASTRIC BYPASS

Danagra G Ikossi MD, Kim Rhoads MD, Nina Bellatorre RN, Sherry M Wren MD, Dan Eisenberg MD, Palo Alto VA HCS and Stanford School of Medicine

**Objective:** Post traumatic stress disorder (PTSD) is an important diagnosis in the Veterans Affairs Health System, where obesity is common. There is little available data describing the impact of PTSD on outcomes following weight loss surgery in morbidly obese patients. Conversely, the mental health effect of weight loss surgery in these patients is unclear. In this study we explore the relationship between PTSD and long term weight loss success after Roux-en-Y gastric bypass for morbid obesity. Also we sought to evaluate the changes in symptoms and treatment of PTSD after surgical weight loss.

**Methods:** We reviewed a prospective database of 107 consecutive patients who underwent bariatric surgery between January 2001 and June 2007 at the Palo Alto VA. Multivariate linear regression models were used to analyze the relationship between PTSD and weight loss after 1 year, taking into account the effect of initial BMI, age and gender.

**Results:** Of 107 patients, 103 patients were available for follow-up 12 months after surgery. Of these, 16 patients carried a diagnosis of PTSD. The other 87 patients represented the control group in this study. All the patients with PTSD were male, while 78% of the control group were men. Excess weight loss (EWL) at 1 year postoperatively was not significantly different between the patients with PTSD and those without PTSD (60 +/-17% vs. 73% +/-22%, respectively; p = 0.24), when corrected for initial BMI, age and gender. Two of the 16 patients with PTSD had an increase in the severity or frequency of PTSD symptoms after 1 year postoperatively. However, symptoms and need for psychotropic medications waxed and waned over that time period.

**Conclusions:** Morbidly obese patients with PTSD performed as well as patients without PTSD with respect to excess weight loss, 1 year after Roux-en-Y gastric bypass. Although DSM Axis I diagnoses are generally considered contraindications to Roux-en-Y gastric bypass, we found a difference that was not statistically significant between patients with PTSD and those without PTSD. Therefore, with respect to weight loss, we do not believe that PTSD is a contraindication to gastric bypass in the morbidly obese. The effect of bariatric surgery on PTSD symptoms, however, is more difficult to discern. A larger study sample and longer follow-up are needed to better define whether bariatric surgery has a positive or negative effect on the mental health of patients with PTSD.

22707

P034

### CAN MORBIDLY OBESE PATIENTS AWAITING BARIATRIC SURGERY ACHIEVE A 10% WEIGHT LOSS PRIOR TO SURGERY AND WHAT IS ITS SIGNIFICANCE?

Ella Segaran BA, Kirsten Mc Dougal RN, Pratik I Sufi MD, Dugal Heath MD, North London Obesity Surgery Service, The Whittington Hospital, London, N19 5NF, UK

**Introduction:** It has been suggested that a preoperative weight loss of 10% of excess body weight, be a key component of the pre-operative preparation process. It can demonstrate motivation and commitment to surgery, reduce liver size and abdominal adiposity as well reducing operating time and length of stay (LOS). It is also associated with greater weight loss 3 years post operatively than in those patients who had not achieved a reduction in their excess weight of 10%. The aim of the study is to examine whether it is possible for patients awaiting surgery to lose 10% of their excess body weight (EBW) using diet alone and to measure the influence this has on operating time, hospital stay and the degree of weight lost 6 months post surgery.

**Patients and Methods:** 37 patients (8 men and 29 women) were studied over a 14-month period. The median age, starting weight and body mass index with, ranges in brackets, were 44 yr (19 to 65 yr), 133 kg (90 to 279 kg) and 49 kg/m<sup>2</sup> (37 to 79Kg/m<sup>2</sup>), respectively. 16 patients underwent gastric banding, 17 Roux en Y gastric bypass and 4-sleeve gastrectomy. Each patient was asked to lose 10% of their EBW prior to surgery. Each was offered expert dietary advice and a 3-week preoperative diet of 1000 kcal per day.

**Results:** 65% of patients were able to lose the target 10% loss of EBW. There was no statistical difference between those who achieved the target and those who did not, in terms of age, sex, start weight, BMI or surgery type.

Median time in the operating theatre for those with and without 10% EBW loss were (2 hr 40 min (1 to 2.40) vs 2 hr 45 min (2.10 to 3) for gastric banding, (36 kg, (2.15 to 6), 5 hr vs 7hr (5.15 to 8) for gastric bypass and (3 hr vs 4 hr 30 min (3.15 to 8) for sleeve gastrectomy. The median lengths of stay with and without 10% EBW loss were 2 days (1 to 5) vs 2.5 (2 to 3) for gastric banding, 4 days (3 to 27) vs 6 days (6 to 7) for gastric bypass and 3 days (3) vs 4 days (4) for sleeve gastrectomy respectively.

Weight loss at 6 months was greater in those who had achieved 10% EBW prior to surgery than those who did not (P 0.004), (29 kg (15 to 38Kg), EBW loss 47%, vs 14 Kg (8 to 29 Kg) EBW loss 24%, for gastric banding, (36 Kg, (18 to 71 Kg), EBW loss 58%, vs 42 Kg (40 to 45 Kg) EBW loss 50 % for gastric bypass and (89 kg, EBW loss 46%, vs 4 Kg EBW loss 21%, (25 to 57 Kg) for sleeve gastrectomy, respectively.

**Conclusions:** The majority of patients (65%) were able to achieve the target of 10% EBW loss through the use of sensible healthy dieting combined with a strict 4-week period of liver shrinking diet. Indeed, some patients were able to lose substantially more. Pre-operative weight loss of at least 10% EBW was related to greater weight loss at 6 months for all patients (but was especially important in those undergoing gastric banding), shorter in theatre times for patients undergoing gastric bypass and sleeve gastrectomy and reduced length of stay for patients undergoing gastric bypass.

22716

P035

### ROUTINE POSTOPERATIVE UPPER GASTROINTESTINAL FLUOROSCOPY IS UNNECESSARY AFTER LAPAROSCOPIC ADJUSTABLE GASTRIC BAND PLACEMENT

Noelle L Bertelson MD, Jonathan A Myers MD, Department of General Surgery, Rush University Medical Center

The purpose of this study is to determine whether routine postoperative upper gastrointestinal fluoroscopy (UGI) is necessary after laparoscopic adjustable gastric banding (LAGB). LAGB has become an accepted procedure for weight loss surgery, particularly because of decreased operative time and fewer early perioperative complications. Many centers utilize UGI to ensure stomal patency and gastric integrity at the banding site. However, UGI increases the cost of the procedure and may increase length of stay due to exam availability.

**Methods:** A prospective database of 200 LAGB cases performed by a single surgeon over three years was reviewed; follow up ranged from 4 months to 3 years. Patients with a difficult dissection underwent intraop instillation of dilute methylene blue (MB) per orogastric tube to diagnose gastric injury. All patients underwent UGI 2 to 24 hours after surgery, dependent on exam availability. Cases were reviewed for age, gender, BMI, comorbidities, operative time, MB usage, abnormal UGI results, and complications. Differences between those who received MB and those who did not were compared using Student's T-test.

**Results:** Mean age was 43; mean BMI was 45. Mean operative time was 44 minutes. Six percent underwent intraop MB test with no leaks identified; these patients were on average 5 years older (p < .05), with operative time 23 minutes longer (p < .01); differences in gender and BMI were not statistically significant. Forty-four percent of patients stayed overnight. All postop UGI results were normal. One patient (0.5%), who had a normal intraop MB test and normal postoperative UGI, returned within 2 days with a gastric perforation requiring band explant and gastric repair.

**Conclusion:** Routine UGI after LAGB is not necessary, based on a 0% stomal obstruction rate and nondetection of a single gastric leak. Elimination of routine postoperative UGI will decrease cost and length of stay. We suggest a selective approach for those patients at increased risk of early postop complications, including those having intraoperative methylene blue instillation, increased length of operation, and increased age.

22741

P036

### INITIAL JAPANESE EXPERIENCE WITH LAPAROSCOPIC ADJUSTABLE GASTRIC BANDING

Masayuki Ohta MD, Seiichiro Kai MD, Yuichi Endo MD, Hidetoshi Eguchi MD, Teijiro Hirashita MD, Yukio Iwashita MD, Kohei Shibata MD, Seigo Kitano MD, Department of Surgery I, Oita University Faculty of Medicine, Oita, Japan

**Background/Aim:** Since bariatric surgery had not been so popular in Japan, we introduced laparoscopic adjustable gastric banding (LAGB) for the treatment of morbid obesity into Japan. Our initial data were evaluated.

**Methods:** Between August 2005 and August 2008, 28 morbidly obese patients (17 women / 11 men, mean age of 38 yr) received LAGB in our institute. All patients were morbidly obese (BMI > 35 kg/m<sup>2</sup>), and the averaged weight was 119 kg and BMI was 44 kg/m<sup>2</sup>. In regard to LAGB devices, LAP-BAND (Allergan Medical) was used in 26 patients and SAGB (OBTECH Medical GmbH) in 2 patients. All procedures of LAGB were performed through the pars flaccida pathway with band fixation using gastric-to-gastric sutures.

**Results:** All the procedures were completed laparoscopically, and no major complications were experienced. Weight loss and % excess weight loss on the average were 25 kg and 42% after 12 months, 32 kg and 55% after 24 months, and 31 kg and 64% after 36 months. These results were comparable to the previous published data. Accordingly, comorbidities were frequently improved, and type 2 diabetes and metabolic syndrome were cured in 9 of 10 patients (90%) and in 12 of 16 patients (75%), respectively.

**Conclusions:** LAGB is safe and effective, and will play an important role in treatment for morbid obesity in Japan.

22818

P037

### THE STAGED APPROACH TO ACUTE GASTRIC PROLAPSE IN ADJUSTABLE GASTRIC BANDING

Raffi Barsoumian MD, Colin J Powers MD, Alan C Geiss MD, Dierdre Hamilton, Miriam Borsch, June Warman RN, Baiju C Gohil MD, Center for Bariatric Surgical Specialties at Syosset Hospital, Northshore-Long Island Jewish Health System

**INTRODUCTION:** Acute gastric prolapse (AGP) represents a sudden or forceful migration of the distal anterior stomach through the more proximal laparoscopic adjustable gastric band (LAGB) stoma, representing a surgical emergency. The current management of acute gastric prolapse often results in removal of the LAGB, extensive manipulation of a friable or hemorrhagic stomach or extensive dissection of ill-defined or edematous retrogastric tissue planes in an attempt to replace the LAGB. In this case series, three patients are presented who underwent a novel surgical approach to this complex clinical issue. **METHODS:** Three instances of AGP were gathered from a review of 2300 LAGB procedures at a single institution with a dedicated center for bariatric surgical specialties. This represented an incidence of 0.15%. In AGP, the LAGB is unbuckled to allow for complete reduction and inspection of the stomach and GE junction. The opened LAGB is then elevated to maintain a position above the GE junction at the Angle of His. Interval closure of LAGB is performed approximately 8 weeks after unbuckling. **RESULTS:** Three patients presenting with AGP underwent emergent unbuckling of the LAGB. Interval closure of the LAGB was performed in all cases. The patients had an unremarkable postoperative course. In spite of AGP, the LAGB was salvaged in all 3 patients who subsequently continued to achieve further weight loss. **CONCLUSIONS:** The advantages of a staged approach to AGP are multiple. First, this technique allows for a simple emergent intervention in anatomically challenging conditions. Second, this technique preserves the LAGB and retrogastric tunnel facilitating future revision without the risks inherent to extensive dissection. Third, this approach allows the non-bariatric surgeon a modality to address a true surgical emergency without limiting future surgical care options. We advocate a staged approach to the repair of the AGP and salvage of the LAGB device.

22821

P038

### GASTRIC BAND COMPLICATIONS: AVOIDANCE AND TREATMENT

Daniel R Leff BA, Pratik Sufi BA, Dugal Heath BA, North London Obesity Surgical Service, Whittington NHS Trust

**Objectives:** To determine frequency of complications associated with laparoscopic gastric banding, and to describe techniques for their avoidance and treatment.

**Methods:** A retrospective review of radiological band fill images was undertaken between Jan 2007 and Aug 2008 to assess: (1) the presence or absence of a gastric pouch; (2) longitudinal and transverse pouch dimensions; (3) radiographic evidence of band slippage and/or erosion; (3) the presence or absence of oesophageal dilatation (4) port site malpositioning. Data on patients returning to theatre for complications of band surgery was collection prospectively from April 2008

**Results:** 59 patients underwent a total of 217 procedures (operative and/or band fill). The band was not around the oesophagus in one patient and required re-positioning (avoided by careful attention to right and left crus dissection) 8 patients suffered access port rotation, of which 2 patients required re-positioning (avoided by anchorage to fascial sheath). 1 patient required port removal due to local sepsis (avoided by careful asepsis at insertion and avoided gastric perforation). The badn tubing was strangulated in 2 patients, both requiring re-intervention to trim the tubing (avoided by trimming tubing at initial band insertion). Band erosion was detected in 2 patients, both requiring endoscopic retrieval (avoided through loose suturing of fundus to pouch). Band slippage occurred in 3 patients, all requiring re-operation to re-site the band. (avoided using 'Birmingham' stitch technique). Oesophageal dilatation was detected in 3 patients, all requiring unbuckling of band (avoided by preventing over-inflation). **Conclusions:** The overall complication rate (33.8%) is inline with other series. Band-related complications can be prevented if appropriate measures are taken to avoid them.

22882

P040

### TREATMENT OF GASTROJEJUNAL LEAKS USING COVERED METAL STENTS IN A PORCINE MODEL

Emanuel Sporn MD, Brent W Miedema MD, J Andres Astudillo MD, Joe Karch MD, Sharon L Bachman MD, Klaus Thaler MD, Department of Surgery, University of Missouri

**Introduction:** Placement of stents may be an alternative non-invasive option to treat gastrojejunal (GJ) anastomotic leaks after Roux en Y gastric bypass (RYGB) surgery. The aim was to evaluate the performance of a covered metal stent (Alveolus 18 × 100 mm), across a GJ leak in a porcine model.

**Methods and procedures** Eight pigs weighing 20–25 Kg were used. In four pigs, a RYGB with a retrogastric GJ was performed and a 1 cm leak was created. In two pigs, no stents were placed and in two pigs one stent was placed across the GJ anastomosis using endoscopy and fluoroscopy. In four pigs, a leak model with an antero gastric GJ was performed. In two pigs, one stent and in two pigs two overlapping covered metal stents were placed. The endpoints were position of the stents, healing of the leak and complications at necropsy.

**Results:** Stent placement was feasible in all pigs it was attempted. In the retrogastric GJ group, pigs without stent survived two weeks without complications and with healing of the leak. The two pigs with stents died on postoperative day (POD) 4 and 5. Kinking, obstruction and pressure necrosis of the Roux limb caused by the distal end of the stent were seen at necropsy. In the antegastric GJ group, one pig with one stent survived two weeks with healing of the leak but with stent migration into the Roux limb. The remaining three pigs died between POD 4 and 6. Pressure necrosis of the Roux limb caused by the distal end of the stent was found in all. In the pig with one stent, gross peritonitis caused by persistent GJ leakage was found. In pigs with two stents, jejunum-jejunostomy leakage was found in one and obstruction of the stent caused by kinking in the Roux limb in the other.

**Conclusions:** Placement of fully covered metal stents is feasible for GI leak in a porcine model. A leak model with a retrogastric GJ is not useful, because control leaks heal without complication. Severe complications were found in all animals. The use of small pigs with a thin small bowel wall in combination with relatively large stents was most likely the reason for complications. Further studies of GJ leaks using these stents will require larger pigs or another species.

22835

P039

### LAPAROSCOPIC ESOPHAGOMYOTOMY FOR ACHALASIA AFTER LAPAROSCOPIC ROUX-EN-Y GASTRIC BYPASS FOR MORBID OBESITY

Kelvin Higa MD, Gavin Sigle MD, Keith Boone MD, Abdelrahman Nimeri MD, UCSF Fresno/ALSA Minimally Invasive Surgery

Obesity has become a national epidemic and the only proven long-term method of weight loss is surgery. The laparoscopic Roux-en-Y gastric bypass is the most common bariatric procedure performed in the United States. Achalasia, a swallowing disorder of the lower esophageal sphincter (LES), is uncommonly found in obese patients or formerly obese patients. Definitive surgical treatment of achalasia is esophagomyotomy. The patient that has undergone laparoscopic Roux-en-Y gastric bypass and then presents with achalasia offers an unusual challenge for surgical treatment. We present the first case of laparoscopic esophagomyotomy after laparoscopic Roux-en-Y gastric bypass.

22885

P041

### LAPAROSCOPIC SLEEVE GASTRECTOMY FOR THE PATIENTS WITH BMI < 50

Nobumi Tagaya PhD, Kazunori Kasama MD, Eiji Kanahira MD, Akiko Umezawa MD, Souji Ohshiro MD, Yoshimochi Kurokawa PhD, Keiichi Kubota PhD, Second Department of Surgery, Dokkyo Medical University, \*Minimally Invasive Surgical Center, Yotsuya Medical Cube

**Introduction:** We evaluate the safety and efficacy of laparoscopic sleeve gastrectomy (LSG) for morbid obesity.

**Materials and Methods:** Between October 2005 and January 2008, we performed LSG in 30 patients. Their BMIs were < 50 in 16 patients and = 1 > 50 in 14 patients. There are 11 males and 5 females in the former and 11 and 3 in the latter with a mean age of 38 years. Mean initial body weight and BML were 139Kg and 49.1 kg/m<sup>2</sup>. Under general anesthesia, the patient was placed in the supine position. Operation was started by 5-port method. Sleeve gastrectomy was carried out using linear stapler from the antrum 5 cm proximal from pyloric ring up to His angle alongside 45-Fr bougie. The specimen was retrieved from 15-mm ports.

**Results:** Laparoscopic procedures were successfully performed in all patients. The mean operation time was 92 min and blood loss was minimal. The BMI change and %EBMIL at postoperative 3, 6, 9, 12, 18 months follow-up of patients with an initial BMI of < 50 and = 1 > 50 were -6.6, and -8.6, -9.4 and -11.3, -12.5 and -13.4, -10.0 and -4.0, and -16.0 and -16.5 kg/m<sup>2</sup>, and 36.8% and 23.0%, 51.4% and 33.7%, 67.0% and 34.0%, 9.0% and 48.0%, and 73.0% and 46.0%, respectively. The patients with a BMI of < 50 obtained good outcomes, but weight loss showed a plateau at a 9 months after surgery in patients with BMI of = 1 > 50. Postoperative morbidity consisted of leakage, bleeding, stricture and peritonitis in each one patient. There was no surgical mortality. Most of the co-morbidities improved after surgery.

**Conclusions:** SG is a feasible and safe treatment for super morbid obesity, however, the evaluation of long-term outcomes are necessary to see if it is a durable procedure in the treatment of morbid obesity.

22979

P042

### LAPAROSCOPIC SLEEVE GASTRECTOMY FOR MORBID OBESITY: SURGICAL TECHNIQUE AND EARLY RESULTS

Brent W Allain, Jr. MD, Roderick J Romero MD, Kenneth P Kleinpeter, Jr. MD, Mark G Hausmann MD, Karl A LeBlanc MD, Minimally Invasive Surgery Institute, Inc., Baton Rouge, Louisiana, U.S.A.; Department of Surgery, Louisiana State University Health Sciences Center, New Orleans, Louisiana, U.S.A.

**Introduction:** Laparoscopic sleeve gastrectomy is a relatively new bariatric procedure that is gaining popularity in the surgical treatment of the morbidly obese patient. The authors present their surgical technique and early results from their first 100 consecutive patients.

**Methods:** A retrospective chart review was completed on the authors' first 100 consecutive patients undergoing a laparoscopic sleeve gastrectomy procedure. A standardized surgical technique was performed on all patients included in this study.

**Results:** 100 consecutive patients underwent laparoscopic sleeve gastrectomy from November 2006 through July 2008. Average age was 44.7 years (range: 18–64 years.) Average pre-operative body mass index (BMI) was 46.4 (range: 34.4–79.6.) Average time of operation was 83.3 minutes (range: 42–210 minutes.) Average post-operative excess body weight loss at 3 and 6 months was 34 percent (range: 21–63 percent) and 49 percent (range 28–95 percent) respectively. Two patients had a post-operative hemorrhage requiring transfusion. One patient developed an abscess with subsequent gastric fistula formation requiring total parenteral nutrition and gastric stent placement. There were no re-operations or mortalities.

#### Discussion

The authors report on the efficacy and safety of laparoscopic sleeve gastrectomy as a viable option in the surgical treatment of the morbidly obese patient. Long term (5 years or greater) outcome data is warranted and forthcoming.

23125

P044

### SINGLE INCISION LAPAROSCOPIC GASTRIC BAND PLACEMENT

Jenny J Choi MD, Marc Bessler MD, Columbia University, College of Physicians and Surgeons, Department of Surgery

To further improve cosmesis and perhaps reduce the disability associated with current laparoscopic operations single incision laparoscopic surgery has been advocated. Single incision laparoscopic surgery has been applied to cholecystectomy and appendectomy. We report on the application of this technique to adjustable gastric banding.

**Methods:** Six patients with BMI of 41–44 underwent single incision laparoscopic band placement, one with associated hiatal hernia repair. The average size of the incision was 4 cm, placed in the umbilicus for 2 patients and in the right upper quadrant for the remainder. Within this incision, 4 ports were placed for camera, liver retractor and two working ports.

**Results:** All 6 patients underwent uneventful single incision laparoscopic gastric banding, with 1 patient also having hiatal hernia repair. The average operative time was 94 minutes (range: 76 min to 129 min) similar to standard laparoscopic band placement with 5 ports. When hiatal hernia was repaired in addition to band placement, the operative time was 199 minutes. There were no intraoperative complications and all the patients were discharged on the same day of the surgery. When subjectively evaluated at 2-week follow up, most patients required minimal pain medications and were able to return to ADLs in the range of 4–7 days. All the patients were very satisfied with the cosmetic results of the single incision surgery.

**Conclusion:** Single incision surgery laparoscopic gastric banding placement is a safe, feasible procedure that may potentially benefit patients with better cosmesis and perhaps less pain, and more rapid recovery.

23002

P043

### LAP BAND: SAFE AND EFFECTIVE PROCEDURE?

Scott N Welle DO, Mark Pleatman MD, St Joseph Mercy Oakland, Pontiac Osteopathic Hospital, Crittenton Hospital

**Background:** The laparoscopic adjustable gastric band (LAGB) is the most commonly performed operation for weight loss worldwide. The Lap-Band was approved for use in the United States in 2001. LAGB has been described as a safe and effective weight loss procedure. Since then, however, insufficient weight loss and long term complications have been reported. Weight loss success and Lap-band conversion rates were studied.

**Methods:** From August 2002 to August 2007, 124 patients underwent LAGB. All procedures were performed by a single surgeon. All charts were retrospectively reviewed. All patients were sent a six question survey. Band longevity, percentage excess weight loss, procedure satisfaction on a 5 point scale, number of conversion procedures, and time from last follow-up was evaluated.

**Results:** Data from 114 charts (92%) and 50 surveys (40%) were analyzed. Mean band longevity was 31 months (range, 3–72 months). Mean excess weight loss 38.7% (range, 14% gain to 87% loss). Mean patient satisfaction with the procedure 3.1. The most common complaints being reflux, and sensation of 'food getting stuck.' Mean time from last follow-up was 28 months (range, 1–60 months). Twenty-eight patients (24.5%) had their band removed with or without conversion to another weight reduction procedure. Four patients had the band removed without conversion, 2 converted to the duodenal switch, 8 converted to a vertical sleeve gastrectomy, 14 converted to a Roux-en-Y gastric bypass. Indications for conversion included insufficient weight loss, band prolapse, intolerance of band due to intractable emesis or severe reflux.

**Conclusion:** Our study calls into question the safety, efficacy, and suitability of LAGB as a primary weight loss procedure.

23157

P045

### ULTRASOUND GUIDED LOCALIZATION OF ADJUSTABLE GASTRIC BANDING ACCESS PORT

James T Mayes MD, J. R Salameh MD, Department of Surgery, Georgetown University, Washington, DC and Surgical Associates at Virginia Hospital Center, Arlington, VA

**INTRODUCTION:** Laparoscopic adjustable gastric banding (LAGB) has become one of the most popular bariatric surgeries performed today. Percutaneous access of the port for adjustment is required during follow-up but can be difficult in some patients with very thick abdominal wall. In these patients, fluoroscopic guidance has been used to localize the port and guide access. We present a novel use of office ultrasound to localize the port and facilitate the adjustment procedure.

**Methods and Procedures:** All patients presenting to the office for postoperative LAGB adjustment had ultrasound evaluation of the access port to determine its exact position and orientation. The port was imaged in the sagittal and horizontal planes and the center of the port was marked. Independently, the port was examined by another surgeon and its center marked again based solely on physical exam. The difference between the two marks was noted.

**Results:** 14 Lap Band adjustment procedures were evaluated by ultrasound and physical exam. The access port was easily imaged by ultrasound and its center accurately marked in all cases. The ultrasound and physical exam markings coincided in most patients or differed by less than 0.5 cm. Percutaneous access of the port from the skin marking was successful in all cases on the first attempt.

**Conclusion:** Ultrasound guided localization of adjustable gastric banding access port is an easy, effective and readily available technique. It limits the need for multiple puncture attempts, allows more efficient access to the port, eliminates the need for fluoroscopic radiation exposure to the patient and operator, and may reduce complications related to tube puncture.

23164

P046

### INITIAL EXPERIENCE WITH HYBRID NOTES SLEEVE GASTRECTOMY USING TWO TROCARS

Michel VIX MD, Cynthia SOLANO MD, Sergio CON MD, Chrysoula ZACHAROPOULOU MD, Bernard DALLEMAGNE MD, Jacques MARESCAUX MD, IRCAD-EITS, University Louis Pasteur, Strasbourg, France

**Background:** Potential benefits using the natural orifices transluminal endoscopic surgery (NOTES) approach including advantages related to reduction of visible scarring, recovery time, hernia formation and adhesions have been evaluated over the traditional surgical approaches for the morbidly obese population. Hybrid NOTES procedures (combination of laparoscopic and transluminal surgery) have emerged as an alternative in minimally invasive surgery.

**Aim:** To analyze the feasibility of a hybrid NOTES laparoscopic assisted sleeve gastrectomy (SG) using only two abdominal trocars.

**Method:** The basic set up of the procedure included: a 12 mm trocar introduced by open technique a hand-width above the umbilicus, and a 5 mm trocar at the same level in the left hypochondrium. For liver retraction, a Berci needle was inserted in the epigastric region with its tip protected with a gauze. A 15 mm/15 cm-long trocar was introduced transvaginally, under laparoscopic control, through a posterior colpotomy to provide a stable platform access for a 12 mm dual-channel endoscope (Karl Storz®, Tuttlingen, Germany). While the endoscope provided vision, the division of the vascular supply of the greater curvature began 6 cm proximal to the pylorus using Ligasure® (Covidien). A standard SG was created using sequential firing of a linear stapler-cutter device (EndoGIA®, Covidien). An haemostatic continuous suture reinforced the stapling line. The resected specimen was placed in an Endobag® (Covidien) and retrieved transvaginally. The colpotomy site was then closed.

**Result:** Since December 2007, five female patients have been operated. The mean age was 37.6 years (27–60), with a mean BMI of 39.52 (38–41.2 kg/m<sup>2</sup>). The median operative time was 224 min (range 210–250 min). Only one case was successfully completed with two abdominal trocars while in the other four cases additional trocars were added due to inadequate liver or gastric retraction, and intraoperative minor bleeding.

No postoperative complications occurred, and patients did not complain of pain localized at both access sites. Patients were discharged on the fourth postoperative day (range 3–5 days).

**Conclusions:** The performance of a hybrid NOTES sleeve gastrectomy using two ports is difficult to reproduce routinely due to difficulties related to exposure and dissection. The performance of this technique might be improved by the development of an internal retractor, eliminating the need for additional trocars.

23216

P048

### LAPAROSCOPIC REVISION OF ANTIREFLUX SURGERY TO ROUX-EN-Y GASTRIC BYPASS IN MORBIDLY OBESE PATIENTS

H L Fitzgerald MD, G G Wisbach MD, T K Nguyen MD, A Tavakkoli-zadeh MD, D B Lautz MD, Brigham and Women's Hospital, Boston, MA

**Introduction:** Laparoscopic Roux-en-Y gastric bypass (LRYGB) is an effective treatment for gastroesophageal reflux disease (GERD) in morbidly obese patients. However, LRYGB in patients with a previous anti-reflux procedure may present a significant technical challenge. We aimed to demonstrate the safety and efficacy of laparoscopic revision from anti-reflux procedures to LRYGB in a series of morbidly obese patients.

**Methods:** Using a prospective database, we reviewed all patients who underwent laparoscopic revision of an anti-reflux procedure to Roux-en-Y gastric bypass from September 2004 to July 2008.

**Results:** Five morbidly obese patients with a previous history of anti-reflux surgery undergoing LRYGB were identified and reviewed. Three of the prior anti-reflux operations were performed open and 2 were performed laparoscopically. The average time between operations was 11.2 years (range 6–14). The average preoperative BMI was 43.2 kg/m<sup>2</sup> (range 35.8–50.8). All 5 patients were on anti-reflux medication preoperatively, and 4 (80%) were refractory to maximal medical therapy. All patients underwent LRYGB; 1 (20%) patient required a conversion to open gastric bypass due to dense adhesions. Mean operative time was 320 (range 235–482) minutes and mean blood loss was 310 cc (range 50–700). The mean length of stay was 4.5 (range 2–7) days. There were no perioperative complications or deaths. At a mean follow up of 16 (range 5–30) months, 80% of patients had complete resolution of reflux symptoms. The mean excess weight loss was 53.8% (range 32.7–77.4) and 13/22 (59%) co-morbid conditions improved or resolved.

**Conclusion:** Although LRYGB following anti-reflux surgery may present significant technical challenges, in this series we demonstrated that it can be done safely, without significant morbidity, and a low rate of conversions. In addition to significant weight loss, LRYGB resulted in an effective treatment of recurrent GERD in our series of morbidly obese patients with failed anti-reflux surgery.

23207

P047

### GASTRIC BAND MANOMETRY: ARE PRESSURE MEASUREMENTS AND THE BAND PRESSURE RATIO USEFUL?

Sebastian V Demyttenaere MD, Simon Bergman MD, Brian J Winkleman MD, Rebecca Dettorre BA, Dean Mikami MD, Bradley Needleman MD, The Ohio State University Medical Centre

**Introduction:** Successful band adjustment requires a method to measure adequate restriction without over-inflation. There is no standardized optimal volume of saline used during band filling. We investigated what the relationship was between subjective optimal band filling and band pressure measurements.

**Methods:** Band pressure measurements were recorded at the first and second band adjustments in patients who had laparoscopic gastric band placement. Pressure measurements were recorded using a portable pressure monitor with a disposable pressure transducer and three way stopcock. Data were analyzed with SPSS 11,  $p < 0.05$  significant.

**Results:** 28 patients (86% F), with mean age 51 (10) and BMI 44 (6) had their first adjustment at an average of 6 weeks and second adjustment at 3 months. Optimal band filling at the first adjustment revealed a mean volume of 2.9 (1) mL and pressure of 68 (42) mmHg while the second filling mean volume was 4.3 (1.6) mL and pressure was 56 (41) mmHg. There was only weak correlation between optimal band fill volume and pressure at the first (0.26,  $p = 0.2$ ) or second (0.45,  $p = 0.2$ ) band fills. The band pressure ratio (optimal band pressure / [occlusion pressure - opening pressure]) was 0.3 (0.2) for both visits.

**Conclusion:** Optimal band fill pressure measurements appear to fall in the range of 50–70 mmHg although the standard deviation is quite large. Band pressure measurements do not appear to correlate well with optimal band volume. An optimal band pressure ratio of 0.3 may be an objective marker for optimal filling, however subjective measurement of optimal band fill is still required.

23221

P049

### SMALLER PATIENTS DO BETTER: THE RATIONALE FOR EXPANDING THE CRITERIA FOR OBESITY SURGERY

Gopal S Grandhige, Andrew J Duffy MD, Kurt E Roberts MD, James Dziura PhD, Shu Chen MS, Robert L Bell MD, Yale New Haven Hospital. Department of Surgery. Section of Gastrointestinal Surgery

**INTRODUCTION:** The prevalence of Americans with a BMI > 40 is 4.7% but over 25% of Americans have a BMI > 30. The risks and benefits of weight loss surgery are well documented. The population of patients between a BMI of 30–35 may also benefit significantly from these surgeries; many centers are proposing investigations along these lines. We hypothesize that a smaller subset of patients is likely to do extremely well from the standpoint of operative time, length of stay, complication rate, and comorbidity resolution, establishing a rationale for expanding surgery eligibility criteria.

**MATERIALS AND METHODS:** Between 2002 and 2008, 672 LRYGB were performed. Patient demographics were entered into a longitudinal, prospective database. There were 120 males and 552 females with an average age of 42 years. The patients were subdivided into 3 groups based on their preoperative BMI: Group A (BMI range 35–45) = 187 patients (27.8%), Group B (BMI range 45–55) = 325 patients (48.4%), and Group C (BMI range > 55) = 160 patients (23.8%). Univariate analysis, log transformation and linear regression were used to compare complication rate, operative time, length of stay and comorbidity resolution between the three groups.

**RESULTS:** There is a statistically significant difference in operative time and length of stay between the three groups, adjusting for age, gender and operative time. Higher BMI patients require a longer operative time with mean times calculated as: Group A 128 m (120–137 m), Group B 137 m (129–146 m) and Group C 145 m (136–155 m) ( $p$ -value 0.0005). Length of stay was converted into a binary variable, less than 2 days and greater than 2 days and compared to Group C. Group A had an odds ratio of 0.53 (0.33–0.84,  $p$ -value 0.007) of staying more than 2 days, while Group B had a ratio of 0.58 (0.39–0.88,  $p$ -value 0.01). Comorbidity resolution/improvement across the groups was similar: Diabetes 97%, Asthma 100%, High Cholesterol 89.6%, Sleep Apnea 97%, Hypertension 96.4%. Mortality was 0% in Groups A and B, with the 30-day total complication rate among all groups being 4.7% (0% stricture, 0.74% leak, 0.44% bleeding, 0.89% conversion rate, 0.3% pulmonary embolism, 0.6% pneumonia, 0.1% ulcer formation, 0.1% intestinal obstruction, 0.3% death).

**CONCLUSION:** Smaller patients do exceedingly well after LRYGB; therefore the same opportunity should be afforded to even smaller patients in order to achieve comorbidity resolution. In smaller BMI patients, complications are minimal and the cost of surgery and to society are low (short length of stay, shorter operative time, decreased mortality).



23267

P050

### LAPAROSCOPIC SLEEVE GASTRECTOMY AS TREATMENT FOR PATIENTS WITH MORBID OBESITY WITH CONCURRENT PARAESOPHAGEAL HERNIA

Hien T Nguyen MD, Kimberley Steele MPA, Bryant McIver MS, Anne Lidor MD, Michael Schweitzer MD, Johns Hopkins Medical Institutions

**Introduction:** The management of paraesophageal hernia in patients undergoing bariatric surgery is controversial. Previously, treatment options have included performance of the procedures either in separate sequential operations, or concurrent performance of cruroplasty with either Roux-en Y gastric bypass or placement of an adjustable gastric band. We report our experience with simultaneous performance of cruroplasty and sleeve gastrectomy.

**Methods:** Four female bariatric surgical patients, aged 43 to 68, with type III paraesophageal hernia, underwent laparoscopic hernia reduction, cruroplasty, biosynthetic mesh reinforcement, and concurrent sleeve gastrectomy. Mean operative time was 2 hrs and 35 minutes. The patients were followed up to one year post-operatively for reflux symptoms, resolution of comorbidities, and weight loss.

**Results:** There were no post-operative complications. The mean average hospital stay was 2.25 days. The mean average weight loss following surgery was 22 lbs at 3 weeks and 44 lbs at 5 weeks. The average estimated excess body weight loss at six months was 30%. Most comorbidities improved or resolved and three patients reported complete resolution of reflux symptoms. One patient reported mild reflux with overeating, which was relieved with a proton pump inhibitor.

**Conclusion:** Laparoscopic sleeve gastrectomy is potentially a useful alternative in the management of bariatric patients with hiatal hernias, resulting in effective weight loss and reduction of reflux symptoms.

23298

P052

### EARLY RESULTS OF LAPAROSCOPIC ADJUSTABLE GASTRIC BANDING IN BMI < 35: THE APPROPRIATE CHOICE

Kari Thompson MD, Adam Spivack MD, John Cullen MD, Garth Jacobsen MD, Lauren Fischer MD, Brian Wong MD, Mark Talamini MD, Santiago Horgan MD, Department of Surgery, University of California, San Diego

**Objective:** Obesity is an epidemic in America and continues to worsen. Lifestyle modifications remain the first line in treatment, but typically fail for patients. As obesity worsens, the associated comorbidities become an expensive and time consuming aspect of our health care system. Placement of an adjustable gastric band in a low BMI population (< 35) allows for adequate weight loss to possibly avoid costly comorbidities.

**Methods:** Patients with a BMI equal to or less than 35 were evaluated for laparoscopic placement of adjustable gastric bands. The patients underwent full psychiatric, nutritional, and medical evaluation prior to operation. Postoperatively the patients were followed by the surgical, medical, psychiatric and dietary teams for optimal results. After placement of the adjustable gastric band patients were followed for 6 months, thus far, and a retrospective chart review performed.

**Results:** 31 patients (4 male, 27 female) with a BMI =/ < 35 underwent laparoscopic adjustable gastric banding. There were no intraoperative complications or conversion to an open procedure. Mean BMI was 32.16 (26-35). 18 of 31 patients have been followed for 6 months thus far. % excess weight loss at 1 month was 17.6% (-15% to 41%), 3 months was 21.9% (-35% to 55%), and at 6 months was 33.5% (9%-63%). There have been no post operative complications.

**Conclusions:** There is no doubt that rising obesity represents a serious epidemic both internationally and nationally. As bariatric surgeons we must find ways to halt obesity before it results in serious comorbidities, and must do so in the safest way possible. We believe gastric banding to be a promising solution. In our low BMI population, the majority of the patients are showing encouraging weight loss in the first six months. Placing an adjustable gastric band in this population shows great success as many are able to exercise and are more apt to change dietary habits. At UC San Diego we believe this offers an exciting option for those typically excluded from obesity surgery before their weight results in serious health problems.

23292

P051

### ENDOSCOPIC TECHNIQUE FOR REMOVAL OF AN INTRA-GASTRIC BALLOONS CAUSING GASTRIC OUTLET OBSTRUCTION

N Agee MD, T Urbas MD, J Goodman MD, W Arnold MD, Maricopa Medical Center Phoenix, AZ USA

**Objectives:** Intra-gastric balloons are devices used in many foreign countries as a bridge to bariatric surgery. Regulatory oversight differs from country to country leading to inconsistency in patient evaluations and procedural techniques. Often a United States (US) physician's first exposure to these devices is generally upon arrival of a patient presenting with device related sequelae. Presented is an option for endoscopic retrieval of such an intra-gastric balloon. **Description:** The patient presented with signs and symptoms of gastric outlet obstruction. Body habitus was within normal limits. CT scan showed an implanted gastric device containing fluid and air occupying the entire stomach. General anesthesia was required to perform an esophagogastroduodenoscopy using a dual channel scope. Alligator forceps were used to stabilize the device to allow for deflation. Multiple fenestrations with a biopsy needle were required. The device was removed using the forceps and a polyp snare. Of note is the fact that the recommended volume for these devices is 300-700 cc, yet our patient's balloon contained 2.5 liters of air/fluid. **Results:** The patient tolerated the procedure well and a post procedural barium swallow was negative for perforations. The patient experienced a full recovery. **Conclusion:** International institutions utilizing these devices have published a couple techniques for retrieval. The technique described here utilizes a standard US community hospital. Manufacturers of these balloons provide information to patients on countries and providers thus promoting medical tourism. With this trend, the chances for US physicians being confronted with complications increases. It is important that physicians not only be aware of such procedures and devices, but also be familiar with techniques to deal with the complications.

23302

P053

### ETHICON REALIZE BAND VERSUS ALLEGAN AP SERIES BANDS: EARLY RESULTS AT UC SAN DIEGO

Adam Spivack MD, Kari Thompson MD, Lauren Fischer MD, John Cullen MD, Brian Wong MD, Garth Jacobsen MD, Mark Talamini MD, Santiago Horgan MD, Department of Surgery, University of California, San Diego

**Objective:** The obesity epidemic has become a worldwide problem with America leading with 32% of its population considered obese (BMI > 30). This is projected to only get worse with 86% of the American population projected to be overweight or obese by 2030 with associated health care spending to be as much as \$956.9 billion. Medical therapy has been largely unsuccessful in treating obesity and the associated comorbidities. Multiple bariatric operations are performed; all with inherent risks and benefits. At UC San Diego we have chosen the laparoscopic adjustable band to be the operation of choice for patients with BMI < 60. Two companies are producing adjustable bands in the United States at this time. We are reporting our early results comparing the Allegran AP series bands versus the Ethicon Realize band.

**Methods:** Patients at UC San Diego undergo thorough evaluation by a psychiatric team, surgeon, medical doctor, and nutritionist prior to approval for placement of a laparoscopic adjustable gastric band. A retrospective chart review was performed to evaluate for any differences in weight loss and early complications between the two systems.

**Results:** A total of 187 adjustable gastric bands have been placed. 56 Realize Bands and 131 AP Lap Bands. Average BMI between the two groups was 41.3 and 41.2. Percent complications are 1.8% and 2.3% (p = 0.410) respectively. Percent excess weight loss at 1 month was 20.7% vs 17.5% (p = 0.007), at 3 months was 23.9% and 22.2% (p = 0.374), and at 6 months was 31.0% and 31.5% (p = 0.869). There was one incisional hernia in the Realize band group in the first 6 months. Six month complications for the AP system included one port erosion through the skin that needed to be replaced and two flipped ports needed repositioning.

**Conclusions:** As the obesity epidemic worsens we need aggressive, safe, and effective treatment modalities. Currently there are two companies producing adjustable gastric bands in the United States. In our experience at UC San Diego we have found equivalence in the % excess weight loss and early complications between the Realize and AP band systems at 6 months. Further longterm follow up is needed to further evaluate weight loss and possible complications.

23330

P054

### RETROGRADE INTUSSUSCEPTION AFTER ROUX-EN-Y GASTRIC BYPASS PATIENTS: A CASE SERIES OF 10 PATIENTS

Nilesh H Bhoor MD, John Pilcher MD, Dana Reiss MD, Michael V Seger MD, Lloyd Stegemann MD, Terive Duperier MD, New Dimensions Weight Loss Surgery, San Antonio, TX, Minimally Invasive Surgeons of Texas

**Introduction:** The number of weight loss procedures is rising rapidly, so that complications which were previously considered rare are not uncommon now. Retrograde intussusception following roux-en-y gastric bypass surgery is an example of a surgical problem that was previously considered rare in adults, but which may become common enough to merit discussion in the overall general surgical community.

**Material and methods:** In one year we encountered 4 cases of retrograde intussusception at the jejuno-jejunostomy. A review of practice records extending back to 1999, revealed a total of 10 cases of intussusception treated by our group.

**Results:** We have treated 3 cases following open and 7 cases following laparoscopic gastric bypass. All patients were female. The average duration from the gastric bypass procedure was 45 months, and the average weight loss was 113 Lbs. Three patients were initially treated by reduction and pexy - all of these developed recurrences of the intussusception, requiring resection and reconstruction of the jejunojejunostomy. In all cases, the intussusception was retrograde fashion and no identifiable lead point was found.

**Discussion:** The underlying cause is not clear, but it seems there must be a combination of anatomic abnormality; an enlarged anastomosis which can accept the intussusceptum, and motility dysfunction to cause reversed or disordered peristalsis. Further research is needed to find out the exact reason and prevention of retrograde intussusception following gastric bypass surgery. We recommend resection of the jejuno-jejunostomy as well as any intestine that was damaged by the intussusception and reconstruction.

23344

P055

### SAFETY OF LAPAROSCOPIC ADJUSTABLE GASTRIC BAND (LAGB): 7-YEAR DATA FROM A U.S. CENTER OF EXCELLENCE

George Fielding MD, Marina Kurian MD, Heekoung Allison Youn, RN, CCRC, MA, Christine Ren MD, New York University Medical Center

**Objectives:** To assess the complications associated with gastric band.

**Methods:** A retrospective analysis was performed using longitudinal data from adult patients who received LAGB between Jan 1, 2000 and Feb 29, 2008. General complications, (bowel obstruction, hernia, dehydration, gall bladder, and pain) as well as band-related complications (erosion, slippage/prolapse, device malfunction, intolerance/removal, and port-related issues) were reported for all patients undergoing surgery. Death and re-operation for weight gain (LAGB followed by either a second band insertion or gastric bypass), were also reported.

**Results:** Mean EWL of 53% was achieved at 3 years post-surgery and sustained over time by LAGB recipients with at least 1 record of post-surgical weight (n = 2,909). Of the 2,965 patients who received LAGB during the study period, 363 (12.2%) experienced 1 or more complications. The most common complications were band slip (4.5%) and port-related problems (3.3%). Other complications were rare (Table); only 7 (0.2%) patients had band erosion. Nine (0.3%) deaths unrelated to surgery, 1 (0.03%) death related to surgery, and 11 (0.4%) re-operations for weight gain were reported.

**Conclusions:** LAGB patients in this 7 year study achieved substantial and sustained weight loss, with few major complications.

Complications	N	%
Band slip	134	4.52%
Port-related problems (leak, abscess, disconnection, port infection, migration, or ulceration)	99	3.34%
Non-band-related problems (nutritional deficiency, ventral hernia, dehydration, surgical site problem, infection, ileus, pancreatitis, deep venous thrombosis, or injury of spleen)	60	2.02%
Band-related problems (band intolerance/removal, leak/perforation, device-related obstruction, or device-related malfunction)	49	1.65%
Band erosion	7	0.24%

23357

P056

### IMPACT OF ROUX LENGTH ON WEIGHT LOSS AFTER LAPAROSCOPIC GASTRIC BYPASS

Brandon Williams MD, Willie V Melvin MD, Robert O Carpenter MD, Sharon E Phillips MPH, William O Richards MD, Vanderbilt University Medical Center

**Background:** Many surgeons use longer roux limbs in laparoscopic roux-en-Y gastric bypass (LRGB) for more overweight patients in an attempt to achieve greater weight loss. However, prior studies have shown conflicting results regarding the impact of roux length on weight loss. Moreover, gastric bypass produces weight loss through additional mechanisms which are potentially more potent. Our hypothesis is that roux length is not a significant determinant of weight loss after gastric bypass.

**Methods:** We retrospectively analyzed 366 LRGB patients, operated on at a single institution between November 2000 and January 2006, for weight loss two years after surgery. All operations entailed a 40 cm biliopancreatic limb, and varying roux limb lengths: 60 cm (n = 3), 75 cm (n = 29), 90 cm (n = 1), 100 cm (n = 179), 125 cm (n = 36), 130 cm (n = 2), 150 cm (n = 104), and 200 cm (n = 2). The roux length was based partly on the patient's pre-operative body mass index (BMI).

**Results:** In our study population the average age was 43.9 years, and 87% were women. The average pre-operative BMI was 49.1 kg/m<sup>2</sup> (range 34.5–82.7). A longer roux limb was associated with a higher pre-operative BMI (Roux length in cm, mean BMI in kg/m<sup>2</sup>): (< 100, 43.2), (100, 45.1), (125–149, 50.0), (> 149, 56.7). Two years after surgery, the mean absolute weight loss (AWL) was 111.7 pounds (range 30 – 253) and mean excess weight loss (EWL) was 79% (range 31.9 – 137). In multivariate analysis, the only predictor of AWL or EWL was starting excess weight. A higher starting excess weight predicted greater AWL but less EWL. In linear regression analysis, controlling for initial excess weight, roux length was not a significant predictor of AWL (p = 0.9) or EWL (p = 0.6). In a subgroup analysis of patients with a pre-operative BMI > 50, roux length was still not a significant predictor of AWL (p = 0.9) or EWL (p = 0.8). **Conclusion:** We found pre-operative excess weight was associated with both absolute and excess weight loss at two years after gastric bypass. After controlling for pre-operative excess weight, roux limb length did not predict either absolute or excess weight loss. We conclude that roux limb length does not significantly impact weight loss two years after laparoscopic gastric bypass.

23375

P057

### LAPAROSCOPIC VERTICAL SLEEVE GASTRECTOMY FOR BMI < 50

Janos Taller MD, Jay Grove MD, Kristen Stevens MD, Tamara Middlesworth DO, Deborah Romero RN, Annelise Brown RN, William Bertucci MD, Naval Medical Center San Diego

**Introduction:** Since its introduction, the laparoscopic vertical sleeve gastrectomy (LVG) has rapidly gained popularity as a treatment modality for morbid obesity. The benefits of the vertical sleeve gastrectomy include a low complication rate, the avoidance of foreign material, maintenance of normal gastro-intestinal continuity, the absence of malabsorption and the ability to convert to multiple other operations for weight loss failure or recidivism. We reviewed our experience with the LVG as the primary treatment modality for morbidly obese patients with a BMI < 50.

**Methods:** All patients took part in a comprehensive obesity program. As laparoscopic gastric banding was not authorized by the military health system until October 2007, patients requesting a purely restrictive weight loss procedure were offered LVG. LVG was performed through linear stapling of the gastric fundus along a 32Fr orogastric tube placed against the lesser curve. We performed a prospective secondary analysis of an existing database with IRB approval.

**Results:** The results for patient characteristics, complication profile and weight loss are detailed in the tables below.

#### Results LVG (n = 105)

Age	37.0	Complications %	7.5
BMI	40.5	OR Time (min)	96.8
Female %	92.0	LOS (days)	2.10
Hypertension %	48.0	Leak %	0.9
Diabetes %	10.0	EBWL% 1 Year	75.2
OSA %	13.0	Follow Up %	81.3

**Conclusion:** LVG is safe and effective as the primary procedure for the treatment of morbid obesity.

### REGRESSION OF NEPHROPATHY IN TYPE 2 DIABETIC PATIENTS WITH BMI BELOW 30 SUBMITTED TO THE LAPAROSCOPIC ILEAL INTERPOSITION

Aureo L De Paula PhD, Antonio Macedo MD, Cesar Machado MD, Vladimir Schraibman MD, Luiz Silva, Bruno Mota MD, Sergio Vencio MD, Hospital de Especialidades, Goiania, Brazil

**Introduction:** Between 20 to 40% of type 2 diabetes mellitus patients (T2DM) develops nephropathy. It is considered the most common cause of end-stage renal disease. The objective of this study is to evaluate the regression of nephropathy in patients with T2DM with BMI below 30 that were submitted to the laparoscopic ileal interposition associated to a sleeve gastrectomy (LII-SG).

**Methods:** The procedure was performed in 72 patients. 51 were men and 21 women. Mean age was 52.8 years (38–66). Mean BMI was 26.7 kg/m<sup>2</sup> (22.1 – 29.4). All patients had evidence of stable treatment with oral hypoglycemic agents and or insulin for at least 12 months. Insulin therapy was used by 51.4 of the patients. Mean duration of T2DM was 10.5 years (3–22). Mean A1c was 8.5%. Microalbuminuria (30–299 µg/min) was diagnosed in 40.3% of the patients and macroalbuminuria (> 300 µg/min) in 8.4%. The mean clearance of creatinine was 98.2 mL/min (45–111), 4.5% of the patients had creatinine clearance below 60 mL/min. Forty patients (55.5%) had arterial hypertension.

**Results:** Mean post-operative follow-up was 24.5 months (12–38). Mean postoperative BMI was 21.2 kg/m<sup>2</sup> (17 – 26.7). Mean A1c was 6.1%, ranging 4.4 to 8.3. Overall, 91.4% of the patients achieved an adequate glycemic control (A1c < 7) without anti-diabetic medication. A1c below 6 was achieved by 50%, 41.4% had A1c between 6 and 7 and 8.6% had A1c above 7. Microalbuminuria was normalized in 86.2% of the patients. Macroalbuminuria was no longer characterized. The mean clearance of creatinine was 116 mL/min, ranging from 58.6 to 145. Arterial hypertension was controlled in 90% of the patients.

**Conclusions:** While the progression of diabetic nephropathy cannot be avoided, the LII-SG seems to be a promising procedure for the control of this disease and an effective operation for the regression of T2DM in a non-obese (BMI < 30) population.

### LINEAR ASSOCIATION OF LIMB LENGTH AND WEIGHT LOSS IN 3,309 MINI-GASTRIC BYPASS PATIENTS

R Rutledge MD, Center for Laparoscopic Obesity Surgery

The effect of limb-length on weight loss after gastric bypass is controversial. Some studies have concluded longer bypasses increase weight loss while others have no effect of bypass length on weight loss. Review of the negative studies show generally small sample sizes and thus are likely to be at risk for a beta, type II error. The purpose of this study was to compare the effect of variable limb lengths in patient weight loss.

**Methods:** 3,309 patients underwent Mini-Gastric Bypass and completed 1 year of follow up. Bypass limb length was modified based on starting weight.

**Results:** Weight loss following surgery followed a logarithmic decline following surgery through the end of the first year and then leveled off (fig. 1.) Weight loss was directly related to bypass limb length (fig 1.) As limb length increased mean weight loss at 1, 3, 6 and 12 months increased linearly. Linear regression model ( $y = mx + b$ ) was  $y = 8.1 \text{ kilograms} * x + 9.6 \text{ kilograms}$ , (Regression Coefficient:  $r = 0.98$ ) i.e. the model predicts an increase 7.7 kilograms for every additional foot of bowel bypassed.

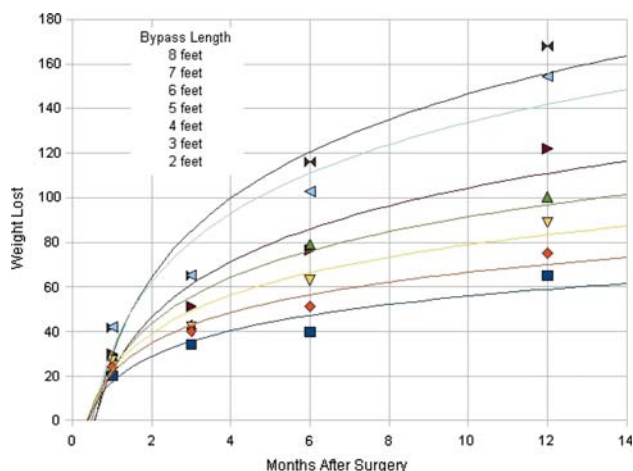


Fig. 1

### TWO YEARS RESULT ON GLYCEMIC CONTROL OF OBESE TYPE 2 DIABETES PATIENTS FOLLOWING INTRAGASTRIC BALLOON REMOVAL

Simon K Wong MD, Enders K Ng MD, Bonnie Y Tsung PhD, Candice C Lam RN, Man Yee Yung RN, The Chinese University of Hong Kong

**Background:** Intra-gastric Balloon (IGB) is an alternative endoscopic procedure to achieve weight loss and improve obesity related co-morbidities. The impact of IGB in type 2 diabetes mellitus (T2DM) after its removal is uncertain.

**Patients and Methods:** 28 obese T2DM patients (20 female; mean age 43.5 ± 11.0 years, mean BW 107.5 ± 24.5 kg; mean BMI 40.6 ± 9.3 kg/m<sup>2</sup>) underwent IGB were evaluated for improvement their glycemic control (fasting blood glucose FBG, HBA1c level, need of hypoglycemic agents) after weight reduction in a multi-disciplinary university referral center. Bioenterics Intra-gastric Balloon (BIB®) system was employed in the study. Remission of their T2DM defined as normalized FBG & HBA1c without need of any hypoglycemic agents.

**Results:** Mean IGB treatment period was 164.5 ± 41.3 days and 2 patients (7.1%) required early removal (27 & 37 days) due to severe vomiting. Mean body-weight, BMI and %EBW loss were 11.3 ± 5.8 kg, 4.2 ± 2.2 kg/m<sup>2</sup> and 37.5 ± 34.2 % immediate after removal of IGB. After IGB removal, their FBG (8.9 ± 2.2 vs. 6.8 ± 3.1 mmol/l;  $p = 0.0005$ ) and HBA1c level (7.5 ± 1.5 vs. 6.4 ± 1.8 %;  $p = 0.011$ ) was significantly improved as compared before IGB placement and 10 of them (35.7%) achieved remission of their T2DM. Nine patients received second stage bariatric surgery (initial T2DM remission,  $n = 3$ ) and further weight loss (weight loss 4.8 ± 10.9 kg) & BMI loss (1.8 ± 4.0 kg/m<sup>2</sup>) were observed at a median FU of 24 months, and one additional patient has T2DM remission. However, for those patients did not receive additional surgery (initial T2DM remission,  $n = 7$ ), there were significant weight regain (4.2 ± 5.2 kg) at a median FU of 21.5 months. Their FBG (6.8 ± 3.6 vs. 8.8 ± 2.7 mmol/l;  $p = 0.019$ ) and HBA1c level (7.0 ± 2.5 vs. 7.6 ± 1.9 %;  $p = 0.262$ ) had worsen after IGB removal and only 3 out of 7 (42.8%) of them remain remission from their T2DM.

**Conclusion:** Although IGB can achieve short term weight loss and improvement of T2DM status, this effect cannot sustain and surgery remains the most reliable procedure for glycemic control in obese diabetic patients.

### MIGRATION OF SUTURE MATERIAL: AN UNUSUAL CAUSE OF ABDOMINAL PAIN AFTER GASTRIC BYPASS SURGERY

Tahir E Yunus MD, Francisco Tercero MD, Abdelrahman Nimer MD, Keith Boone MD, Kelvin Higa MD, UCSF-Fresno

**Objective:** The potential for internal hernias and subsequent bowel obstruction following laparoscopic RNY gastric bypass (RYGB) mandates closure of mesenteric defects. We have previously recommended the use of non-absorbable suture material to limit this complication. However, recently we have identified several patients presenting with abdominal pain and/or perforation secondary to migration of the suture material. This is a review of our experience with this rare, unusual complication; potential causes, management and prevention. **METHODS:** Retrospective review of prospective database, hospital and clinic records with 100% follow up. **RESULTS:** 12 patients were identified: (1) male, (11) female; mean age at presentation 43 yrs. All had undergone a primary standard retrocolic, ante-gastric RYGB with closure of all potential hernia defects: jejuno-jejunostomy (JJ), mesocolic (MC), and Petersen's space with permanent suture. Most frequent presentation was of post-prandial abdominal pain. Mean interval between RYGB and presentation was 16 months. 11 pts underwent 13 endoscopies, 10 were diagnostic, and 3 were negative. 8 endoscopies identified intra-luminal suture bezoar, 3 were therapeutic using endoscopic shears and 3 were suggestive due to stricturing in roux limb at MC defect. 11 CT scans were obtained in 8 pts, 6 were normal, 5 had positive findings including: mesenteric inflammation  $n = 4$ , intra-abdominal abscess  $n = 1$  and contrast in the gastric remnant suggestive of partial obstruction  $n = 2$ . Nine pts were managed by exploratory laparoscopy, 1 pt was explored twice. Laparoscopic findings included: mesenteric fibrosis and scarring at MC or JJ defect closures  $n = 6$ , intra-abdominal abscess, chronic perforation  $n = 2$  and free air after endoscopy  $n = 1$ . Intra-luminal suture bezoar was seen in 10 pts, 1 pt had extra-luminal suture abscess, and 1 pt had chronic MC defect fibrosis. **CONCLUSION:** Abdominal pain after RYGB mandates investigation. CT scan and endoscopy may help to delineate the cause; however work up is incomplete without a laparoscopic exploration. This has been proven to rule out the presence of an internal hernia; and now also to investigate for potential complications of permanent suture material. Although often diagnostic and therapeutic, endoscopic evaluation alone will not rule out complete migration of the suture material. If suspected, endoscopists should be prepared to treat this problem with the proper endoscopic shears available. Non-circumferential closure of the mesocolic defect may decrease the incidence of this complication.

23448

P062

### MINI-GASTROPLASTY: RESULTS OF NON-RESECTIONAL SLEEVE TYPE GASTROPLASTY

R Rutledge MD, The Centers for Laparoscopic Obesity Surgery

Background: Work continues to find the ideal weight loss surgery. The Mini-Gastroplasty (MG) was designed to provide a simple, safe and effective restrictive type of Gastroplasty, with anatomy similar to the sleeve gastrectomy, has been used for 9 years.

Methods: The MG consists of a complete division of the lesser curve from the body of the stomach to the antrum (Collis gastroplasty.) The gastric tube is then reattached to the distal stomach with a 1 cm diameter anastomosis. The MG was chosen over Gastric Bypass for two groups of patients, 1, those that were morbidly obese but could not have a bypass for various reasons and 2, for those that needed lesser amounts of weight loss.

The MG was chosen for 32 patients who had morbid obesity (MO) and an inability to perform a bypass and 207 patients underwent MG because of less severe obesity (LSO).

Mean preoperative BMI in MO patients was 46.5 kg/m<sup>2</sup>, and mean Excess Body Weight (EBW) was 65 kg. The mean BMI in LSO patients was 34.6 and the mean EBW was 33 kg. There was no mortality. Major complications occurred in 2% of patients. There were few side effects. Mean weight loss was 31 kg ( $\pm$  10 kg), equivalent to 48% of excess weight in MO patients. Mean weight loss in LSO patients was 29 kg ( $\pm$  12 kg), equivalent to 87% of EBW.

Conclusions: The results of the Mini-Gastroplasty are very similar to other restrictive operations (i.e. Lap Band, Sleeve Gastrectomy). When confined to lower weight patients it is a simple and successful procedure with a mean expected weight loss of 33 kg equal to 87% of EBW. In heavier patients the absolute weight loss remains the same and the value of the procedure lessens although it can be useful in staged procedures and when a bypass cannot be performed. The Mini-Gastroplasty avoids the foreign body of the Lap band and unlike the Sleeve Gastrectomy is easily reversible.

23512

P064

### EARLY EFFECTS OF BARIATRIC SURGERY ON PRO AND ANTI-INFLAMMATORY MEDIATORS AND CARDIOVASCULAR RISK FACTORS

Patrick Gatmaitan MD, Stacy Brethauer MD, Dan Cottam MD, Tomasz Rogula MD, Bipan Chand MD, Hazel Huang MS, Deanne Nash RN, Rami Fouad MD, John Kirwan PhD, Snageeta Kashyap MD, Philip Schauer MD, Cleveland Clinic, Cleveland, OH

Introduction: Obesity is associated with a chronic inflammatory state and increased risk for cardiovascular disease. We hypothesize that gastric bypass is associated with rapid improvements in inflammatory mediators and cardiovascular risk.

Methods: We performed a prospective pilot study of morbidly obese patients who underwent laparoscopic Roux-en-Y gastric bypass. Patient demographics, clinical data and biochemical markers related to inflammation and cardiovascular risk were documented (i.e. fibrinogen, C-reactive protein, TNF-alpha, PAI-1, IL-6, IL-10, IL-1Ra, adiponectin, leptin, triglycerides, total cholesterol, HDL, LDL, glucose, insulin, HbA1c). Framingham cardiovascular risk score was calculated. Above parameters were gathered pre-operatively and at 3 and 6 months post-operatively.

Results: Fifteen patients (11 female) were included in the study with a mean age of 49.3 years, average body mass index of 48.1  $\pm$  5.3. At 6 months, the mean BMI decreased to 35.4  $\pm$  4.5 corresponding to 51.7% excess weight loss. The mean waist circumference decreased significantly from 132 cm to 110 cm at 3 months (p 0.003) and 107 at 6 months (p 0.0001). At 3 months, there was a significant decrease in the pro-inflammatory markers CRP (p 0.01) and leptin (p 0.005) while the anti-inflammatory mediator adiponectin was increased (p 0.002). Also, triglyceride, total cholesterol and LDL cholesterol were all significantly decreased (p 0.01, 0.006, 0.011). At 6 months, there were significant reductions in CRP (p 0.0008) and fibrinogen (p 0.047). The other pro-inflammatory markers such as PAI-1, TNF and IL-6 were decreased but did not reach statistical significance. Leptin and insulin were significantly decreased (p 0.005 and 0.006 respectively). IL-10 was increased at 3 months (NS) but not at 6 months. IL-1Ra decreased significantly at 6 months (p 0.006). Adiponectin continued to increase at 6 months (p 0.004). Relative risk for 10-year coronary heart disease based on Framingham risk score was significantly improved at 6 months (1.69  $\pm$  0.20 vs. 1.118  $\pm$  0.20, p 0.005).

Conclusion: Gastric bypass is associated with an early decrease in levels of pro-inflammatory mediators, an increase in some anti-inflammatory markers, and improved cardiovascular risk at 6 months.

23498

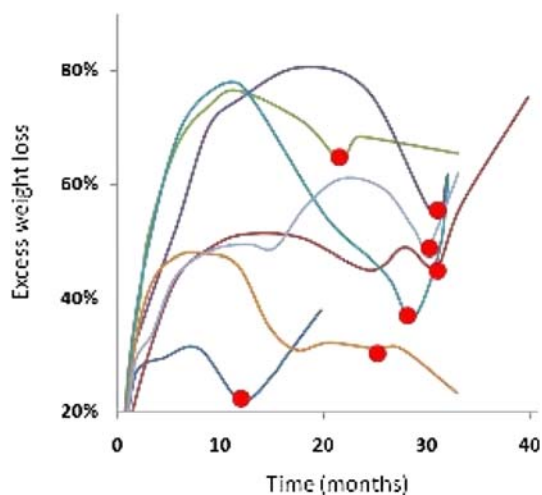
P063

### LAPAROSCOPIC REVISION AFTER ROUX-EN-Y GASTRIC BYPASS FOR POUCH ENLARGEMENT

Guillaume Becouarn BA, Patrick Ritz BA, Philippe Topart BA, Société de Chirurgie Viscérale, Clinique de l'Anjou, Angers, France and PCVM, CHU, Toulouse, France

Some patients that have had a gastric bypass display a distension of the gastric pouch that may participate to weight regain. We studied the impact of pouch size reduction on weight changes. Seven patients aged 42.9  $\pm$  8.9 yrs, with an initial BMI of 42.5  $\pm$  5.7, who had had a Roux-en-Y gastric bypass (RYGB) were reoperated on from June 2007 to September 2008. All procedures except one had been done laparoscopically in an antegastric-antecolic fashion with a 30-50 cc vertical gastric pouch, and a sum of biliopancreatic and Roux lengths of 212  $\pm$  50 cm. Two patients with a BMI < 40 had a gastric band failure and RYGB included band removal, while in another patient a Nissen fundoplication was left untouched. Indication for revision was weight regain. Gastric pouch enlargement was documented on barium swallow in every case. Revisions were performed laparoscopically 25.8 months after the RYGB. Gastric pouch size reduction (with takedown of a fundoplication valve in 1) and redo gastrojejunal anastomosis was performed over a mean 116 min in five patients. The other 2 patients had pouch size reduction with blind Roux loop resection only. Biliopancreatic and Roux limb length remained unchanged. There were no complications. After revision weight loss resumed in the 5 patients who had redo gastrojejunal anastomosis (as shown in the figure, large dot indicating revisional surgery).

The other 2 patients with a follow-up of one year did not achieve further significant weight loss. Although long term efficacy and larger studies are warranted, laparoscopic revision of RYGB can be safely performed and seems to resume weight loss. Gastric pouch size reduction only may not be sufficient to achieve additional weight loss.



23516

P065

### RESOLUTION OF DIABETES MELLITUS FOLLOWING LAPAROSCOPIC GASTRIC BYPASS. A PROSPECTIVE ANALYSIS OF 49 PATIENTS

Piotr Gorecki MD, Paul Thodiyil MD, Catherine Gribbin MD, Sabita Moktan MD, Torolani Anthony MD, New York Methodist Hospital, Brooklyn, New York

Introduction: Morbid obesity is a chronic disease that reduces life expectancy and is a major risk factor for type II diabetes. Bariatric surgery is the only therapy that produces significant and sustained weight loss and has been reported to result in clinical and biochemical resolution of type II diabetes.

Aim: Measure the effect of gastric bypass surgery on Type II diabetes mellitus

Hypothesis: Gastric bypass improves fasting blood glucose, HbA1c and plasma insulin levels

Methods: This is a review of prospectively collected database of morbidly obese subjects undergoing laparoscopic Roux-en-Y gastric bypass (LRYGBP) between August 2001 and October 2006. Consecutive series of patients with type II diabetes and morbid obesity and meeting NIH criteria for bariatric surgery were chosen. Demographic data, weight and height were recorded. Fasting plasma glucose, HbA1c and fasting insulin levels were measured preoperatively and at 3 and 12 months postoperatively.

Results: 49 patients (female 43) had complete follow-up and data at 3 and 12 months. The mean age was 37 yrs (18-67yrs) with weight and BMI of Weight 298 lb (186-479 lb) and 48.3 kg/m<sup>2</sup> (35-73) respectively. Mean percentage excess weight loss was 70% at 12 months. Fasting blood glucose (mg/dl) fell from a preoperative value 161 to 98 and 88 at 3 and 12 months respectively (p < 0.001). HgA1c(%) showed significant improvement from a preoperative value of 7.4 to 6.3 and 5.6 at 3 and 12 months postoperatively (p < 0.02). This was associated with a significant fall in fasting insulin (pmol/L) from a preoperative 44.7 to 8.8 and 7.5 at 3 and 12 months postoperatively (p < 0.03)

Conclusions: The majority of morbidly obese patients with diabetes who underwent LRYGB showed improvement in fasting glucose levels, HbA1c and fasting insulin levels. These findings are consistent with resolution or improvement in diabetes mellitus in morbidly obese patients undergoing Roux-en-Y gastric bypass.

**EFFECT OF GASTRIC BYPASS ON C-REACTIVE PROTEIN LEVELS: A PROSPECTIVE ANALYSIS**

Piotr Gorecki MD, Ankeet Udani BA, Tetsuya Takeuchi MD, Krystyna Kabata, Anthony Tortolani MD, Department of Surgery, New York Methodist Hospital, Brooklyn, New York

**Introduction:** Surgical treatment of morbid obesity improves many co-morbidities including diabetes, hypertension, sleep apnea, and asthma. Elevated CRP levels, common in the morbidly obese, and its reflected increase in cardiovascular and cerebro-vascular complications has led to further study in patients undergoing laparoscopic Roux-en-Y gastric bypass (LRGB). In this study we prospectively investigate the relationship between laparoscopic gastric bypass surgery induced weight loss and serum CRP levels.

**Methods and Procedures:** All patients met the NIH criteria for Bariatric surgery and were operated upon by a single surgeon (PG) between June 2006 and January 2008. Demographic data, weight, and height were measured preoperatively. CRP levels were obtained pre-operatively and at 3 and 12 months following LRGB.

**Results:** Forty-one subjects (average age 43.6 years, average BMI 48.8) were followed for 3 months. Mean CRP levels decreased from 12.3 mg/l pre-operatively to 6.6 mg/l at 3 months (P < .0001, Paired t-test, 37.9% Normalized). Twenty-five subjects (average age 39.1 years, average BMI 50.4) were followed for 12 months. Mean CRP levels decreased from 11.9 mg/l pre-operatively to 2.8 mg/l at 12 months (P < .0001, Paired t-test, 63.2% Normalized).

**Conclusion:**C-Reactive protein serum levels were significantly reduced at 3 and 12 months following LRGB. The reduced pro-inflammatory state may play a significant role in the mechanism of resolving co-morbidities associated with morbid obesity.

**DOES MEDICALLY SUPERVISED WEIGHT-LOSS EFFECT WEIGHT LOSS AFTER BARIATRIC SURGERY?**

Galaxy Shah MD, Mark Choh MD, Heather Herren, Subhashini Ayloo MD, University Of Illinois, Chicago

**Introduction:** It is a proven fact that the bariatric surgery is effective in the treatment of morbid obesity and as a consequence results in the improvement/resolution of obesity associated comorbidities. Yet health insurers have stringent guidelines for indication of bariatric surgery which includes multidisciplinary evaluation with different time lengths of mandatory medically supervised weight loss (MSWL). For reasons MSWL would result in patient education and in turn would lead to life-style changes quintessential for weight loss. The objective of our study is to evaluate the equivalence of weight loss between two major providers: HMO's (MSWL ranging from 3 months to 18 months) and Medicaid and self pay group with one month of MSWL.

**Methods and Procedures:** Single institution and single surgeon experience of minimally invasive roux-en-Y gastric bypass between 2006 and 2008 were retrospectively reviewed. Data were analyzed for patient demographics, payor type, change in Body Mass Index (BMI) at regular intervals of 1, 3, 6 and 12 months, and 90-day patient outcomes. T-test was performed to compare the decrease in BMI at 1, 3, 6 and 12 months between the two payor groups.

**Results:** Analysis demonstrated in HMO group the patients were female 82%, mean age of 43 and mostly accounted by Caucasian patients 44.8%. In Medicaid and self pay the patients were female 100%, mean age of 37 and mostly accounted by African American patients 67.6%. The interval change in BMI at 1, 3, 6 and 12 months are tabulated as below

Table 1 Demographic information

	HMO n = 67 n(%)	IDPA & Self Pay n = 37 n(%)
Age $\mu$ ( $\sigma$ ,min,max)	43.3yrs (8.5,22.7,60.2)	37.0yrs (7.7,25.4,56.4)
Female Gender	55 (82.1%)	37 (100.0%)
Race		
African american	22 (32.8%)	25 (67.6%)
Caucasian	30 (44.8%)	5 (13.5%)
hispanic	8 (11.9%)	5 (13.5%)
Others	7 (10.5%)	2 (5.4%)

n = Number,  $\mu$  = Mean,  $\sigma$  = standard deviation

Table 2 Decrease in BMI at months 1, 3, 6, and 12

	HMO	Medical + Self Pay
BMI decrease at 1 month $\mu(\sigma)$	5.42 (1.98)	5.83 (2.34)
BMI decrease at 3 month $\mu(\sigma)$	9.40 (3.15)	10.30 (2.96)
BMI decrease at 6 month $\mu(\sigma)$	11.11 (3.21)	13.55 (4.70)
BMI decrease at 12 month $\mu(\sigma)$	13.50 (2.31)	15.82 (6.63)

**Conclusions:** Roux-en-Y gastric bypass resulted in good weight loss in both groups. The Medicaid group is predominantly accounted by woman and African-American patients. In short term follow up there is no significant difference in weight loss between the HMO and Medicaid group in spite of different time lengths of mandatory medically supervised weight loss. Long term follow-ups are required to modify the policies of health-insurers for indication of bariatric surgery.

**MULTIPLE DIAGNOSTIC INVESTIGATIONS DELAY APPROPRIATE CARE IN THE MANAGEMENT OF BARIATRIC SURGERY-RELATED MALNUTRITION**

Geoffrey P Kohn MD, Juan C Vasquez MD, Raghid S Bitar MD, Timothy M Farrell MD, Division of Gastrointestinal Surgery, University of North Carolina, Chapel Hill, NC

**Introduction:** The recent increase in primary bariatric surgery has been coupled with an increase in revisional bariatric surgery. While most revisional surgery is for inadequate weight loss, a small but significant number of malabsorptive complications require re-intervention. The requirement for revision is suggested by symptoms and signs of malabsorption and malnutrition. Multiple investigational studies are often performed in an attempt to determine the anatomy. The utility of such tests is examined.

**Methods:** We describe our series of three patient with bariatric surgery-induced malabsorption who underwent pre-operative workup followed by surgical revision. Two of the patients had previously undergone Roux-en-Y gastric bypass, and one had received a duodenal switch procedure. The initial operative record was reviewed and it was noted that all operating surgeons had intended to apply accepted limb length configurations. Preoperative investigations to determine the anatomy were attempted. Correlation of these investigations with surgical findings were investigated.

**Results:** Clinical findings suggestive of malabsorption and malnutrition were identified in all patients. Biochemical hypoproteinemia was confirmed. Careful review of operative records, as well as multiple diagnostic methods, including small-bowel follow through contrast imaging, abdominal computed tomography scans and endoscopy provided no additional important information. Due to difficulties in identifying the enteroenterostomy anastomosis, the length of the common channel was not able to be determined. Though not helpful, these investigations did cause significant delay in scheduling for revisional surgery, with the time from initial surgery to appreciating the requirement for revisional surgery in all cases being more than 6 months.

**Conclusion:** In the post-bariatric surgery patient, clinical findings suggestive of malnutrition are best managed by early revisional surgery. Repeated attempts at anatomic investigation are unhelpful.

**SUTURE LINE BUTTRESSES ARE NOT ASSOCIATED WITH FEWER COMPLICATIONS IN ROUX-EN-Y GASTRIC BYPASS**

William M Bowling MD, Judith L Priestley BS, Janet A Fike, Kurt A Kralovich MD, James W Wagner MD, Jamal Farhan MD, Hurley Bariatric Center

**Introduction:** Suture line complications can cause major morbidities and mortality after Roux-en-Y gastric bypass. Suture line buttresses have been used in an attempt to prevent these complications. This study was done to determine if the introduction of suture line buttressing to our practice has decreased our complication rate.

**Methods:** After obtaining IRB approval, our database was queried for the following complications: leak, endoscopy, dilation, GI bleed, readmission, reoperation and thirty-day mortality. The incidence of these complications before and after the introduction of suture line buttressing was compared using chi-squared.

Complication	Leak	Dilation	Endoscopy	GI bleed	Re-admit	Re-operation
W/o buttress	10 (0.4%)	114 (5.1%)	237 (10.6%)	18 (0.8%)	173 (7.8%)	17 (0.8%)
With buttress	1 (0.4%)	13 (4.8%)	19 (7.1%)	0 (0.0%)	27 (10.0%)	5 (1.9%)
p	0.858	0.844	0.686	0.273	0.191	0.141

**Results:** There were 2499 Roux-en-Y gastric bypasses. Two thousand two hundred thirty patients were operated on without buttressing, while buttresses were used in 269 cases. There were 5 deaths among patients without buttresses (0.2%) and 3 among patients with buttresses (1.1%); this difference was significant (p = 0.015). The incidence of complications in each group is shown in the table.

**Conclusion:** The use of suture line buttresses is not associated with decreased suture line complications in this study. The power of this study is limited by smaller numbers of patients who received buttresses and the rarity of the events analyzed. The increased mortality is most likely a Type I error given that complications are not increased. Larger studies may identify differences, but such small gains may not be cost-effective.

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P070

### LAPAROSCOPIC ROUX-EN-Y GASTRIC BYPASS: SHORT TERM WEIGHT LOSS OUTCOMES AT A MILITARY TREATMENT FACILITY

Joel R Brockmeyer MD, Jason M Seery MD, Yong U Choi MD, Arthur B Chasen MD, D.D. Eisenhower Army Medical Center, Ft. Gordon, GA

**Introduction:** Short term weight loss outcomes after Roux-en-Y gastric bypass (LGB) are not found in large numbers within the literature. This study establishes a weight loss curve that individual patients may be compared to at follow up visits.

**Methods:** This study is a retrospective analysis of all patients receiving LGB from the initial inception of the procedure at Eisenhower Army Medical Center from September 2006-October 2008. Weight and data were collected from the patients' General Surgery Obesity Clinic charts and the Armed Forces Health Longitudinal Technology Application (AHLTA) system.

**Results:** 76 patients (91% female) received LGB over this time period with a mean BMI of  $42.5 \pm 12.1$  (Range 35.7-50.8). The average age was  $42.5 \pm 12.1$  years. The mean excess body weight was  $127.2 \pm 28.0$  lbs prior to surgery. Following LGB, the mean percentage of excess weight loss at 1 week was  $11.5 \pm 6.64\%$ , at 1 month was  $21.9 \pm 8.28\%$ , at 3 months was  $40.8 \pm 12.3\%$ , at 6 months was  $60.4 \pm 27.8$ , and at 12 months was  $63.24 \pm 20.6\%$ . The mean BMI at 1 week was  $39.5 \pm 4.49$ , at 1 month was  $37.9 \pm 4.42$ , at 3 months was  $33.7 \pm 4.62$ , at 6 months was  $29.8 \pm 5.86$ , and at 12 months was  $28.72 \pm 4.56$ .

**Conclusions:** These results are comparable to published values of percent of excess weight loss at 3, 6, and 12 months. After adjusting for age and demographics, expected short term weight loss outcomes following LGB can be established. These values can be used to motivate patients during the first year and to help physicians track the early success of bariatric surgery. As long term outcome data is collected, comparison of successful short term weight loss may be compared to successful long term weight loss to determine correlation.

23664

P072

### SURGERY VS. NO SURGERY: A CONTROLLED STUDY OF OUTCOMES FOLLOWING BARIATRIC SURGERY

Preeti Malladi MD, Edward Auyang MD, Alexander P Nagle MD, Eric S Hungness MD, Patrick N Smith-Ray MPH, C Lin BA, K Vaziri MD, J B Prystowsky MD, Feinberg School of Medicine, Northwestern University, Chicago, IL

**Introduction:** Bariatric surgery has been shown to be an effective therapy that results in long term weight loss, resolution of co-morbidities and improved quality of life (QOL). Most of these studies lack comparison with a non-operative group. We hypothesize that after one year, patients who undergo bariatric surgery will see significant weight loss, resolution of co-morbidities and improved QOL compared with morbidly obese patients who do not undergo surgery.

**Methods:** We identified 166 patients (operative group) in our prospective bariatric database that had bariatric surgery (Roux-en-Y gastric bypass (RYGB) [n = 141] or adjustable gastric band (AGB) [n = 25]) with at least 1 year of complete follow-up. Thirty patients who were initially evaluated for bariatric surgery at least one year prior, but never had an operation (non-operative group), were contacted for follow-up. Demographics (age, gender), weight, BMI, co-morbidities (joint pain, hypertension, diabetes, GERD, hypertriglyceridemia, obstructive sleep apnea) and QOL (Obesity Adjustment Survey) were compared initially and at 1 year follow-up. Either ANOVA, t-test or Chi-Square was used for analysis. Significance was set at  $p < 0.05$ . This study was IRB approved.

**Results:** There was no significant difference between the operative (OP) and non-operative (NOP) groups for gender, pre-operative weight, BMI, co-morbidities and QOL. After 1 year, percent excess weight loss (EWL) was significantly different between RYGB, AGB and NOP groups (61% vs. 40% vs. 9.9%,  $p < 0.05$ ). There was significant resolution in all co-morbidities and improvement in QOL in the OP group compared to the NOP group, but no significant difference between RYGB and AGB groups for these outcomes.

**Conclusions:** Over a one year period, we observed significant weight loss, resolution of co-morbidities and improved QOL in patients who underwent bariatric surgery compared to a group of morbidly obese patients who did not undergo surgery. Although RYGB provided statistically significant greater weight loss compared to AGB, the improvements in co-morbidities and QOL were similar between RYGB and AGB. These findings confirm that both RYGB and AGB are effective weight-loss therapies that improve co-morbidities and QOL compared to non-surgical management.

23633

P071

### EQUAL SHORT TERM WEIGHT LOSS FOR SELF-PAY AND INSURANCE COVERED PATIENTS AFTER ADJUSTABLE GASTRIC BANDING

John P Cullen MD, Garth Jacobsen MD, Kari Thompson MD, Adam Spivack MD, Bryan Wong MD, Lauren Fischer MD, Bryan Sandler MD, Yoav Mintz MD, Mark Talamini MD, Santiago Horgan, University of California San Diego

**Introduction:** Adjustable gastric banding is one option for obese patients pursuing bariatric surgery, though not all insurance policies cover the procedure. Patients may pay out of pocket for bariatric procedures if they do not have insurance that covers the operation. There may be a difference in expectations and motivation between these two patient populations may leads to a difference in outcomes. Self-pay patients may have more motivation to lose weight due to the significant financial investment. **Methods:** Data was collected prospectively in a bariatric surgery database for all patients undergoing adjustable gastric banding at our institution. Excess weight loss was then compared at our institution at 6 months (n = 83) and 1 year (n = 41) using a paired student t-test. Minors were excluded from data analysis. **Results:** Age, gender, and ideal body weight were identical between groups. Actual body weight was higher in the insured group (262 lbs vs. 248 lbs). At one year follow-up, excess weight loss was 50.63% (range 26-79) for the insurance group versus 43.68% (range 12-78) for the self-pay group though this difference was not significant ( $p = 0.12$ ). The difference was also not significant at 6 months (35% excess weight loss for the insured versus 30% self pay) **Discussion:** Method of payment for bariatric surgery did not result in a significant difference in short term weight loss following adjustable gastric banding. Though the insured group lost more weight, this group also had a higher initial weight. Further long-term data with a larger number of patients will be needed to determine if any significant difference between insurance coverage and outcomes.

23667

P073

### LAPAROSCOPIC SLEEVE GASTRECTOMY: REVIEW OF 536 CASES AND 2 YEAR FOLLOW UP

Camilo Boza MD, Jose Salinas MD, Cristian Gamboa MD, Gustavo Perez MD, Alex Escalona MD, Fernando Pimentel MD, Luis Ibañez MD, Pontificia Universidad Católica de Chile

**INTRODUCTION:** LSG is increasingly performed among surgeons as a sole bariatric procedure. The aim of this study was to describe the results of Laparoscopic Sleeve Gastrectomy (LSG) on the first 536 patients performed in our institution as a definitive procedure

**METHODS AND PATIENTS:** We conducted a review of our prospective electronic database for patients who underwent LSG as a sole bariatric procedure from August 2005 to September 2008. We assessed surgical results, complications, weight progression and resolution of co-morbid conditions.

**Results:** In this period, 536 patients underwent LSG (77.8% females). Mean age was  $36.7 \pm 11.6$  years. Mean preoperative BMI was  $36.1 \pm 5.8$  kg/m<sup>2</sup> (28.7-60.5). Mean operative time was  $76.8 \pm 28.3$  minutes. There were no conversions to open surgery. Mean hospital stay was  $2.8 \pm 0.8$  days. Thirteen patients (2.4%) had early complications: 4 portal vein thrombosis (0.7%), 3 wound infections (0.6%), 2 leaks (0.3%), 2 hemoperitoneum (0.3%), 1 antral stenosis and 1 acute pancreatitis. No mortality was observed. Three patients required reoperation (2 leaks and antral stenosis). Seventeen patients (3.2%) developed late complications mainly due to cholelithiasis (6) and gastroesophageal reflux (3). Median follow up time was 12 months (1-36). Percent excess weight loss at 6, 12 and 24 months was  $80.1 \pm 24.9\%$ ,  $88.3 \pm 29.2\%$  and  $88.5 \pm 33\%$ .

Preoperative comorbidities were dyslipidemia (DLP) 66%, type 2 diabetes (T2D) 6%, insulin resistance (IR) 54% and arterial hypertension (HTN) 20%. Resolution or improvement of comorbidities at follow-up was 64% for DLP, 88% for T2D, 94% for IR and 73% for HTN.

**Conclusions:** LSG proved to be effective and safe. Complication rate is low, however a high incidence of portal vein thrombosis needs to be carefully studied.

23685

P074

### COMPARISON OF HAND-SEWN, LINEAR STAPLER, AND CIRCULAR STAPLER GASTROJENOSTOMY ANASTOMOSIS IN LAPAROSCOPIC GASTRIC BYPASS SURGERY

Dennis P Orr DO, Blythe Lori RN, Selzer Donald MD, Ditslear Jack MD, Mattar Samer, Indiana University, Methodist Hospital, Clarian Hospital, Clarian Bariatric Center

**Background:** Three commonly used techniques to construct the gastrojejunostomy in a laparoscopic gastric bypass are the circular stapler, the linear stapler, and hand-sewn. The purpose of this study is to evaluate the difference in complications between these three techniques.

**Methods:** This is a multi-institutional, retrospective study of all consecutive patients that had a laparoscopic Roux-en-Y gastric bypass at the foundation of a bariatric program beginning in December 4, 2004 to August 23, 2007. Surgical technique consisted of a single-layer hand-sewn anastomosis, a linear stapler reinforced with a hand-sewn second layer, and a 25 mm circular stapler. Complications that were studied included death, leak, hemorrhage, stricture, intra-abdominal collection, wound infection, and marginal ulceration. Information was obtained through the center's database and electronic chart review.

**Results:** A total of 243 patients were operated on. 4 patients died for a total death rate of 1.6%. Of the 243 patients, 179 (73.7%) followed up 1 year or greater. Of these, 58 (32.4%) had a hand-sewn anastomosis, 96 (53.6%) had a linear stapler anastomosis, and 25 (14%) had a circular stapler anastomosis. There were a total of 3 leaks (1.7%), one in each group, 20 (11.2%) strictures, and 17 (9.5%) marginal ulcers. No statistically significant difference was reached in any of the groups, however there was a decrease trend in marginal ulceration and strictures in the circular stapler [1(4%) and 1(4%), p value 0.5 and 0.43] group compared to the hand-sewn and linear stapler groups [6(10.3%), 10(10.4%) and 8(13.8%), 11(11.5%)].

**Conclusion:** There is a clinical trend towards decreased marginal ulcer and stricture formation in the circular stapler group compared to the hand-sewn and linear stapler group although statistical significance was not reached.

23699

P076

### STARTING LAPAROSCOPIC SLEEVE GASTRECTOMY PROGRAM: SHORT TERM OUTCOMES

S Wiebe MD, D Klassen MD, J Bonjer MD, D Lawlor RN, J Plowman BS, T Ransom MD, J Ellsmere MD, Departments of Medicine and Surgery, Dalhousie University, Queen Elizabeth II Health Sciences Centre, Halifax, Nova Scotia

**Introduction:** Laparoscopic sleeve gastrectomy has been shown to be a safe and effective primary weight loss procedure. With increasing international experience, more bariatric surgery centers are starting to offer sleeve gastrectomy. Our hypothesis is that laparoscopic sleeve gastrectomy as part of a multidisciplinary weight loss program can be safely introduced with acceptable short term results. **Methods:** The first 21 consecutive patients undergoing laparoscopic sleeve gastrectomy at our center between Dec 2007 and Sept 2008 were reviewed. All sleeves were constructed over a 42 F bougie. Staple buttress material was not used and staple lines were selectively oversewn.

**Results:** The 21 patients included 19 females with a mean age of 39.3 years. The mean preoperative body mass index was 50.8 kg/m<sup>2</sup> (range 41.0 to 75.1). Mean operative time was 143.9 minutes (range 75–275); all procedures were completed laparoscopically. Mean length of stay was 3.2 days (range 2–5). There were no perioperative mortalities or major complications. No patients required blood transfusions or had staple line leaks. One patient had a compression neuropathy of the gluteal region. One patient was found in a follow up visit to have a pulmonary embolism. Mean follow-up was 3.6 months, ranging from 1 to 10 months. Weight loss outcomes are shown in the table below.

Absolute and excess weight loss after laparoscopic sleeve gastrectomy

Length of the follow-up	Absolute weight loss(kg)	Excess weight loss(%)
1 Month	12.4	18.4
3 Month	22.9	34.1
6 Month	39.0	55.8

**Conclusion:** Laparoscopic sleeve gastrectomy as part of a multidisciplinary weight loss program can be safely introduced with acceptable short term results.

23698

P075

### CT SCAN: AN EFFECTIVE WAY TO MEASURE GASTRIC POUCH'S VOLUME IN GASTRIC BYPASS

A. Ibarzabal, J.R. Ayuso, S. Delgado, D. Momblan, R. Corcellles, R. Bravo, R. Almenara, J. Vidal, A.M. Lacy, Hospital Clinic, Barcelona.

**Introduction:** Weight regain after bariatric surgery is a controversial issue. Some authors argue that this happens because of dilated gastric pouch, others because limb length, hormonal reasons etc. Concerning gastric volume, several procedures have been described to measure this volume. Three dimension CT scan is a reproducible and effective procedure to measure gastric volume.

**Objective:** The objective of this study is to check if CT scan is an effective and reproducible way to measure the gastric volume.

**Material and methods:** First of all we choose ten patients operated of gastric bypass in our centre. We performed three CT scans to every patient and we compared the different volumes that we got in every scan by a correlation statistic analysis. After we concluded that the CT scan is a reproducible and effective way to measure gastric volume, we measured the volume of the pouch in the operating room (with a balloon) in two patients and we performed a CT scan getting similar results.

**Results:** When we performed the analysis, we got excellent correlation results of the different measures with a sample concordance correlation coefficient (&#961;c) = 0.8857

**Conclusions:** CT scan is an effective and reproducible way to measure gastric pouch's volume in patients with gastric bypass.

23703

P077

### INTRAGASTRIC BALLOONS ARE EFFECTIVE FOR THE WEIGHT CONTROL IN NON OBESE PATIENTS

Gustavo L Carvalho PhD, Carlos Eduardo Moraes MD, Alvaro Freire MD, Pedro Paulo C Albuquerque, José Sergio N Silva, Raphael M Coelho, Masaichi Okazaki MD, Cesar B Barros MSc, Nair C Almeida MD, Moacir F Novaes PhD, FACULDADE DE CIÊNCIAS MÉDICAS DA UNIVERSIDADE DE PERNAMBUCO (FCM/UPE), CLÍNICA CIRÚRGICA VIDEOLAPAROSCÓPICA GUSTAVO CARVALHO and UNIDADE DE PESQUISA CLÍNICA DO HOSPITAL UNIVERSITÁRIO OSWALDO CRUZ - UNIP-ECLIN, RECIFE - PE, BRAZIL.

**Background:** Many clinical treatments have been attempted for weight reduction in overweight patients, body mass index (BMI) below 30, most commonly medically treated with Orlistat, Sibutramine and more recently with Rimobant, all presenting gastrointestinal, circulatory, metabolic or psychological side effects which are sometimes severe. Recent Silicone intragastric balloons (SIB) clinical trials have used overweight patients as part of their population, proving the safe usage of SIBs in non obese patients. So far, a study reporting the treatment with SIB only in overweight non obese patients is not yet published. **OBJECTIVE:** To present the SIB treatment results in overweight patients. **METHOD:** From June 2006 to May 2008, 223 patients were submitted to the treatment with the Silimed® Gastric Balloon, in two different centers. Of those, 39 were selected for this study for presenting BMI < 30. **RESULTS:** All balloons were placed and retrieved by office endoscopy, safely and effectively in all the cases. General anesthesia was not needed. All the patients left the outpatient clinic in less than 1 hour. The patients mean age was 41.6 (16–67) years-old, initial weights and BMI were 76.4 ± 9.9 (58.0–100.2) kg and 27.8 ± 1.6 (22.8–29.9) kg /m<sup>2</sup>. For the 21 patients who had completed the 6-month treatment, the results in weight loss and final BMI were 9.6 ± 4.2 (19.7–0.4) kg and 24.9 ± 1.7 (21.9–27.8) kg /m<sup>2</sup>. Five patients (12.8%) had episodes of severe vomiting and opted to stop the treatment. One patient (2.6%) had insufficient weight loss. 58.9% of the patients complained of nausea in the first days of treatment. One balloon spontaneously deflated during the treatment and was removed uneventfully by office endoscopy. **CONCLUSIONS:** Preliminary data suggest that the SIB procedure is a safe and effective alternative to the medical treatment of weight control in non obese patients with appropriate indication of use.

23706

P078

### INTRAGASTRIC BALLOON FOR WEIGHT LOSS BEFORE CARDIAC TRANSPLANT – A CASE REPORT

Gustavo L Carvalho PhD, Masaichi Okazaki MD, José Sérgio N Silva, Pedro Paulo C de Albuquerque, Raphael M Coelho, Fábio Moura MD, Moacir F Novaes PhD, FACULDADE DE CIÊNCIAS MÉDICAS DA UNIVERSIDADE DE PERNAMBUCO (FCM/UPE), CLÍNICA CIRÚRGICA VIDEOLAPAROSCÓPICA GUSTAVO CARVALHO and UNIDADE DE PESQUISA CLÍNICA DO HOSPITAL UNIVERSITÁRIO OSWALDO CRUZ - UNIPECLIN, RECIFE - PE, BRAZIL.

**BACKGROUND:** Intra-gastric balloon treatment for obesity has been developed and its placement and removal techniques has been improved. Its primary objective is the treatment of obese people, who have had unsatisfactory results in their clinical treatment for obesity, despite of being cared for by a multidisciplinary team, and to prepare super obese patients with a higher surgical risk to a bariatric procedure. **PACIENT AND METHODS:** A 45 years-old obese male patient, who was going to be submitted to a heart transplant. With a high surgical risk, the patient presented before the balloon placement 102 Kg weight, BMI 35 (obesity grade 2), Excess Weight 28.8%. A new silicone Intra-gastric Balloon (SIB) was developed (SILIMED®). The procedure was carried out by attaching the SIB covering to the end of the endoscope with a polypectomy snare and inserting it under direct vision in the stomach fundus. The SIB was filled with 800 ml of a saline solution containing iodine contrast (20 ml) and methylene blue 2% (10 ml). Retrieval was made by positioning a double silicone overtube in the patient's esophagus. SIB was perforated, and a catheter was inserted, draining the solution. The empty SIB was retracted by a snare and inserted into the overtube and both were removed together, avoiding aspiration. **RESULTS:** The SIB was placed and removed without any complications. Nausea and vomiting occurred in the first 2 days after the placement. The patient lost 16Kg and became more suitable for the heart transplant, being actually in the waiting list. **CONCLUSION:** These novel techniques have made SIB placement and removal an office procedure, which is fast, safe, and cost-effective and it can also be useful to prepare obese patients for major surgeries - a heart transplant.

23711

P079

### INTRAGASTRIC BALLOONS FOR OBESITY - A NOVEL TECHNIQUE FOR MORE SECURE, QUICKER, AND LESS EXPENSIVE OFFICE PLACEMENT AND REMOVAL – THE FIRST 138 BALLONS

Gustavo L Carvalho PhD, Moacir F Novaes PhD, Nair C Almeida MD, Pedro C de Albuquerque MD, Masaichi Okazaki MD, Chika Wakiyama, Pedro Paulo C de Albuquerque, José Sérgio N Silva, Raphael M Coelho, Cesar B Barros MSc, FACULDADE DE CIÊNCIAS MÉDICAS DA UNIVERSIDADE DE PERNAMBUCO (FCM/UPE), CLÍNICA CIRÚRGICA VIDEOLAPAROSCÓPICA GUSTAVO CARVALHO and UNIDADE DE PESQUISA CLÍNICA DO HOSPITAL UNIVERSITÁRIO OSWALDO CRUZ - UNIP-ECLIN, RECIFE - PE, BRAZIL

**BACKGROUND:** Although bariatric surgery is the fastest and most effective way to lose and control weight, some overweight patients are not eligible for this procedure. **OBJECTIVE:** To report improvements made in the technique for office placement and removal of Silicone Intra-gastric Balloons (SIB). **MATERIAL AND METHODS:** Between June 2006 and September 2008, 117 obese patients (93 women, average weight 94.5 kg;  $\pm$  21.9) underwent treatment for obesity using 138 SIBs. All SIBs were successfully placed and retrieved by way of office endoscopy under normal sedation. General anesthesia was not necessary, thereby greatly decreasing the risks and costs. For this purpose, a new Silicone Intra-gastric Balloon was developed (SILIMED®). Placement was carried out by attaching the SIB with a polypectomy snare and inserting it under direct vision. The SIBs were released at the stomach fundus and filled with a solution of saline, iodine contrast and methylene blue (470–850 ml). Retrieval was performed by positioning an overtube in the patients' esophagus. A hole was made in the SIB using a needle and a catheter was inserted. The entire contents of the balloon were suctioned completely. A snare was used to retract the empty SIB. The SIB was partially inserted into the overtube and both were removed together. **RESULTS:** All balloons were satisfactorily placed. Of the 138 balloons, 80 have since been removed, 10 because of intolerance, 6 through balloon perforation, and 64 at the end of the 6-month course of treatment. All patients left the office within one hour after the insertion or removal procedures, and were satisfied with the procedure and the sedation. The day after SIB placement, 28 patients needed to stay in hospital for 12–48 hours, to control nausea and vomiting. The average weight loss among the 64 patients who finished the 6-month course of treatment was 11.3 ( $\pm$  6.2) kg, and the average excessive weight loss (EWL%) was 55.1 ( $\pm$  68.5)%. **CONCLUSION:** These novel techniques have made SIB placement and removal an office procedure, which is fast, safe, and cost-effective.

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P080

### POOR OUTCOMES AFTER LAPAROSCOPIC ADJUSTABLE GASTRIC BAND

Jason R Kasza MD, Fredrick J Brody MD, Khashayar Vaziri MD, Brian Wallace, Carl Scheffey PhD, Sheldon McMullan BS, George Washington University Medical Center

**Background:** Recent studies document EWL > 50% for the laparoscopic adjustable gastric band (LAGB). This study reviews the LAGB experience at an urban academic center regarding complications, re-operative rate, and co-morbidities.

**Methods:** 146 consecutive patients undergoing LAGB from August 2005 to December 2007 were reviewed. Pre and postoperative data were collected including weight, BMI, EWL, co-morbidities, and complications. Multiple patient demographics were analyzed using a t-test.

**Results:** There were 139 women and 18 men with a mean weight of 127.2 kg  $\pm$  20.7 kg and BMI of 45.6  $\pm$  6.2. The mean EWL was 20%  $\pm$  14% at 6 months (n = 118), 26%  $\pm$  15% at 12 months (n = 99), 27%  $\pm$  18% at 18 months (n = 56), and 34%  $\pm$  24% at 24 months (n = 37). Complications were seen in 6.2% (n = 9) including port flipping, stoma obstruction, tube disconnection, port infections, and band slippage. Re-operation was required in 8 of these patients. Co-morbidities resolved in only 23% of patients. So far 4.8% (n = 7) of patients required revision to sleeve gastrectomy for inadequate EWL. At 12 months, only 6 (6.1%) patients achieved > 50% EWL. Also, > 50% EWL was achieved in 1 (2.6%) patient over 45 years old and in 1 (2.1%) African-American patient. Overall, %EWL was significantly greater in Caucasians (p = 0.022)

**Conclusion:** Following LAGB, a majority of patients failed to achieve a 50% EWL and 10.3% required re-operation. Our data shows that patients older than 45 years and African Americans may not benefit from LAGB.

23729

P081

### CHANGING PRACTICE OF LAPAROSCOPIC BARIATRIC SURGERY IN 2 COUNTRIES

Esteban Moscoso MD, Brandon Williams MD, Willie Melvin MD, Michael D Holzman MD, William O Richards MD, Santa Ana Hospital, Cuenca Ecuador, Vanderbilt, Nashville, USA

**Introduction:** Internationally, operative procedures performed for weight loss differ in type based upon local socioeconomic conditions. The purpose of this study was to examine the practice patterns for bariatric surgeons at a hospital in Cuenca, Ecuador and in Nashville, TN at a major tertiary care institution. **Methods:** The personal database of the surgeon in Ecuador (EM) and the Bariatric database for the Vanderbilt Center for Surgical Weight Loss (VCSWL) were examined.

**Results:** Laparoscopic Roux-en-Y Gastric Bypass (LRYGB) was performed in 20 patients in Santa Ana Hospital in Cuenca, Ecuador from 2/2003 through 12/2006. From 1/2007 through 6/2008, 28 patients underwent laparoscopic sleeve gastrectomy (LSG). Two patients undergoing LRYGB developed leaks, required laparotomies, and had extended hospitalizations, while none of the LSG patients had major complications.

From 11/2000 through 1/2003 VCSWL performed 153 open RYGB and 126 LRYGB procedures. From 2/2003 through 12/2006 VCSWL performed 769 LRYGB, 342 Open RYGB, 62 hand-assisted LRYGB, and 121 Lap Adjustable Gastric Bands (LAGB).

From 1/2007 through 6/2008 VCSWL performed the following procedures: 240 LRYGB, 5 Open RYGB, 112 LAGB, and 12 LSG. All the Ecuadorian patients paid cash for the operative procedure for both LRYGB and for LSG. In the US all of the patients undergoing LRYGB had insurance coverage, while 16/19 (84%) of the patients undergoing LSG paid cash for their procedure.

**Conclusions:** Laparoscopic bariatric surgery has replaced open gastric bypass in these 2 centers. Since 2007 most patients in Ecuador or the USA paying cash for the procedure elect to undergo LSG. Choice of bariatric surgical procedure is highly dependent on insurance coverage. Utilization of the LSG is increasing in Ecuador and at VCSWL, particularly in cash pay patients.



23793

P082

**GASTRO-COLONIC FISTULA AFTER ROUX-EN-Y GASTRIC BYPASS FOR MORBID OBESITY**

Oscar A Garcia MD, J Andres Astudillo MD, Raffatt Jaber MD, Angel J Tamez MD, Loma Linda University Medical Center, Department of Surgery

Introduction: The incidence of morbid obesity in the United States is increasing. Roux-en-Y Gastric Bypass is a surgical treatment for morbid obesity resulting in weight loss and control or resolution of obesity-related co-morbidities, however, is not without complications. More common post-surgical complications include anastomotic leaks or strictures, bowel obstruction or vitamin/mineral deficiency. While relatively rare, marginal ulceration, gastro-gastric and gastro-cutaneous fistulae have been reported. This is a case report of a patient that developed a gastro-colonic fistula.

Case report: This patient is a 34 year old female with a remote history of an open Roux-en-Y Gastric bypass with subsequent marginal ulcer and gastric pouch disruption requiring two revisions, and an incisional hernia requiring repair. She presented with weight loss, p.o. intolerance, diarrhea and abdominal pain for several months. Preoperative workup with contrast swallow, esophago-gastro-duodenoscopy (EGD), colonoscopy and computed tomography (CT) revealed a gastro-colonic fistula. The fistula and malnutrition were managed preoperatively withholding oral intake and starting total parenteral nutrition (TPN). During exploratory laparotomy, a fistula was identified between the gastrojejunal anastomotic site and proximal transverse colon. Treatment included excision of the fistula with repair of the gastrojejunostomy and an extended right hemicolectomy. A postoperative swallow study revealed no leak at the repair site. During the postoperative course an intra-abdominal fluid collection was identified and drained percutaneously. The patient also had a prolonged ileus. Currently the patient is improving with complete resolution of presenting symptoms, weight gain and p.o. tolerance.

Conclusion Fistula development as a complication after Gastric Bypass can be catastrophic. Gastro-colonic fistula is a rare complication and to our knowledge this is the first case report of a Gastro-Colonic fistula after this type of procedure. This should be considered in the differential diagnosis when a patient presents with PO intolerance, diarrhea and malnutrition after gastric bypass surgery.

23809

P083

**FEEDING TUBE PLACEMENT IN THE EXCLUDED STOMACH AFTER GASTRIC BYPASS: A NOVEL LAPAROSCOPIC TECHNIQUE**

Andrew A Wheeler MD, Brent W Miedema MD, Roger A de la Torre MD, University of Missouri, Columbia, Mo

Introduction: Enteral access for nutritional support after gastric bypass is a challenging problem due to dense postoperative adhesions, difficulty in gaining endoscopic access to the excluded stomach, and the thick abdominal wall in an obese patient. Open techniques can be technically difficult and associated with high morbidity. We present our novel laparoscopic technique for feeding tube placement in the excluded stomach after bariatric surgery.

Methods: After trocar placement and adhesiolysis, an ultrasonic dissector was used to create a gastrotomy along the lesser curve. An 18 gauge needle was placed percutaneously in the left upper quadrant of the abdomen and inserted in the anterior remnant stomach near the greater curvature. A guide wire was passed through the introducer needle into the stomach lumen. The wire was grasped with an atraumatic grasper inserted into the gastrotomy and the wire was removed through a right sided 10 mm port. A push technique was then used to advance the gastrostomy tube over the wire, through the gastrotomy and out through the left abdominal wall. Moderate tension was placed on the bulb at the distal end of the gastrostomy tube and the tube was secured to the abdominal wall. The gastrotomy was then closed with a running silk suture and all ports were removed.

Results: Patient data is shown in the table below. Patient 3 also had an omental patch of a staple line leak. There were no complications.

Conclusion: We describe our experience with a novel technique for obtaining enteral access in patients after gastric bypass when other standard techniques for placing enteral feeding tubes are difficult or impossible.

	Org. Procedure	Reason Placed	OR Time (min)
1	Gastric bypass	Nausea/Vomiting	69
2	Gastric bypass	TBI	108
3	Revisional GB	PO leak	126

23812

P084

**LAPAROSCOPIC BARIATRIC SURGERY ON A VIDEO SHARING WEBSITE**

Atul K Madan MD,Emanuele Lo Menzo MD,Alberto R Iglesias MD,Ray I Gonzalez,Diya I Alaedeen MD,Jose M Martinez MD, Division of Laparoscopic and Bariatric Surgery, University of Miami Miller School of Medicine

Introduction: Patients utilize the Internet to obtain information regarding bariatric surgery. The quality of this available information is inconsistent. Specifically, many patients browse video sharing websites to further educate themselves about the procedures. This study tested the hypothesis that a common video sharing website would provide high quality information for bariatric surgery patients.

Methods: The most common video sharing website (Youtube) was browsed with the term 'laparoscopic bariatric surgery'. The first page of videos were all explored and graded by laparoscopic bariatric surgeon. The following metrics (via a Likert scale of 1 -10) were measured: patient friendliness, educational value, and relevance (higher number = higher level). Bias and current information were graded as yes or no. Entity whom submitted video, description of video, and advertising was also recorded.

Results: The term 'laparoscopic bariatric surgery' yielded 11,600 videos. The first page revealed 20 videos. The mean relevancy was high (9) but the patient friendliness and education level value were both relatively low (6) and 30% had some type of bias. The average time from submission to current date was 419 days; yet 80% had current information. The list of entities that submitted the videos included third party website (7), surgeon (5), hospital/university (3), webcasting company (3), patient (1), and unknown (1). The descriptions included Video of procedure (6), webcast advertising (3), program advertising (2), university series (2), procedure description (2), dietary education (2), patient testimonial (2), and National Society lecture. There was obvious advertising for the surgeon (16), practice (12), website (6), webcast (3), bariatric industry (2), and non-bariatric industry (1).

Conclusions: The most common video sharing website yielded a great amount of videos concerning laparoscopic bariatric surgery. Unfortunately, the average video had low value in terms of patient friendliness and educational level. Bariatric surgery practices must understand that many patients who have researched laparoscopic bariatric surgery may have done so with low quality information.

23832

P085

**MANAGEMENT OF COMMON BILE DUCT STONES IN PATIENTS AFTER ROUX-EN-Y GASTRIC BYPASS**

Dmitri V Baranov MD,David R Lichtenstein MD,Miguel A Burch MD,Donald T Hess MD, Departments of Surgery and Medicine Boston University School of Medicine

Introduction: Alteration of normal anatomy with Roux-en-Y gastric bypass (RYGB) makes it difficult to access common bile duct (CBD) in cases of choledocholithiasis. We present our experience in management of choledocholithiasis after RYGB. The purpose of the study was to develop the management algorithm of choledocholithiasis in patients after RYGB.

Methods and Procedures: Retrospective review of patients who underwent treatment of CBD stones after RYGB was performed. Procedures used include: laparoscopic CBD exploration (LCBDE), ERCP using double balloon endoscopy (ERCP with DBE), ERCP through the remnant stomach (RS).

Results: We divided the patients into 2 groups: with gallbladder (GB) and without the GB. We had 3 pts in the first group. First pt underwent lap chole with LCBDE and successful stone removal. Second pt had failed LCBDE due to impacted stone, ERCP through RS was successful with dilatation of the ampulla. Third pt had acute cholecystitis, procedure was converted to open due to extensive inflammation; CBD stone was managed also by ERCP through RS. One pt in the second group had primary CBD stone. ERCP using DBE failed and the stone was managed using ERCP through RS and laser lithotripsy.

Conclusions: Pts with choledocholithiasis after RYGB can be divided in 2 groups: with and without GB. For pts with GB, procedure of choice is lap chole with LCBDE; if this fails, ERCP through RS in the same setting. In pts without GB, ERCP using DBE is our first choice; if this fails, ERCP through RS should be performed.

23834

P086

### CONCURRENT HIATAL HERNIA REPAIR DURING LAPAROSCOPIC ADJUSTABLE GASTRIC BAND PLACEMENT AND ITS EFFECT ON GASTROESOPHAGEAL REFLUX DISEASE

Pavlos K Papasavas MD, Darren S Tishler MD, Simon Buttrick, Ela Banerjee, Kristy Thurston MD, Hartford Hospital

**Introduction:** Presence of hiatal hernia (HH) in patients undergoing laparoscopic adjustable gastric band (LAGB) placement may pose technical difficulties and predispose to postoperative GERD and a higher risk of band prolapse. We reviewed our experience with LAGB and concurrent HH repair.

**Methods:** Retrospective chart review of all patients who underwent LAGB and prospective interview of patients with concurrent HH repair. GERD symptoms were evaluated with GERD-HRQL questionnaire. All cases were performed laparoscopically using pars flaccida technique. Hiatal hernias were routinely repaired anteriorly. Correlation between weight loss and GERD score was evaluated by Pearson correlation test.

**Results:** 421 patients underwent LAGB from 2005–2008. The mean weight and BMI were 283.4 lbs and 47.1 kg/m<sup>2</sup> respectively. Median follow-up was 9.8 months. Of the 403 patients with preoperative UGI data available, 119 patients (30%) had radiographic evidence of HH. 211 patients (52%) underwent HH repair at the time of LAGB. 19 patients with positive UGI did not undergo HH repair due to inability to identify a hernia or technical reasons. Two patients underwent posterior crural repair due to the large size of the hernia. The sensitivity and specificity of UGI in identifying HH was 45% and 96% respectively. We evaluated GERD symptoms on 127/211 patients (60%) who underwent HH repair; 76% of patients reported scores 0–5, 11% scores 6–10 and 13% scores > 10. There was no correlation between GERD-HRQL score and postoperative weight loss. Two patients developed anterior band prolapse, one of which had prior HH repair. 64/211 patients (30%) with HH repair underwent UGI study at a median time of 12.2 months postoperatively; 7.8% were diagnosed with a small recurrent HH.

**Conclusion:** Preoperative UGI is not a sensitive test for identifying HH in the majority of patients undergoing LAGB. We advocate routine inspection of the hiatus and repair of HH during LAGB. This approach effectively controls GERD symptoms and may improve long term LAGB tolerance.

23836

P087

### MINIMALLY INVASIVE REMOVAL OF SILASTIC BAND FOLLOWING BANDED GASTRIC BYPASS

Robert O Carpenter MD, Brandon Williams MD, Willie V Melvin MD, William O Richards MD, Vanderbilt University Medical Center

**INTRODUCTION -** Diagnosis and management of silastic band malfunction after gastric bypass in the referred patient is the focus of this paper. The use of prosthetic material to reinforce the gastric outlet created during open bariatric surgery has seen many iterations. These ‘bands’ are intended to prevent dilation of this ostomy in an attempt to optimize and maintain desired weight-loss. Band erosion, displacement, or mechanical failure may result in pain, bleeding, weight regain, dysphagia, nausea, vomiting, or frank gastric outlet obstruction. Surgeons may be confronted by seemingly complex problems in bariatric patients with unclear or unknown operative history given our country’s mobile population.

**Methods:** We provide information regarding the workup, treatment and subsequent follow-up of three patients who presented to our tertiary care medical center over a three month period in the Summer of 2008. Each of these patients had undergone an open bariatric procedure at an outside facility. The first patient presented to our clinic for extraction of a ‘retained perigastric foreign body or drain’ discovered on an outside CT scan performed to evaluate abdominal pain. An eroded band was extracted via endoscopy and the patient was discharged the following morning. Her symptoms resolved and she was tolerating solid food upon follow-up. The second patient presented with persistent nausea and vomiting. Gastric outlet obstruction was established by barium swallow. An obstructing silastic band was divided and removed laparoscopically with intraoperative endoscopic observation. The patient was discharged the following morning and was tolerating food well upon follow-up. The third patient presented complaining of dysphagia and intolerance of solid food. Outside endoscopy revealed stenosis of the gastrojejunostomy with a visible foreign body eroding into the lumen of her gastric pouch. A silastic band was extracted endoscopically with balloon dilation of her gastrojejunostomy stenosis. She was discharged the next morning, and her symptoms were resolved at follow-up.

**Conclusions:** - We present a series detailing a simple yet effective solution to a complication of banded gastric bypass. Each of the patients in this series had complete resolution of their symptoms as a result of minimally invasive band extraction. Representative imaging is provided and the pertinent literature is reviewed as an aid to surgeons confronted with this clinical problem.

23856

P088

### LAPARO-ENDOSCOPIC SINGLE SITE (LESS) SURGERY FOR PLACEMENT OF ADJUSTABLE GASTRIC BAND

Kevin M McGill MD, Nikalesh Ippagunta MD, Julio A Teixeira MD, St. Luke’s-Roosevelt Hospital Center New York, NY

**Objective:** Laparo-endoscopic single site (LESS) surgery for cholecystectomy and appendectomy have been described in the literature. However, the benefits of these procedures to traditional laparoscopic approaches has yet to be determined. To date, LESS surgery for placement of an adjustable gastric band has not been published or documented. Our goal is to determine the safety and feasibility of LESS surgery for placement of an adjustable gastric band.

**Methods:** From December 2007 to June 2008, LESS surgery to place an adjustable gastric band was performed on 10 patients under IRB approval via a transumbilical incision. Essentially, multiple ports are placed through a single incision in the umbilicus to allow for liver retraction, visualization, and working instruments. All critical steps using a standard pars flaccida technique were not altered.

**Results:** 10 patients were carefully selected including 9 women and 1 man ranging in age from 32 to 61 with a mean age of 47, mean BMI of 42, ranging 35–45. Patients were selected for the absence of hepatomegaly, absence of central obesity, and super-obese patients were not considered for inclusion. The mean operative time was 1 h and 10 min with a range of 53 min to 1 h and 48 min. All patients were discharged home within the 23 hour admission and there were no perioperative complications noted. In addition there were no wound related complications. Of note only 2 of 10 patients required the use of narcotic analgesia after discharge from the recovery room. There were no intraoperative or postoperative complications.

**Conclusions:** In our experience LESS surgery for adjustable gastric band shows this technique to be both feasible and safe. Although technical limitations exist which will be improved upon, further studies need to be performed to compare LESS surgery for placement of adjustable gastric band to traditional laparoscopic techniques.

23861

P089

### PERIOPERATIVE NASAL ADMINISTRATION OF KETAMINE SUCCESSFULLY ELIMINATES THE NEED FOR OPIOID USAGE IN THE BARIATRIC PATIENT

Ismail H Ozerhan MD, Onur C Kutlu MD, Yusuf Peker MD, Sadettin Cetiner MD, Turgut Tufan MD, Gulhane Medical Academy Department of General Surgery Ankara Turkey, Etimesgut 600 Bed Army Hospital Ankara Turkey

**Introduction:** Usage of opioids for pain management in bariatric surgery patients requires special attention. Administration of narcotics to the obese patient carries the risk of respiratory suppression both due to the opioids and redistribution of the anaesthetics from the adipose tissue. We would like to share our experience in nasal administration of ketamine for post operative pain management following gastric bypass.

**Materials and Methods:** 33 (28 Laparoscopic Gastric Bypass, 5 Laparoscopic Sleeve Gastrectomy) Patients were included in the study. Total Intravenous Anesthesia (Propofol Remifentanyl) was the preferred method of anesthesia. 10 mg’s of ketamine was administered to every patient intravenously after the cessation anaesthetics, prior to removal of trocars. A metered nasal spray delivering 2.5 mg’s of ketamine was utilized to administer 10 mg’s of ketamine (first dose) by the onset of pain and 10 mg’s every 3 hours.

**Results:** The ketamine spray was effective in pain control with the onset of analgesic effect 2–3 minutes following nasal administration. No changes in oxygen saturation were seen, the patients did not experience hallucinations, and postoperative mobilization was effectively carried out every 4 hours. Only 1 patient required opioids despite nasal ketamine administration.

**Conclusion:** Although our series are small and our results to be confirmed by other researchers, there are increasing numbers of papers on the analgesic properties and augmenting effects of ketamine on other analgesics. We believe that ketamine may be an effective and safe way of controlling postoperative pain in the morbidly obese patient.

23881

P090

**LAPAROSCOPIC VERTICAL SLEEVE GASTRECTOMY FOR MORBID OBESITY: THE NEW STANDARD OF TREATMENT FOR BMI < 50**

William Bertucci MD, Jay Grove MD, Kristen Stevens MD, Tamara Middlesworth DO, Deborah Romero RN, Annelise Brown RN, Janos Taller MD, Naval Medical Center San Diego

**Introduction:** The ideal procedure for the treatment of morbid obesity should be safe across a broad range of patients with equivalent weight loss results as the current standard, the Laparoscopic Roux-en-Y Gastric Bypass (LGB). Since its introduction, the Laparoscopic Vertical Sleeve Gastrectomy (LVG) has increased in popularity for the primary treatment of morbid obesity. The benefits of the LVG include a low complication rate, the avoidance of foreign material, maintenance of normal gastro-intestinal continuity, the absence of malabsorption and the ability to convert to multiple other operations for weight loss failure or recidivism. We reviewed our experience with both the LGB and LVG for patients with a BMI < 50.

**Methods:** In August of 2005, a comprehensive bariatric surgery program was established at Naval Medical Center San Diego. LGB and LVG were both offered as primary treatment of morbid obesity. LGB was performed in an antecolic, antegastric fashion with a lesser curve based, rectangular gastric pouch. LVG was performed through linear stapling of the gastric fundus along a 32Fr orogastric tube placed against the lesser curve. We performed a prospective secondary analysis of an existing database with IRB approval.

**Results:** There were no statistical differences in preoperative patient characteristics or postoperative weight loss results. The only significant differences were the decreased operative time and length of stay in favor of LVG.

**Conclusion:** LVG is the new procedure of choice for the treatment of morbid obesity with a BMI < 50.

**Comparison Results LVG vs LGB**

	LVG (n = 106)	LGB (n = 163)	p-value
Complications %	7.5	12.9	0.227
OR Time (min)	96.8	130.3	<.001
LOS (days)	2.10	2.31	0.015
Leak %	0.94	0	0.394
EBWL% 1 Year	75.2	79.8	0.123

23885

P091

**PREOPERATIVE EXERCISE ON OUTCOMES IN BARIATRIC SURGERY**

Robert B Lim BA, Limarís Barrios BA, Daniel B Jones BA, Daniel Rooks PhD, Benjamin Schneider MD, Henry Lin MD, Jody Dushay MD, Corine Carsuro MSc, George Blackburn MD, Beth Israel Deaconess Medical Center

**Introduction:** Exercise is thought to improve functional outcomes and weight loss. As little as thirty minutes of brisk exercise daily can increase weekly metabolic caloric expenditure to about 35000 Kcal. This study is designed to measure change in preoperative exercise activity and functional health status, and subsequent postoperative physical activity in bariatric surgical patients.

**Methods and Procedures:** 41 patients, who were candidates for weight loss surgery, were prospectively randomized. Patients in the intervention group were contacted weekly and encouraged to exercise. Patients in the standard group were contacted regularly and no extra effort was made to ensure they were exercising. Patient activity was recorded using an accelerometer (Actical, Respironics, Inc) that was worn continuously for seven days prior to each data point. Data was recorded at baseline, 30 days after starting the exercise regimen and prior to the operation, and 8 weeks after the operation. Patients' functional health status was recorded at each endpoint using the Short Form 36 Health Survey.

**Results:** Intervention group (n = 25) and the control group (n = 16) underwent testing. 32% (13/41) patients dropped out because they did not exercise at all or refused to wear the accelerometer. At baseline the intervention group had an average total energy expenditure (AEE) of 37143 (± 5759) Kcal while the control group's average was 31666 (± 9522) Kcal. After 30 days of exercise, the intervention group's AEE was 34385 (± 1386) Kcal while the control group's average was 33625 (± 9895) Kcal (p = 0.50). Weight loss was noted in both groups prior to the operation: study group (3.10 ± 4.66 lbs) and control group (6.39 ± 8.03 lbs). Postoperatively the study group experienced a weight loss of 35.00 lbs ± 12.72 and the control group of 56.90 lbs ± 46.95.

**Conclusions:** Patients, receptive to exercise, were able to maintain an average energy expenditure equivalent to a brisk walk. This may lead to significant clinical weight loss in the perioperative period. Verbal encouragement alone did not increase activity and augment energy expenditure.

23926

P092

**ENDOFLIP: A NOVEL DEVICE FOR PRECISE MEASUREMENT OF GASTRIC POUCH VOLUME AND WALL COMPLIANCE**

Brian J Winkleman MD, Peter N Nau MD, Bradley J Needleman MD, Dean J Mikami MD, The Ohio State University

**Introduction:** Significant weight regain after gastric bypass can occur over time due to dilatation of the gastric pouch and stoma. Endoluminal approaches for gastric pouch reduction are currently under investigation. EndoFLIP® (Crospon Ltd., Dangan, Galway, Ireland) is an endoscopic functional imaging probe designed to accurately measure intraluminal volume and wall compliance. Our objective was to utilize EndoFLIP® technology to accurately document gastric pouch reduction and wall compliance in an ex vivo porcine model.

**Methods:** An explanted porcine stomach was used to create an ex vivo model of a dilated gastric pouch and stoma. Gastric pouch volume was measured using an EndoFLIP® functional lumen imaging probe. Endoluminal gastric pouch reduction was then performed with a StomaphyX® device using ten tissue fasteners. EndoFLIP® was used to calculate post-reduction gastric pouch volume and wall compliance.

**Results:** The porcine ex vivo gastric pouch had an intraluminal volume of 31.4 mL at 0 mmHg of wall tension. Following the StomaphyX® procedure, the reduced gastric pouch had a volume of 9.8 mL at 0 mmHg of wall tension, and 12.3 mL at 2 mmHg of wall tension. EndoFLIP® demonstrated a reduction in gastric pouch volume of 21.6 mL and a wall compliance of 1.25 mL/mmHg (0.00092 L/cmH2O).

**Conclusions:** EndoFLIP® is a novel device for measuring intraluminal volume and wall compliance. We report the first use of EndoFLIP® technology to accurately document a reduction in gastric pouch volume and measurement of pouch wall compliance. Further studies with this technology are ongoing and may elucidate the relationship between gastric pouch reduction and weight loss following gastric bypass surgery.

23937

P093

**CHYLOPERITONEUM AFTER LAPAROSCOPIC ROUX Y GASTRIC BYPASS (LRYGB)**

Hidalgo E Jesus MD, Alexander Ramirez MD, Sheetal Patel MD, Emeka Acholonu MD, Jeremy Eckstein MD, Wasef Abu-Jaish MD, Samuel Szomstein MD, Raul Rosenthal MD, Cleveland Clinic Florida

The extravasation of milky chyle into the peritoneal cavity is known as Chylous ascites. A true chylous effusion is defined as the presence of ascitic fluid with high fat (triglyceride) content, usually higher than 110 mg/dl. This can occur de novo as a result of trauma, neoplasm, obstruction of the lymphatic system as well as many other causes that have been described in the literature. It can also occur as a secondary event, this is when an existing clear ascitic fluid turns chylous. Laparoscopic Roux Y Gastric Bypass (LRYGB) has assumed a central role in the surgical treatment of obesity; we present a case of chylous ascites following a Laparoscopic Roux Y Gastric Bypass (LRYGB).

**Case presentation:** We report a case of Chyloperitoneum following a Laparoscopic Roux-en-Y Gastric Bypass (LRYGB) with 100 cm alimentary and 50 cm biliopancreatic limb in a 40 year old male patient who was admitted for surgery on May 31, 2007. The procedure was performed without apparent complications. On August 2008, an Abdominal CT with contrast was ordered, it showed ascites at the level of the liver, spleen, and right paraocolic gutter as well as mesenteric adenitis. On September 2008, the patient is admitted to Cleveland Clinic Florida due to a chronic abdominal pain of unknown etiology. The patient is scheduled for an elective diagnostic laparoscopy and possible reduction of internal hernia and closure of a mesenteric defect. Upon inspection of the abdominal cavity, it came to our attention that there was a large amount of chylous fluid accumulating in the right upper quadrant (RUQ), cul-de-sac and left upper quadrant (LUQ), a specimen was sent for microscopic analysis which came back negative for any bacteria. The loops of small bowel showed signs of lymphectasia, in addition an internal herniation of the common channel was also found. The patient made an uneventful recovery after surgery. To our knowledge, this is the first reported case of chylous ascites following a Laparoscopic Roux Y Gastric Bypass (LRYGB). **Conclusion** Chyloperitoneum should be considered as a possible cause of ascites in patients with chronic small bowel obstruction following a Laparoscopic Roux Y Gastric Bypass (LRYGB).

23946

P094

### REASONS AND OUTCOMES OF SURGICAL REVISION OF GASTROJEJUNAL ANASTOMOTIC COMPLICATIONS IN PATIENTS AFTER LAPAROSCOPIC RYGBP FOR MORBID OBESITY

Alexander Ramirez MD, Rafael Arias MD, Samuel Szomstein MD, Raul Rosenthal MD, Cleveland Clinic Florida

**Background:** Stenosis, ulceration and dilatation at the gastrojejunostomy (GJ) are recognized complications after Roux-en-Y gastric bypass (RYGBP). Treatment options for GJ complications include in most cases endoscopy; rarely, a surgical revision is needed. In this series we reviewed our experience with surgical revisions of the GJ in patients that did not respond to an endoscopic treatment algorithm.

**Patients & Methods:** After IRB approval, we retrospectively reviewed the charts of all patients who underwent LRYGBP between July 2000 and December 2007. Data of patients, who required surgical intervention due to GJ complications including: gender, age, preoperative body mass index (BMI), time of presentation from the initial surgery, postoperative complications, and mortality were documented.

**Result:** During the study period 2,098 patients underwent LRGBP for the treatment of morbid obesity. Ten patients (0.4%) required corrective surgery for problems at the GJ. There were nine females and one male, the average age was 43 years (range 23 –62 years), and the average BMI was 37.8 kg/m<sup>2</sup> (range 20–56 kg/m<sup>2</sup>).

The most common symptoms were sialorrhea, vomiting, nausea and abdominal pain.

Eighty percent of the patients had more than one reason for surgical revision. We identified a stricture in 8 patients (80%), a non-healing marginal ulceration in 4 patients (40%), Gastro - Gastric fistula in 2 patients (20%), a perforation after dilation in 3 patients (30%), gastroparesis in 1 patient (10%) and an enlarged anastomosis in 1 patient (10%). In this series, one mortality (10%) was found and the morbidity was 20%.

**Conclusions:** The most frequent cause for revision of a GJ was anastomotic stricture. The high morbidity and mortality presented in this series should warn surgeons to have clear indications and surgical expertise when performing this delicate procedure.

24004

P095

### UNEXPECTED AND UNUSUAL FINDINGS DURING LAPAROSCOPIC ROUX-EN-Y GASTRIC BYPASS. HOW TO PROCEED? Piotr Gorecki MD, Paul Thodiyil MD, Teddy Takeuchi MD, Leslie Wise MD, New York Methodist Hospital

**Introduction:** Unexpected findings during laparoscopic Roux-en-Y gastric bypass (LRYGB) are frequent and consist mainly of peritoneal adhesions, hernias, organomegaly, gallstones and adnexal cysts. These findings are relatively frequent and their management remains a part of every day bariatric practice. Unexpected and unusual intraoperative findings are only sporadically encountered during LRYGB. Management and clinical decision making of such encounters remains poorly described and largely depends on surgeons' experience.

**Methods:** This is a review of prospectively collected database of the consecutive 525 morbidly obese patients who underwent LRYGB between August 2001 and September of 2008. As a part of clinical pathways all patients were evaluated preoperatively with upper endoscopy and abdominal sonogram. Female patients over 40 years-old also underwent pelvic sonogram.

**Results:** There were six significant and unusual intraoperative findings that have altered the conduct of the planned procedure. These were: Gastrointestinal stromal tumors (GIST) of the stomach (2), GIST of the small intestine (1), ectopic pancreas of the proximal jejunum (1), complete malrotation of the bowel (1), hemoperitoneum due to perforated hemorrhagic ovarian cyst. The therapeutic decisions made were as follow; resection of GIST tumors (3), biopsy of the 3 cm mass of the jejunum (ectopic pancreas) (1), laparoscopic lysis of the Ladd's bands and completion of the LRYGB, evacuation of the hemoperitoneum and abortion of the procedure (1 each). All patients made an uneventful recovery. The patient with malrotation was reoperated on postoperative day 28 for abdominal pain and completion of Ladd's procedure and appendectomy was performed.

**Conclusions:** Intraoperative findings that are unexpected and unusual during LRYGB require decision making that may result in therapeutic resection, biopsy or abortion of the planned procedure.

24011

P096

### FAVORABLE OUTCOMES IN ELDERLY PATIENTS UNDERGOING BARIATRIC SURGERY DESPITE INCREASED CO-MORBIDITIES

Christopher J Myers MD, Sandhya Lagoo-Deenadayalan MD, Rebecca P Petersen MD, John Grant MD, Dana D Portenier MD, Aurora D Pryor MD, Eric J DeMaria MD, Duke University Medical Center, Durham, North Carolina

**Background:** Elderly (65 years and older) obese patients are expected to be at high risk for bariatric surgery. We sought to study outcomes in elderly patients undergoing bariatric surgery with or without Medicare (MC, since 2006), and to evaluate differences in co-morbidities when compared to a meta-analysis study of younger patients.

**Methods:** Elderly patients undergoing bariatric surgery with or without MC were retrospectively reviewed in our database from 2000 to present. Parameters studied included pre-operative weight, co-morbidities, medications, length of stay (LOS), complications, mortality, and percent excess weight loss (%EWL). Incidences of co-morbidities were compared to a meta-analysis review of 22,094 patients between the ages of 16 and 64 (JAMA, 2004, 292:1724). Students' t and Chi-square tests were used to compare continuous and categorical variables respectively.

**Results:** Out of 3000 patients, 47 (1.3 %) elderly patients underwent bariatric procedures. 18 (38%) patients had MC while 29 (62%) did not. There were no significant differences between the groups regarding pre-operative weight, co-morbidities, and medications. All co-morbidities were significantly increased in elderly patients ( $p < 0.001$ , except heart disease  $p = 0.03$ ) compared to patients in the meta-analysis. In elderly patients, mean LOS was 4 days, number of complications was 0.19 and there was no mortality. %EWL at 6 months was 41.6 +/-20.4 in elderly patients and 61.2 +/-3.1 in patients in the meta-analysis review ( $p < 0.001$ ).

**Conclusions:** Bariatric surgery in elderly patients is safe despite more frequent co-morbidities when compared with patients younger than 64 years of age. %EWL was less than younger patients at 6 months following surgery.

24044

P097

### LARGE BLOOD CLOT CAUSING AN ACUTE OBSTRUCTION AT THE JEJUNOJEJUNOSTOMY FOLLOWING LAPAROSCOPIC ROUX-EN-Y GASTRIC BYPASS

Obos I Ekhaese DO, Timothy Oppermann MD, Luis A Bonilla MD, Fariba Dayhim MD, Philip Leggett MD, Patrick Reardon MD, University of Texas @ Houston/ MIST/ Methodist Hospital System

**Background:** Laparoscopic Roux-en-Y gastric (RYGB) bypass is the most common Bariatric procedure performed in the US. Postoperative gastrointestinal bleeding occurs in approximately 1% of all procedures. We report our experience with the rare complication of intraluminal gastrointestinal hemorrhage leading to an obstructing intraluminal blood clot at the jejunojunostomy (JJ) following RYGB.

**Methods:** Two cases of laparoscopic RYGB performed at separate institutions by different surgeons were reviewed. The patient demographics, signs and symptoms, day of presentation, diagnostic imaging, laboratory work, operative findings and perioperative sequelae were compared.

**Results:** Both patients were women, 46 and 49 years old with BMI's of 42.3 and 39.7 kgm<sup>-2</sup>, respectively. Onset of symptoms was on post-operative day (POD) #2. Bilous vomiting, abdominal pain, and tachycardia were present in both patients. Patient 1 was an inpatient when her symptoms developed. An emergent laparotomy revealed a distended biliopancreatic limb and remnant stomach, and a leak at the JJ anastomotic site due to increased intraluminal pressure from the obstructing clot. No active bleeding was found when the anastomosis was examined. Patient 2 had been discharged on POD #1. At the time of exploratory laparoscopy, an obstructing JJ clot was found but no evidence of a leak. Patient 1 developed complications due to an aspiration pneumonia. This led to systemic sepsis, hemodynamic decompensation, and she subsequently expired on POD # 7. Patient 2 also aspirated, leading to pneumonia with prolonged ventilation requiring tracheostomy. She was adequately treated with a course of antibiotics, improved, and was discharged to a LTAC facility on POD #26. She has recovered well and has a BMI of 25 kgm<sup>-2</sup> six months after surgery.

**Conclusion:** Obstructing intraluminal blood clot at the JJ following laparoscopic RYGB can have devastating consequences. Bleeding from the staple line and DVT prophylaxis are probable etiologies. An extensive English literature search revealed that this is a rarely reported cause of obstruction at the JJ. Similarities in these two patient demographics and presentation should prompt more research and possibly a revision of risk stratification for DVT prophylaxis.

24052

P098

**REDUCTION OF OBESITY COMORBIDITIES: LAPAROSCOPIC ROUX-EN-Y GASTRIC BYPASS VERSUS LAPAROSCOPIC ADJUSTABLE GASTRIC BANDING**

Phuong H Nguyen MD, Timothy S Kuwada MD, Dimitrios Stefanidis MD, Amy E Lincourt PhD, B. Todd Heniford MD, Keith S Gersin MD, Carolinas Medical Center

Introduction: Surgical weight loss has been shown to effectively lead to improvements of obesity associated comorbid conditions. The goal of our study was to compare the timing of comorbidity resolution between laparoscopic roux-en-y gastric bypass (LRYGB) and laparoscopic adjustable gastric banding (LAGB).

Methods: All patients (n = 476) undergoing LRYGB or LAGB at our institution over a 2 year period were prospectively entered in a bariatric database. Percentage excess weight loss and comorbidity changes were recorded at 2 and 6 weeks and 3, 6, and 12 months postoperatively. Comorbidities evaluated included diabetes (DM), hypertension (HTN), reflux (GERD), and obstructive sleep apnea (OSA) and their changes were assessed by the operating surgeon at each follow-up visit on a 4 point scale (1 = resolved, 2 = improved, 3 = unchanged, 4 = worse). Chi-square was used to compare differences in % comorbidity resolution at each interval. P < 0.05 was considered significant.

Results: During the study period, 339 patients underwent LRYGB and 137 LAGB. Patient age was 42 ± 9.9, 87% were women, and BMI was 45.3 ± 5. At baseline 36.1% of patients had diabetes, 63.6% hypertension, 60.4% GERD, 36.1% OSA and there were no differences between the groups. Fewer postoperative complications occurred in the LAGB group and there were no mortalities. %EWL and comorbidity resolution was better after LRYGB compared to LAGB. With the exception of OSA, DM, HTN, and GERD improved and stabilized early after surgery (see table).

Parameter	Procedure	2wks	6wks	3mos	6 mos	12mos	P-value
%EWL	LRYGB	15*	25*	35*	51*	61*	<0.001
	LRGB	11*	14*	17*	23*	27*	
DM	LRYGB	91	100*	97*	97*	100*	<0.01
	LRGB	100	82*	91	71*	83*	
HTN	LRYGB	73	89*	88*	91*	88*	<0.01
	LRGB	62	64*	44*	64*	67*	
GERD	LRYGB	97	96*	99*	97*	94	<0.05
	LRGB	96	83*	86*	87*	100	
OSA	LRYGB	40	75*	79*	89*	98*	<0.001
	LRGB	30	25*	17*	50*	55*	

Values reflect percentages of patients with comorbidity resolution or improvement\* p-value refers to pair-wise comparisons (LRYGB vs LAGB) at each interval Conclusion: Overall improvement/resolution of DM, HTN, and GERD occurs early after weight loss surgery and is more pronounced after LRYGB compared to LAGB. This information may be important for the preoperative counseling of morbidly obese patients. Further work is needed and currently underway to incorporate objective data on comorbidity resolution and expand our patient pool and follow up period.

24054

P099

**POST-OPERATIVE GASTRIC BYPASS MARGINAL ULCERS AND STRICTURES LEAD TO INCREASED WEIGHT LOSS**

Gavitt Woodard BS, Tina Hernandez-Boussard PhD, John Morton MD, Stanford University

Introduction: Morbid Obesity is the leading public health epidemic of the industrialized world with bariatric surgery as the only effective and enduring treatment for this disease. Gastric Bypass is known to be very effective for weight loss but can have complications like marginal ulcers or strictures. We hypothesized that gastric bypass patients with ulcers/strictures have differing demographics and outcomes.

Methods: From 2005-8 at an academic center, 500 patients underwent laparoscopic roux en y gastric bypass by a single surgeon who employed a 25 mm EEA stapled gastro-jejunostomy technique. One year follow-up was 82% and marginal ulcers/strictures were identified in 17 patients (3.4%) in a prospectively maintained database.

Results: Study patients were 82% female with an average age of 43 and BMI of 49. 3.4% of patients had marginal ulcers and/or strictures as determined by endoscopy. There were no preoperative demographic differences between patients who did or did not have ulcers/strictures. At one year post-operatively, patients with ulcers/strictures had less improvement in CRP (45% vs. 75%) but significantly increased percent excess weight loss (98 vs. 78, %).

Conclusion In this large cohort, marginal ulcers and strictures in the post gastric bypass patient leads to significantly increased weight loss. This finding may lend credence to the use of endoscopic stoma reduction. in gastric bypass patients who have had poor post-operative weight loss.

24057

P100

**IS THERE A DIFFERENCE BETWEEN EARLY AND LATE ENDOSCOPIC BALLOON DILATION FOR GASTROJEJUNAL STRICTURE AFTER ROUX-EN-Y GASTRIC BYPASS?**

Joseph A Talarico MD, Amy Cha MD, Jill Zink MD, Fady Moustarah MD, Ramy Fouad MD, Patrick Gatmaitan MD, Matthew Kroh MD, Stacy Brethauer MD, Philip Schauer MD, Bipan Chand MD, Bariatric and Metabolic Institute, Cleveland Clinic Foundation

Introduction: Endoscopic balloon dilation has been shown to be an effective treatment for gastrojejunal (GJ) strictures after Roux-en-Y gastric bypass (RYGB). We hypothesize the number of necessary interventions is influenced by the time interval since RYGB. This is a retrospective review examining the relationship between the interval from RYGB to balloon dilation in patients with stricture.

Materials and Methods: Records between July 2006 and September 2008 of patients who underwent upper endoscopy (UE) after RYGB were retrospectively reviewed. A non-consecutive series of 466 symptomatic morbidly obese patients were evaluated using UE. The endoscopic findings for this cohort was extracted directly from the patients' original endoscopy report, classified, and recorded.

Result: Of the 466 patients who underwent UE after RYGB 74% had symptoms which resulted in 53 patients with stricture. Patients were divided into three groups based on their interval from RYGB to initial balloon dilation (group 1; 0 to 120 days from RYGB, group 2; 121 days to 365 days, and group 3 greater than 1 year). Strictures were dilated using controlled radial expansion balloons up to 20 mm. There were no perforations or clinically significant complications at the time of dilation. 97% of early strictures resolved with balloon dilation; however, only 79% of late strictures were resolved with balloon dilation.

	0-120 days	121-365 days	1 year or more
Total Patients	39	8	14
Total Dilations	51	8	21
Pt. w. MultDil	11	0	4
Revisional Surg	1	0	3

Conclusion Early strictures are more likely to be resolved with balloon dilation. However, late strictures are less likely to be resolved with repeated balloon dilations and are more likely to result in revisional surgery. Endoscopic balloon dilatation is safe and effective in GJ stricture.

24065

P101

**GASTRIC BYPASS IMPROVES MUSCLO-SKELETAL QUALITY OF LIFE**

Gavitt Woodard BS, Tina Hernandez-Boussard PhD, John Morton MD, Stanford University

Introduction: Morbid Obesity is the leading public health epidemic of the industrialized world with bariatric surgery as the only effective and enduring treatment for this disease. Gastric Bypass is known to be very effective for weight loss and can also improve obesity related comorbidities like joint disease. Joint disease may be difficult to assess without radiographs. We hypothesized that gastric bypass patients would demonstrate substantial improvement in muscle-skeletal quality of life.

Methods: In 2007 at an academic center, 89 patients underwent laparoscopic roux en y gastric bypass by a single surgeon and had the SMFA Questionnaire administered preoperatively and at 3, 6, and 12 months postoperatively. The SMFA (Skeletal-Musculo Functional Assessment) is a disease-specific quality of life instrument that has been previously validated by the American Academy of Orthopedic Surgery. This is the first use of SMFA outside of Orthopedic Surgery.

Results: Study patients were 82% female with an average age of 43 and BMI of 49. Preoperative SMFA results were significantly lower than societal norms (45 vs. 87). Both at 3, 6, and 12 months post-operatively, there were significant improvements in all SMFA domain scores including overall, upper/lower extremity, and cervical/thoracic/lumbar spine. Overall improvement from preop to 12 months was profound from 45 to 98. In addition, a trend was noted for correlation between SMFA scores and weight loss. Conclusion Obese patients have a significantly reduced muscle-skeletal quality of life that is substantially improved after gastric bypass surgery. The SMFA instrument is easily administered and can be useful in assessing resolution of joint disease.

24072

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### THE RELEVANCE OF USING FLUROSCOPY AS A ROUTINE IN GASTRIC BANDING CONTROL

Ali Fardoun MD, Fawaz Torab PhD, Frank Branicki PhD, Tawam Hospital Al-ain UAE

The relevance of using fluroscopy as a routine in gastric banding control  
Hypothesis: using fluroscopy as a routine in performing gastric banding controls will enable early detection of possible complications and will optimize the adjustment of the band.

Method: 100 patients were strictly followed up in our center for LGB control. All controls were done routinely in the x-ray department under fluroscopy. The plan of controls was 1st day, 6 weeks, monthly postoperative until the optimal adjustment of the band, than as necessary. Gastrographin was used in the first control and barium in the following controls. In standing position, patients were given contrast to swallow under fluroscopy. The position and angle of band, time of passage through the band, the width of passage and the formation of pouch in addition to the type of oesophageal peristalsis and oesophageal diameters were recorded. Adjustment of band was done accordingly and another contrast swallow was confirming the good adjustment or a readjustment was necessary.

the patient weight, eating habits and presence of any symptoms related to the band were documented. The number of controls needed for each patient and the pathology detected at what period in the postoperative time were also registered. Results: 15 cases of asymptomatic patients with severe oesophageal dilatation, tertiary persitalsis and very slow emptying of the contrast were detected. in 10 cases, the oesophageal dilatation could be reversed and the function of the band could be restored with emptying of the band, medications and successive adjustments of the band, 4 patients the dilatation was recurred by adjustmet of the band and this combined with insufficient weight loss. Band was removed and a simulatneous gastric bypass was done. By 1 patients, incomplete ersosion was diagnosed and the band was removed. could be withmany cases of band slippage were detected on time before. 2 cases of disconnection of the port, 2 cases of torsion of the port, 1 case of baloon rupture with escape of contrast were detected in asymptomatic patients. 2 cases of slippage and 1 case of ersoion were detected in symptomatic patients.

Conclusion: in 10% of cases the fuction of the band could be restored and unreversible oesophageal dilatation which could lead to future slippage were corrected. Using the fluroscopy with contrast swallow as a routine is useful to detect the complication earlier than the symptoms and will reduce the rate of complications after gastric banding.

## BASIC SCIENCE (CELLULAR BIO, PHYSIOLOGY)

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### ENHANCED LOCAL PERITONEAL LEUKOCYTE P38 ACTIVATION AND TNF SECRETION WITH AIR VERSUS CO2 INSUFFLATION

Edward D Auyang MD, Eric S Hungness MD, Ann Koons BS, Nathaniel J Soper MD, Michael A West MD PhD, Department of Surgery, Northwestern University, Department of Surgery, University of California San Francisco

Background: Laparoscopic surgery has been shown to decrease systemic stress compared to open abdominal surgery. One of the mechanisms to explain this finding is the effect of carbon dioxide (CO2) as an insufflation gas. Previous studies have shown that peritoneal exposure to CO2 results in a suppressed inflammatory response compared to air exposure. With the revolution of natural orifice transluminal endoscopic surgery (NOTES), the question of insufflation gas choice has re-risen. The objective of this study was to examine the impact of CO2 and air on plasma cytokine levels and peritoneal cell expression of inflammatory mediators.

Methods: Eight pigs underwent unilateral uterine horn resection using a 3-trocar technique. The animals were divided into 2 groups – laparoscopic with CO2 insufflation (CO2) and laparoscopic with air insufflation (AIR). Peritoneal lavage specimens were taken at 0, 1, and 4 hours from the time of incision. Lymphocytes, monocytes, and granulocytes were analyzed for phospho p38 expression using flow cytometry. Plasma tumor necrosis factor-alpha (TNF- $\alpha$ ) was analyzed using enzyme-linked immunosorbent assay (ELISA) and compared at 0, 1, 2, and 4 hours from the time of incision. Welch-Satterthwaite t test was performed to compare the groups. Differences between groups were considered statistically significant at  $p < 0.05$ .

Results: Peak TNF- $\alpha$  levels were lower in the CO2 group compared to the AIR group ( $p = 0.0034$ ). Peritoneal lavage specimens only had sufficient cell counts for analysis at 4 hours after surgery. While not statistically significant due to insufficient sample size, phospho p38 expression was decreased in all cell types in the CO2 group compared to the AIR group (Table 1).

Table 1 Comparison of CO2 and Air Insufflation

	CO2	AIR	p-value
PeakTNF-a pg/ml	190 +/- 53	341 +/- 89	0.0034*
p38 (% cells)	CO2	AIR	p-value
Lymphocytes	3.91 +/- 1.4	9.60 +/- 5.9	0.1479
Monocytes	2.78 +/- 1.4	22.81 +/- 16.0	0.0866
Granulocytes	0.92 +/- 0.5	1.17 +/- 0.5	0.5171

Conclusions: Laparoscopy with CO2 appears to result in decreased acute systemic inflammatory response in the forms of decreased levels of TNF- $\alpha$  and decreased expression of phospho p38 in peritoneal cells compared to AIR. This is consistent with previously reported results comparing the CO2 and air insufflation, and suggests that CO2 should be used for insufflation for NOTES instead of air.

### CARDIOVASCULAR DIFFERENCES WITHIN THE OMENTUM OF MORBIDLY OBESE DIABETIC PATIENTS

A Katharine Hindle MD, Claire Edwards MD, Jason Kasza MD, Tim McCaffrey PhD, Sidney Fu PhD, Fred Brody MD, The George Washington University

Background: The metabolic syndrome describes the association between obesity and a host of co-morbidities including insulin resistance, hypertension, dyslipidemia, and cardiovascular (CV) disease. Adipokines produced from omentum increase the inflammatory state and reportedly contribute to the risk of CV disease. This study examines the genetic differences in the omental tissue of morbidly obese diabetic and non-diabetic patients.

Methods: Twenty morbidly obese patients undergoing bariatric surgery (BMI greater than 35) were included. Ten patients were diabetic and ten were non-diabetic. Omental samples were collected intra-operatively and flash frozen in liquid nitrogen. RNA was extracted using the Trizol reagent and protocol. 100 ng of purified RNA (Qiagen) was amplified and labeled using the Affymetrix protocol and the Affymetrix GeneChip array. The microarray data was analyzed with the Partek program using an unpaired t-test ( $p < 0.05$ ). The gene expression profiles of the diabetic group were compared to the non-diabetic group. Using the Ingenuity program, the gene list generated from the microarray analysis was evaluated for relevant biologic themes. Real time quantitative PCR (QPCR) was used to validate the array data.

Results: The diabetic group identified 99 upregulated genes and 13 down regulated genes with greater than 1.5 fold difference in expression. Ingenuity analysis demonstrated numerous dysregulated genes associated with CV disease including leptin, Von Willebrand Factor, P-Selectin and Periostin osteoblast specific factor. Of note, leptin was increased 1.6 fold in diabetic patients on the microarray analysis. Leptin upregulation was confirmed with QPCR and showed a 1.9 fold change.

Conclusions: Our microarray analysis of the visceral fat from morbidly obese diabetics and morbidly obese non-diabetics documents a host of up-regulated genes related to CV disease. This study sheds further insight into the genomic relationship between diabetes and CV. This information will help guide further cell line analyses.

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**ADIPONECTIN AND LEPTIN IN THE BARIATRIC PATIENT**

A Katharine Hindle MD, Claire Edwards MD, Jason Kasza MD, Tim McCaffrey PhD, Sidney Fu PhD, Fred Brody MD, The George Washington University

**Background:** Through relatively unknown mechanisms, bariatric surgery can resolve type 2 diabetes in morbidly obese patients. Potentially, pre- and post-operative changes in adiponectin and leptin expression are involved in this process. This study attempts to identify differences in gene expression in diabetic and non-diabetic patients undergoing bariatric surgery with regards to adiponectin and leptin.

**Methods:** Seventeen morbidly obese patients undergoing bariatric surgery were included in this study. Eight patients were diabetic and nine patients were non-diabetic. In addition, four non-obese, non-diabetic blood samples were included. Blood samples were drawn pre and post-operatively and stabilized in Paxgene tubes (PreAnalytix). Total RNA was extracted and purified (Qiagen). 100 ng of total RNA was amplified and labeled using the Ovation RNA Amplification System V2 with the Ovation Whole Blood reagent (Nugen) before hybridizing to an Affymetrix Focus array containing over 8500 verified genes. Microarray results were analyzed using the GeneSpring program which uses an ANOVA analysis. Finally, real time quantitative PCR (QPCR) was used to verify genes of interest.

**Results:** Overall, 167 genes were upregulated and 39 genes were down-regulated in the obese diabetic patients versus obese non-diabetic patients. Pre-operatively, adiponectin was down-regulated 1.5 fold for diabetic versus non-diabetic patients. Leptin expression was not different between the two groups. However, post-operative leptin expression was up-regulated 2 fold using QPCR. Of note, post-operative leptin expression was similar to leptin expression in non-obese, non-diabetic patients.

**Conclusions:** Leptin and adiponectin are critical for glucose homeostasis and there are distinct genetic differences for these two hormones between diabetic and non-diabetic morbidly obese patients. Post-operatively, bariatric surgery can alter gene expression in morbidly obese patients to comparable levels of normal individuals.

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**THE EFFECT OF INHALED LPS ON THE DEVELOPMENT OF BRONCHIOLITIS OBLITERANS**

Sean M Lee MD, Frank Schneider MD, Errol Bush MD, Hao-Jin Wei MD, Keki Balsara MD, William Parker PhD, Robert D Davis MD, Shu S Lin MD, Department of Surgery and Department of Pathology, Duke University Medical Center, Durham, NC, USA, 27710

**Introduction:** Gastroesophageal reflux-associated chronic aspiration contributes to the development of various lung disease processes including chronic pulmonary allograft dysfunction, as manifested by the histologic finding of bronchiolitis obliterans (BO). The TLR-4 innate immune pathway is thought to play a role in these processes and may be activated by bacteria within the gastric contents. Here we examine whether LPS, a TLR-4 agonist found in bacteria, leads to the progression of BO when inhaled by rats with left lung allografts.

**Methods:** Thirteen F344 rats underwent left lung transplantation using WKY rat donors. Three times a week for 15 weeks, starting 1 week after the transplant, rats were exposed for 1 hour to an aerosolized solution of either LPS or sterile 0.9% saline. All rats were given 5 mg/kg cyclosporine three times weekly. After 15 weeks, all rats were sacrificed, and tissue from each lobe of transplanted and native lungs was prepared for pathologic review. A board-certified pathologist then graded every visible airway on all slides on a scale from 0 (no BO) to 3 (severe BO) in a blinded fashion.

**Results:** Comparison of LPS- and saline-treated animals revealed no difference in overall BO disease burden, defined as number of diseased (grade 1-3) airways divided by the total number of airways, in allograft lungs ( $p = 0.949$ , by unpaired t-test). However, there was a trend toward greater BO disease burden in native (non-transplanted) lungs in LPS-treated animals than in saline-treated animals ( $p = 0.119$  by unpaired t-test). LPS also caused a trend towards inducing severe (grade 3) BO lesions ( $p = 0.053$  by X2 contingency table), all of which were found in the native rather than the transplanted lungs ( $p = 0.014$  by X2 contingency table).

**Conclusions:** These data demonstrate that inhaled LPS alone, as a component that triggers the innate immune pathway, is not sufficient to induce BO in pulmonary allografts under the conditions used. The findings do suggest that exposure to LPS may play a role in generating a response in non-transplanted lungs in single lung allograft recipients. These observations merit further study and suggest that innate immune pathways in the native lung contribute to pulmonary pathology.

23228

P106

**LARYNGOPHARYNGEAL REFLUX (LPR): PATHOPHYSIOLOGIC EVIDENCE OF TWO DIFFERENT SUBTYPES**

Shahin Ayazi MD, Peter F Crookes MD, Jeffrey A Hagen MD, Jorg Zehetner MD, Arzu Oezcelik MD, Matthew R Lilley BA, Priyanka K Wali BA, Emmanuele Abate MD, Farzaneh Banki MD, Steven R DeMeester MD, John C Lipham MD, Tom R DeMeester MD, Department of Surgery, University of Southern California

**Introduction:** Laryngo-pharyngeal reflux (LPR) refers to symptoms caused by back-flow of gastric contents to the larynx and pharynx. Concurrent pH recordings at increasing distances above the LES are reported to show a linear decrease in acid exposure as the distance from the LES increases. While abnormal distal esophageal acid exposure is common in patients with LPR, abnormal proximal esophageal acid exposure in the absence of abnormal distal reflux has also been reported. The aim of this study was to assess if patients with proximal reflux alone have different physiologic characteristics of the lower esophageal sphincter (LES) and the esophageal body than patients with combined proximal and distal reflux. **Subjects and Methods:** Patients who underwent combined proximal and distal pH monitoring and esophageal motility studies were identified, excluding those studied on antireflux medication and those with previous foregut surgery. Abnormal reflux was defined based on % total time less than 4 (> 4.4% in the distal and > 1% in the proximal esophagus). Patients were classified into three groups (1) isolated distal reflux (2) isolated proximal reflux (3) combined reflux (abnormal at both levels). Manometric and demographic factors were compared between the group with isolated proximal reflux and the group with combined reflux. **Results:** A total of 359 (171 males) had abnormal esophageal acid exposure. Median age was 54(45-64) and median (BMI) 27.2(24.2-29.9). There was a strong correlation between % time pH < 4 in the distal and proximal in the whole study population ( $r = 0.56$ ,  $p < 0.0001$ ). Combined reflux was found in 203 patients and isolated proximal reflux in 28(14%). Compared to the patients with combined reflux, patients with isolated proximal reflux had higher distal peristaltic amplitudes (97.1 vs. 81.9 mm Hg,  $p = 0.042$ ), higher resting LES pressure (14.5 vs. 10.8 mm Hg,  $p = 0.049$ ) and a lower frequency of a defective LES (21% vs. 41%,  $p = 0.047$ ). The median gastric pH was similar. Proximal reflux was not correlated with BMI. **Conclusion:** In patients with proximal reflux, the abnormal reflux is limited to the proximal esophagus in 14%. In this subgroup the structural characteristics of the LES and distal esophageal body function are less abnormal than those with combined proximal and distal reflux. This suggests that in patients with combined reflux functional deterioration is the cause. Isolated proximal reflux appears to have different pathophysiology and thus may respond differently to conventional antireflux therapy.

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**DETAIL ANALYSIS OF VESSEL SEALING PERFORMANCE OF BIPOLAR VESSEL SEALING SYSTEM FOR LAPAROSCOPIC SURGERY**

Hideki Hayashi MD, Terumasa Yamaoka, Satoki Zenbutsu BS, Masashi Sekine BS, Hozumi Tatsuoka MD, Yoichi Miyake MSc, Research Center for Frontier Medical Engineering, Chiba University

**INTRODUCTION:** Vessel sealing devices of 5 mm in diameter for laparoscopic surgery provide only a small breadth of sealing area. Therefore, various double sealing techniques have been tried to enhance bursting pressure of the sealed vessels by surgeons. However, there have been no reports to reveal which technique achieved best performance of vessel sealing. Those were examined in a porcine mode.

**METHODS AND PROCEDURES:** Three 3-month-old domestic pigs were used. Under general anesthesia, gastric arteries were sealed in vivo by Ligasure V with single or double sealing technique. Sealed vessels were excised, normal saline was infused inside and bursting pressure was measured with electric manometer. Sealing techniques tested were as follows; #1:Regular usage (artery was divided with built-in cutter after single sealing, sealing width = 2 mm), #2:Artery was divided distal to single sealing (sealing width = 5 mm), #3:Two consecutive sealing with 50% overlap and division of artery with built-in cutter after second sealing, sealing width = 5 mm), #4:Two consecutive sealing with 1 mm interval and division of artery with built-in cutter after second sealing, sealing width = 8 mm).

**RESULTS:** Mean bursting pressures of the tested #1-#4 were 1064, 1732, 1361, 1053, respectively (mmHg). Generally, leakage of saline was observed at the distal end of the sealing on bursting, however, it was observed at the proximal end of the sealing when the artery was sealed with double sealing technique #4.

**CONCLUSION:** Best sealing performance was observed with the sealing technique without using built-in cutter. These data suggested that recommended technique to securely seal arteries is as follows; place a hemostasis clip distal to single sealing and divide with scissors between clip and sealing.

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P109

**NO HEMODYNAMIC DIFFERENCE BETWEEN NOTES AND ENDOSCOPY OVER SHORT TIME PERIOD**

Juliane Bingener MD, Erica Moran MD, Chris Gostout MD, Marianne Huebner PhD, Mayo clinic

**Introduction:** Natural Orifice Transluminal Endoscopic Surgery (NOTES) promises decreased invasiveness by performing intra-abdominal procedures while avoiding the abdominal wall. Data from a randomized blinded study showed significant divergence of heart rate and diastolic blood pressure for NOTES animals compared to laparoscopy animals. We compared animals undergoing diagnostic or interventional NOTES with animals undergoing standard endoscopy over a 30 minute period. Hypothesis: There will be no difference between the groups.  
**Methods:** 37 female 50 kg domestic swine were randomized to 3 groups using permuted block design. The diagnostic NOTES group (group 1, n = 11) underwent NOTES diagnostic peritoneoscopy using air insufflation. Group 2 (n = 14) underwent diagnostic endoscopy with gastric irrigation (no gastrotomy). The interventional NOTES group (group 3, n = 12) underwent transgastric mesh placement. All animals received invasive hemodynamic monitoring and ABG at baseline, 10 minutes and 30 minutes. Data collection was blinded from the start of the pneumoperitoneum (group 1& 3) or gastric intubation (group 2). Groups were contrasted with repeated measures linear models (SAS v9.1). The study was IACUC approved.  
**Results:** As in the prior study, no difference in the systolic blood pressure was noted. A statistically significant difference in the diastolic blood pressure (DBP) between groups was noted at time 0 (p = 0.05). This corresponds with the beginning of the pneumoperitoneum for groups 1&3 and the start of endoscopy for group 2. The mean DBP was 14 points higher in group 2 than group 1 (p = 0.02). However two animals exhibited very low DBP and when analysis was repeated after the outliers were removed, the difference did not remain significant. Mean bladder pressure was 5.4 +/-6.2 cm H2O in group 1, 6.9 +/-8.4 in group 2 and 5.7 +/-6.6 in group 3. Heart rate and ABG values were not statistically significantly different (p > 0.10) between groups.  
**Conclusion:** Hemodynamic measurements suggest a similar reaction for diagnostic or interventional NOTES and endoscopy animals over a 30 minute time period. Comparing these results with results between laparoscopy and endoscopy this might support the less invasive effect of NOTES.

24013

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**WEIGHT LOSS INDUCED BY LAPAROSCOPIC BARIATRIC SURGERY IS ASSOCIATED WITH A REDUCTION IN AUTONOMIC RESPONSIVENESS**

William Bertucci MD, Erica Sturdivant MD, Janos Taller MD, Ryan Woodman BS, Deborah Romero RN, David Gallus MD, Todd Peterson MD, Warren Lockette MD, Department of Surgery and Department of Clinical Investigations, Naval Medical Center, San Diego, CA

**Introduction:** In the face of high caloric intake and low levels of physical exertion, obesity induces sympathetic nervous system activation. This increased autonomic activity is manifested as higher blood pressure in obese patients, and as a result, excess body weight is associated with increased cardiovascular morbidity. Furthermore, it has been shown that when patients lose weight, their blood pressure falls, and this is believed to result from a decrement in sympathetic nervous system activation that can be induced by weight loss. However, it is not known if the reduction in weight diminishes sympathetic nervous system responsiveness when subjects are being stressed. We hypothesized that weight loss not only reduces blood pressure at rest, but also, there is a concomitant reduction in autonomic responsiveness to stress.  
**Methods:** We recruited 31 subjects with a body mass index over 35 kg/m2 who were awaiting weight loss surgery and 7 subjects who had received bariatric surgery and were at least one year out from surgery. We measured hemodynamics in these patients while they were resting, and again after inducing stress with two experimental paradigms. The orthostatic challenge test and cold pressor tests are two safe, commonly used, non-invasive assessments of sympathetic nervous system reactivity. In the cold pressor test, resting patients are seated and asked to place their hand in ice-cold water for one minute. It has been shown that patients with exaggerated hemodynamic responsiveness to the discomfort of cold water immersion are more likely to develop high blood pressure and other risk factors associated with cardiovascular morbidity. Similarly, it has been shown that individuals who are genetically predisposed to develop cardiovascular risk factors such as hypertension have greater sympathetic responses to orthostatic stress. In the orthostatic stress test, patients are asked to stand suddenly after lying comfortably supine and changes in hemodynamic variables are recorded.  
**Results:** As expected, patients with a history of morbid obesity who underwent weight loss surgery had significantly lower systolic blood pressure and mean arterial pressure when compared to obese subjects awaiting surgery. Most importantly, these reductions in resting blood pressures were maintained in post-operative patients when they were stressed with either an orthostatic challenge or the cold pressor test (\* denotes p < 0.05 when comparing pre- and post-surgery values).

	Pre-Surgery		Post-Surgery	
	Resting	Stressed	Resting	Stressed
<b>Orthostatic tolerance testing</b>				
Systolic Blood pressure	133 ± 3	136 ± 4	119 ± 3*	116 ± 3*
Mean Arterial pressure	105 ± 2	108 ± 3	95 ± 3*	95 ± 3*
<b>Cold pressure testing</b>				
Systolic Blood pressure	129 ± 3	141 ± 4	116 ± 5*	131 ± 8*
Mean Arterial pressure	104 ± 2	111 ± 3	95 ± 4*	105 ± 4*

**Conclusions:** Surgically-induced weight loss not only reduces cardiovascular risk factors such as elevated blood pressure in patients while they are at rest, but also, during maneuvers designed to induce significant stress and reflex autonomic reactivity. Reductions in stress-induced increases in blood pressure accompany the weight loss induced by surgery. It remains to be determined whether other indicators of sympathetic nervous system-dependent hyperactivity such as platelet aggregation and the release of inflammatory cytokines are similarly reduced. These risk factors are being prospectively evaluated in this cohort of volunteers.

**COLORECTAL / INTESTINAL SURGERY**

22144

P111

**RETROSPECTIVE ANALYSIS OF RESECTED PRIMARY COLORECTAL CANCER REVEALED NO CORRELATION BETWEEN NODE HARVEST AND NODE INVOLVEMENT**

Munir A Rathore, Muhammad I Bhatti, Liz Hand, Derek Allen, Mohey Ismail, Victor Loughlin, Lagan Valley Hospital Lisburn and Belfast City Hospital, Northern Ireland UK

**Introduction:** The study aims to analyze the correlation between lymph node harvest (LNH) and node involvement (LNI) in resected primary colorectal cancer specimens.  
**Patients & methods:** Retrospective analysis. The study period is Jan 2002 - Dec 2006 (5y). The data were obtained from medical records. The patient inclusion criteria were resection of primary CRC including synchronous or metachronous cancer. Exclusion criteria were recurrent CRC, cancer not operated, cancer not resected and endomucosal resection. LNH and LNI were obtained. The data were analyzed and compared with literature and national audit.  
**Results:** There were 142 resections (mean = 28 per annum). M:F ratio = 0.97:1. Median age = 71y. There were 86 (60.5%) colonic and 56 (39.5%) rectal cancers. There were 70 (49.3%) anterior resections and 11 APRs from a total of 83 rectal resections (pan-proctocolectomy = 2). Median CRM = 7.5 mm. The CRM involvement = 12.7% for all CRC and 16% for rectal cancers. Median overall LNH was 12 (mean = 13 p = 0.08 when compared to the recommended LNH = 12). Median LNH for rectal cancers = 11 and for colonic cancer = 13. R0 resections = 84%. 30-day mortality = 4.3%. There was 17.6% chance of metastasis at presentation. All-stage 3-year disease-free survival (DFS) was 67% and 82% for stages I-III (Tany Nany M0).  
**When correlation was determined between LNH and lymph node involvement, it revealed a low correlation (r = 0.16 p = 0.06). When the national audit calculated the same relationship among its much larger sample the results were the same (r = 0.15 p = 0.001).**  
**Conclusion:** LNI as a function of tumour and host behaviour is of prognostic significance. LNH is dependent on multiple factors and may be a quality assurance (QA) tool to be used to compare inter-institutional standard of multi-disciplinary meetings (MDM)

22151

P112

**ROLE OF INITIAL CLINICAL ASSESSMENT IN THE DIAGNOSIS OF ACUTE DIVERTICULITIS**

Munir A Rathore, Muhammad I Bhatti, Celma DeSilva, Adel Osman, Maurice Fernando, Liz Hand, Victor Loughlin, Lagan Valley Hospital Lisburn, Northern Ireland UK

**Introduction:** This paper aims to determine the diagnostic accuracy of initial clinical assessment in the diagnosis of acute diverticulitis (AD).  
**Patients and methods:** Retrospective analysis. Patients admitted to the surgical unit via A&E between Apr 2002 and March 2006 inc. (4y) were identified using the International Code of Diseases (ICD-10 version 2007) coding system. Exclusions were gynae, medical or those discharged at the A&E level. Code K00-K93 was used to segregate GI emergency. Code R10 was used to identify "abdominal pain". Code K57 was used to identify admissions with acute diverticulitis (AD) of the GI tract. From this list, case notes were appraised. Modified Hinchey score (0-IV) was used to describe diverticulitis severity.  
**Results:** Between Apr 02 and mar 06 (4y), n = 3647 presented to the surgical take (75/month). These form 3.3% of the hospital catchments population (110000). The patients with GI emergency including acute abdomen were n = 2360 (64.7% of all referrals and 2.1% of population). Patients with acute diverticulitis of the GI tract were 121. Three were excluded (small bowel diverticulitis). From the remaining n = 118 notes there were more exclusions: no mention of diverticulitis (n = 31), no diverticular disease (n = 3), notes not traceable (n = 3), elective admission (n = 1). Hence there were 80 eligible patients.  
**Confirmed AD was seen in 32/80 patients. The median age = 65y (mean = 65 mode = 43 iqr = 51-77 range = 32-89). M:F = 0.7:1. The diagnostic capability of initial clinical assessment revealed a sensitivity = 47%, specificity = 96.8%, false-v-rate = 53%, false + ve = 60%, an AD prevalence of 40% from the initial AD-coded patients and an overall accuracy of 42.5%. The initial diagnosis agreed with the final only on the basis of chance (k = -0.127 SE = 0.195ci -0.34 -0.082). The population prevalence of diverticular disease (DD) = 0.7%, endoscopic prevalence of DD = 29.5%. The population prevalence of acute diverticulitis was 0.03% of the population, 1% of all GI + abdominal emergency, 5.8% of all emergency abdominal pains alone, and 3.7% of all DD. A strong correlation of acute diverticulitis was seen with CRP (r = 0.5) and WCC (r = 0.3).  
**Conclusion:** The initial clinical assessment in the diagnosis of acute diverticulitis was correct on < 50% occasions and was chance-based. It had high success in excluding acute diverticulitis (negative predictive value = 96.8%).**



22225

P113

**LAPAROSCOPIC RESECTION OF LYMPHANGIOMA OF THE SMALL BOWEL MESENTERY IN AN ADULT**

Susan A Garand DO, George Y Apostolides MD, Greater Baltimore Medical Center

A 32-year-old female presented for Colorectal Surgery consultation regarding an 18-month history of vague left-sided abdominal pain, intermittent bloating, frequent stools, and occasional passage of mucus. Her laboratory work-up was negative. CT scan of the abdomen and pelvis revealed a "mass in the small bowel mesentery". She had no chronic medical issues and had no prior surgeries. Physical findings included a palpable mass in the left upper abdomen with tenderness to palpation at that site. She underwent EGD and colonoscopy, both of which demonstrated an extra-luminal mass. Diagnostic laparoscopy was performed. Findings included a small amount of chylous-appearing peritoneal fluid and a lobulated mass involving the small bowel mesentery. Laparoscopic resection of the cystic mass including the short segment of jejunum was undertaken with primary anastomosis. She had complete resolution of her symptoms. The diagnosis on final pathology was that of a mesenteric lymphangioma measuring 7 x 6 cm.



Lymphangiomas are congenital malformations thought to be the result of failure of the primary lymphatic sacs to join the lymph system. These are most often seen in the pediatric population as a head, neck, or axillary mass. Less than 1% are found in the small bowel mesentery. Considering the rarity of this benign cystic tumor and the vague presenting symptoms, one must have a high index of suspicion to sort this out. Most are diagnosed after resection. Lymphangiomas tend to enlarge and can cause significant morbidity including obstruction, volvulus, or rupture with hemorrhage and/or peritonitis. The mass can be visualized on ultrasound, CT, or MRI. Pre-operative diagnosis can be made by percutaneous aspiration of the cystic mass. Complete surgical resection is the treatment of choice. Reported recurrence rates are from 0% to 27% for complete resection and 10% to 100% for incomplete resection.

22347

P114

**USE OF ALVARADO CLINICAL SCORE FOR ACUTE APPENDICITIS TO DIRECT UTILIZATION OF CT FOR ACUTE APPENDICITIS**

Robert McKay MD, Roger Barrowman MD, Ellis Hospital, Schenectady NY

Introduction: CT is considered the 'gold standard' in the diagnosis of acute appendicitis (AA). The radiation dose associated with an abdominal CT has recently been revisited, leading to a reassessment of indications to perform CT for AA. The Alvarado score for AA, determined prior to CT, is compared to CT and pathology results and recommendations are made on the utilization of CT for AA.

**Methods and Procedures:**

Over a 12 month period, 201 patients (77 males, 124 female) in a community hospital ED, with a clinical suspicion of AA, were enrolled by ED physicians. The Alvarado clinical score was performed by the ED physician prior to reviewing the CT result. Consultation with surgical services, after all investigations had been performed, was at the discretion of the ED physician. Demographics, CT and pathology results were collected and analyzed.

Results: CT for AA had a sensitivity of 95.8%, specificity of 98.7% and accuracy of 98%. The average Alvarado score for a positive CT was 6.9 and for a negative CT was 4.8 (p < 0.005). The Alvarado score, compared with positive CT for AA, is a significant variable (p < 0.005). Gender was also significant, with males more likely to have a positive CT (p < 0.0001). There was no significant difference with age (p = 0.3516). Probabilities of positive CT per Alvarado score for gender (average age 30)

Score	Male	Female
1	0.047	0.015
2	0.075	0.025
3	0.119	0.041
4	0.182	0.066
5	0.269	0.104
6	0.379	0.162
7	0.502	0.242
8	0.625	0.305
9	0.734	0.366
10	0.82	0.59

Conclusion: This study revealed a significant gender difference for the Alvarado score for AA, with the endpoint of a positive CT. Recommendations for the utilization of CT in the diagnosis of AA, include: a probability of under 0.075 of a positive CT for AA as an acceptable level not to perform a CT, including males with scores of 2 or less and female with scores of 4 or less; a probability over 0.5 of a positive CT, surgical consultation prior to imaging, including males with a score of 7 or greater and females with a score of 10. The mid range scores of 4 through 9 for females and 3 through 6 for males are considered equivocal and CT is recommended.

22355

P115

**LAPAROSCOPIC MANAGEMENT OF ENTEROVESICLE FISTULAS IN CROHN'S DISEASE**

AMIR DAGAN MD, PETACHIA REISSMAN MD, Department of General Surgery, Shaare-Zedek Medical Center, Jerusalem

Introduction: In the past decade laparoscopic surgery for uncomplicated Crohn's disease (CD) was shown to be safe and feasible. Laparoscopic management of CD complicated by enteric fistulas is more controversial, with a higher reported conversion rate and postoperative complications.

Methods: We retrospectively reviewed all patients who underwent elective laparoscopic surgery for CD complicated by enterovesicle fistula in a high volume center for laparoscopic colorectal surgery. Clinical data and outcome are presented.

Results: During a 7-years period (2002-2008), 148 CD patients were operated, 67 with complicated disease. Of those 15 patients were treated for enterovesicle fistulas (11 males, 4 females) average age was 29.

Mean duration of disease was 9 years before the complication of enterovesicle fistula presented. Presenting symptoms included: recurrent urinary tract infection (10 patients), pneumaturia (7 patients), pelvic pain (5 patients) and frank fecaluria (2 patients). In two patients the diagnosis was made incidentally during operation. Almost all patients suffered from an ileovesicle fistula (12 patients), two had a fistula between the sigmoid colon and the urinary bladder and one had a rectovesicle fistula. Multiple additional fistulas including enterocutaneous, ileoileal and ileocolic were noted in 5 patients.

All patients with an ileovesicle fistula underwent an ileocecal resection with resection of the fistula tract debridement and repair of the bladder. Additional procedures were added depending on the findings. One of the two patients with sigmoid vesicle fistula underwent segmental sigmoid resection and the other had a subtotal colectomy due to diffuse longstanding colonic disease. One patient with rectovesicle fistula underwent a low anterior resection and was the only patient who required conversion to an open procedure (6%). Postoperatively there was no major morbidity. 3 patients suffered from minor morbidity (2 wound infection, 1 CVL infection). Length of stay was 8-19 days (average 9.8 days).

At follow up of 6 months to 6 years (average 3 years) all patients are well with no symptoms of recurrent fistula and none required additional surgery. All patients have received immunomodulating medications.

Conclusions: According to our experience, laparoscopic management of enterovesicle fistula related to complicated CD, is feasible and safe. With low conversion rate, low morbidity and good long term results.

22359

P116

**OPPORTUNITY COST IN THE EVALUATION OF SURGICAL INNOVATIONS: A CASE STUDY OF LAPAROSCOPIC VERSUS OPEN COLECTOMY**

Abhishek Chatterjee MD, Lilian Chen BS, Elie A Goldenberg MD, Harold T Bac MS, Samuel R G Finlayson MD, Dartmouth Hitchcock Medical Center

Introduction: Opportunity cost is the value of an activity forgone to participate in some other activity. With respect to surgery, an innovation incurs an opportunity cost when it uses additional operating time that could otherwise be used in a productive way. Although fundamental to the economist's view of costs, opportunity cost is infrequently used in the laparoscopic literature. In an environment of limited resources, providers must understand opportunity cost and apply it to the assessment of new technologies. We present an example of assessing opportunity cost in the transition from open to laparoscopic colectomy using pooled analysis data from the surgical literature and hospital financial data.

Methods: Using an OVID/MEDLINE search of English language journals between the years 1998 and 2008, we identified studies from which we pooled data related to costs and operating room times for laparoscopic versus open colectomy. The weighted mean differences for these variables were calculated using inverse variance weights. Where appropriate, standard deviations were imputed based on reported p-values or confidence intervals, following the guidelines outlined in Cochrane Handbook for Systematic Reviews of Interventions.

Using our university hospital 2007 financial records, we then identified the five most frequently performed, elective general surgery procedures. Their profit margins were determined and then divided by their average surgical time in order to calculate a range of opportunity cost multipliers. We then applied these opportunity cost multipliers to the additional time required to perform laparoscopic colectomy (versus open colectomy) to demonstrate that procedure's true overall cost.

Results: Seven comparative studies in the literature were identified representing 11,326 laparoscopic and 21,319 open colectomies. Based on the pooled analysis, operating time was longer for a laparoscopic colectomy by 27.08 minutes (p < .0001). Additionally, laparoscopic colectomies had slightly higher total costs, with a difference of \$104.67, but this was not statistically significant (p = 0.28).

The five highest volume, elective procedures chosen were laparoscopic cholecystectomy, laparoscopic inguinal hernia repair, breast biopsy, partial mastectomy and total thyroidectomy. By multiplying these procedures' profit margins by their surgical times, we obtained five opportunity cost multipliers with a range between \$9/minute and \$26/minute.

Depending on which opportunity cost multiplier one uses, the opportunity cost of using an additional 27.08 minutes to perform laparoscopic colectomy ranges between \$243.72 and \$704.08, which is approximately 2 to 6 times greater than the point estimate of difference in total costs based on published studies.

Conclusion: Although frequently overlooked, opportunity cost is a potentially very important element of assessing the true costs of surgical innovation.

22378

P117

### SHORT AND LONG-TERM OUTCOME AFTER LAPROSCOPIC-ASSISTED SURGERY FOR STAGE III COLORECTAL CANCER: A MATCHED-CASE CONTROL STUDY

Shunichi Osada PhD, Shigeru Yamagishi PhD, Mitsuyoshi Ota PhD, Shoichi Fujii PhD, Yasushi Ichikawa PhD, Itaru Endoh PhD, Shigeo Ooki PhD, Department of Gastroenterological Surgery, Yokohama City University Graduate School of Medicine

**Aim:** The aim of this study was to clarify the short and long-term outcome after laparoscopic-assisted surgery for Stage III (Any T, N1-2, M0) colorectal cancer compared to open surgery.

**Methods:** 50 patients underwent LAP for stage III colorectal cancer from 2000 to 2006, were compared with 50 patients underwent OPEN surgery matched for the age, gender, tumor site, stage, histology, and follow up time.

**Results:** There were no significant differences in the mean number of dissected lymph node and the mean number of metastatic lymph between two groups. Mean operative time of LAP and OPEN groups were 267?}72 vs. 228?}120(p < 0.01), mean blood loss were 101?}131 vs. 257?}247(p < 0.01), mean postoperative stay were 12.1?}8.6 vs. 16.3?}9.3(p < 0.01), respectively.

19 patients in LAP group and 16 patients in OPEN group developed recurrences (LAP: OPEN, liver 9: 9, lung 3: 2, peritoneum/local 5: 1, abdominal lymph node 2: 4). Mean follow up time were 36.8?}22.1 month vs. 32.6?}21.5 month in LAP and OPEN groups, respectively. There were no significant differences in the 3-year recurrence free survival rate (LAP:OPEN, 57.1%: 56.2%, p = 0.805) and the 5-year overall survival rate (LAP: OPEN, 83.6%: 68.2%, p = 0.069).

**Conclusion:** LAP for stage III colorectal cancer may be acceptable with viewpoint of the short and long-term outcome.

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### EVALUATION OF THE SHORT TERM OUTCOME OF LAPAROSCOPIC COLORECTAL SURGERY

Mitsuyoshi Ota MD, S Fujii MD, C Kunisaki MD, S Ohki MD, S Yamagishi MD, S Osada MD, Y Ichikawa MD, Yokohama City University Medical Center

**Aim:** The outcome of 536 patients who underwent LAC during 1993–2007 were compared with that of 1140 patients of OC. **Methods:** We evaluated patient outcome in two phases; phase 1 (1993–2004) and phase 2 (2005–2007). **Results:** Operation time was significantly longer in LAC patients (254 min. vs. 234 min.). Bleeding, postoperative hospital stay and the rate of postoperative complication were significantly less in LAC patients. These differences, however, had a tendency to becoming less significant in phase 2 compared to phase 1.

22399

P118

### NEW METHOD OF RECTAL IRRIGATION AND CUTTING IN LAPAROSCOPIC-LOW ANTERIOR RESECTION FOR RECTAL CANCER: EXTRACORPOREAL HALS&#12288;METHOD

Shoichi Fujii PhD, Hirokazu Suwa MD, Shigeru Yamagishi MD, Shunichi Osada MD, Mitsuyoshi Ota MD, Yasushi Ichikawa PhD, Chikara Kunisaki PhD, Shigeo Ohki PhD, Hiroshi Shimada PhD, Yokohama City University, Gastroenterological Center, Department of Surgery

**(Aim)** To evaluate a new method of rectal irrigation and cutting in laparoscopic-low anterior resection for rectal cancer

**(Apparatus)** A clamp forceps for the rectal irrigation and the Y-shaped vinyl hood for the operation under airtight were made. The point of forceps is J character type, and the total length is 36 cm. 22 cm between the clamping part and the hinge and the length of the clamping part is 6 cm. Y-shaped vinyl hoods that have 76 cm in the total length, 60 cm in the length of both sleeves, and 27 cm in the width of both sleeves enables the instrument operation under the pneumoperitoneum. These apparatuses enable the single-stapling cutting of the rectum under the pneumoperitoneum with the automatic suture machine for the open operation.

**(Technique)** After the dissection of rectal anal side, the lower abdomen is cut by small incision, and the wound retractor was attached at the wound margin. Y-shaped hood was installed in this, the anal side of the lesion was clamped by J-shaped forceps, and the irrigation was done under the pneumoperitoneum. The forceps was moved to the sleeve one of Y-shaped hood, and the automatic suture machine (Curvedcutter) is inserted from the other sleeve, and the suturing and cutting were done. Because the hand is outside of the body though it is hand for under the insufflation of the abdominal cavity assistance, it is called the Extracorporeal HALS method. This method was used in a case that the multiple stapling was expected in rectal cutting.

**(Object and method)** Sep2000 - Sep2008, The short-term results were compared between the DST that used two times and more of the automatic suture machine for the laparoscopy-assisted surgery with the E-HALS.

**(Results)** The multiple stapling were 106 cases, and E-HALSs were 27 cases. The short-term results of both groups did not have the difference. The anastomotic leakage was not different but the frequency of it in E-HALS was a little fewer (7.4% vs. 11.3% in the multiple stapling). The medical costs of the rectal cutting were significant (53,296 Japanese Yen in E-HALS vs. 92,594 Japanese Yen in the multiple stapling, the difference was about 370 dollars, P < 0.05).

**(Conclusion)** The E-HALS method enabled the pelvic operation without decreasing the number of ports. This method is economically advantageous because the number of staples used is the minimum. The cutting of rectum becomes equal with the open operation in rectal irrigation and single-stapling by this method.

22476

P120

### LAPAROSCOPIC RESTORATION OF INTESTINAL CONTINUITY AFTER HARTMAN'S PROCEDURE

Laurent Potiron BA, Timothee Dugue BA, Catholic Institute of Lille

**Objective:** The aim of this study was to analyse the faisability and the outcome after laparoscopic reversal after Hartman's procedure (LRH) **Methods:** We retrospectively reviewed the medical reports of patients who underwent LRH between January 2003 and February 2008. Data regarding demographics, surgical details and post-operative course were reviewed. Specifically age, gender, diagnosis at initial operation, Body Mass Index (BMI), American Society of Anesthesiology (ASA) score, comorbidities, operative time, conversion, complications, time to normal diet, post-operative bowel movements and hospital stay were assessed.

**Results:** 24 patients have been identified. Median age was 64 years old (32–81). 62.5% had ASA score I or II. The procedure was laparoscopically completed for 21 patients. All conversions happened in the beginning of the procedure because of dense adhesions. Mean operative time was 101,4 minutes (60–220) and mid hospital stay was 8,9 days (4–30). The overall morbidity rate was 25% (6 patients). One patient needed two reoperations (intraabdominal bleeding and intra-abdominal abscess). No anastomotic leak was recorded. The median time to normal diet was 3,2 days (1–6) and to return to bowel function was 3 days (2–5).

**Conclusions:** In hands of trained and experienced surgeons, Laparoscopic reversal of Hartman's procedure is a faisable, safe and allow early return to bowel function and hospital discharge.

22488

P121

### ACCURACY OF PREOPERATIVE ASSESSMENT AND CLINICAL OUTCOME OF T1 COLORECTAL CANCER

Takeshi Naitoh MD, Takashi Tsuchiya MD, Hiroshi Honda MD, Masaya Oikawa MD, Tetsuya Kakita MD, Atsushi Oyama MD, Department of General Surgery, Sendai City Medical Center

[Backgrounds] Since the first case of colon cancer surgery was reported, a laparoscopic treatment for colorectal cancer has become rapidly popular. A T1 colorectal cancer is thought to be a good indication for laparoscopic procedures because of the low risk of recurrence. However, since the lymph node metastasis rate of T1 colorectal cancer is around 10% and an accuracy of preoperative assessment of cancer depth is not satisfactory, care should be taken during the surgery for T1 colorectal cancer. The aim of this study is to clarify the accuracy of preoperative diagnosis of cancer depth and to assess the clinical outcome of these cases retrospectively. [Patients and Methods] During June 1999 and December 2007, 407 cases of colorectal cancer were operated laparoscopically. Of those 183 cases considered as T1 cancer preoperatively (cT1) were included in the accuracy study. Then 156 cases diagnosed as pathologically T1 cancer (pT1) were included in the clinical outcome study. [Results] Fifty-three cases out of 183 cT1 cases were additional surgery cases after EMR or ESD. Pathological distribution of tumor depth of cT1 cases were as follows; Tis 26 cases, T1 134 cases, T2 19 cases, T3 3 cases, T4 1 case. The accuracy of preoperative evaluation is therefore 73.2%. Twenty-three (12.6%) cases were underestimated. In clinical outcome study, tumor localization of 156 pT1 cases were as follows; 15 in cecum, 23 in ascending, 13 in transverse, 6 in descending, 50 in sigmoid colon, 14 in rectosigmoid region, 35 in rectum. Their male-female ratio is 97:59 and a mean age is 64.6 year-old. Postoperative complications were found in 7 cases (4 anastomotic leakages, 2 wound infections, and 1 ischemic colitis). Regional lymph node metastasis was recognized in 20 cases (12.8%), and 2 of them had intermediate lymph node metastasis along the main feeding artery. Metachronous recurrence was found in 2 cases. One patient who presented a cecum cancer with N2 lymph nodes metastases had multiple lung metastases and died 53 months after surgery. Another patient, who previously had EMR of a transverse colon cancer and underwent additional colon resection, developed liver metastasis and lung metastasis thereafter, in spite of no residue of cancer at EMR site and no regional lymph node metastasis in the surgical specimen. [Conclusion] Considering the accuracy of preoperative assessment of T1 cancer is around 70% and T1 cases potentially have intermediate lymph node metastasis or metachronous recurrence, extent lymph nodes dissection and long-term follow-up is necessary even for T1 colorectal cancer.

22511

P122

### SIMPLE RECTAL IRRIGATION IN LAPAROSCOPE-ASSISTED RESECTION FOR COLORECTAL CANCER

Shigeoki Hayashi MD, Minoru Matsuda MD, Motoo Yamagata MD, Tadatoshii Takayama MD, Department of Digestive Surgery, School of Medicine, Nihon University, Japan

**INTRODUCTION:** The rectal irrigation in the laparoscopic operation for rectal cancer is very important to avoid recurrence of the anastomosis, but it is the present conditions not to yet establish certain technique. We devised the safety, simple and unique technique for rectal irrigation in the laparoscopic procedure. We present the new method using the clamp for the open surgery.

**METHODS & PROCEDURES:** Between February 2005 and September 2008, we have performed 101 colorectal cases in laparoscopic procedure. In the cases, 29 rectal procedures underwent. The ten cases with rectal cancer underwent using the new technique in these days. The patient was injected ICG to four places in the submucosal membrane near the tumor before the day of the operation. The five trocars were placed including for the flexible scope. After dissection of lymph nodes and ligation of the individual vessels, descending colon and upper rectum were free from the peritoneum using electrocautery and Sonosurg. And the rectal mesentery around the anal side of the tumor was cleared away. The wound of the port at navel was extended for 5 cm and the Alexis was placed there. The rubber glove was attached to Alexis and the Fogarty aorta interception clamp was inserted in the abdominal cavity reversing the part of two fingers. After the injected points of ICG were confirmed, the rectum was clamped using the Fogarty. The distal rectum was irrigated by 500 ml saline and divided using ENDO Cutter that was inserted through another finger of rubber glove. The intestine was pulled out through Alexis. The resection of the sigmoid colon was performed and the anvil was placed within the lumen using pursestring. After the intestine was returned into the abdominal cavity, a 31 mm circular stapler was introduced through the anus. Then the anastomosis was performed between sigmoid colon and rectum. A drain was left in the pelvis. **Results:** There were no complications during the operation. The patient tolerated the procedure well and had no complications. The patient was discharged well and is currently doing well.

**Conclusions:** The special preparation is not necessary in this method. Although it is necessary that we experience the number of the cases and examine the prognosis of the patients in the long time, this method is very simple, useful and certain to prevent recurrence of the anastomosis for rectal cancer.

22517

P123

### OUTCOME OF LAPAROSCOPIC COLONIC RESECTION FOR SUBMUCOSAL COLORECTAL CARCINOMA NOT SUITABLE FOR ENDOSCOPIC RESECTION

Kazuki Ueda MD, Haruhiko Imamoto MD, Tadao Tokoro MD, Eizaburo Ishimaru MD, Takehito Yoshifuji MD, Jin-ichi Hida MD, Kiyotaka Okuno MD, Hitoshi Shiozaki, Kinki University School of Medicine

**Introduction:** Endoscopic resection (ER) that may be malignant deep invasion may not be suitable for ER. The submucosal colorectal carcinoma (CRC) may be needed additional treatment such as laparoscopic colonic resection (LAC), when tumors are failed to remove endoscopically. The purpose of this study was to assess the outcome of submucosal CRC (pT1 tumor) that were managed either endoscopically or laparoscopically. **Method:** Patients with submucosal CRC referred for ER followed by laparoscopic resection (ER/LAC group) or laparoscopic resection only (LAC group) were identified from colonic endoscopy database. **Results:** Seventy-nine patients were identified. The ER/LAC group was undergone for 30 patients with a mean age of 66 years, male/female ratio 2:1, and mean tumor size of 19 mm in diameter. The reasons for utilization of LAC were as follows; submucosal deep invasion (33%), lymphatic and/or vascular invasion (27%), and incomplete ER (47%). According to the postoperative pathological report, there were 23% of cancer involvement of the resection margin, and 3% of pN1 positive. One patient was identified liver metastasis and underwent partial liver resection during 966 days of mean postoperative observation period (POP). The LAC group was 49 patients with mean age of 49 years, male/female ratio 1.3:1, and mean tumor size of 20 mm in diameter. The reasons to perform LAC only were as follows; more than 2 cm in diameter (43%), the prediction of deep submucosal invasion (31%), anatomical difficulties (12%), and patient proposal (14%). According to the pathological report, there was 24% of pTis, 59% of pT1, 12% of pT2, 4% of adenoma. Lymphatic involvement was identified 10% including 3 cases of pT1 and 2 cases of pT2. One case was identified death by lung cancer during 403 days of mean POP. In this series, LAC was performed for 79 patients. Mean postoperative stay was 12 days. The complication rate was 13%, including anastomotic leakage (6%), wound infection and small bowel obstruction (5%), and pulmonary embolism and anastomotic stricture (1%). **Conclusions:** The ER such as polypectomy or endoscopic submucosal dissection offers to be performed for carcinoma with slight submucosal invasion. However, this prediction by endoscopy is difficult. In this study, there was 26% of patients earned privilege by LAC in the ER/LAC group, and 71% of patients earned privilege including 10% of lymph node metastases in the LAC group. Laparoscopic procedure is now widely accepted with low complication rate and short hospital stay. Our indication for pT1 tumor is feasible to perform either endoscopically or laparoscopically.

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P124

### IMPACT OF VISCERAL OBESITY ON LAPAROSCOPIC SURGERY FOR COLORECTAL CANCER

Ryoko Oura MD, Mitsuo Shimada MD, Nobuhiro Kurita MD, Takashi Iwata MD, Masanori Nishioka MD, Kozo Yoshikawa MD, Jun Higashijima MD, Departments of Surgery, The University of Tokushima, Japan.

**Introduction:** Body mass index (BMI) has been used as one of the most reliable anthropometric indices of obesity. However, laparoscopic surgical techniques may be influenced by intra-abdominal anatomic and physical conditions. It has been suggested that visceral obesity, indicating an altered intra-abdominal environment, may be more practical for the assessment of laparoscopic surgery compared with BMI.

**Purpose:** This study was designed to assess whether visceral obesity is a more useful predictor of surgical outcomes compared with BMI on laparoscopic surgery for colorectal cancer.

**Methods:** A total of 42 patients who underwent elective laparoscopic surgery for colorectal cancer were included. Visceral fat area was measured by Fat-scan CT soft. Obesity was defined by visceral fat area  $\geq 8805$  cm<sup>2</sup> or body mass index  $\geq 25$  kg/m<sup>2</sup>. Operative time, blood loss, dissected lymph nodes number and complication rate were compared for obese and nonobese patients.

**Results:** There were 15 (35.7 percent) obese patients according to visceral fat area and 10 (23.8 percent) according to BMI. Patients classified as obese by visceral fat area had tendency of longer operative time (238.3 vs. 202.6 minutes,  $p = 0.14$ ) and higher complication rates (4.8 vs. 0 percent) compared with nonobese patients. Dissected lymph nodes number was significantly fewer in obese patients compared with nonobese patients classified by visceral fat area (14.8 vs. 10.7,  $P = 0.04$ ). Blood loss had no significance between obese patients and nonobese patients classified by visceral fat area (31.5 vs. 20.0). Using BMI definition, all investigated items had no significance between obese patients and nonobese patients.

**Conclusion:** Visceral fat area is a more useful parameter than BMI in assessment of laparoscopic surgery for colorectal cancer.

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### LAPAROSCOPIC RECTAL SURGERY: DIFFERENT OUTCOME IN RELATION TO GENDER?

JM Sanchez-Hidalgo MD, EM Targarona PhD, MC Martinez MD, MP Hernandez MD, R Renger MD, L Pallares MD, F Marinello MD, M Trias PhD, Serv of Surgery, Hospital Santpau, UAB, Barcelona, Spain

**Introduction:** A classic limitation in the surgical approach to the rectum is the different anatomy between male and female. In the open era, several studies have shown the importance of sex anatomy on the outcome, considering male sex as independent factor for leak. These difficulties are exaggerated during the laparoscopic approach, the aim of this study has been to compare the immediate outcome after the laparoscopic approach to the rectum according the sex of the patient. **Materials & methods:** Prospective analysis of 230 patients diagnosed of rectal cancer approached by laparoscopy between Jan-98 to Dec 07. Study variable were: age, sex, IBM, op. time, type of resection (Ant resection (AR), low AR (LAR) and Miles procedure (APR), conversion, stay, morbidity (Dindo score), reop, mortality and n° of lymph nodes retrieved. **Results:** 152 men and 77 females, Median age was 70 (male, 69 vs 70 female, ns), mean BMI was 25.41 (25.5 m vs 25.2 f), Conversion rate was 28% (27.6% m vs 30% f, ns), Op time was 180 min (184 m vs 167 f, p < .001), AR: 28%, LAR 38% and Miles 34% without differences between male and female. Mean lymph nodes10, without differences between male and female s. Reop rate was 8,6%, (10 % in females vs 7,8% in males). Morbidity after RA and LAR: el 11% (6/56) in males vs 20% (6/30) in woman. Mortality: 3 in males vs 0 in females, ns. Mean stay was 10 d in men vs 9 in females. **Conclusion:** Rectal cancer in the male approached by laparoscopy entails a greater difficulty confirmed by longer operative time. However, this fact do not have impact on the conversion rate, reoperation, morbidity or leakage. We consider that laparoscopic approach may be offered with security for most patients diagnosed of rectal cancer.

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### LAPAROSCOPIC VS. OPEN COLECTOMY FOR SIGMOID DIVERTICULAR DISEASE. 8 YEARS OF MINIMALLY INVASIVE SURGERY AT THE COMMUNITY TEACHING HOSPITAL

Robert Shirinov MD, Dan Ruiz MD, Amanda Bailey, James W Turner MD, Howard Tiszenkel MD, New York Hospital of Queens

**Introduction:** Surgery for diverticulitis can be a challenge due to significant inflammatory process in the surrounding area. Laparoscopic management of sigmoid diverticular disease has emerged as an important adjunct to the armamentarium of surgical options for this disease process. We compared laparoscopic colorectal resections to open surgery for left sided diverticular disease in a community teaching hospital.

**Materials and Methods:** After IRB approval, between July 1999 and January 2008, from 1165 open colorectal resections and 588 laparoscopic resections, 89 cases of laparoscopic colon resections and 76 cases of open for diverticulitis were reviewed and compared. This study represents a retrospective data analysis of patients charts and medical records database, together with ongoing prospective review of eligible cases.

**Main outcome measures:** Intra-operative complications, operative times, postoperative complications, conversion rates, length of hospital stay, mortality.

**Results:** Mean age was 54 years of age (range 20-60) for (Group 1) laparoscopic colectomies and (Group 2) 63 (range 32-85) in open colectomies. 41 females in Group 1 and 45 females in Group 2. ASA score was 2.2 and 2 respectively. Postoperative length of stay, were significantly less in laparoscopic sigmoid colectomy patients when compared to the open group. 5.3 + 4.6 (range 3-45 days) and 10.1 + 8.1 (range 3-71 days) p < 0.005. Significant shorter time to resume a regular diet on the laparoscopic group. Group 1 had mortality 0; post op complications 7, conversion 7 patients (8%), intra operative complications in 1 patient (bladder injury). In Group 2, mortality 3, post op complications in 11 patients, intraoperative none.

**Conclusions:** Laparoscopic sigmoid colectomy as the modality of treatment for diverticular disease has better outcomes in respect to the postoperative length of stay, mortality, time to resume diet. However operative time is longer. The outcomes for laparoscopic colorectal resections for left sided diverticular disease performed in a community hospital are similar to the historical results from academic health science centers.

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### LAPAROSCOPIC VS. OPEN PROCTOCOLECTOMY IN THE TREATMENT OF ULCERATIVE COLITIS AND FAMILIAL ADENOMATOUS POLYPOSIS

L Sommarruga MD, R Renger MD, EM Targarona PhD, MC Martinez MD, MP Hernandez MD, C Balague MD, L Pallares MD, F Marinello MD, M Trias PhD, Service of Surgery,

**Introduction:** Restorative proctocolectomy is the operation of choice for patients with ulcerative colitis (UC) and familial polyposis coli (FAP). The role of laparoscopy for this extended procedure has been controversial given its technical difficulty, high conversion rate, and complications. But recent reports have demonstrated that these laparoscopically extensive colorectal resections are feasible and safe. The aim was to compare our results of lap and open proctocolectomy for UC or FAP in a single centre study. **Methods:** A retrospective review of all patients who underwent a proctocolectomy at our department from Jan-00 to Jun-08. Demographic, intraop and postop data were compared. **Results:** 50 patients underwent proctocolectomy. Of these, 11 patients were excluded because they were operated at the Emergency Dept. In the remaining group of 39 patients, 15 were operated by lapy (LP) and 24 t open surgery (OP). Patient age, gender and the procedures performed (proctocolectomy + J pouch ileoanal anastomosis or proctocolectomy + end ileostomy) were equally divided in both groups. UC vs. FAP distribution was 27% vs. 63% in the LP group, compared to 54% vs. 46% in the OP group (ns). Median op. time was significantly longer for the lap group (283 min vs. 222 min, p = .001). One lap case was converted (7%). Both groups had a similar postop recovery: return of bowel movement 2.6 d. (LP) vs. 2.5 (OP) d., return to oral diet 4.4 d. (LP) vs. 4.3 d. (OP), length of hospital stay 15 days (LP) vs. 13 days (OP). Postop. morbidity was equal between LP and OP: anastomotic leakage 15% vs. 11%, pelvic abscesses 13% vs. 17%, pelvic hematoma 7% vs. 4%. We observed significant fewer complications after ileostomy closure in the lap group: 13% vs. 31%. (p = .01) **Conclusion:** Laparoscopic proctocolectomy are equivalent to open proctocolectomy in terms of feasibility, safety and postop recovery. Although median operative time was longer in the LP group, we observed fewer complications after ileostomy closure.

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### PLASMA LEVELS OF SVEGFR2 ARE DECREASED AND SVEGFR1 INCREASED EARLY AFTER COLECTOMY FOR CANCER; THE NET IMPACT IS DECREASED BINDING OF FREE VEGF WHICH MAY ACCOUNT FOR INCREASED PLASMA VEGF LEVELS EARLY POSTOPERATIVELY

HMC Shantha Kumara PhD, A Hoffman MD, N Dujovny MD, M Kalady MD, M Luchtefeld MD, N Hyman MD, D Feingold MD, R Baxter BS, Whelan L R MD, Columbia University New York, NY, USA, Ferguson Clinic, Grand Rapids, MI, USA, Cleveland Clinic, Cleveland, OH, USA, University of Vermont, Burlington, VT, USA

**Purpose:** Plasma VEGF levels are elevated after minimally invasive colon resection (MICR) and may pose a danger for colon cancer (CRC) patients. It is thought that surgical wounds produce VEGF which enters the circulation. VEGF induces angiogenesis in wounds and tumors by binding to endothelial cell bound VEGF-Receptor 1 (VEGFR1) and VEGF-Receptor 2 (VEGFR2). Soluble VEGFR1 (sVEGFR1) and sVEGFR2, not capable of signal transduction, bind VEGF in the blood and decrease free VEGF levels and limit VEGF's proangiogenic effects. This study's purpose was to assess plasma levels of sVEGFR1 and 2 in CRC patients after MICR.

**Methods:** Blood samples were obtained preoperatively (PreOp) and on postoperative day (POD) 1 and 3 (n = 45). In some patients a 4th and a 5th sample were taken between POD 7-13 and POD 14-30 after surgery. sVEGFR1 and 2 levels were measured via ELISA and the results reported as median + 95% CI for sVEGFR1 and mean ± SD for sVEGFR2. The POD 7-13 and POD 14-30 samples were bundled and considered as two separate time points. The student t-test was used for sVEGFR2 and the Wilcoxon signed rank test for sVEGFR1 (significance, p < 0.05).

**Results:** The mean incision size was 5.7 ± 3.7 cm (4 conversions). The mean sVEGFR2 levels were significantly decreased on POD1 (6068 ± 2035 pg/ml, p = <0.001), on POD3 (6228 ± 2007 pg/ml, p = <0.001) when compared to the PreOp result (7584 ± 2070 pg/ml); by POD14-30 the value had normalized. In contrast, the median sVEGFR1 level was significantly increased on POD1 (238, CI 190-260 pg/ml, p = <0.001), on POD3 (200, CI 159-253 pg/ml, p = <0.001), when compared to PreOp (98 CI 90-104 pg/ml); By POD 14-30 levels were back to normal range.

**Conclusions:** MICR significantly decreased sVEGFR2 levels on POD 1 and 3 while it increased sVEGFR1 levels on POD 1 and 3. By POD 14-30 sVEGFR2 levels had normalized. The net effect of the much higher PreOp sVEGFR2 levels and the large decrease noted early after surgery is a decrease in the VEGF bound by the combination of sVEGFR1 and sVEGFR2 in the blood. Plasma VEGF elevations noted early after surgery may be due to the sVEGFR2 changes rather than increased VEGF production. Further study is warranted.

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### LONGTERM OUTCOMES OF LAPAROSCOPIC SURGERY FOR RECTAL CANCER

J Westerholm MD, S Garcia-Osogobio MD, F Farrokhyar PhD, M Cadeddu MD, M Anvari MD, Centre for Minimal Access Surgery, St Joseph's Hospital, Hamilton Ontario

**Introduction:** Although surgeons are increasingly using a laparoscopic approach in rectal cancer surgery, its long-term outcomes have not yet been conclusively defined. In this study, we examine the longterm outcomes of laparoscopic surgery for rectal cancer at a single institution, with up to eleven years of follow-up.

**Methods:** We performed a retrospective review of a prospective database for all open and laparoscopic rectal cancer surgeries performed at this institution between 1996 and 2006. Longterm follow-up data was obtained through retrospective review of hospital and office charts. We excluded patients with T4 tumors, metastatic disease, synchronous cancers, and those who underwent emergency surgery. The primary endpoints were 5-year overall and disease-free survival and local and distant recurrence.

**Results:** A total of 167 patients met our inclusion criteria. Of these, 93 had laparoscopic surgery and 74 had open surgery. The two groups were similar with respect to stage of disease and comorbidities. Patients undergoing open surgery were older on average (mean 70.9 years) than those undergoing laparoscopic surgery (mean 66.3 years,  $p = 0.01$ ). More open cases were done during the earlier years of the study. 8 laparoscopic cases (8.6%) were converted to open. The median follow-up period was 36 months (range 0–132 months). Overall survival was 94% at 60 months for laparoscopic cases, and 80% for open ( $p = 0.013$ ). Disease-free survival at 60 months was 96% for laparoscopic surgery, and 87% for open cases ( $p = 0.024$ ). 5.4% of laparoscopic cases and 13.5% of open developed local recurrence ( $p = 0.1$ ). Metastases occurred in 16.1% of laparoscopic cases and 29.7% of open ( $p = 0.041$ ).

**Conclusion:** Laparoscopic surgery for rectal cancer does not compromise overall survival, disease free survival, and local recurrence when compared to open surgery. While results of prospective randomized trials are awaited, it is likely that laparoscopic approach will become the standard of care for rectal cancer surgery.

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### MINIMALLY INVASIVE APPROACH TO LEFT-SIDED LARGE BOWEL OBSTRUCTION

William Bisland MD, Henry J Lujan MD, Gustavo Plasencia MD, Manuel Viamonte III MD, Rene F Hartmann MD, Laparoscopic Center of South Florida at Mercy Hospital

**Introduction:** Self-expanding metallic stents (SEMS) are being used for "palliation" and as a "bridge" to surgery in obstructing colorectal disease. This approach may be associated with less morbidity and mortality than immediate operation for this surgical emergency. A laparoscopic approach is usually contraindicated due to bowel distention encountered in this acute situation. However, by relieving the obstruction with SEMS, laparoscopic colon resection becomes feasible in an elective setting. We present our early experience with combining these minimally invasive techniques in the management of left-sided large bowel obstruction.

**Methods:** 14 consecutive patients that presented with left-sided colonic obstruction underwent an attempt at SEMS. Ten had advanced, metastatic or recurrent malignancy and were treated with SEMS for palliation in order to avoid a stoma. Three patients were treated with SEMS as a "bridge" to surgery and underwent laparoscopic anterior resection.

**Results:** No significant complications occurred, specifically, no perforations. There was one failure in a patient with obstruction secondary to severe diverticular disease. Of the three patients that underwent laparoscopic colectomy, none required conversion to open.

**Conclusion:** Laparoscopic colectomy and self-expanding metal stents are minimally invasive techniques that have been slow to gain wide acceptance, but their use and advantages are extensively published. These cases demonstrate how left-sided large bowel obstruction can be managed by combining two minimally invasive techniques and, thus, decrease morbidity and avoid the need for a stoma. Whether this approach will improve outcome in this patient population will require further study. However, our early experience and success is promising.

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### COMPARISON WOUND BACTERIAL CONTAMINATION BETWEEN OPEN COLORECTAL SURGERY AND LAPAROSCOPIC COLORECTAL SURGERY

Yoshihisa Saida MD, Y Nakamura MD, T Enomoto MD, K Takabayashi MD, M Katagiri MD, S Nagao MD, R Watanabe MD, Y Okamoto MD, M Watanabe MD, S Kusachi MD, J Nagao MD, Toho University Ohashi Medical Center, Third Department of Surgery

**PURPOSE:** Many investigators reported the advantage of laparoscopic colorectal surgery for prevention of surgical site infection (SSI). To compare wound bacterial contamination between open colorectal surgery (OC) and laparoscopic colorectal surgery (LC).

**METHOD:** Colorectal cancer surgery with no association of ileus was evaluated between 22 OC cases and 19 LC cases. Preoperatively, only mechanical preparation was applied. And second generation cephalosporins were administered right before the operation. Soon after the surgery, wound irrigation was performed utilizing 500 ml warm saline. Subsequently, 10 ml saline was irrigated and extracted to determine viable count. The count below 20 CFU/ml was determined to be "undetected".

**RESULTS:** Backgrounds were similar between two groups. The bacterial detection rate before irrigation was 5/21 cases (24%) in OC and 6/19 cases (32%) in LC; no difference was found in detection rate. In addition, the rate after irrigation with 500 ml warm saline was 2/21 cases (10%) in OC and 1/19 cases (5%) in LC; no difference. In open group, detected bacteria were aerobic *Bacillus* sp., anaerobic *Bacteroides* and anaerobic gram-positive *Bacillus* that was detected even after the irrigation. In LC, detected bacteria were aerobic *Enterococcus* and anaerobic gram-positive *Bacillus* that was detected even after the irrigation. Clinically, one wound infection was found in OC comparing to no wound infection in LC. Each group has one case of intraabdominal abscess.

**DISCUSSION:** In colorectal cancer surgery, LC demonstrated high incidence of wound contamination than OC, but LC seems to have advantage in wound infection. Some immunological advantage in LC suggested for prevention of surgical site infection (SSI). In this study, however, wound irrigation after both open and laparoscopic surgery proved higher effectiveness.

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### LAPAROSCOPIC COLORECTAL RESECTION FOLLOWING ENDOSCOPIC STENT INSERTION FOR MALIGNANT COLORECTAL OBSTRUCTION

Jea-Im Lee MD, IK Lee MD, WK Kang MD, JK PARK MD, HM CHO PhD, ST Oh MD, JG Kim MD, YS LEE MD, Department of Surgery, The Catholic University of Korea

**Introduction:** Colorectal cancer obstruction is not uncommon presentation requiring emergency operation. Laparoscopic surgery was not indicated in colorectal cancer obstruction, but preoperative endoscopic stent insertion allowed laparoscopic approach for malignant colorectal obstruction. **Methods and procedures:** Authors presents their experiences of laparoscopic colorectal resection following endoscopic stent insertion for managing malignant colorectal obstruction. From August 2004 to August 2008, author experienced 36 cases of endoscopic stent insertion for colorectal cancer obstruction. Of 36 cases, laparoscopic colorectal resection was performed in 28 cases following endoscopic stent insertion. **Results:** The average age of patients was 61.0±14.9 years (23–82 years), male to female sex ratio was 17:11, and average BMI was 22.7±3.6 kg/m<sup>2</sup> (16.8–33.3 kg/m<sup>2</sup>). The mean interval from stent insertion to surgery was 7.4±2.3 days (3–15 days). Sigmoid colon cancer was 14 cases (50%) and rectal cancer was 7 cases (25%). Anterior resection was performed in 13 cases (46.4%), and low anterior resection was performed in 6 cases (21.4%). Curative resection was performed in 23 cases (82.1%). 2 cases (7.1%) were converted into conventional open surgery due to severe cancer adhesion to peritoneum and iliac vessels. Mean operation time was 185.5±53.1 minutes (90–280 minutes) and mean blood loss was 77.0±72.9 ml (10–300 ml). Of 5 cases of surgical morbidities, 2 cases of anastomosis leak was developed and treated with surgical intervention, and the others were treated conservatively. Average tumor size was 5.9±2.1 cm, distal resection margin was 10.6±4.0 cm, proximal resection margin was 14.7±4.9 cm and number of lymph node was 24.2±5.7. The patients passed flatus at average 2.2±1.0 postoperative days and started diet at 3.8±2.7 postoperative days. Average postoperative hospital stay was 11 days. **Conclusions:** Their initial experiences using endoscopic stent insertion in colorectal cancer obstruction followed by laparoscopic surgery can be performed safely and is effective minimal invasive approach for malignant colorectal obstruction.

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### LAPAROSCOPIC SURGERY FOR FAMILIAR ADENOMATOUS POLYPOSIS: FEASIBILITY AND SAFETY

Jung Wook Huh MD, Hyeong Rok Kim PhD, Sang Hyuk Cho MD, Jae Kyoon Joo MD, Young Jin Kim PhD, Department of Surgery, Chonnam National University Hwasun Hospital and Medical School

**Purpose:** The role of laparoscopy in patient with familial adenomatous polyposis (FAP) has been controversial given its technical difficulty, high conversion rate, and complication rate. We present our experience of laparoscopic dissection and transection of rectum in the FAP patients.

**Methods:** Consecutive 9 patients who underwent laparoscopic surgery for FAP were recruited. Eight patients combined with carcinoma arising from FAP. All the operations were performed by the same surgeon, who had already completed the learning curve for colorectal laparoscopic procedures.

**Results:** Eight of the patients underwent laparoscopic total proctocolectomy (LTPC) and one patient underwent a laparoscopic total abdominal colectomy (LTAC). No hand-assisted laparoscopic technique was performed. There was no conversion case and postoperative mortality. The median operative time was 320 (range, 210–480) min, and the median blood loss was 210 (range, 50–500) ml. The median time to feeding was 2 (range, 2–3) days, and the median hospital stay was 9 (range, 7–12) days. There were two postoperative complications (small bowel obstructions). Pathology proved a carcinoma arising from FAP in eight patients and 4, 3, 1 patients had Stage I, III, IV cancers, respectively. The median number of the harvested lymph node was 116 (range, 43–204).

**Conclusions:** The laparoscopic approach to FAP is technically feasible and safe. It is an alternative to open surgery for surgeons experienced with the laparoscopic approach to colectomy.

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### MINIMALLY INVASIVE COLORECTAL RESECTION IS ASSOCIATED WITH A RAPID AND SUSTAINED DECREASE IN PLASMA EPIDERMAL GROWTH FACTOR LEVELS IN THE COLON CANCER SETTING

HMC Shantha Kumara PhD, A Hoffman MD, D Feingold, N Dujovny MD, N Hyman MD, M Kalady MD, M Luchtefeld MD, R L Whelan, Columbia University, New York, NY, USA, Ferguson Clinic, Grand Rapids, MI, USA, University of Vermont, Burlington, VT, USA, Cleveland Clinic, Cleveland, OH, USA,

**Purpose:** Epidermal Growth Factor (EGF) is a potent promoter of angiogenesis. Most colorectal adenocarcinomas (CRC) express the EGF-receptor and many make EGF as well. EGF is thought to independently stimulate tumor growth in addition to promoting tumor angiogenesis. Blood EGF levels have been shown to be elevated in CRC patients. The early impact of minimally invasive colorectal resection (MICR) on EGF levels in the blood is unknown. This study's purpose was to determine plasma EGF levels before and after MICR for CRC.

**Methods:** Clinical, operative and demographic data was collected. Blood samples were taken preoperatively (PO) and on postoperative day (POD) 1 and 3 in all patients; in a subset samples were also taken between POD 7–35. EGF levels were determined via ELISA; the results are reported as the mean  $\pm$  SD. The late samples (POD 7–14, POD 15–21, POD 21 +) were bundled and considered as single time points. The student's t-test was used after logarithmic transformation of the data to a normal distribution (significance,  $p < 0.05$ ).

**Results:** A total of 48 CRC patients were studied (mean incision,  $4.7 \pm 1.6$  cm, 0 conversions); the majority had right, sigmoid or segmental left resections. When compared to the preop result ( $122.9 \pm 75.9$  pg/ml) plasma EGF levels were significantly lower on POD 1 ( $85.8 \pm 39.4$  pg/ml,  $p = 0.003$ ), POD 3 ( $77.3 \pm 45.6$  pg/ml,  $p = 0.001$ ), and for the POD 21 + bundled time point ( $79.4 \pm 47.7$  pg/ml,  $n = 22$ ,  $p = 0.033$ ). The POD 15–21 result was also lower ( $96.9 \pm 77.3$  pg/ml,  $n = 21$ , vs. preop,  $p = 0.05$ ) as was the POD 7–14 result ( $94.3 \pm 55.8$  pg/ml,  $n = 14$ , vs. preop,  $p = 0.11$ ).

**Conclusions:** Plasma EGF levels fall soon after CRC resection and remain lower for the first month. Levels were decreased at all postoperative time points; significant differences were noted on POD 1, 3 and for the bundled POD 21 + time point. Elevated EGF levels preop may be due to tumor production; after surgery levels return to 'normal.' If EGF levels are elevated preop and normalize post surgery, then periodic plasma EGF tests may have value as a diagnostic test for recurrence. Further study is warranted.

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### IMPACT OF GENDER ON EARLY SURGICAL OUTCOMES AFTER LAPAROSCOPIC SURGERY FOR RECTAL CARCINOMA

Seiichi Yamamoto PhD, Masazumi Okajima PhD, Takao Hinoi PhD, Koki Otsuka PhD, Hisanaga Horie PhD, Masahiko Watanabe PhD, National Cancer Center Hospital, Hiroshima University Hospital, Iwate Medical University, Jichi Medical University, Kitasato University Hospital,

**Introduction:** Controversies still persist regarding the appropriateness of laparoscopic surgery in patients with rectal carcinoma because of the uncertainty of long-term outcome, and of concerns over the safety of the procedure. Recently, several studies analyzing the risk factors of laparoscopic surgery for rectal carcinoma have been reported, and in some reports, male gender has been regarded as a risk factor for intraoperative conversion to open surgery and for early morbidity, but other studies showed opposite findings. This study was designed to evaluate the impact of gender on early surgical outcomes after laparoscopic surgery for rectal carcinoma.

**Methods:** A total of 1073 patients with carcinoma of the rectum and anus, who initially underwent laparoscopic surgery, were collected from 28 institutions and retrospectively reviewed. Short-term surgical outcomes were compared between male and female patients.

**Results:** Patients' preoperative clinical characteristics were similar except for BMI (male 23.2, female 22.3,  $P < 0.001$ ). There were no perioperative mortalities. Male patients were associated with significantly longer duration of surgery (291 vs. 276 minutes,  $P = 0.010$ ), greater blood loss (175 vs. 129 ml,  $P < 0.001$ ), longer incision (5.6 cm vs. 5.2 cm,  $P = 0.028$ ), longer length of postoperative median hospital stay (22.8 vs. 19.3 days,  $P = 0.007$ ), and a higher rate of postoperative complications (26.0% vs. 17.3%,  $P < 0.001$ ) than the female patients. Anastomotic leakage in the double stapling technique occurred more often in male patients (12.9% vs. 3.8%,  $P < 0.001$ ). However, conversion rates were similar for the two groups (male 7.1%, female 7.5%,  $P = 0.808$ ). Regarding the re-operation rate, male patients had a significantly increased re-operation rate (12.9% vs. 3.8%,  $P < 0.001$ ), and anastomotic leakage accounted for 75% of the reasons for re-operation in male patients.

**Conclusions:** Our findings demonstrated that male gender has an adverse impact on the technical difficulty and postoperative outcomes of laparoscopic surgery in patients with rectal carcinoma. Male patients are associated with significantly greater morbidity compared to female patients. Appropriate patient selection is essential for laparoscopic surgery for rectal carcinoma, and technical improvement is needed before the laparoscopic approach can be offered to all patients.

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### MINIMALLY INVASIVE COLORECTAL RESECTION IS ASSOCIATED WITH A TRANSIENT INCREASE IN PLASMA HGF LEVELS EARLY AFTER SURGERY FOR CANCER

HMC Shantha Kumara PhD, I Y Kim MD, D Kim MD, M Kalady MD, M Luchtefeld MD, K Hoffman BS, V DiMaggio BS, R L Whelan MD, Columbia University, New York, NY, USA, Ferguson Clinic, Grand Rapids, MI, USA, Cleveland Clinic, Cleveland, OH, USA,

**Purpose:** Hepatocyte Growth Factor (HGF) is a potent angiogenic factor; preoperative blood levels have been shown to correlate with disease stage and prognosis in colorectal cancer (CRC) patients. In addition, some CRCs express HGF receptor which suggests HGF might directly stimulate tumor growth. The impact of minimally invasive colorectal resection (MICR) on plasma HGF levels during the first month after surgery is unknown. The purpose of this study was to determine plasma HGF levels after MICR in a population of CRC patients.

**Methods:** Clinical and operative data was collected. Blood samples were obtained in all patients preoperatively (PreOp) and on postoperative day (POD) 1 and 3; in some patients blood samples were also taken during the second (POD 7–14) and third weeks (POD 15–21) after surgery. The late samples were bundled and considered as single time points. HGF levels were determined via ELISA in duplicate. The student t-test was used to analyze the data (significance,  $p < 0.05$ ).

**Results:** A total of 28 CRC patients that underwent laparoscopic-assisted resections were studied. The vast majority underwent right, sigmoid, or left segmental colectomy. The mean operating time was  $179 \pm 69$  minutes, the mean incision size was  $5.4 \pm 4.0$  cm and the mean length of stay was  $5.7 \pm 2.7$  days. The mean plasma HGF levels were significantly higher on POD 1 ( $2417 \pm 1476$  pg/ml,  $p = 0.0001$ ) and POD 3 ( $2081 \pm 1048$  pg/ml,  $p = 0.0001$ ) when compared to PreOp levels ( $1045 \pm 406$  pg/ml). Plasma concentrations were back to PreOp levels during the second ( $1100 \pm 474$  pg/ml,  $n = 12$ ,  $p = 0.64$ ) and third Post-Op week ( $1010 \pm 327$  pg/ml,  $n = 11$ ,  $p = 0.51$ ).

**Conclusions:** MICR in the cancer setting is associated with a transient 2–2.3 fold increase in plasma HGF levels during the first 3 days after surgery after which blood levels normalize. The significance of this short-lived change is unclear; however, elevated HGF levels may stimulate the growth of residual tumor cells after resection. A larger study is needed to determine if there is any correlation between the magnitude or duration of the increase and tumor recurrence or prognosis.

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### PLASMA ANGIOSTATIN AND ENDOSTATIN LEVELS REMAIN UNCHANGED FOR THE FIRST 3 WEEKS AFTER COLORECTAL CANCER RESECTION

HMC Shantha Kumara PhD, A Hoffman MD, A Nasar MSc, A Senagore MD, M Kalady MD, N Hyman MD, I Y Kim MD, R L Whelan MD, Columbia University, New York, NY, USA, Ferguson Clinic, Grand Rapids, MI, USA, Cleveland Clinic, Cleveland, OH, USA, University of Vermont, Burlington, VT, USA.

**Purpose:** Angiostatin and endostatin are endogenous inhibitors of angiogenesis that have been shown to have anti-cancer effects. Major surgery has been associated with significantly elevated plasma VEGF and Angiopoietin 2 levels for the first 3 weeks after colorectal resection. Furthermore, human plasma from the second and third Post-operative week has been shown to stimulate in vitro endothelial cell proliferation and migration rates when compared to culture results with preoperative plasma. Thus, the patient is in a pro-angiogenic state early after surgery. Surgery's impact on perioperative angiostatin and endostatin levels is unknown. This study's purpose was to determine the periop levels of these two proteins in colorectal cancer (CRC) patients undergoing minimally invasive colon resection (MICR).

**Methods:** Plasma endostatin levels were assessed in 34 CRC patients while angiostatin levels were determined for 30 CRC patients. Blood samples were taken preoperatively (PO) and on postoperative day (POD) 1 and 3 in all patients; in a subset samples were also taken between POD 7-20. The late samples (POD 7-13, POD and 14-20) were bundled and considered as single time points. Plasma angiostatin and endostatin levels were determined via ELISA in duplicate. For the endostatin data the median value and the 95% Confidence intervals are provided and the Wilcoxon signed rank test was utilized. For the angiostatin data the students t-test was used after logarithmic transformation of the data to a normal distribution (data reported as mean  $\pm$ SD, significance,  $p < 0.05$ ).

**Results:** There was no difference in any of the median plasma endostatin levels between the PreOp results (124, CI 109-154 ng/ml) and any of the Post-Op results (select results: POD 3:135, CI 121-170 ng/ml; POD 7-13: 151, CI 131-198 ng/ml). Similarly, there was no difference in the pre and Post-Op plasma angiostatin levels (select results: PreOp, 198  $\pm$ 238 ng/ml; POD 3: 164  $\pm$ 120 ng/ml; POD 7-13: 153  $\pm$ 122 ng/ml).

**Conclusions:** CRC has no impact on plasma angiostatin or endostatin levels in humans during the first 21 days following surgery. This is in contradistinction to surgery's impact on plasma VEGF, Angiostatin 2, HGF, EGF and a long list of other proteins. Thus, angiostatin and endostatin do not likely contribute to or inhibit the proangiogenic changes that have been noted after CRC.

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### IS PFANNENSTIEL BETTER? SURGICAL SITE INFECTIONS FOLLOWING LAPAROSCOPIC-ASSISTED COLORECTAL SURGERY

Lacee J Laufenberg BS, Jaime E Sanchez MD, Beth R Krieger MD, Jorge E Marcet MD, Division of Colon and Rectal Surgery, University of South Florida

**Introduction:** Colorectal surgery has classically been associated with a high rate of surgical site infection (SSI) due to the contaminated nature of the operations. The most recent National Nosocomial Infections Surveillance (NNIS) System Report indicates overall rates of 11.3%. However, other investigators have reported rates as high as 26%. It has been proposed that the Pfannenstiel incision may provide superior outcomes to other common incisions including reduced SSI rates due to increased blood supply of the wound. The aim of this study was to evaluate the use of the Pfannenstiel incision in reducing SSI rates after laparoscopic-assisted colorectal surgery.

**Methods:** We retrospectively reviewed all cases of laparoscopic-assisted colon resection performed at a single, academic, tertiary hospital from 10/2002-9/2008. Patients were categorized based on their type of incision; either Pfannenstiel or vertical midline. Infections were classified according to CDC definitions of nosocomial surgical site infections. Rates were then calculated based on 30 day follow-up and included data from initial hospitalization, readmission, emergency room visits, and outpatient clinic visits. Fisher's exact test was used to compare infection frequencies and other data were reported using descriptive statistics.

**Results:** We report on a total of 123 patients. Sixteen patients had Pfannenstiel incisions and 107 patients had vertical midline incisions. Our data demonstrate an overall SSI rate of 30.8%. Patients with Pfannenstiel incisions had an infection rate of 12.5% whereas patients with midline incisions had a rate of 33.6% ( $p = 0.07$ ).

**Conclusion:** The overall SSI rate at our institution following laparoscopic-assisted colon resection was found to be higher than previously published. However, we believe that this is a more accurate rate of postoperative infection than is typically reported due to our thorough 30 day follow up and strict inclusion criteria. Although we found a much lower rate of Pfannenstiel infections than midline infections it was not statistically significant. This may be due to the low number of Pfannenstiel incisions in our study. However, these results suggest that the use of the Pfannenstiel incision may improve postoperative infection rates in laparoscopic-assisted colorectal surgery and should be further investigated with a larger sample size and across multiple centers.

22815

P139

### CECECTOMY MAY BE A SUPERIOR ALTERNATIVE TO RIGHT HEMICOLECTOMY FOR SELECT BENIGN CECAL POLYPS

K C Walters MD, C D Dolce MD, J E Keller MD, A E Lincourt PhD, H J Norton PhD, K S Gersin MD, K W Kercher MD, T S Kuwada MD, D Stefanidis MD, B T Heniford MD, Carolinas Medical Center

**Introduction:** Colorectal cancer usually arises from polyps. Patients with endoscopically-unresectable polyps frequently undergo hemicolectomy. Selected patients with very proximal benign cecal polyps may be amenable to cecal cap resection with preservation of the ileocecal valve. The purpose of this study was to compare outcomes at our institution of patients undergoing cecectomy vs. right hemicolectomy for cecal cap polyps.

**Methods:** Retrospective review of prospectively collected data on patients with endoscopically-unresectable cecal polyps who underwent either cecectomy or right hemicolectomy from 1997 to 2008. Only patients with benign cecal cap polyps on endoscopic biopsy were considered for cecectomy. If invasive cancer was found on frozen section during cecectomy, patients underwent a formal right hemicolectomy. Patient demographics, operative and perioperative data, and outcomes were analyzed. Descriptive statistics, t-test and Fisher's exact test were used for data analysis;  $p < 0.05$  was considered significant.

**Results:** Of 170 patients with endoscopically-unresectable cecal polyps, 35(21%) underwent cecectomy and 135(79%) right hemicolectomy during the study period. While race and gender were similar, cecectomy patients were younger ( $61.4 \pm 11.7$  years vs.  $66.5 \pm 11.2$  for hemicolectomy;  $p < 0.001$ ). Estimated operative blood loss ( $50.4 \pm 31.8$  vs.  $121.8 \pm 96.6$ ,  $p < 0.01$ ), operative time ( $127.9 \pm 73.5$  vs.  $166.8 \pm 52.3$ ,  $p < 0.01$ ), length of stay ( $2.4 \pm 1.8$  vs.  $7.7 \pm 6.8$ ,  $p < 0.001$ ); 51% of cecectomy patients were discharged within 24 hours), operating room charges ( $\$3,632 \pm 2175$  vs.  $\$4,992 \pm 3328$ ,  $p < 0.01$ ) and total hospital charges ( $\$17,938 \pm 9319$  vs.  $\$26,746 \pm 26657$ ,  $p < 0.01$ ) were less for cecectomy vs. hemicolectomy respectively. Postoperative complications were significantly fewer after cecectomy (2% vs. 35%,  $p < 0.001$ ).

**Conclusions:** In selected patients with endoscopically-unresectable or proximal benign cecal polyps, cecectomy with preservation of the ileocecal valve is safe and offers improved patient outcomes.

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### TEST METHOD FOR EVALUATION OF BLOOD LOSS AND FREE BLEED TIME

Elizabeth M Lalime BS, Jennifer Broom BS, Michael Soltz PhD, Christina Rideout MS, Jeffrey Zaruby PhD, © 2008 Covidien AG or its affiliates. All rights reserved.

**Objective:** To develop a quantitative in vivo test method for measuring acute blood loss and time to hemostasis in order to assess the hemostatic performance of investigational linear stapling and dividing devices.

**Methods:** All animals were screened pre-operatively for clotting sufficiency. Pertinent vital parameters were also controlled within narrow limits during testing (MAP =  $80 \pm 10$  mmHg, ACT not changed by 10% of original measurement). Linear stapling and dividing devices were deployed in standard fashion in vivo in a variety of gastrointestinal tissues. Immediately after firing, pre-weighed absorbent paper was used to absorb blood from the divided edges of the stapled tissue. The blood soaked paper was weighed on a calibrated digital scale (to within  $\pm 0.005$  gram) and imported into a spreadsheet. Serial measurements were taken every 60 seconds, for a 15 second time period, until the amount of bleeding was less than or equal to 5% (by weight) of the previous weight. A decision tree embedded within the spreadsheet identified when the amount of staple line bleeding had fallen below the designated cut off point.

**Preliminary results:** Statistically significant differences in hemostatic performance between the control and developmental stapling devices were demonstrated with this testing protocol.

**Conclusions:** Variation in subject-to-subject measurements can be reduced by pre and intra-operative screening/monitoring. Human error can also be reduced by quantitatively defining end points versus relying on more subjective visual assessments. This test method provides an accurate and repeatable way to quantitatively compare the hemostatic performance of different stapling technologies.

22984

P141

### CT SCAN AS A COMPLEMENTARY STUDY FOR COLON TUMOR LOCALIZATION

Jessica Lee MD, Robert Kozol MD, William Pennoyer MD, Kristy Thurston MD, Anthony Voytovich MD, University of Connecticut

**Introduction:** Our hypothesis is that a CT scan may complement colonoscopy in preop localization of colon tumors. Erroneous tumor localization via colonoscopy creates a challenging intraoperative problem for surgeons. The ideal method to minimize these errors is unclear. In this study, we have examined the ability of CT scans to properly localize colon lesions, and potentially correct errors from colonoscopic tumor localization.

**Methods:** A retrospective chart review on patients having surgery for colon malignancies between January 2004 and May 2006 at St. Francis Hospital, a tertiary care teaching hospital. Of the 305 patients with documented colon cancer, 104 charts contained all of the following data: preoperative colonoscopy report, preoperative CT report, operative report, and final pathology report. The main outcome measures: accuracy of colonoscopy, and CT scan in localizing tumors, and tumor size threshold for detection by CT scan.

**Results:** Over all, tumor location was accurately determined via colonoscopy in 75/104 cases (72.1%). Thus there was a 27.9% error rate. CT scan accurately localized colon tumors in 48/104 (46.1%) of cases. Of the 29 tumors erroneously located by colonoscopy, 12 (41.4%) were accurately localized by CT scan. The average tumor size for all patients in this study was 5.72 (+/- 1.3) cm. The tumor size threshold for CT was 3.5 (+/- 1.5) cm.

**Conclusions:** As expected, the accuracy of colonoscopic localization of tumors (72.1%) was superior to CT scan (46.1%)  $p < .05$  and should remain the gold standard for tumor localization. However, pre-op CT scans corrected 41.4% of errors by colonoscopy. Thus CT may complement colonoscopy. This is of particular value for laparoscopic cases. Further investigation utilizing colonoscopic tattooing, CT and perhaps virtual colonoscopy should bring the error rate closer to zero.

23066

P143

### ACTINOMYCOTIC MECKEL'S DIVERTICULITIS – A CASE STUDY AND REVIEW OF LITERATURE

Venkata K Kella MD, Zafar Jamil MD, Nalini S Parikh MD, John M Cosgrove MD, Bronx Lebanon hospital center and St Michaels medical center

**Introduction:** Actinomycosis is a rare inflammatory disease caused by anaerobic bacterium that can affect the abdomen, chest and neck. Meckel's diverticulum is the most common congenital abnormality of the gastro intestinal tract. We present a rare case of Meckel's diverticulitis due to actinomycosis and review of literature.

**Methods:** 37 yr old diabetic lady presented with 3 day history of central abdominal pain associated with non-bilious vomiting. She underwent colonoscopic examination for bleeding per rectum 1 year prior to this admission, which was normal. On examination, Vital signs were stable. Abdominal examination revealed central abdominal tenderness, laboratory tests revealed white blood cell count of 21,000 and CT scan of abdomen revealed a non-contrast filled  $5 \times 3$  cm mass in central abdomen.

**Results:** Diagnostic laparoscopy revealed inflammatory mass and exploratory laparotomy confirmed perforated Meckel's diverticulitis. Meckel's diverticulectomy with segmental small bowel resection, stapled anastomosis and appendectomy was performed. Cultures grew actinomycosis and Pathology revealed acute supportive Meckel's diverticulitis with actinomycosis. She was treated with penicillin and made an uneventful recovery.

**Conclusion:** Meckel's diverticulitis due to actinomycosis is rare. After extensive literature search, It appears to be the first case report in modern literature.

23017

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### SHORT-TERM RESULT OF LAPAROSCOPIC COLORECTAL SURGERY FOR ELDERLY PATIENTS

Yosuke Hashimoto MD, Shuji Saito MD, Yusuke Kinugasa MD, Akio Shiomi MD, Hiroyuki Tomioka MD, Hiroyuki Hazama MD, Seiichi Kawasaki MD, Takashi Kojima MD, Yujiro Kokado MD, Etuo Bando MD, Hideyuki Kanemoto MD, Masanori Terashima MD, Katsuhiko Uesaka MD, Masayuki Ishii MD, Shizuoka Cancer Center Hospital

**Introduction:** To evaluate the safety of the laparoscopic colorectal surgery to elderly patients with age over 75, a short-term result was examined.

**Patients and Methods:** From September 2002 to July 2008, 513 patients with tumors located in colon and/or rectosigmoid junction who underwent laparoscopic colorectal surgery in Shizuoka Cancer Center Hospital were studied. Patients with tumors located in rectum (Ra and Rb) were excluded from this study. Out of 513 patients, 89 patients age over 75 (76–90) were categorized as Group A, and 424 patients with age under 75 (29–75) were categorized as Group B. Intraoperative parameters (operation time, blood loss, and rate of conversion to the laparotomy) and post operative parameters (start date of oral intake, discharge date, and complication occurred within 30 days after operation) were compared in these two groups. There were no differences in distribution of gender and stages in these two groups. The incidence of chronic disease was significantly higher in Group A than that of Group B (70.8% vs 49.8%,  $p = 0.0003$ ). **Results:** The rate of conversion to laparotomy was significantly higher in Group A than in Group B (10.1% vs. 3.1%,  $p = 0.007$ ). However, there were no differences in blood loss and operation time between these two groups (66.0 g vs. 48.5 g, 211.6 min vs. 204.1 min, respectively). The main reason of conversion to the laparotomy was narrow field of view due to mesenteric fat and/or advanced adhesion. There were no significant differences in start date of oral intake (3.5 d vs. 3.4 d) and date of discharge (8.7 d vs. 8.7 d). The rate of surgical site infection was significantly higher in Group A than Group B (14.6% vs. 4.5%,  $p = 0.0003$ ). There were no significant differences in the rate of ileus (4.5% vs. 2.4%) and anastomotic leakage (1.1% vs. 3.1%) in these two groups. **Conclusion:** The incidence of complications which leads to extend the hospital stays was not significantly higher in elderly patients. We think 10% of conversion rate in elderly patients is acceptable and the majority of elderly patients are candidates for laparoscopic colorectal surgery.

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### COMPARISON OF EARLY AND LATE EXPERIENCE FOR LAPAROSCOPIC LOW RECTAL CANCER RESECTION; PERIOPERATIVE OUTCOME AND SURVIVAL ANALYSIS; PROSPECTIVE COHORT STUDY

JIRAWAT PATTANA-ARUN MD, CHUCHEEP SAHAKITRUNGRUANG MD, ARUN ROJANASAKUL MD, Colorectal Division, Department of Surgery, Chulalongkorn University, Kingdom of Thailand

**Purpose:** Indications of laparoscopic rectal resection are continually increasing worldwide, but technical difficulties have been encountered in laparoscopic low rectal resection.

The aim of this study is to compare perioperative outcome and its impact on two-years survival for early and late experience groups from one colorectal surgeon.

**Methods:** Review a database of all 69 laparoscopic resection for low rectal cancer (less than 7 cm. from anal verge) between June 2004 to Jan 2007, perform by one colorectal surgeon with self-trained laparoscopic colorectal surgery.

Two consecutive groups are analyzed: Early experience = case 1 to 35 (35), Late experience = case 36 and higher (34). Pearson's chi-square, fisher's Exact test and ANOVA are used to compare differences in demographics and perioperative parameters. Survival analysis is analyzed by the Kaplan-Meier method and the log rank tests.

**Results:** There are no significant differences between two groups with respect to age, sex, BMI, comorbidities, staging or distance of anastomotic line from anal verge. Mean operative time (368vs296,  $p = 0.000$ ) and mean blood loss (477vs163,  $p = 0.010$ ) decline significantly with late experience. There are no differences in the rate of anastomotic leakage (5vs2,  $p = 0.396$ ) between two groups. However, there are three conversions in early experience group because of technical difficulty (3vs0,  $p = 0.23$ ).

The same result is showed after divided all 69 patients for 3 consecutive groups: A (1–23), B (23–46), C (46–69). Group C show significantly shorter operative times than group A ( $p = 0.000$ ) and group B ( $p = 0.001$ ) respectively.

Recurrence is noted in two patients (local and port site) for early experience group (2vs0,  $p = 0.368$ ) and also no different significantly for distant metastases (6vs1,  $p = 0.263$ ).

There are differences significantly in two-year DFS rates (88%vs100%,  $p = 0.042$ ). Overall 2-year survival was 91%vs100% ( $p = 0.081$ ).

**Conclusions:** Perioperative and two-year outcomes after laparoscopic resection of low rectal cancer will be better after 35–46 procedures in this study, base on a decline in operating time, blood loss and recurrence rate.



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### IMPACT OF LAPAROSCOPIC ANTERIOR RESECTION ON POSTOPERATIVE BOWEL FUNCTION

H Matsuoka PhD, T Masaki PhD, T Mori PhD, M Sugiyama PhD, Y Atomi PhD, Department of Surgery, Kyorin University, Tokyo, Japan

Background: Laparoscopic anterior resection would be beneficial not only cosmetic aspect and less invasiveness but also for postoperative bowel function compared to those of open surgery.

Methods: Twenty patients had laparoscopic anterior resection (LAP) and pre- and postoperative anorectal physiologic investigation by patients' questionnaire and manometry. These factors were compared with 25 open anterior resection candidate (OP) in the same period. All patients had DST straight anastomosis. Patients' questionnaire was composed of frequency of bowel movement, any history of incontinence and more. Wexner's incontinence score was used for objective measure. Manometric study was performed with water perfuse type by station pull through technique. Evaluation was obtained at pre- and 6 months postoperative period.

Results: No significant difference was noted in terms of age, gender and tumor stage. Time of operation was longer in the LAP. However, loss of operative blood was significantly smaller than that of the OP. Postoperative hospital stay of LAP was shorter than that of OP. In terms of anorectal function, anastomosis level was 5 cm from the anal verge in both groups. Frequency of bowel movement was increased equally in both groups (5 vs. 5 per day). Wexner's incontinence score also showed significant deterioration from 0 to 6. However, there was no significant difference. Anorectal manometry showed no significant change in terms of anal resting and squeezing pressures. Maximum tolerable volume (100 vs. 96 ml) and rectal capacity (80 vs. 76 ml) were significantly decreased in both groups. However, there was no significant difference.

Conclusion: Laparoscopic anterior resection provided similar functional outcome to those of open surgery in the early postoperative periods.

23104

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### CLINICAL ANALYSIS OF ANASTOMOTIC LEAKAGE IN LAPAROSCOPIC LOW ANTERIOR RESECTION FOR RECTAL CANCER

Bac Hoang Nguyen MD, Thanh Nguyen Huu MD, Viet Van Ung MD, University Medical Center Ho Chi Minh City VietNam

Introduction: The aim of this study is to present the incidence of anastomotic leakage after anterior resection for rectal cancer and to demonstrate the therapeutic approach for the treatment of this complication.

Methods: Retrospective data of 267 patients who underwent anterior resection or low anterior resection of the rectum for rectal cancer from November 2002 to July 2008 at University Medical Center Viet Nam Results: 118 patients underwent anterior resection for rectal cancer. Low anterior resection with total mesorectal excision (TME) was performed in 149. Anastomotic leakage developed in 18 patients (6.7%). 5 patients were managed conservatively and 13 operatively.

Conclusions: The incidence of anastomotic leakage after anterior resection of the rectum for rectal cancer is relatively low (6.7%). Early diagnosis and reoperation decreased the results of this complication.

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### LAPAROSCOPIC RECTOPEXY IN THE TREATMENT OF RECTAL PROLAPSE

Bac Hoang Nguyen MD, Tuan Le Quan Anh MD, University medical center Ho Chi Minh City VietNam

Background: Laparoscopic rectopexy in the treatment of rectal prolapse have good results and many advantages of minimally invasive surgery compared to conventional open surgery.

Objectives. Evaluate the safety and efficacy of laparoscopic rectopexy. Method: This is a retrospective study of 20 patients with rectal prolapse underwent laparoscopic rectopexy from August 2004 to August 2007 at University Medical Center, Ho Chi Minh city.

Results: The mean age is 67 (30–86 yrs). Laparoscopic rectopexy was done successfully in all patients. Fixation to the presacral fascia was done without mesh in fifteen patients (75%) and with a mesh in 5 patients (25%). Five patients (25%) underwent concomitant surgery such as hysteropexy, perineal hysterectomy, cholecystectomy, appendectomy. The mean operative time was 125 minutes (70–190 minutes). Flatus was on postoperative day 2. The mean postoperative hospital stay was 4,3 days. There was no complications and death. The mean follow up time is 19 months.

Conclusions: Laparoscopic rectopexy is safe and effective with many advantages of minimally invasive surgery and low recurrence rate.

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### LAPAROSCOPIC COLECTOMY FOR COLON CANCER: THREE-PORT TECHNIQUE

Bac Hoang Nguyen MD, Thanh Nguyen Huu MD, tuan Le Quan Anh MD, University Medical Center Ho Chi Minh City VietNam

Introduction: This study aimed to present the early results of laparoscopic colectomy for cancer using three-port technique.

Methods: Retrospective data of 150 patients who underwent three-port laparoscopic colectomy from November 2002 to June 2008 at University Medical Center Viet Nam.

Results: The types of resections were right colectomy (n = 67), transverse colon segmentectomy (n = 9), left colectomy resection (n = 27), sigmoidectomy (n = 47). The mean operative time was 142 minutes. The mean postoperative hospital stay was 7.5 days. The overall complication rate was 10.7% with the most frequent complications being anastomosis leakage 1.3%, pulmonary 1.3%, cardiac 0.7%, and wound infection 7.4%.

Conclusions: This study demonstrates that three-port laparoscopic colectomy was safe and effective for cancer. Standardization of surgical technique benefits of shorter length of stay, low rate of complications.

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### TEMPORARY MUCOCUTANEOUS TRANSVERSE COLOSTOMY: TECHNICAL APPROACH

Luis Gramatica (h) PhD, Pedro R Martinez Duartez MD, Sabino Ochoa MD, Jorge A Canedo MD, Hospital Nacional de Clinicas, Cordoba, Argentina

**Introduction:** Transverse colostomy (TC) is a surgical procedure used to protect a low colorectal or coloanal anastomosis. The aim of this study was to evaluate the risks and benefits of a temporary mucocutaneous TC.

**Methods:** 83 patients (56 males, 27 females) with TC were retrospectively reviewed. The indications for fecal diversion included colorectal carcinoma (27) 32.5%, diverticulitis (9)10.8%, megacolon (8) 9.6%, colovesical fistula (7) 8.4%, stab (2)2.4%, gynecological cancer (1)1.2%, Fournier Syndrome (1) 1.2%, colonoscopic perforation (1)1.2%, foreign body perforation (1)1.2%, and traumatic perforation (1)1.2%. 24–48 hours after surgery the rod was removed after 1–3 months. The TC was reversed under local anesthesia using one layer of extramucosal suture in an extraperitoneal fashion. We reviewed the mean age, length of time, early and late complications.

**Results:** No complications were noted during construction of the TC; the mean length of operative time was 25 (15–45) minutes. Early complication occurred in 1 patient (ileus) and late complications occurred in 3 patients (3 parastoma hernias). All 3 hernias were repaired at the time of reversal. One patient had a segment resection due to injury to the posterior wall during TC reversal. After reversal, 9 patients had wound infection, and 1 patient had a fistula that was successfully clinically managed.

**Conclusions:** TC is an option to protect a low colorectal or coloanal anastomosis. The positive results should be further evaluated compared to loop ileostomy. parastomal hernias, the most frequent complication, can be repaired at the time of TC reversal.

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### LAPAROSCOPIC IRRIGATION AND DRAINAGE IN THE TREATMENT OF COMPLICATED ACUTE DIVERTICULITIS: INITIAL EXPERIENCE

J. R Salameh MD, James T Mayes MD, Department of Surgery, Georgetown University, Washington, DC and Surgical Associates at Virginia Hospital Center, Arlington, VA

**Introduction:** While most mild episodes of acute diverticulitis respond well to medical therapy, surgical treatment is indicated in the complicated forms of the disease with abscess and/or peritonitis. We evaluate our initial results of treatment of complicated acute diverticulitis by laparoscopic irrigation and drainage only with no colon resection.

**METHODS AND PROCEDURES:** Three patients with acute sigmoid diverticulitis presented to us, one with diffuse peritonitis, and the other two with abscesses that could not be accessed percutaneously by an interventional radiologist. One was a pelvic abscess, and the other was interloop in nature. Both patients underwent a laparoscopic exploration, lysis of the inflammatory adhesions and phlegmon, irrigation and drainage. No clear colonic perforation could be identified in any of the patients. Estimated blood loss was minimal. Patients were kept on intravenous antibiotics then transitioned to oral antibiotics. Postoperative courses were unremarkable and average hospital stay was 4 days. There was no wound infection or recurrent intra-abdominal infection. One patient subsequently underwent uneventful elective laparoscopic sigmoid colectomy.

**Conclusion:** Laparoscopic irrigation and drainage with possible colorrhaphy could be considered a valid alternative to the traditional sigmoid colectomy with/without colostomy or diversion in the management of complicated and perforated sigmoid diverticulitis in selected patients. It may potentially decrease overall and wound-related morbidity, avoid an ostomy and facilitate interval definitive procedure.

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### DOES THE LEARNING CURVE DURING LAPAROSCOPIC COLECTOMY ADVERSELY AFFECT COSTS?

Hasan T Kirat MD, Ersin Ozturk MD, Daniel P Geisler MD, Feza H Remzi MD, Ravi P Kiran MD, Cleveland Clinic Foundation

**Background:** The aim of this study is to investigate whether the learning curve during laparoscopic colectomy (LC) is associated with increased costs when compared with the procedure after the learning curve has been achieved.

**Methods:** Direct costs for patients undergoing LC during the learning curve (Group A) and after the attainment of proficiency by two colorectal surgeons performing the procedure (Group B) between 2001 and 2007 were compared. Learning curve was defined as the first 40 LC cases for each surgeon. Distribution of cases for the surgeons ensured that costs differences were not influenced by lead time bias of cases performed during the learning curve.

**Results:** There were 80 Grp A and 74 Grp B patients. Age ( $57.6 \pm 15.5$  vs.  $58 \pm 15.8$  yrs,  $p = 0.72$ ), gender (female,  $n = 42, 52.5\%$  vs.  $n = 35, 47.3\%$ ,  $p = 0.52$ ), ASA score ( $p = 0.76$ ), body mass index ( $27.2 \pm 4.96$  vs.  $28.4 \pm 6.3$ ,  $p = 0.3$ ), diagnosis ( $p = 0.88$ ), previous abdominal surgery ( $n = 19, 48.7\%$  vs.  $n = 10, 27.8\%$ ,  $p = 0.07$ ) and comorbidity ( $p = 0.44$ ) were similar for groups A and B. Performance of anastomosis or resection ( $p = 0.17$ ,  $p = 0.58$ , respectively), conversion to open surgery ( $n = 17, 21.2\%$  vs.  $n = 18, 24.3\%$ ,  $p = 0.65$ ), postoperative morbidity ( $p = 0.73$ ), readmission ( $n = 6, 7.5\%$  vs.  $n = 12, 16.2\%$ ,  $p = 0.1$ ), and reoperation rate ( $n = 1, 1.2\%$  vs.  $n = 2, 2.7\%$ ,  $p = 0.61$ ) were similar. Operation time was significantly longer for group A (Group A,  $172.84 \pm 62.86$  vs. Group B,  $146.27 \pm 39.22$ ,  $p = 0.013$ ). Total direct costs ( $p = 0.7$ ) and operating room ( $p = 0.58$ ), nursing ( $p = 0.72$ ), pharmacy ( $p = 0.95$ ), radiology ( $p = 0.98$ ), and professional ( $p = 0.051$ ) costs were however similar between groups.

**Conclusions:** As expected, the learning curve period during LC is associated with prolonged operating time. Concerns pertaining to increased conversions, complications or direct costs during this period are not substantiated.

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### 12 MONTHS RESULTS OF EVALUATION OF ANAL SPHINCTER RADIOFREQUENCY REMODELING

Roman Herman PhD, P Walega PhD, Michal Nowakowski PhD, Jakub Kenig PhD, Katarzyna Smeder MD, Jerzy Salowka MD, Dorota Zelazny MD, 3rd Department of General Surgery Jagiellonian University Collegium Medicum

**BACKGROUND:** The main doubt reducing enthusiasm for the radiofrequency remodeling technique (secca) was based on lack of physiological studies, which may explain the possible pathomechanism of improvement of symptoms.

**AIM:** The aim of this study was clinical physiological evaluation of the anorectal function prior and during 12 months follow-up after the secca procedure.

**MATERIAL:** 16 fecal incontinence (FI) patients (4 male and 12 female, mean age 59 ranged 41–78 years) have been enrolled into the study. The standard technique and secca device was used (Curon Medical, Fremont, CA USA). The following parameters were evaluated at baseline, 3, 6 and 12 months after the procedure: continence (CCF-FI, FI-SI scores), improvement (FI-QoL, patient diary, VAS), electromyography (EAS-superficial, IAS-needle), rectal electro- and thermosensitivity, barostat, anal manometry, morphology (endoanal ultrasound).

**Results:** Comparing to baseline, 1, 3, 6 and 12 months average results were as follows: CCF-FI 12,1 - 10,4 - 9,1 - 9,3 - 6,8; FI-SI 36,9 - 38,6 - 34,9 - 35,2 - 30,8; compliance 5,6 - 5,6 - 4,0 - 4,2 - 4,0; manometry BAP 30,6 - 34,23 - 39,3 - 42 - 43, SAP 73,15 - 75,53 - 86,07 - 96,69 - 96,3; electrosensation 23 - 53 - 52 - 41 - 37, thermosensation 0,7 - 0,28 - 0,3 - 0,4 - 0,4, respectively. In FI-QoL scale significant improvement in 4 of 4 measures was observed, as well as IAS and EAS electromyography improvement.

**Conclusions:** Secca remodeling is safe and seems to be effective method of FI treatment. It reduces the frequency and severity of FI symptoms, and improves patient's quality of life. This effect seems to be related to restored anorectal sensitivity and recto-anal coordination, however effect on IAS morphology and function is also detectable.

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### SINGLE INCISION LAPAROSCOPIC APPENDECTOMY IS SAFE AND RESULTS IN EXCELLENT COSMETIC OUTCOMES

Chris Edwards MD, Alan Bradshaw MD, Regional Surgical Specialists, Mission Hospitals, Asheville NC

**Objective:** Single incision laparoscopic surgery (SILS) is a new advance wherein laparoscopic surgery is carried out through a single small incision hidden in the umbilicus. The use of this technique has been described for many urological and GYN procedures. However, the use of this procedure in general surgery so far has been largely limited to cholecystectomy. Little has been published of its use in other general surgical procedures. The objective of this study is to describe the safety and feasibility of SILS appendectomy in a single community based institution. **Methods:** A retrospective review of a prospectively collected database was reviewed on all patients who underwent SILS appendectomy. Both single incision three-port technique as well as single incision dual-port technique with transabdominal suture retraction of the appendix was used. All patients were included including any conversions to traditional laparoscopic technique. Operative and perioperative outcomes were analyzed using standard statistical methods. **Results:** 8 SILS appys (6 three-port and 2 suture retraction) were performed from 7/30/08 - 10/1/08 (indications: 5 early, 2 suppurative, and 1 gangrenous). There were no conversions to traditional or open techniques. No perforations were identified. Mean BMI was 25.5 (rng: 22 -30.5), mean OR time was 41 mins (rng: 30 -55), mean EBL was 5 cc and mean skin incision length was 1.7 cm. Complications include one minor wound infection. Mean 10-point pain score prior to discharge was 2.6 (rng: 0 -6). Number of days of post op oral narcotic use was described as minimal (1 day) in 5 pts (63%), moderate (1-3 d) in 1 pts (13%), and heavy (> 4 d) in 2 pt (25%) with follow up accomplished in all 8 patients. All patients described excellent cosmetic outcomes with minimal to no visible scar. **Conclusion:** SILS appendectomy is safe and feasible with acceptable morbidity and operative times. Cosmetic results are excellent.

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### SERRATED ADENOMA OF THE APPENDIX: A RISK FOR COLON CANCER?

Mark E Lytle MD, Chad R Edwards MD, James P Dolan MD, Robert M Cromer MD, Keesler Medical Center - Department of Surgery

Because of the association of serrated adenomas with microsatellite instability in concomitant colon polyps, a more vigilant surveillance may be needed to screen for colon cancer. This is an interesting case of a serrated adenoma of the appendix as a cause of acute appendicitis. This patient is a 70 year old male who presented with intermittent right lower quadrant pain for one week. Initial laboratory data revealed leukocytosis with a left shift, normocytic anemia, and thrombocytosis. A CT of the abdomen showed inflammatory stranding in the RLQ, free fluid in the pelvis, and an appendix measuring 6 mm. After admission for diverticulitis, an ultrasound of the appendix revealed a noncompressible appendix with fat stranding in the pelvis. An Lap appendectomy was performed. Lap visualization revealed an inflamed appendix with a gangrenous tip. Pathological exam demonstrated the presence of acute appendicitis with rupture and a sessile serrated adenoma that was completely contained within the specimen. Because of the association with microsatellite instability in concomitant colon polyps with possible progression to colon cancer, a post operative colonoscopy was performed. This revealed hyperplastic polyps in the right colon. Due to the fact microsatellite instability may exist in any or all of the polyps with increased risk of progression to colon cancer, arguments can be made to decrease the length of time between screening colonoscopies.

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### CLINICAL AND FUNCTIONAL RESULTS OF TRANSANAL ENDOSCOPIC LOCAL EXCISION OF RECTAL TUMORS

P Walega PhD, J Kenig PhD, T Cegiely MD, M Nowak PhD, R Herman PhD, 3rd Department of General Surgery Jagiellonian University Collegium Medicum

Transanal endoscopic excision of rectal tumors is an accepted sphincter preserving technique in rectum surgery. Detailed preoperative diagnostic procedures (histopathology, endosonography) and functional assessment (manometry, electromyography) are crucial for proper patients selection. **Aim:** To determine clinical and functional results of patients undergoing local excision for benign and malign lesions. **Material and Methods:** 90 patients (54 male, 46 female, mean age 68.4) treated for rectal tumor with transanal endoscopic rectal microsurgery technique at Department of Surgery. To avoid postoperative sphincter dysfunction NO ointment was routinely applied. **Results:** 75 patients were operated on for benign rectal tumors, 6 for malign disease (T1) and 4 patients due to miscelanous reasons (solitary ulcers, rectum stenosis, rectovaginal fistula). Full-thickness excision was performed on 76 patients and submucosal local excision on 14. The mean distance from the anal verge was 10.6 cm. 34% of the lesions were located on the anterior wall, 40% on the posterior and 17% on the side wall. The mean operative time was 80 min (range 30 -180 min). Average blood loss was 45 ml (range 0 -150 ml). The mean length of stay was 3.6 days (range 1-11 days). Peri- and postoperative mortality was 0,0%. Complication included urinary retention (4), bleeding (2), wound dehiscence (1), rectocutaneous fistula (1). Postoperative fecal incontinence was observed in 3 patients. In the follow-up time between 6 and 46 months local recurrence rate reached 6,7% in the adenoma group and up to 30% in the malign diseases group. **Conclusions:** Transanal endoscopic rectal operation is a safe and cost efficient procedure for local excision of selected patients with rectal tumors. It significantly reduces the number of postoperative functional disturbances what allows to maintain good quality of life with acceptable local recurrence rate and postopeative morbidity. Sphincter protection using nitroglycerin ointment reduces also almost entirely possibility of sphincter damage due to introduction of operational rectoscope.

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### VISUAL ENHACEMENT OF FASCIA FACILITATES LAPAROSCOPIC PREPARATION

Tilman Laubert MD, Hamed Esnaashari DO, Robert Keller MD, Uwe Johannes Roblick PhD, Jan Nolde MD, T. Stehle MD, Hans-Peter Bruch MD, Department of Surgery, University Hospital Schleswig-Holstein, Campus Luebeck

**Introduction:** Laparoscopic surgery for both benign and malign diseases of the colon is well established. The correct dissection of layers may impose some difficulties in patients who underwent surgical interventions before, who suffer from inflammatory diseases and for surgeons who are still in their learning phase of laparoscopy. The presented system encompassing both hardware and software components serves to facilitate the identification of the fascia by visual transformation. **Methods and Procedures:** The RealTimeFrame-System published in 2007 served to develop a software which in real-time mode alters the saturation of individual pixels enhancing the contrast between fatty tissue and fascia. The colours and saturations of other tissues are not impaired thus avoiding the creation of a picture which hides other important structures or possibly confuses the surgeon in his proceeding. Diverse algorithms were applied to video sequences of laparoscopic colon resections. Surgeons experienced in laparoscopy viewed these sequences to determine the optimal parameters of software-generated modification of the original picture. First clinical experiences were obtained using a second monitor next to the one routinely used in laparoscopy which displayed the augmented contrast. Optical transformation was achieved in real time mode and could be switched off according to the surgeon's preference.

**Results:** The visual transformation allows a clear distinction of layers which implies a facilitation in preparation for the untrained surgeon and the experienced surgeon facing a difficult situs, respectively. This, in return, entails positive effects for both the patient with regard to the perioperative risk and the surgeon for whom the procedure becomes less stressful in certain situations. The stated factors will be evaluated in a prospective randomised trial to verify the estimated effects. Furthermore, the preparation of the rectum may be another procedure in which the application could be advantageous.

**Conclusion:** The results for the application of the transforming software obtained to this point appear to be very promising. Particularly, the mobilisation of the left sided hemicolon and the rectum may be faster and safer which constitutes a benefit for the patient.

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### TOTALLY LAPAROSCOPIC RIGHT HEMICOLECTOMY WITH INTRACORPOREAL ANASTAMOSIS

Naresh K Ahuja MD, Bethany Sacks MD, Artun Aksade, Ramesh Ramanathan MD, Department of Surgery, University of Pittsburgh, Pittsburgh, PA

**Introduction:** Laparoscopic right colonic resections has been performed with comparable results to open colectomies. Laparoscopic assisted approach, utilizing an access incision for ileocolic anastomosis is commonly performed for laparoscopic right colectomies. We report our right colon resections experience, using a totally laparoscopic approach utilizing an intracorporeal anastomosis.

**Methods:** Fifty-nine patients underwent a laparoscopic right colectomy with totally intracorporeal anastomosis from August 1996 to November 2007. Retrospective data were collected and analyzed including: age, sex, indication for surgery, procedure performed, operative time, complications, length of stay, pathology, number of nodes, and length of disease-free follow-up.

**Results:** Of 59 patients, 32 were female (54.2%), with an age range of 27 to 88 years (mean age 59). Operative indications included colonic polyps in 33, adenocarcinoma in 24, and diverticular/inflammatory disease in 2 patients. The average number of lymph nodes in carcinoma specimens were 17.3 (range 2 to 39). Average OR time was 277 minutes (range 111 to 473 minutes). The median and mean lengths of stay were 4 and 5 days respectively (range 2 to 18). Mean follow up for all patients was 16 months, and for the carcinoma cases it averaged to 24 months. There were three intraoperative complications and no mortality. Long-term complications included 5 extraction site hernias (8.8%) and 4 small bowel obstructions. There were three intraabdominal carcinoma recurrences (5%), but no port site or wound recurrence.

**Conclusions:** Laparoscopic right colon resection with intracorporeal anastomosis is technically feasible for both benign and malignant diseases. Advantages of totally intracorporeal anastomosis includes the avoidance of malignant diseases extensive colonic mobilization, usually required for extracorporeal anastomosis, smaller incision for specimen extraction, particularly in obese patients with thicker abdominal wall and reduced risk of mesenteric hematoma due to excessive traction on shortened mesentery. Furthermore, future molecular cancer staging may even negate the need of a larger incision for the intact specimen extraction, thus theoretically decreasing postoperative discomfort and hernias.

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### ILEOSTOMY REVERSAL AFTER LEFT COLONIC OR RECTAL RESECTION FOR CANCER: DOES THE INITIAL APPROACH (LAPAROSCOPY VERSUS LAPAROTOMY) AFFECT OUTCOME?

Elie K CHOUILLARD MD, Nicolas TABARY MD, Abe L FINGERHUT MD, Poissy Medical Center (FRANCE)

The aim of stoma in patients who had left colonic or rectal resection for cancer is to limit the consequences of anastomotic leakage. We retrospectively analyzed the short-term outcome of patients who had ileostomy reversal in this setting. Patients who had initial laparoscopic cancer resection were compared to those who had the same procedure openly.

The charts of all patients who had left colonic or rectal resection with anastomosis and ileostomy between 2004 and 2007 were reviewed.

164 consecutive patients were eligible for the study. 91 patients were initially operated by laparotomy (Group A) and 73 patients by laparoscopy (Group B). Mean time interval between cancer resection and stoma reversal was 14 weeks (8–27). Overall operative mortality was 2.2% and 1.4% in group A and group B, respectively. Mean operative duration was 61 min and 85 min in group A and group B, respectively ( $p < 0.05$ ). Overall operative morbidity was 16.5% and 17.8% in group A and group B, respectively ( $p > 0.05$ ). The length of hospital stay was 5.1 days (3–23) in group A and 6.3 days (2–32) in group B, respectively ( $p < 0.05$ ).

Ileostomy reversal after left colonic or rectal resection for cancer seems to be associated with longer operative duration, increased morbidity and a longer hospital stay if the initial cancer resection was performed laparoscopically as compared to the open approach.

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### LAPAROSCOPIC LEFT COLONIC RESECTION FOR PERITONITIS CAUSED BY DIVERTICULITIS

Elie K CHOUILLARD MD, Abe L FINGERHUT MD, Poissy Medical Center (FRANCE)

**Purpose:** Purulent or fecal peritonitis is one of the most serious complications of acute diverticulitis. Up to one fourth of patients hospitalized for acute diverticulitis require an emergent operation for a complication including abscess, peritonitis, or stenosis. Open Hartmann's procedure has been the operation of choice for these patients. The advantages of laparoscopy could be combined with those of the primary resection in selected patients with peritonitis complicating acute diverticulitis. However, due to technical difficulties and to the theoretical risk of poorly-controlled sepsis, laparoscopic resection procedures have seldom been reported for such patients.

**Methods:** Data were prospectively collected from 2002 to 2006 in a single referral center specialized in abdominal emergencies. Laparoscopic left colonic resection was performed in selected patients with peritonitis complicating acute diverticulitis.

**Results:** Forty five patients were studied. The median Mannheim Peritonitis score was 21 (+ 5, 12–32). The conversion rate was 16%. 30 patients had Hartman's procedure and 15 patients had immediate colorectal anastomosis. There was no perioperative uncontrolled sepsis. Overall operative 30-day mortality and morbidity rates were 3% and 23%. Stoma reversal was possible in 90% of patients.

**Conclusion:** The indications of laparoscopy for the treatment of diverticulitis could be extrapolated to selected patients with peritonitis.

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### DIAGNOSIS, TREATMENT, AND OUTCOMES OF DUODENAL NEOPLASMS

S. Medda, William W Hope MD, Charles J Dolce MD, B. Todd Heniford MD, Department of Surgery, Division of Gastrointestinal and Minimally Invasive Surgery, Carolinas Medical Center, Charlotte, North Carolina

Duodenal neoplasms are rare and range from benign lesions that can be treated with endoscopic techniques to adenocarcinoma that often requires surgical resection. The purpose of this project was to evaluate the incidence, diagnosis, treatment, and outcomes of duodenal neoplasms at a large tertiary-care hospital. A retrospective review was conducted (2002–2007). Patients were identified from the gastrointestinal tumor registry at our institution. Medical records were examined for demographics, treatments, complications, and outcomes.

Twenty patients were identified with primary duodenal neoplasms. The overall incidence of duodenal neoplasms in the GI tumor registry was 10.6%. The mean age was 64 years (range, 47–87 years) with 45% of patients being male. The most common presenting symptoms were weight loss (35%) and nausea and vomiting (41%). Of the 20 duodenal neoplasms, 13 were adenocarcinomas and 7 were carcinoid tumors. Methods of diagnosis included upper gastrointestinal series (58%), esophagogastroduodenoscopy (63%) and CT scan (53%), with 10 patients having more than one diagnostic study. All neoplasms in the 3rd and 4th portion of the duodenum were adenocarcinomas. The majority of patients were diagnosed with Stage IV disease ( $n = 8$ ). Surgical therapy was undertaken in 45% of patients ( $n = 9$ ) and ranged from local excision ( $n = 6$ ) to pancreaticoduodenectomy ( $n = 1$ ). 66% of patients ( $n = 6$ ) that underwent surgery had negative surgical margins and one of these patients had a recurrence 2 years postoperatively. Additionally, 40% of patients ( $n = 8$ ) received no therapy (surgery, radiation, or chemotherapy). Overall 3-year mortality rate was 50% and 70% for surgical and nonsurgical patients respectively. 3-year mortality was 75% for patients receiving no therapy.

Duodenal neoplasms remain a rare entity. We found the majority of these tumors were adenocarcinomas and were diagnosed by EGD. The majority of the patients in our series did not receive surgical therapy as a result of metastatic disease at initial diagnosis.

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### ADVERSE EVENTS ASSOCIATED WITH LAPAROSCOPIC COLOSTOMY REVERSAL FOLLOWING HARTMANN'S PROCEDURE: A MULTI-INSTITUTIONAL STUDY

Hai P Huynh MD, Daniel C Trotter MD, Husein Moloo MD, Eric C Poulin MD, Joseph Mamazza MD, Robin P Boushey MD, The Ottawa Hospital - MIS Research Group, Ottawa, Canada.

**Background:** Open restoration of bowel continuity after Hartmann's procedure has been associated with significant morbidity, including anastomotic leak, incisional hernia, inability to re-establish intestinal continuity and wound infections. Few studies have examined the role of laparoscopy in performing Hartmann's reversal. The aim of this study is to review our experience with laparoscopic colostomy reversal after Hartmann's procedure with an emphasis on intra- and post-operative adverse events. **Method:** A prospectively collected laparoscopic colorectal database involving three surgeons in four academic centers between 1991 and 2008 was reviewed. All patients underwent a laparoscopic approach and there was no patient selection during this time interval. Factors evaluated are patient demographics, diagnosis, operative time, intra- and post-operative complications, recovery of bowel function and hospitalization length.

**Results:** Twenty-eight consecutive patients (13 males), mean age 61.1 +/- 15.3, mean weight 72.3 +/- 20.1 kg, underwent laparoscopic Hartmann's reversal. The diagnosis at initial surgery was complicated diverticulitis in 19 patients (67.9%), cancer in 6 patients (21.4%) and other in 3 patients (10.7%). Median operative time was 166.2 +/- 74.4 min and mean incision length was 4.5 +/- 1.9 cm. There were no conversions. There was one major intraoperative complication (bleeding) (3.6%). There were three postoperative complications (10.7%): one abscess, one prolonged ileus and one wound hematoma. Only one patient with an abscess required readmission and there were no observed clinical anastomotic leaks. All patients underwent successful reanastomosis. The median time for bowel function return was 4 days (3,4) (IQR). The median hospitalization length was 5 days (3,5,6) (IQR). There was no mortality.

**Conclusion:** Laparoscopic colostomy reversal after Hartmann's procedure is safe and feasible in experienced hands. It is associated with low morbidity, quick return of bowel function and short hospitalization.

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### LAPAROSCOPIC ANTERIOR RESECTIONS USE FEWER DEFUNCTIONING STOMAS

S H Clark MD, P Schwingshackl MD, E Drye MD, K Jaggs RN, S Warren MD, Chase Farm Hospital, Middlesex, UK; North Middlesex Hospital, Greater London, UK; Colchester Hospital, Essex, UK.

**Aims:** It is our contention that with the improved visualization of the operating field afforded by laparoscopic surgery, that during laparoscopic anterior resection fewer drains and defunctioning stomas are being utilized. We assessed a single consultant surgeon's anterior resectional practice.

**Methods:** A retrospective study compared all laparoscopic anterior resections (LAR) versus open anterior resections (OAR) conducted by a single consultant surgeon over a five year period from January 2003 to June 2008, who changed his practice from open to laparoscopic surgery in January 2005. We compared the total theatre time, the use of drains and the number of defunctioning stomas constructed. Additionally, rates of neoadjuvant therapy and anastomotic leak were assessed, along with the height of tumour above the anal verge. Data was extracted from theatre records and operation/patient notes from 38 consecutive patients who underwent anterior resection.

**Results:** Data were compared from 22 laparoscopic vs. 16 open anterior resections (there was one laparoscopic to open conversion). There was no significant difference in mean total theatre time (to include anaesthetic/epidural and laparoscopic equipment setup times) of OAR compared to LAR (OAR = 227 minutes vs. LAR = 245 minutes,  $t = 0.741$ ,  $p = 0.464$ ). No drains were inserted during any of the LAR compared to seven in OAR ( $p < 0.01$ ). There were significantly fewer defunctioning stomas in the laparoscopic procedures compared to open group (1/22 vs. 9/16 respectively,  $t = -4.184$ ,  $p < 0.0001$ ) despite no significant difference in the height of tumour above the anal verge (mean LAR = 13.38 cm vs. OAR = 13.28 cm), and similar rates of neoadjuvant therapy in the two groups. Anastomotic leak rates were similar (LAR 1/22 vs. OAR 0/16).

**Discussion:** Despite similar rates of neoadjuvant therapy in both groups and resections at the same rectal height, we found significantly fewer defunctioning stomas were constructed, no drains inserted and no significant increase in anastomotic dehiscence in the laparoscopic anterior resections. Total theatre time (more accurately reflecting surgical theatre efficiency) between OAR and LAR is not significantly different, countering the historical argument quoted against laparoscopic resections. We feel that reducing the use of stomas and drains is likely to reduce morbidity and increase patient satisfaction without compromising safety. Therefore, our study further promotes the benefits of a laparoscopic approach to anterior resection.

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### ONCOLOGIC AND PERIOPERATIVE OUTCOMES OF HAND-ASSISTED LAPAROSCOPIC SURGERY (HALS) VS OPEN LOW RECTAL CANCER RESECTION: A CASE MATCH STUDY

JIRAWAT PATTANA-ARUN DO, PORNTHEP PRATHANVANICH DO, CHUCHEEP SAHAKITRUNGRUANG DO, PUTTARAT ATITHANSAKUL DO, ARUN ROJANASAKUL DO, Colorectal Division, Department of Surgery, Chulalongkorn University, Kingdom of Thailand

**Purpose:** Hand-assisted laparoscopic colorectal resection, the non-dominant hand in the pelvis has been believed as the major obstacle and may be the cause of difficulties and longer the operative time compares to open procedures. Hand-assisted laparoscopic colorectal resection was found to be associated with less postoperative pain, faster return to bowel function, and shorter hospital stay.

**Whether HALS should be performed for lower rectal malignancy is controversial. There have been only a few reports on Hand-assisted laparoscopic lower rectal resection for malignancy.**

This study is designed to analyze oncologic and perioperative outcomes for selected patients; match by staging who undergoing either HALS and open low rectal resection for cancer.

**Methods:** A total of 40 patients (2007-2008) are prospectively analyzed; by select the same staging for each group. HALS is chosen by 20 patients and also 20 patients for open surgery. The following parameters are compared between the two groups: operative time, first bowel movement and oncologic outcomes such as clearance of the margins of the specimen, number of lymph nodes identified.

Pearson's chi-square, fisher'sExact test and student t test are used to compare differences in demographics and perioperative parameters.

**Results:** Both groups are comparable regarding age,gender,tumor localization,and complications. Each group has 3/stage 0, 9/stage IIA, 1/stage IIIA, 6/stage IIIB,1/stage IIC. No mortality occurred in either group. Mean operative times are not difference significantly between two groups (288 min/open vs 272 min/HALS,  $p = 0.567$ ). But difference are found in first bowel movement (3.9 day/open vs 1.6 day/HALS,  $p = 0.000$ )

The mean tumor size is 4.4 cm in the open group and 3.9 cm in the HALS group ( $p = 0.393$ ). The mean tumor-free margin is 1.5 cm in the open group and 2.6 cm in the HALS group ( $p = 0.004$ ). And the mean number of harvested lymph nodes is 17 in the open group and 16 in the HALS group. No wound recurrence is observed.

**Conclusions:** Hand-assisted laparoscopic surgery is equivalent in the treatment of low rectal cancer and shows advantages of faster recovery. A longer follow-up period is required to evaluate the long-term efficacy of the procedure and its impact on survival.

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### BODY IMAGE AND COSMESIS AFTER LAPAROSCOPIC OR OPEN APPENDECTOMY

I Sucullu BA, AI Filiz BA, AE Canda BA, E Yucel MD, Y Kurt MD, M Yildiz MD, Department of Surgery, Gulhane Military Medical Academy, Haydarpaşa Training Hospital and Manisa State Hospital, TURKEY

**Introduction:** Minimal invasive techniques such as laparoscopic appendectomy (LA) are thought to produce better cosmetic results. This aim of this study was to evaluate the body image n cosmesis of patients after LA and open appendectomy (OA).

**Methods and procedures:** Between August 2007 and June 2008, patients who underwent LA or OA with the diagnosis of acute appendicitis were invited to participate the study by filling out the body image questionnaire. For OA, patients who had Rocky-Davis incision and for LA patients who had the operation by three trocars (10-mm infraumbilical, 5-mm suprapubic and additional 10 mm left lower quadrant) were included the study. Patients with the pathologies other than acute appendicitis, having McBurney or vertical incisions, having prior abdominal surgery, who had conversion to open exploration during laparoscopy, and in whom different number and positioned trocars used were excluded from the study. Student's t-test and paired samples t-test were used for statistical analysis.

**Results:** A total of 38 patients (20 LA, 18 OA) participated to the study. The mean Scores from the body image questionnaire (both body image scale and cosmetic scale) were similar in both groups ( $P > 0.05$ ). No significant complications were observed in both groups. The mean incision size for OA was 3.2 cm (range, 2-6 cm). No significant change in self confidence (preoperative vs. postoperative) was observed in both groups ( $P < 0.05$ ).

**Conclusion:** To our knowledge, there is no study in the literature, evaluating body image and cosmesis with objective methods in LA. Our results showed that LA has no advantage for body image and cosmesis over OA. Further prospective randomized studies using different tools with larger sample size are needed for the rationalization of laparoscopy for appendectomy.

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### COMPARATIVE STUDY OF LAPAROSCOPIC VERSUS OPEN APPENDECTOMY AT A TERTIARY CARE HOSPITAL IN PAKISTAN

shaikh a razaque MD, sangrasi a khan MD, basant kumar MD, Liaquat Universty of Medical Health & sciences Jamshoro Pakistan

**Introduction:** Open appendectomy is the most common and most popular operation in Pakistan. There are few studies from the third world countries to compare the Open appendectomy (OA) with Laproscopic appendectomy (LA). The aim of study was to compare the postoperative outcome of LA with OA in terms of operating time, hospital stay, postoperative morbidity and time to return to normal activity.

**METHODS AND PROCEDURES:** This prospective comparative study was carried out at surgical department of Liaquat Universty of Medical Health & sciences Jamshoro Pakistan from January 2006 to Decmber 2007. There were 100 case of clinically diagnosed acute appendicitis between the age of 15-45 years .Patients with mass right iliac fossa and female with history of amenorrhoea were not include in the study. All the cases were randomly allocated two groups., 50 in OA and 50 in LA.

**Results:** There were 69 males and 39 females. Operating time was 55.3 + 13.9 minutes in LA and 30.2 + 11.8 minutes on OA. Hospital stay was 1.40 + 0.49 days in LA and 3.58 + 0.99 days in OA. Return to normal activity was 3.58 + 0.99 days in LA and 19.54 + 2.82 days in OA. Requirement to parenteral analgesics were 1.08 + 0.59(1-3) doses in LA and 1.51 + 0.65(2-5) doses in OA. Vomiting, paralytic ileus and wound infection were decreased in LA than OA

**CONCLUSION:** LA is an alternative to OA due to short hospital stay,-decreased analgesic requirement,lower incidence of postoperative complications and early return to normal activity, where as the OA is associated with less operating time

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### EFFECTS OF PREVENTING OXIDATIVE AND NITROOXIDATIVE STRESS ON HEALING OF EXPERIMENTAL RAT COLON ANASTOMOSIS

Yavuz Poyrazoglu MD, Taner Yigit MD, Ali Harlak,Öner Menten MD, Semih Görgülü MD, Ihsan A Uzar MD, Orhan Kozak MD, Güllhane Military Medical Academy Dep. Of General Surgery

**Introduction:** Colon anastomosis is a frequently used technique.Decreasing oxidative substances may prevent surgeon from complications.We investigated the efficacy of N-acetyl cysteine(NAC) as an antioxidant, Ebselen as a peroxide reducer and 1400 W as an inducible nitricoxide synthetase(INOS) inhibitor on ischemic and non-ischemic colon anastomosis. Methods and procedures; 90 Sprague-Dawley rats were used. Study design as follows;1)non-ischemic control group,2)ischemic control group,3)non-ischemic NAC group,4)ischemic NAC group,5)non-ischemic ebselen group,6) ischemic ebselen group,7)non-ischemic 1400 W group,8)ischemic 1400 W group. NAC:150 mg/kg, Ebselen:50 mg/kg, 1400 W:10 mg/kg were given intraperitoneally for 4 days after colonic surgery. Postoperative 5th day, relaparotomy were performed, anostomotic bursting strength were measured and hydroxypyroline, malondialdehyde(MDA), superoxidisedismutase(SOD),glutathione-peroxidase(GPx) were assayed. Results; Bursting strength and hydroxypyroline levels were increased( $p < 0.01$ ) and MDA, SOD levels were significantly decreased ( $p < 0.01$ ) in ischemic and non-ischemic 1400 W groups. Conclusion; Inhibition of INOS enzyme to prevent NOS induced oxidative stress is beneficial for anostomotic healing.

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### LAPAROSCOPIC SURGERY FOR COLON DIVERTICULITIS: ADVANTAGES OF HAND-ASSISTED LAPAROSCOPIC SURGERY IN THE PRIMARY SURGERY AND HARTMANN REVERSAL

Fumihiro Uchikoshi MD, Yuko Yamagami MD, Osamu Yamada MD, Takahiko Tatsumi MD, Department of Surgery, Tatsumi clinic & Hospital

**[Background]** Laparoscopic surgery for the colonic diverticulitis has following unique aspects that are different from surgery for colonic cancer, 1) Due to the inflammation of the bowel and mesocolon, it is difficult to keep proper dissectional plane, 2) resection of long-segmental colon usually needs to mobilize the splenic flexure for the safe anastomosis, 3) complicated inflammation sometimes requires Hartmann procedure or additional segmental resection of adjacent organs, 4) In Hartmann reversal, adhesions of the small bowel and the rectal stump is hard to release under the laparoscope. In this study, we summarize the results and discuss the advantage of Hand-assisted laparoscopic surgery for colon diverticulitis.

**[Patients and methods]** Seven patients (2: right-sided, 5: left-sided) operated under the laparoscope. For sigmoid diverticulitis, 8 cm lower midline incision was made first, and dissection or resection was performed under the direct vision as possible. Remaining mobilization of mesocolon, and splenic flexure were performed with hand assistance. GelPort was usually used to maintain pneumoperitoneum during HALS. In the reversal operation, take-down of stoma was performed first and GelPort was attached to the stoma wound.

**[Results]** All operations for right-sided colon diverticulitis could be accomplished by laparoscope without unexpected conversion. In left-sided cases, 2 patients were carried out by laparoscope only (operative time; 256 and 365 min) and 2 patients were operated by HALS (165 and 200 min). Reversal surgery for Hartmann procedure was performed by HALS for one patient (205 min).

**[Conclusion]** In the primary surgery or reversal procedure for colonic diverticulitis, our technique of HALS is effective and shortens the operative time.

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### LAPAROSCOPIC SIGMOID COLON RESECTION IN THE MANAGEMENT OF A 13-YEAR-OLD PATIENT WITH SEVERE RECTAL PROLAPSE

Aaron P Leshner MD, Katherine A Morgan MD, Andre Hebra MD, Medical University of South Carolina

**Background:** Rectal prolapse in the pediatric population is usually a benign and self-limited condition. We present a rare case of severe recurrent rectal prolapse on a 13-year-old patient associated with a redundant sigmoid colon treated with laparoscopic resection.

**Case Presentation:** A 13-year-old male presented with a five-year history of chronic intermittent rectal prolapse requiring digital reduction on a daily basis. The patient did not have any other co-morbid conditions. Only after manual reduction of the 5-10 cm prolapsed rectum the patient was able to evacuate stool. Preoperative workup, including colonoscopy, contrast enema, anal manometry, defecogram, and sitz marker study, demonstrated an elongated, redundant sigmoid colon with significant prolapse of the sigmoid and rectum through the pelvic floor. With straining, the defecogram also demonstrated the development of a prominent fold in the upper rectum at the level of the peritoneal reflection. Non-operative treatment with stool softeners, Miralax, and bio-feedback failed to provide any improvement. The patient was taken to the operating room for laparoscopic sigmoid colon resection with side-to-side stapled anastomosis. Approximately 13 centimeters sigmoid were resected eliminating the 'accordion' effect caused by the redundant sigmoid. A rectopexy was unnecessary as the remaining distal sigmoid and rectum were tethered to the pelvis. The patient was discharged on post-operative day one and his rectal prolapse has completely resolved. He now has normal bowel movement without the use of any laxatives.

**Conclusion:** We present a rare case of redundant sigmoid colon causing constipation and rectal prolapse in a pediatric patient. This is the first reported pediatric case successfully treated with laparoscopic sigmoid resection.

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### COULD THE TUMOR CHARACTERISTICS IDENTIFIED BY COLONOSCOPY PREDICT THE LOCALLY ADVANCED RECTAL CARCINOMA?

Hao Wang PhD, Fuao Cao MD, Ronggui Meng MD, Xiaohui Wu MD, Enda Yu MD, Wei Zhang PhD, Lianjie Liu PhD, Liqiang Hao PhD, Chuangang Fu PhD, Department of Colon and Rectal Surgery, Changhai Hospital, Shanghai, China, 200433

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Objective: To investigate the clinical and pathological characteristics of locally advanced rectal carcinoma and identification of the candidates for neoadjuvant chemoradiation (nCRT).

Summary Background data: So far the nCRT has been the standard care for locally advanced rectal cancer (T3-4 or/and N1-2 lesions). But the accuracy of staging examinations (mainly ERUS and MRI) is far from excellent. Besides, such examinations or professionals are not available in many hospitals in China, while the colonoscopy and biopsy are routinely obtained before surgery.

Methods: This is a retrospective study. Patients who were treated for rectal cancer with total mesorectal excision (TME) technique at Changhai hospital from January 1999 to July 2008 were identified from our prospectively collected database. Patient's characteristics, colonoscopy records, operative and pathologic reports were reviewed. Exclusion criteria were recurrent rectal tumors, tumors receiving nCRT, stage IV tumors, synchronous multiple colorectal carcinomas and the patients with incomplete information.

Result: Totally 1005 cases were included in this research and 761 cases were identified as locally advanced rectal cancer (T3-4 or/and N1-2 lesions) depending on postoperative TNM stage. The investigated factors included: gender, age, primary symptoms, period of symptom, synchronous polyps, CEA, CA19-9, tumor distance from the anal verge, tumor circumferential extent, tumor type, tumor size and differentiation. The results from a univariate analysis showed that nine factors were associated significantly with locally advanced rectal cancer: primary symptoms, synchronous polyps, CEA, CA19-9, tumor distance from the anal verge, tumor circumferential extent, tumor type, tumor size and differentiation. Furthermore, a multivariate logistic regression analysis was performed and indicated seven independent risk factors as followed. The poor differentiation (odds ratio [OR] 3.856; 95% confidence interval [CI]: 2.064 to 7.204;  $P < 0.001$ ), large tumor size (OR: 2.455; 95%CI: 1.755 to 3.436;  $P < 0.001$ ), elevated CEA level (OR: 1.823; 95%CI: 1.309 to 2.537;  $P < 0.001$ ), non-polypoid tumor type (OR: 1.758; 95%CI: 1.273 to 2.427;  $P = 0.001$ ), without synchronous polyps (OR: 1.602; 95%CI: 1.103 to 2.327;  $P = 0.013$ ), no record of bloody stool (OR: 1.659; 95%CI: 1.049 to 2.624;  $P = 0.030$ ) and greater circumferential extent of tumor (OR: 1.813; 95%CI: 1.055 to 3.113;  $P = 0.031$ ) independently predicted a locally advanced rectal cancer.

Conclusions: A few independent risk factors related with locally advanced rectal cancer were identified. It is possible to establish a logistic equation to predict the candidates of neoadjuvant chemoradiation with the outcomes of colonoscopy. Further research is warranted.

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### ACCURACY OF COLONOSCOPIC VISUALIZATION

Khashayar Vaziri MD, Sarah C Choxi BA, Bruce A Orkin MD, George Washington University Medical Center

Introduction: The objective of this study is to evaluate the accuracy of pre-operative colonoscopic localization of colonic lesions. Localization of the colonic lesion plays a key role in determining the type of operation a patient may require. Inaccurate localization may result in removal of the wrong segment of colon and/or a change in the operation performed.

Methods: A retrospective review of patients who had a colon resection by a single surgeon after pre-operative colonoscopic localization from 1991 to 2008 was performed. A comparison of the preoperative colonoscopic and final intraoperative localization was made. Clinical and demographic information was gathered to determine accuracy rates overall and by colon region, and to attempt to identify predictive factors.

Results: 374 patients were included in this study. 184 (49%) were male. The mean age was 61.6 years. 362 patients (97%) underwent colon resection for colorectal cancer. 15 patients (0.27%) were found to have non-concordant colonoscopic and intra-operative findings. 14 or 15 (87%) were being resected for colorectal cancer, and 1 for inflammatory bowel disease. 7 (47%) lesions were inaccurately localized in the sigmoid colon, 4 (27%) in the descending colon, 2 (13%) in the ascending colon, 1 (7%) in the rectum and 1 (7%) lesion was not visualized by colonoscopy preoperatively. 11 of the 15 patients (73%) with non-concordant localization had a modification of their planned operative procedure. Due to non-concordant intraoperative localization, 10 patients underwent a different segmental colectomy than planned preoperatively, and 1 patient underwent an extended resection.

Conclusions: Preoperative colonoscopic localization of colorectal lesions was surprisingly accurate (99.8%) in this large series of patients undergoing colon resection. The majority of inaccurately identified lesions occur in the sigmoid and descending colon. Incorrect localization, even though not terribly common, can result in significant changes in intraoperative plan and ultimate outcome. Therefore even though this is not common, every effort should be made to localize the lesion before surgery, especially when thought to be in the left or sigmoid colon, to reduce the need for intraoperative localization efforts, for an intraoperative change in procedure, and for a surprise for the patient after surgery.

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### SHORT TERM OUTCOME OF LAPAROSCOPIC TOTAL MESORECTAL EXCISION IN LOW RECTAL CANCER FOLLOWING NEOADJUVANT CHEMORADIATION

Hao Wang MD, Paula Denoya MD, Eric Weiss MD, Dana R Sands MD, Juan Noguera MD, Steven Wexner MD, Cleveland Clinic Florida

Objective: To investigate the feasibility of laparoscopic total mesorectal excision (TME) in mid-lower rectal cancers following neoadjuvant chemoradiation (nCRT).

Summary Background data: The laparoscopic approach for colon cancer has been widely accepted. A few studies have shown that there are advantages of laparoscopic over open TME surgery for rectal cancer. However, the role of laparoscopy has not been clearly defined specifically in cases following nCRT.

Methods: All patients with rectal cancer who underwent nCRT were identified; no operations for rectal carcinoma were performed laparoscopically prior to 2005. The laparoscopic cases were matched to open cases based on gender, procedure, age and BMI. The medical records were reviewed and short term outcome was compared between these two groups. Statistical analysis was performed using SPSS© 15 software. Results: Between 2002 and 2008, 64 patients were identified; including 32 laparoscopic cases and 32 open cases. There was no difference between the two groups based on gender, procedure, age, BMI, or ASA classification. The procedures performed within each group included 8 abdominoperineal resections and 24 anterior resections, which included 20 colonic J-pouch-anal anastomoses and 4 straight coloanal anastomoses. In the laparoscopic group, 12 received totally laparoscopic operations, 12 were either laparoscopic-assisted or hand-assisted procedures, and 8 were converted. The reasons for conversion included bleeding, splenic injury, and difficult anatomy. There was no difference in comorbidities, tumor location, tumor size, tumor stage, or radiation dose between the two groups. Operative time was longer in the laparoscopic group (205 ± 49 vs 267 ± 76 minutes,  $p < 0.001$ ). Operative blood loss, complication rate, and mortality rate were all similar between the two groups. However, the laparoscopic group benefited from shorter length of stay (7.6 ± 2.3 vs 6.1 ± 2.4,  $p = 0.012$ ), earlier first bowel movement (3.3 ± 2.4 vs 1.9 ± 1,  $p = 0.006$ ), and shorter time to regular diet (5.8 ± 2.5 vs 3.9 ± 2.1,  $p = 0.003$ ). There was no difference in lymph node harvest (both positive node harvest and total lymph node harvest), distal margin, and circumferential margin.

Conclusions: In our experience, laparoscopic TME for mid-lower rectal cancer is feasible and safe. Patients benefit from the short-term advantages of laparoscopy, including shorter length of hospital stay, time to tolerating a regular diet, and time to first bowel movement or stoma function. Although there were no short-term differences in oncologic parameters, the long-term oncologic outcome requires further investigation.

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### LAPAROSCOPIC PROCTECTOMY FOR LOWER RECTAL CANCER

Shigeki Yamaguchi MD, Jo Tashiro MD, Toshimasa Ishii MD, Tomonori Hosonuma MD, Takahiro Sato MD, Shutaro Ozawa, Department of Surgery, Saitama Medical University International Medical Center

Purpose: Laparoscopic proctectomy is still controversial, especially for lower rectal cancer. This study assessed laparoscopic proctectomy for extraperitoneal rectal cancer. Patients: Thirty four consecutive laparoscopic proctectomy for extraperitoneal rectal cancer were enrolled since 2002 to 2008. Mean age was 64.4 year-old, they were 21 males and 13 females. Procedures were; low anterior resection (LAR) with stapling anastomosis: 20, intersphincteric resection (ISR): 13, Hartmann: 1. Lymph node dissection was: D3 (from origin of the IMA): 12, D2 (from LCA): 22. Preoperative diagnosis was: T1: 22, T2: 9, T3: 3. There were no case with preoperative radiation therapy. Diverting stoma was made in 11/13 of ISR and in 8/20 of LAR.

Technique: Regarding very low anterior resection and ISR, intersphincteric space was opened by laparoscopic approach. Generally anorectal ring is well-confirmed and dissected easily. This technique is very useful for ISR to diminish the anal work near cancer. Also for very low anterior resection, linear stapling is easier after intersphincteric mobilization.

Results: Mean operating time was 327 minutes. According to procedures, operating time of LAR was 316 min. and that of ISR was 354 min. Mean blood loss was 119 g in overall, 104 g in LAR and 143 g in ISR. No patients needed blood transfusion. Median postoperative hospital stay was 10 days in overall, 9 days in LAR and 11 days in ISR. There were two leakages in LAR (10%), and no leakage in ISR. Postoperative ileus was seen in each one case of both LAR and ISR. Urinary dysfunction with transient self-catheterization was also seen in one case each. There was no mortality. One local recurrence was detected in T3 patients.

Conclusion: Laparoscopic proctectomy for lower rectal cancer is feasible and safe in T1 and T2 patients.

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**LAPAROSCOPY IN THE ELDERLY POPULATION**

Yair Edden MD, Badma Bashankaev MD, Sue M Cera MD, Anthony Ver-  
nava III MD, Eric Weiss MD, Juan Noguera MD, Steven D Wexner MD,  
Cleveland Clinic Florida

**Introduction:** The American Geriatric Society divides the population of people over 65 years of age into 3 groups: 'young old' aged 65-74, 'middle old' aged 75-84 and 'old old' aged more than 85. The aim of this study was to assess the feasibility and safety of laparoscopic surgery for elderly patients.

**Methods:** Patients aged 65 and older were retrospectively identified from a prospective data base. General demographic information as well as related variants served as a basis for this report.

**Results:** From January 2001 to August 2008, 423 patients aged 65 to 95 years underwent laparoscopic surgery. These patients were divided into 3 groups: 65-74 years of age (n = 226), 75-84 years of age (n = 163) and  $\pm$  85 years of age (n = 34). Surgical indications included adenocarcinoma (n = 149), colonic polyps (n = 100), diverticular disease (n = 80) and others. Procedures included right hemicolectomy (n = 161), sigmoidectomy (n = 82), anterior resection (n = 28), ileocolic resection (n = 14), abdomino-perineal resection (n = 9) and others. Procedures were elective in 90.4% (n = 382). The average length of hospital stay for the 'young', 'middle' and 'old' groups were 6.7 days, 8.2 days and 11.4 days respectively (p < 0.002 for all groups) and the mortality rates were 0.5% (n = 1), 2% (n = 3) and 3% (n = 1) respectively. The major morbidity rates were 1% (n = 3), 2.4% (n = 4) and 3% (n = 1) respectively. The length of ICU admission was 3.5 days for the 'young' group and 7 days for the 'old' group (p = 0.05).

**Conclusions:** Although laparoscopic colorectal surgery is feasible in elderly patients, as age advances morbidity, length of ICU and overall hospital stay significantly increase from 65 to > 85 years of age.

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**CLINICAL RESULTS OF LAPAROSCOPE-ASSISTED GASTRECTOMY (LAG) FOR GASTRIC CANCER IN THE EARLY STAGE: ANALYSIS OF 200 CASES PERFORMED BY A SINGLE SURGEON**

masayuki kakyo PhD, chikashi shibata PhD, iwao sasaki PhD, department of surgery, school of medicine, tohoku university

**Background and aim:** Although LAG has not become a standard procedure because of its technical difficulties, it is necessary to show that clinical results after LAG are similar to those after open gastrectomy. Aim was to study perioperative and long-term results after LAG.

**Methods:** During March, 2000-June, 2008, we performed LAG for 232 patients who were preoperatively diagnosed to have gastric cancer with T1 or T2 without lymph node metastasis. The mobilization of the stomach and lymph node dissection were carried out under laparoscope, then, removal of the specimen and reconstruction were performed with small skin incision of 5-8 cm length. Performed procedures were, distal gastrectomy (DG) for 174 cases, proximal gastrectomy (PG) for 26 cases, and total gastrectomy (TG) for 32 cases. We studied operation time, intraoperative blood loss, postoperative complications, and postoperative hospital stay as perioperative results. Rate of postoperative recurrence was also investigated.

**Results:** Mean operation time (min) was 267 for DG, 259 for PG, and 356 for TG. Intraoperative blood loss (ml) was 51 for DG, 58 for PG, and 90 for TG. Postoperative complications were observed in 8 patients (3.4%). We converted LAG to open gastrectomy in 2 patients, and following complications were observed in 1 patient, respectively; surgical site infection, anastomotic leakage, intraabdominal abscess, anastomotic hemorrhage, aspiration pneumoniae, and incisional hernia. The average hospital stay was 13 days. No patients had recurrence except for 3 patients who died of recurrent disease.

**Conclusions:** Intraoperative blood loss of LAG was considered much less than open conventional gastrectomy. We believe that morbidity and mortality rate after LAG was comparable to or even better than that after open gastrectomy. We were able to obtain excellent results by performing fine and polite procedures under good operation field and thus making blood loss as few as possible.

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**SMALL BOWEL LYMPHOMAS -A FIVE YEAR RETROSPECTIVE STUDY FROM THE DEVELOPING WORLD**

Ben Selvan MS, V Auro, Aravindan Nair MS, Sheila Nair MS, Christian Medical College, Vellore, India

**Introduction:** We have evaluated 197 GI lymphomas from 2001 and 2006 and specifically looked at the small bowel lymphomas

**AIMS & METHODS:** the inpatient and out patient record of 33 small bowel lymphomas were included and analysis was done in various aspects such as clinical presentation, mode of treatment, diagnosis, their relapse and remission rate

**Results:** There were 30[90%] males and 3[9%] females. 88% were within 60 years of age with a mean age of 38 yrs, 50% percentage fall within in 2nd and 4th decade. 96% were B cell lymphoma and 1[3%] was T cell lymphoma. Among B cell lymphoma 66% were diffuse large cell, 9% were Burkitt's, 18% were MALT and 3% were T cell lymphomas. 27[81%] patients underwent laprotomy for the diagnosis as they primarily presented with bowel symptoms and in the rest the diagnosis was made by either colonoscopy ileal biopsy or trucut biopsy of the exophytic mass. 4[12%] had peritonitis at presentation 2[6%] had enterocutaneous fistulae. 60% of them had abdominal mass and pain. Only 3[9%] had anemia at presentation and 2[6%] had renal transplantation. All of them had small bowel resection except two who had right hemicolectomy. 10[30%] had lost follow up. Among 23 patients 3[9%] died in the postoperative period due to sepsis and DIC, 2[6%] died of neutropenia due to chemo, the rest had received chemotherapy. Primary chemo used is CHOP as first line. 5[15%] had relapsed at 62 months follow up. 3[60%] recurrence was seen in MALT group. High LDH at the time of follow up is a strong predictor of recurrence. The site of recurrence was seen in intestine, nodal, and liver. At the median follow up of 3-5 years [range 1-5 years] 15[65%] are alive and well.

**Conclusion:** Small intestinal lymphoma is not unusual in developing countries, males are the majority, 2nd and 4th decade has more common incidence. LDH is not high at the time of initial diagnosis but raises at the time of recurrence. MALT lymphoma has more incidence of recurrence and the overall prognosis is good.

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**LAPAROSCOPIC SURGERY FOR INFLAMMATORY BOWEL DISEASE:**

Jorge Canedo MD, Rodrigo Pinto MD, Sthela Regadas MD, Lester Rosen MD, Steven Wexner MD, Cleveland Clinic Florida

**Background:** Recent studies have shown improved outcomes following laparoscopic colorectal surgery when compared to open laparotomy for the operations of benign and malignant colorectal diseases, including inflammatory bowel disease (IBD). The aim of this study was to evaluate the results of laparoscopic colorectal resections in normal weight patients compared to overweight and obese patients with IBD.

**Methods:** After IRB approval, a retrospective analysis of a prospectively accrued surgical data-base was performed. 194 consecutive patients with IBD who underwent laparoscopic resections from January 1st 2000 to April 30th 2008 were reviewed. Weight status, surgical technical factors and 60 day post-operative complications were reviewed. Chi square and Student T - tests were used.

**Results:** Normal weight (Group I) included BMI (18.5-24.9 Kg/m<sup>2</sup>) 117 patients. Group II included overweight BMI (25-29.9 Kg/m<sup>2</sup>) 60 patients and obese BMI ( $\pm$  30 Kg/m<sup>2</sup>) 17 patients. Crohn's Disease was diagnosed in 76 (64%) for Group I and 42 (54%) in Group II. Procedures performed included ileocolic resection in 52% of patients in Group I, and 52% in Group II. Total colectomy with or without restoration occurred in 40% in Group I, and 45.5% in Group II. The conversion rate for Group I was 20% and 26% for Group II (p > 0.005, ns). The most common reason for conversion was failure to progress due to adhesions or phlegmon. There was no difference in major postoperative complication rates (wound infection, or abscess, or anastomotic leakage, or small bowel obstruction), or in mean hospital stay (7.0, 6.8, respectively). There was no mortality.

**Conclusions:** There were no significant differences in the rates of conversion, major postoperative complication, or length of stay between normal weight, or overweight and obese patients with IBD. Patients' weight did not affect outcomes after laparoscopic surgery for IBD.



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### PREDICTIVE VALUE OF COMPUTERIZED TOMOGRAPHY SCAN ON CONVERSION IN LAPAROSCOPIC SURGERY FOR DIVERTICULITIS

Sherief Shawki, MD, Rodrigo Pinto MD, Jacobo Kirsch MD, Kazuhiro Narita MD, Eric Weiss MD, Steven Wexner MD, Cleveland Clinic Florida

Computerized tomography scan (CT) is an important tool in evaluation and assessment of diverticulitis disease. Previous Studies demonstrated different approaches depending on CT scan findings, which vary from clinic treatment to guided drainage or even urgent surgery.

The aim of this study was to find out if CT findings have any predictive value for conversion in laparoscopic surgery for diverticulitis.

#### Methodology:

After IRB approval, we identified all the patients who had laparoscopic surgery for diverticulitis who had a pre-operative CT performed, between 2001 & 2008. CT was interpreted by a radiologist blinded to intraoperative findings and outcomes. CT findings were examined for their predictive value of conversion overall, within 1, 2, and > 2 months as well as before and after 2004

Fisher's exact test and chi2 were used to assess statistical significance.

Results: A total of 161 patients (91 males) were included in this study. The mean age was of 56 (range 24–83) years, and the mean BMI was 27.8 (range 17.5–34.5), and ASA I-21, II-115, and III-26 patients respectively.

The conversion rate was 24% (40/161); 33 due to failure to progress as a result of phlegmon, abscess, or dense adhesions, and in 4 patients due to the length of incision > 10 cm (due to bulky specimen), in 2 due to difficult anatomy and in 1 due to bleeding. CT findings were positive in 74% of patients (n = 119); 100% with bowel thickening and/or fat stranding, 23.5% air bubbles in the colonic wall or surrounding fat, 11.75% phlegmon, 30.2% abscesses, and 10.2% fistulas. 48, 51 and 62 patients had their CT done within 1, 2 and > 2 months of operation respectively.

The timing of CT either before or after 2004, or based upon 1, 2 or > 2 months from surgery were not significant predictors of conversion (p > 0.05).

However, the presence of abscess or air bubbles in the colonic wall and/or surrounding fat were statistically associated with conversion when found within 2 months of operation (p < 0.05)

Conclusions: The presence of abscess and/or air bubbles was significant predictor of conversion during laparoscopy for diverticulitis.

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### COMPARATIVE STUDY ON THE RADICAL RESECTION OF RECTAL CARCINOMA BY LAPAROSCOPY VERSUS OPEN APPROACH

X Zhi MD, M Zhao MD, L Wang MD, G Zhang MD, S Hu MD, A Park MD, Department of Surgery, Qilu Hospital of Shandong University Department of Surgery, University of Maryland

Introduction: Does laparoscopic rectal resection (LRR) versus open rectal resection (ORR) improve the curative effect and reduce complications in the radical resection of colorectal carcinoma? This comparative study was undertaken to investigate possible advantages of LRR for rectal carcinoma.

Methods: Seventy-five cases were enrolled in this study from May 2002 to October 2007 at Qilu Hospital, including 33 cases undergoing LRR and 42 cases undergoing ORR. There were no obvious clinical differences between the two groups. The data of the two groups were compared in terms of blood loss (EBL), operative (OR) time, complications, operation recovery, and hospital expenses.

Results: All cases in LRR were successful, with only one case converted to open surgery. In the LRR group: mean OR time was 200 min (150 to 300 min); mean EBL was 100 ml (30 to 400 ml); bowel movement returned in 36 hours on average (24 to 50 hrs); incision infection developed in four cases; the mean lymph node harvest (LN) was 10.9 (4 to 20); and mean hospital stay (LOS) was 10.8 days (7 to 19 days). In the ORR group: mean OR time was 140 min (90 to 210 min); EBL was 170 ml (80 to 500 ml); bowel movement returned in 48 hours (36 to 72hrs); incision infection developed in four cases; the mean LN was 12.3 (4 to 19); and mean LOS was 14.5 days (9 to 22 days). Comparison of group data in terms of EBL, OR time, complications, and operation recovery (P < 0.01) establishes significant differences; however, hospital expenses in the laparoscopic group were higher than in the open group (20.5 thousand yuan RMB vs 17.6 thousand yuan RMB, P < 0.05). The follow-up time in the two groups, including 30 cases (90.9%) in the laparoscopic group and 38 cases (95%) in the open operation group, ranged from 1 to 60 months, with a mean of 31 months. The recurrence and overall survival rates were 30.0% and 80.0% in the LRR group, with no significant difference compared to those of the ORR group (28.5% and 77.8%), (P > 0.05).

Conclusion: The radical resection of rectal carcinoma by laparoscopy is safe and feasible. One advantage is the assurance of a smaller incision in LRR. That laparoscopy produces the same outcome as the conventional open approach is suggested by the similarity between rates of overall recurrence and survival in both groups. To verify the advantages of laparoscopy, further study of oncologic outcomes as well as a cost analysis should be undertaken.

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### DOES OPERATIVE TIME INFLUENCE OUTCOME IN PATIENTS UNDERGOING LAPAROSCOPIC COLORECTAL SURGERY?

Dan Geisler BA, Cleveland Clinic Foundation

Laparoscopy has gained acceptance for the treatment of many colorectal disorders. However, the reality that laparoscopic cases are often time consuming and take longer than the conventional open approach has led to speculation that increased operative time may negatively affect the overall patient outcome.

We examine all laparoscopic cases performed by a single surgeon (N = 512) in a prospectively maintained database to determine if increased operative time negatively impacts patient outcome with regards to EBL, length of stay, and overall morbidity and mortality.

Between September 2005 and August 2008, 96 patients (18.75%) underwent laparoscopic colorectal procedures with an operative time greater than or equal to 5 hours (300–623 minutes). The most common diagnosis were rectal cancer (N = 29), ulcerative colitis (N = 24), colon cancer (N = 10), diverticulitis (N = 9), familial adenomatous polyposis (N = 7), Crohn's disease (N = 6), motility disorder (N = 4), rectal prolapse (N = 3), GI bleeding (N = 1) and other (N = 3). The mean EBL was 323 mL (10–1500) and no cases were converted to open. There were no mortalities. Overall morbidity was 31%; UTI/urinary retention (N = 11), wound infection (N = 7), ileus (N = 6), leak (N = 3), abscess (N = 3), DVT (N = 2), pneumonia, atelectasis, fistula, and post-op bleed (N = 1 each). The average length of stay was 7.8 days (3–70) with 70% of patients discharged by POD 6.

Length of operation is not associated with adverse patient outcomes. In experienced hands, the potential need for a longer operative time should not deter the use of a laparoscopic approach as the benefits of minimally invasive surgery continue to show benefits over an open operation even when operative times exceed 5 hours.

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### LAPAROSCOPIC SIGMOID RESECTION FOR ALL PATIENTS WHO PRESENT WITH COMPLICATED DIVERTICULITIS AND FISTULA FORMATION

Carrie B Jahraus MD, Edward C Lee MD, Brian T Valerian MD, Albany Medical College

Purpose: Traditionally, complicated diverticulitis with fistula formation was thought to be a contraindication to performing laparoscopic sigmoid resection and was performed with an open procedure. As experience in laparoscopic surgery increased, more complex surgery was performed laparoscopically in selective patients. Since 2004, our institution has been offering laparoscopic colectomy to all elective patients presenting with diverticulitis including diverticular fistulas. This is a study evaluating the outcomes for consecutive patients who had complicated diverticulitis with fistula formation who underwent elective laparoscopic sigmoid colectomy.

Methods: All patients with diverticular disease with fistula formation from 2004–2008 were offered laparoscopic colectomy. Data for this patient population were collected by chart review and analyzed retrospectively.

Results: Between November 2004 and September 2008, 22 patients (13 females and 9 males) with an average age of 59 years were identified. All cases were managed by one of two colorectal surgeons at one institution. One male patient was excluded from the study because of a diagnosis of a colon cancer at the time of surgery. Of the 21 patients in the study all had fistulae including, 12 colovesical fistulas, 4 colovaginal fistulas, 3 enterocolonic fistulas, and 2 colocolic fistulas. The mean operative time was 185 minutes, and the conversion rate to an open procedure was 19% (4/21). A total of 4 early postoperative complications occurred in 3 patients including ileus (n = 2), and pneumonia (n = 1). Late complications were experienced in 2 patients, both with wound infection (n = 2).

Conclusion: Laparoscopic colectomy for all patients presenting with diverticular fistulas is safe with minimal morbidity and an acceptable conversion rate. We believe that a laparoscopic approach should be offered to all patients who present with complicated diverticulitis with fistula formation for elective sigmoid colectomy.

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### FECAL INCONTINENCE QUALITY OF LIFE AFTER TRANS-ANAL ENDOSCOPIC MICROSURGERY (TEM)

Elsa B Valsdottir MD, Shadi Sadeghi Yarandi MD, John H Marks MD, Gerald J Marks MD, Lankenau Hospital and Institute for Medical Research and University Hospital of Iceland

**INTRODUCTION:** TEM is a natural orifice minimally invasive treatment option used to excise a variety of rectal lesions. The procedure requires dilatation of the anal canal to allow placement of the 40 mm operating scope, which has the potential for overstretching the sphincter musculature. This combined with partial resection of the rectum and the subsequent loss of rectal volume and compliance creates a concern regarding anorectal function postoperatively. Data regarding patient satisfaction with their anorectal function is scant.

**METHODS:** A prospectively maintained database of 171 consecutive patients undergoing TEM from 1997 to 2007 was queried to identify TEM patients to survey using the fecal incontinence quality of life scale (Wexner's Scale) questionnaire. This is a list of 29 questions that are grouped together to test lifestyle, coping, depression and embarrassment secondary to accidental bowel leakage. Higher score represents better function. Thirty patients were deceased and thirty five patients were missing addresses, leaving 106 patients for survey. 20 of the questionnaires did not reach the designated patients leaving a group of 86 patients. Patient satisfaction outcomes were conferred by age (< 75 versus > 75), disease status (cancer versus benign), tumor level in the rectum (< 4 cm versus > 4 cm), excision method (submucosal versus full thickness) and radiation treatment (yes or no).

**RESULTS:** 57 of 86 patients responded (66%). Demographics were as follows: gender: 25 women, 32 men; mean age: 62 years (29 - 88); 42 benign diseases, 15 cancers; mean level in the rectum: 5.2 cm (0 - 17); 14 underwent preoperative radiation, mean dose 4983 cGy (4000-5580 cGy). For lifestyle, coping, depression, embarrassment, respectively, the group scored 2.28, 3.5, 3.1 and 3.4. Patients who underwent submucosal excision (n = 7) scored better on the lifestyle scale compared to the FTLE patients (3.4 vs. 2.1, p = 0.002). Younger patients scored better on coping than older patients (3.6 vs. 3.2, p = 0.03). Cancer patients scored lower on depression (2.7 vs. 3.5, p = 0.001) and coping (3.2 vs. 3.7, p = 0.03). There was no difference between groups based on level of the lesion in the rectum or whether radiation therapy was used.

**CONCLUSION:** A patient response based questionnaire study following TEM suggests that TEM as a treatment option results in high patient satisfaction with their fecal continence. Younger patients and those undergoing submucosal excision fared better. Surprisingly, low lesions and radiation treatment did not impact patient fecal continence satisfaction after TEM.

	Depression	Embarrassment	Coping	Lifestyle
Age group				
<75	3.1	3.5	3.6	2.2
≥75	3.2	3.2	3.2	2.6
p-value	0.77	0.3	0.03	0.1
Disease Status				
Cancer	2.7	3.1	3.2	2.2
Benign	3.5	3.6	3.7	2.2
p-value	0.001	0.06	0.03	0.94
Tumor level				
< 4 cm	3.2	3.5	3.6	2.2
≥4 cm	3.1	3.5	3.5	2.3
p-value	0.68	0.4	0.6	0.8
Excision				
Submucosal	3.2	3.6	3.6	3.4
FTLE	3.1	3.4	3.5	2.1
p-value	0.7	0.4	0.7	0.002
Radiation				
yes	3.2	3.3	3.4	2.2
No	3.1	3.5	3.6	2.2
p-value	0.9	0.5	0.3	0.9

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### INITIAL EXPERIENCE IN SINGLE-PORT LAPAROSCOPIC APPENDECTOMIES

Amanda J Kravetz MD, Douglas M Iddings DO, Michael A Kia DO, McLaren Regional Med Ctr, Genesis Regional Med Ctr

**OBJECTIVES:** Single port access surgery is an emerging technique in laparoscopic surgery. Currently outcome data is limited for a majority of procedures. We present the largest series of single port appendectomy performed for acute appendicitis.

**Methods:** Over a 5 month period, ten consecutive patients presenting with appendicitis underwent single-port appendectomy using the Tri-Port multiport (Advanced Surgical). The procedures were all performed through the umbilicus. Retrospectively, patient characteristics and operative outcomes were evaluated.

**Results:** The average age of our patients was 34 and the majority of patients were male (6/10). Average BMI of our patients was 29.4. The mean total operative time was 68 minutes with an incision size of 1.5 cm in the umbilicus. No postoperative complications occurred. No additional trocars or conversions to open were required.

**Conclusions:** Preliminary measures of the outcomes of single port appendectomy reflect that this is an effective and feasible laparoscopic approach. In addition to the obvious cosmetic benefit, patients may benefit from decreased pain and hernia rates.

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### IS A LAPAROSCOPIC APPROACH USEFUL FOR TREATING COMPLICATIONS AFTER PRIMARY

Nicolas Rotholtz MD, Mariano Laporte MD, Sandra Lencinas MD, Maximiliano Bun MD, Laura Aued MD, Norberto Mezzadri, Hospital Aleman de Buenos Aires

**PURPOSE:** Although the use of laparoscopy for the management of postoperative complications has been previously well documented for different pathologies, there is scarce information regarding its use after laparoscopic colorectal surgery.

**METHODS:** Data were prospectively collected from all patients undergoing laparoscopic colorectal surgery between June 2000 to October 2007. Patients were divided into two groups according to the approach used for the reoperation: laparoscopy (Group I) or laparotomy (Group II). Data were statistically analyzed by using Student's t-test and chi-squared test.

**RESULTS:** In all, 510 patients were analyzed. Twenty-seven patients (5.2 percent), 14 men and 13 women (men/women Group I: 10/7 vs. Group II: 4/6; P = not significant (NS)), required a second surgery because of postoperative complications (Group I: 17 (63 percent); Group II: 10 (37 percent)). Mean age was 60 ± 17 years (Group I: 61.7 ± 17.7 vs. Group II: 57.1 ± 16 years; P = NS). Fifteen patients (55.5 percent) had anastomotic leaks (Group I 13/17 (76.5 percent) vs. Group II 2/13 (15 percent); P = 0.004). There were no differences between the groups regarding the length of stay or postoperative complications (Group I: 11.9 ± 9.6 vs. Group II: 18.1 ± 19.7 days; P = NS; Group I: 1 vs. Group II: 3; P = NS).

**CONCLUSIONS:** Laparoscopic approach is a useful tool for treating complications after laparoscopic colorectal surgery, especially anastomotic leaks. Randomized, controlled trials are necessary to validate these findings.

**KEY WORDS:** Relaparoscopy; Laparoscopic colorectal surgery.

23854

P184

### ENSEAL® VS. CONVENTIONAL FERGUSON HEMORRHOIDECTOMY: COST AND CLINICAL OUTCOMES

Fuad Alkhoury MD, Alejandro Betancourt MD, Scott Helton MD, Christopher McLaughlin MD, Hospital of Saint Raphael

**Introduction:** The optimal treatment of hemorrhoids remains an active topic in the surgical community. New technology and approaches have offered potentially less traumatic and painful treatment for symptomatic hemorrhoid disease. This study was designed to compare the surgical outcomes and costs of hemorrhoidectomy performed by a new bipolar vessel sealer device EnSeal® with those performed by conventional hemorrhoidectomy.

**Methods:** We, retrospectively, compared 38 consecutive patients undergoing EnSeal® triple hemorrhoidectomy within the last two years with a historical cohort of 38 consecutive patients who underwent conventional hemorrhoidectomy, all by the same surgeon. Demographics, operative time, recovery room time, postoperative complications, and cost were collected and compared between the two groups. Statistical analysis was performed using student t test.

**Results:** The two groups were comparable in terms of age, and female to male ratio. The average operative time was 21.3 minutes for the EnSeal® group and 28.1 minutes for the conventional group (P < 0.001). The average recovery room time was 77.9 minutes for the EnSeal® group and 106.8 minutes for the conventional group (P < 0.0005). There was no statistical difference in the average pain score between the two groups in the immediate post operative period before discharge (P < 0.126). The average equipment cost per patient 438.5 \$ for the EnSeal® group and 161.5 \$ for the conventional group (P < 0.0001) In the EnSeal® group there was one readmission for bleeding. In the conventional group there were two admissions for pain control and one admission for bleeding.

**Conclusions:** EnSeal® provides a safe and superior alternative to conventional hemorrhoidectomy by reducing operative time, postoperative recovery, and post procedure pain. These advantages balance the increased cost of equipments.

23876

P185

### LAPAROSCOPIC COLORECTAL RESECTION FOR HIGH RISK PATIENTS

WL LAW MD, Jensen TC Poon MD, Joe KM Fan MD, Oswen SH Lo MD, The University of Hong Kong

**Introduction:** Laparoscopic colectomy has been proven to be an accepted option for the treatment of colorectal cancer. Its application in high-risk patients is still controversial. This study reviewed the outcome of high-risk patients who underwent laparoscopic resection for colorectal neoplasm.

**Methods:** During the study period, data on patients with colorectal resection were collected prospectively. In this study, patients who were of ASA (American Society of Anesthesiologists) Class 3 or above, and underwent laparoscopic resection (LR) for colorectal neoplasm were included. The outcomes of surgery were analyzed and compared with those who underwent open operation (OR).

**Results:** One hundred and thirteen patients (68 men) with a median age of 76.5 years (range 53–90) were in the LR group. Seventeen of them had previous treatment for other malignancies and 87.6% of patients had concomitant medical diseases. The median was 120 ml and transfusion was required in 7 patients. Conversion was required in 16 patients (14.2%). The median postoperative hospital stay was 6 days (IRQ: 4–9 days). The operative mortality (30 days) was 0.9% and the overall complication rate was 23.9%. When compared with the 230 patients in the OR group, there were no differences in age, gender, site of the tumor, the presence of medical disease, the stage of the cancer and operative mortality. However, complication rate was significantly lower in the LR group (23.9% versus 38.3%,  $p = 0.01$ ) and hospital stay was also shorter (6 days versus 8 days,  $p < 0.005$ )

**Conclusion:** Laparoscopic colorectal resection for the high-risk patients is associated with more outcome than open surgery and should be the preferred option in those patients with significant medical illnesses.

23909

P187

### HAND-ASSISTED LAPAROSCOPIC VS. LAPAROSCOPIC TPC IPAA

Alex J Ky MD, Erin Ly BA, Randolph Steinhagen MD, Mount Sinai Hospital

**PURPOSE:** This study was designed to compare short-term outcomes after hand-assisted laparoscopic vs. straight laparoscopic total proctocolectomy with ileoanal pullthrough. **METHODS:** A retrospective study was performed on all TPC IPAA at a single institution by a single surgeon between July 2002 to July 2008. The study was powered to detect a 30-minute reduction in operative time between hand-assisted laparoscopic and straight laparoscopic groups. **RESULTS:** There were 9 hand-assisted patients and 47 straight laparoscopic patients. There were no differences in the patient age, sex, previous surgery, and procedures performed between the hand-assisted and straight laparoscopic groups. Resident participation in the procedures was similar for both groups. The mean operative time (in minutes) was significantly less in the hand-assisted laparoscopic group versus the straight laparoscopic group (175 +/- 60 vs. 370 +/- 120). There were no apparent differences in the time to return of bowel function, tolerance of diet, narcotic usage, postoperative pain scores or length of stay, between the hand-assisted laparoscopic and straight laparoscopic groups. There was 0 conversion in the hand-assisted laparoscopic group and 4 (9 percent) in the straight laparoscopic group. Complications were less in the hand assisted group than the straight laparoscopic group (0 vs 5). The number of diversion were similar in both groups (6 vs 37) **CONCLUSIONS:** In this prospective, randomized study, hand-assisted laparoscopic colorectal surgery resulted in significantly shorter operative times and lower complication rate while maintaining similar clinical outcomes as straight laparoscopic techniques for patients undergoing TPC IPAA.

23901

P186

### THE INFLUENCE OF MAJOR CARDIAC COMORBIDITIES ON LAPAROSCOPIC COLORECTAL PROCEDURES

Dan Geisler MD, Cleveland Clinic Foundation

Underlying cardiac disease is a major risk factor for abdominal surgery. While laparoscopic colorectal surgery is gaining widespread acceptance, the physiologic effects of a pneumoperitoneum coupled with extreme position changes and a potentially longer operation raise concern regarding the safety and efficacy of a minimally invasive approach in this patient cohort.

We examine all laparoscopic cases by a single surgeon to determine how the presence of cardiac comorbidities impacts the perioperative and postoperative course and compare these to a case-matched cohort of patients undergoing conventional open surgery.

Between September, 2005 and August, 2008, data relevant to 512 consecutive patients undergoing laparoscopic colorectal procedures by a single surgeon were prospectively entered into an IRB-approved laparoscopic database. Major cardiac comorbidities were present in 156 patients (30.5%). Diagnosis included colorectal neoplasia (N = 59), diverticulitis (N = 45), inflammatory bowel disease (N = 24), volvulus (N = 12), and other (N = 16). There were no deaths. 4 cases (2.6%) were converted to open for adhesions (N = 2), bleeding (N = 1), and the presence of a large cancer (N = 1). There were no untoward intraoperative cardiac or pulmonary events. The overall morbidity was 36% (N = 56). Mean length of stay was 6.4 days (1–53).

Laparoscopic colorectal surgery is safe in patients with major cardiac comorbidities. The morbidity and mortality in patients undergoing major abdominal surgery is less in patients undergoing laparoscopic colorectal procedures compared to open surgery. In appropriately trained hands, a minimally invasive approach is associated with a decreased incidence of major perioperative morbidity and mortality in patients with underlying cardiac disease.

23933

P188

### TWO WEEK WAIT COLORECTAL CANCER REFERRALS – ITS COMPLIANCE AND YIELD?

KAMAL NAGPAL MS, ABDUL HAKEEM PhD, J MUEN, Doncaster & Bassetlaw NHS Trust, Doncaster, UK

**Introduction:** The two-week rule in United Kingdom was introduced to ensure that all patients with a suspected colorectal cancer (CRC) saw a hospital specialist within 14 days of an urgent GP referral. The usefulness and practicality of such a decision has been questioned. The aims of this study were to measure the compliance to the guidelines and evaluate the effectiveness of such referrals.

**Methods:** All patients who were referred under two week wait target for suspected CRC over six months period were included.

**Results:** A total of 68 referrals were made. Change in bowel habits was the commonest (69%) cause for referral. Most common investigation used was Colonoscopy (54%) followed by Barium Enema (40%). Diverticular disease was the most frequent (35%) condition diagnosed. Forty four percent of referrals did not comply with guidelines. 97% of patients were seen in the clinic within 2 weeks. Three colorectal cancers (4.4%) were diagnosed out of which two were rectal and one was caecal. In addition, during this 6 months period, total of 10 CRCs were diagnosed. Out of this, only 30% were identified through 2-week wait referrals. Average time from referral to diagnosis was 9 weeks.

**Conclusion:** Two week wait referrals identified less than half of patients with bowel cancer in this study. The majority of patients received appointments within two weeks. The number of referrals was not limitless, however a high number of referrals failed to adhere to guidelines. The cancer detection rate was disappointingly low.

23972

P189

### ADVANTAGES OF LAPAROSCOPIC ASSISTED COLORECTAL SURGERY AT A VA HOSPITAL INDIANAPOLIS

Virgilio George MD, Munshi Imtiaz MD, Chihara RAY MD, Bruce Robb MD, Jose Moreno MD, Indiana University Department of Surgery  
Advantages of Laparoscopic Assisted Colorectal Surgery at a VA Hospital

**Background:** The safety and efficacy of laparoscopic assisted colectomy has been demonstrated in several trials and has become an accepted means for the surgical management of benign and malignant colorectal disease. We provided a laparoscopic colorectal surgery option to our veteran population at the Indianapolis VA beginning in 2007.

**Methods:** Retrospective analysis of 126 subjects comparing our experience in performing laparoscopic assisted colorectal surgery and open colorectal operations performed between June 2006 to May 2008. Demographic data and peri-operative data was collected for both operations from hospital and outpatient records. Statistical analysis was performed using Student's t-test with a p-value of < 0.05 to demonstrate statistical significance.

**Results:** see table

	Laparoscopic	Open	P-value
Number of Cases	58	68*	n/a
Average Operative Time(Hours:mins)	3:22	3:35	0.22719
Average Estimated Blood Loss(ml)	137.16	458.90	0.00001
Average Length Of Stay(days)	8	15	0.00032
Average ICU Length of Stay(days)	2	6	0.00013
Number of Resected lymphnodes	15	15	0.47111

\*two cases were Laparoscopic to open conversion

**Conclusions:** Laparoscopic colorectal surgery approach can be used safely, efficaciously, and may be beneficial when used to treat colorectal diseases in the veteran population at the Indianapolis VA. The tangible benefits provided by laparoscopic colorectal surgery include, a trend toward a reduction in the following: operative time, overall length of stay, blood loss, and ICU length of stay; while maintaining the required national standard for number of resected lymph nodes. We believe that laparoscopic colorectal surgery can be offered to veterans at VA medical center.

23995

P190

### OBJECTIVE MAPPING OF THE ANAL SPHINCTER COMPLEX USING 3-D ENDOANAL ULTRASOUND

Johan Nordenstam MD, David Rothenberger MD, Jan Zetterstrom PhD, Department of Surgery, University of Minnesota, Minneapolis, MN, USA; Department of Obstetrics and Gynecology, Danderyd Hospital, Karolinska Institutet, Stockholm, Sweden

**Introduction:** Despite the subjectivity of the method, endoanal ultrasonography (EAUS) is the gold standard to evaluate the external (EAS) and Internal (IAS) anal sphincters. Differentiating a sphincter defect from normal anatomic variation is challenging. We developed a new standardized protocol to evaluate the anal sphincter complex and establish normal values of lengths and thickness of the EAS and IAS for men and women. **Methods:** 19 nulliparous women and 19 men were recruited to the study. Eligible subjects had no history of anal trauma or surgery. EAUS was done with a 3-dimensional endo-probe and 14 MHz transducer. To minimize recall bias, interpretation of the 3-D 'image blocks' was done by one examiner (JN) at least 3 months after clinical examination and EAUS. We measured the length of the EAS and IAS in the anterior and posterior midlines and the thickness of the muscles at 10 mm from the distal end of the IAS as well as at mid EAS in 4 quadrants (20 measurements per subject). Means and standard deviations were calculated for the measurements and Wilcoxon signed-rank test was used to compare means of the two groups. To account for anatomic variation, a sphincter score was calculated by dividing the anterior lengths by posterior lengths for EAS and IAS. **Results:** Mean length (mm) of the anterior EAS was 17.2 (sd 3.13) for men and 12.6 (sd 3.08) for women (p = 0.00043) versus posterior lengths of 21.1 (sd 3.81) for men and 18.4 (sd 3.60) for women (p = 0.05036). Mean length (mm) of the anterior IAS was 15.3 (sd 4.01) for men and 11.6 (sd 2.52) for women (p = 0.004545) versus posterior lengths of 16.8 (sd 3.38) for men and 13.4 (sd 3.52) for women (p = 0.006598). Men's mean anterior mid-EAS thickness was 4.1 mm (sd 1.81) compared to 2.8 mm (sd 0.81) for women (p = 0.0089). The EAS sphincter score was .84 for men vs .70 for women (p = 0.0576). **Conclusions:** Men's EAS and IAS are longer than women's and thicker anteriorly. Objective mapping of the anal sphincter with 3-D EAUS may improve the evaluation of patients with suspected anal sphincter defects.

24023

P191

### VESSEL SEALING IN LAPAROSCOPIC COLONIC SURGERY

Matthew Albert MD, Sergio Larach MD, Sam Atallah MD, Florida Hospital, Department of Colorectal Surgery

Despite the widespread use of vessel sealing devices in laparoscopic colonic and abdominal surgery, there is little clinical data to support its safety or efficacy with any of the current manufactured devices. A prospective study was conducted using the Enseal Treo by Surg Rx for laparoscopic segmental and total colectomy to evaluate the safety of intracorporeal major pedicle ligation.

A total of 125 vessels were divided in 50 consecutive patients undergoing laparoscopic colectomy. Division of named vessels (ileocolic, inferior mesenteric, or middle colic) was documented and recorded digitally. No significant bleeding complications occurred in any of the patients. Three vessels with minimal oozing were successfully resealed. In 2 patients the inferior mesenteric artery had pulsatile bleeding controlled with 5 mm clips. Adequate major vessel ligation was accomplished 98% in 96% of the patients.

**Conclusions:** The Enseal by Surg Rx, is safe and efficacious for major pedicle division in laparoscopic colonic surgery. Technical aspects are critical with minimal tension and slow division being the most important. After video analysis, failures seemed to be most likely secondary to poor technique or atherosclerotic vessels. Using proper surgical technique, in appropriately selected patients the enseal is safe with no adverse outcomes reported in our cohort of patients. A cost benefit also seemed to be demonstrated as there was no need for additional clip appliers or vascular staplers which led to fewer instrument exchanges and quicker operative time.

24024

P192

### MAXIMIZING THE BENEFITS OF LAPAROSCOPY, HALS COLECTOMY IN THE MORBIDLY OBESE

Matthew Albert MD, Sergio Larach MD, Sam Atallah, Florida Hospital, Department of Colorectal Surgery

Morbid obesity continues to be a major obstacle in patients undergoing laparoscopic colon surgery. A review of the surgical literature repeatedly demonstrates morbid obesity to be one of the most common causes of conversion in patients undergoing laparoscopic colectomy. Particular troublesome is the fact that it is these patients who perhaps could benefit the most from a laparoscopic approach. A retrospective review was performed of patients who had undergone laparoscopic colectomy in our department to determine whether the HALS technique could be successfully performed in morbidly obese patients without significant conversion rates, while maintaining the benefits of laparoscopy.

From 2004-2008, four hundred patients underwent laparoscopic sigmoid resection, anterior resection, total colectomy, or restorative proctocolectomy. Of this group, 40 were categorized as being morbidly obese (bmi > 40), with a mean BMI of 42.5. Length of stay, wound infection, incisional hernia, anastomotic dehiscence, PE/DVT, as well as pulmonary complications was calculated. **Conclusions:** In all 40 patients, HALS was completed through a 7.5-8 cm pfannenstiel incision without any conversion (extension of the original incision or conversion to midline). Morbidly obese patients displayed significant benefits of a minimally invasive approach with a length of stay of 4.1 days. Wound infections occurred in 6% of the patients. At 2 years follow up there were 0 incisional hernias. No anastomotic leaks occurred. 1 patient developed a pulmonary embolism despite postoperative prophylaxis and an IVC filter. No patients required an ICU admission, mechanical ventilation or documented pulmonary infection.

In our experience, hand assisted laparoscopic colectomy in morbidly obese patients, maintains all advantages of minimal access surgery. We recommend HALS colectomy as a primary technique for morbidly obese patients undergoing colectomy whom are not amenable to laparoscopic techniques or as a first alternative to conversion.

24032

P193

**APPLICATION OF LAPAROSCOPIC AND HAND-ASSISTED APPROACH IN SEGMENTAL COLECTOMY**

Y Y Yurko MD, A S Prabhu MD, P H Ngyuen MD, D Stefanidis MD, A E Lincourt PhD, K W Kercher MD, B T Heniford MD, Carolinas Medical Center

Background: We have previously shown that laparoscopic (LAP) colectomy can be accomplished safely for the curative treatment of benign and malignant colorectal disease. Hand-assisted (HA) laparoscopic surgery appears to be an effective treatment for colorectal disease as well. Here, we perform a comparative analysis of clinical outcomes for open, LAP, and HA segmental colonic resection.

Study Design: All open, LAP and HA sigmoid and right hemicolectomies performed in our institution from 1998 to the present were prospectively reviewed. A number of clinical outcomes, including operative time, lymph nodes harvested, perioperative morbidity and length of stay were compared.

Results: The open sigmoidectomy group was older than LAP and HA (58.7 vs. 54.9 vs. 52.1, p = 0.01).

Sigmoid (n = 377)	Open (n = 207)	LAP (n = 84)	HA (n = 60)	P-value
Procured Ln	10.6	15.5	7.1	0.02
OR time	143	199	202	<0.0001
EBL	256	127	140	<0.0001
Death	3.9	1.2	0	0.2
Pneumonia	4.4	1.2	1.7	0.3
Blood transfusion	9.4	1.25	1.82	0.028
Hospital stay	11.3	5.05	5.55	<.0001
OR charge	4562	5555.0	5058.0	<.0001
Right hemicolectomy (n = 475)	Open (n = 262)	LAP (n = 141)	HA (n = 43)	P-value
Procured Ln	14.9	17.6	18.2	0.05
OR time	133.8	154.3	173.2	<.0001
EBL	209	97.8	109	0.0005
Blood transfusion	9.4	1.25	1.82	0.028
Hospital stay	12.2	5.9	6.5	<.0001
OR charge	4653.0	5592.0	5265.0	0.001

Conclusion: Results of this study show that LAP colectomy offers significant benefits when compared to open surgery, including shorter postoperative recovery, less blood loss and blood transfusions, more lymph nodes procured, lower morbidity rates application and a shorter LOS. HA can be considered a valuable addition to LAP surgery, and it conveys many of the same benefits as LAP colectomy.

24064

P194

**LAPAROSCOPIC COLECTOMY FOR ULCERATIVE COLITIS THAT LEAVES NO INCISIONAL WOUND**

Yukihito Kokuba PhD, Masayoshi Nakanishi PhD, Kazuma Okamoto PhD, Chohei Sakakura PhD, Eigo Otuji PhD, Kyoto prefectural university of medicine

Laparoscopic colectomy was performed on 57 patients with UC (subtotal colectomy, ileoanal pouch formation, ileoanal anastomosis, and double-barrel ileostomy). With previous methods, the intestine was mobilized under laparoscopic guidance from cecum to sigmoid colon. Following placement of a median incision on the lower abdomen, the rectum was dissected and anal anastomosis performed by the open method. However all UC patients are surgically treated laparoscopically today. The median time of surgery for the entire patient population was 360 minutes, and oral intake was initiated after an average of 13 days. After the introduction of the present method, the median time of surgery for the entire patient population was 318 minutes, and oral intake was initiated after an average of 5 days. While this low-invasive method that eliminates even small incisional wounds has been performed on only eight patients, it has been associated with less pain from the wound, earlier postoperative recovery, earlier postoperative oral intake, and easier management of the artificial anus in these patients. The present method may become the standard procedure for UC due to its minimal invasiveness.

24069

P195

**HAND-ASSISTED LAPAROSCOPIC PELVIC NERVE SPARING RESECTION OF RECTAL CANCER: PREOPERATIVE CHEMORADIATION INFLUENCES CONVERSION RATE**

Mona Shah MD, H Kargozaran MD, M Ali MD, Vijay Khatri, M.B.Ch.B., FACS MD, University of California-Davis, Sacramento, CA USA

Introduction: We hypothesize that gender, BMI and preoperative chemoradiation may influence the ability to perform a hand-assisted laparoscopic (HAL) resection for patients with rectal cancer.

Methods: We performed retrospective analysis of patients who underwent HAL resection of rectal cancer. Four trocars and a standard 7 cm incision length were used. We abstracted clinical and pathological variables to examine conversion rate, number of lymph nodes harvested, radial margin, length of stay, and local recurrence. We performed descriptive analyses and Fishers Exact probability test (2-tailed).

Results: Our study evaluated 32 patients (12 females, 20 males) with a mean age of 54.8 years and mean BMI of 26. The mean distance of the rectal cancer from the anal verge was 8 cm. Preoperative chemoradiation was administered to 59% of the patients who had clinical stage III. 24 patients had a low anterior resection while 8 had abdominoperineal resection. The median length of stay was 7 days. A mean of 15 lymph nodes were harvested and the radial and distal resection margins were tumor free for all patients. Histopathology showed that 71% were T3 lesions and 47% had lymph node metastases. In 9 (34%) patients the operation was converted to open and 25% needed have their incision extended by 2 cm to facilitate pelvic dissection secondary to local tumor bulk. However patients treated with preoperative chemoradiation therapy for clinically stage III rectal cancer were significantly (73% vs 30%, p = 0.01) likely to require conversion or extension of incision. Gender and BMI did not influence conversion rate or rate of incision extension.

Conclusions: In our initial experience of HAL rectal resection, we noted that preoperative chemoradiation therapy for clinically stage III increased the conversion rate and the need to extend the incision.

## Complications of Surgery

22512

P196

### PORTAL VEIN THROMBOSIS AFTER LAPAROSCOPIC SPLENECTOMY FOR MASSIVE SPLENOMEGALY

eran lavi MD, Joseph Alberton MD, Ram Spira MD, Petachia Reissman MD, Department of General Surgery, Shaare Zedek Medical Center ? Hebrew University-Hadassah School of Medicine, Jerusalem

**Background:** Laparoscopic splenectomy has become the surgical procedure of choice in the therapy of various hematologic diseases. Portal vein thrombosis (PVT) is a well known complication of splenectomy, but the true incidence is not well established with several reports of up to 50% incidence. Massive splenomegaly is considered a risk factor for developing post operative PVT.

The aim of this study was to assess PVT incidence after laparoscopic splenectomy for massive splenomegaly in our institution.

**Methods:** The records of all patients who underwent laparoscopic splenectomy between 2003 and 2008 at Shaare Zedek Medical Center, and who were found to have a large spleen (> 850 g), were reviewed retrospectively. Patients who had fever, abdominal pain or other symptoms suggestive for abdominal pathology had further imaging studies. The presence of portal vein thrombosis was determined by a color Doppler ultrasound or abdominal Computed Tomography.

**Results:** During the study period, out of 96 patients who underwent laparoscopic splenectomy, 28 patients had massive splenomegaly (17 male, 11 female) with Mean spleen weight of 2135 g. Fourteen had Doppler ultrasound (50%); six (21.4%) had abdominal CT examination. All patients received prophylactic anticoagulant treatment during peri-operative period. PVT was diagnosed in two of 20 patients who had imaging studies (10 %). One patient had mild elevation in liver function test. Both patients were treated with low molecular weight heparin without any further adverse consequences.

**Conclusion:** In contrast to several previous reports in the literature, our results suggest that the incidence of portal vein thrombosis after laparoscopic splenectomy, may be lower than expected, even in patients with large spleens.

22561

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### LAPAROSCOPIC APPENDECTOMY FOR ACUTE APPENDICITIS DOES NOT CARRY A HIGHER RISK OF POSTOPERATIVE COMPLICATIONS

Philippe Topart MD, Guillaume Becouarn MD, Pierre Olivier Betton MD, Michel Bressollette MD, Jean Delaby MD, Raoul Duplessis MD, Frederic Marichez MD, Societe de Chirurgie Viscerale, Clinique de l'Anjou, Angers, France

Following a number of readmissions after laparoscopic appendectomy, we reviewed the procedures performed for acute appendicitis over 1 year. Excluding 64 cases of peritonitis, 237 emergency appendectomies were performed by a group of surgical associates at a single institution between August 2007 and August 2008. The procedure of choice was laparoscopy performed using 3 ports in 154 patients (94 women). 83 lean individuals (60 men) were operated on through a small McBurney incision. Laparoscopy patients were significantly older than McBurney patients (28.5 ± 16.4 and 20.3 ± 16.5 years). An abdominal drain was left in 20.7% of laparoscopies and 7.2% of open procedures after abdominal lavage in all cases. In addition to systematic perioperative antibioprophyllaxis, 27.3% of the laparoscopy group and 28.9% of the McBurney group patients were discharged on antibiotics for 1 week. 10 patients in the laparoscopy group and 4 in the McBurney group developed complications. Major complications requiring prolonged stay and/or readmission occurred in 6 of the laparoscopy and 4 of the McBurney group patients. In the laparoscopy group 3 of these 6 patients required reoperation for inflammatory bowel obstruction, abdominal abscess and evisceration after conversion to a midline laparotomy. 2 patients were treated by needle aspiration or antibiotics alone for abscess. In the McBurney group 2 patients were reoperated on (laparoscopy for bowel obstruction and open abdominal abscess drainage), one patient had prolonged antibiotherapy and another was diagnosed with Crohns disease. There was no fatal complication. The rate of complications and reoperations was not different between the 2 groups. A multivariate analysis did not identify: age, type of procedure (laparoscopy or open), abdominal drainage or prolonged antibiotherapy as a predictor of the outcome. In conclusion, laparoscopic appendectomy has a similar 93.5% favourable outcome when performed for acute appendicitis compared to the open McBurney approach. Liberal use of abdominal drains or prolonged antibiotherapy is not supported by this retrospective study and does not seem to influence the outcome.

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P197

### SMALL BOWEL OBSTRUCTION IN A POSTPARTUM FEMALE FOLLOWING LAPAROSCOPIC ROUX-EN-Y GASTRIC BYPASS: A CASE REPORT

W. Borden Hooks III MD, Annick D Westbrook MD, Thomas V Clancy MD, William W Hope MD, South East Area Health Education Center/New Hanover Regional Medical Center

Laparoscopic Roux-en-Y gastric bypass (LRYGB) is the most common bariatric surgical procedure performed in the United States. Small bowel obstruction following LRYGB is a common complication often caused by adhesions, internal hernias, or obstruction at the gastrojejunal or jejuno-jejunal anastomosis.

We present a case report of a 38 year old Caucasian female, 36 week gestation, who had previously undergone LRYGB 4 years previous. She was admitted with nausea, vomiting, and abdominal pain. The patient went into labor followed by an uncomplicated vaginal delivery the day following admission. She continued to have abdominal pain and distention without bowel function. A computed tomography scan revealed a small bowel obstruction and the patient was taken to the operating room for diagnostic laparoscopy. Laparoscopy was converted to exploratory laparotomy following the recognition of ischemic bowel. Findings at exploratory laparotomy included a volvulus of the jejuno-jejunal anastomosis with ischemic small bowel requiring resection of the anastomosis and reconfiguration of her jejuno-jejunosomy. The patient had an uncomplicated recovery and was discharged home on postoperative day 6 with good bowel function.

Bowel obstruction following vaginal delivery is rare entity with few reported cases. Displacement of abdominal viscera by a gravid uterus may be an inciting event for bowel obstructions in patients that have undergone LRYGB. This case highlights the need for the general surgeon and obstetrician's familiarity with bariatric surgery operations and their complications.

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### LAPAROSCOPIC MANAGEMENT OF GASTROGASTRIC FISTULAS RESULTING FROM OPEN UNDIVIDED GASTRIC BYPASS

David S Tichansky MD, Atul K Madan MD, Khurram A Khan MD, Carol Hendrix RN, University of Tennessee Health Science Center

**Introduction:** Before the era of laparoscopic gastric bypass, many bariatric surgeons performed open undivided gastric bypasses (OUGB). The inherent issue with not dividing the stomach is that these patients are prone to staple line failure and gastrogastric fistula formation. Gastrogastric fistulas can lead to reflux, pain, marginal ulceration of the gastrojejunostomy, and weight regain. Any of these symptoms are an indication to repair these fistulas. Herein, we examine the feasibility of laparoscopic division of the stomach to repair gastrogastric fistula after OUGB, despite previous open surgery.

**Methods:** Patients presenting to our office with pain or weight gain following OUGB were evaluated with upper gastrointestinal radiographic studies and upper endoscopy. Presence of a gastrogastric fistula was the indication for repair. All procedures were planned by the laparoscopic approach. Patients gave informed consent to divide their stomachs using linear cutting staplers with preservation of their previous gastrojejunostomy. Postoperative complications and short-term weight loss were examined.

**Results:** Five patients presented with symptomatic gastrogastric fistulas from 9/2004 – 9/2007. Patients presented 15 months to 14 years after their OUGB. Average BMI on presentation was 40.1. Pre-OUGB weight data was not available in all patients. All procedures were completed by the laparoscopic approach. All patients were discharged from the hospital uneventfully on postoperative day 1 or 2. One patient required return to the hospital and operating room for fever and leukocytosis on postoperative day 5. No leak was present. However, a 0.5 × 2 cm wedge of possible ischemia along the staple line on the excluded stomach was noted and resected. The patient recovered uneventfully. Average weight loss at initial postoperative follow up (1–2 weeks) was 6.4% of total weight. Average weight loss at 1–2 months was 10.8% of total weight.

**Conclusion:** Repair of gastrogastric fistulas following OUGB is safe and feasible by the laparoscopic approach. All patients had some weight loss in the early postoperative period.

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P200

### 5 YEAR NATIONAL AUDIT OF BILE DUCT INJURIES FOLLOWING LAPAROSCOPIC CHOLECYSTECTOMY

C E Moffat, S Agrawal, G David, D J Durkin, J P Slavin, M Deakin, University Hospital of North Staffordshire, Stoke on Trent, & Leighton Hospital, Crewe

**Introduction:** Our aim was to determine the number of bile duct injuries requiring biliary reconstruction after laparoscopic cholecystectomy in England over a 5 year period, and to investigate factors associated with increased risk of bile duct injury.

**Methods:** Hospital Episode Statistics (HES) Data were obtained from the UK Department of Health for a 5 year period from 2001–2006. Patients undergoing laparoscopic cholecystectomy (LC) and biliary reconstruction were identified using diagnostic codes (OPSC4) and the data analyzed using an MS Access database.

**Results:** The number of cholecystectomies increased year on year from 33569 in 2001/2 to 46243 in 2005/6 and the percentage of emergency cholecystectomies increased over the same time period from 9.47% to 12.28%. The percentage of patients who underwent laparoscopic cholecystectomy and required subsequent biliary reconstruction was similar (0.22%, 0.25%, 0.24%, 0.21%) in the first 4 years studied, but showed a decrease in the final year (2005/6) to 0.16%. Male sex was significantly associated with bile duct injury requiring biliary reconstruction.

**Conclusion:** Biliary reconstruction following laparoscopic cholecystectomy is rare. There has been a gradual increase in both the total number of laparoscopic cholecystectomies and the number of emergency cholecystectomies performed over the last 5 years in England. Bile duct injury rates do not appear to be increasing and may even be falling, but more data is needed to confirm this trend. Biliary injury is more common in men.

22872

P202

### THE IMPACT OF BODY MASS INDEX (BMI) AND INTRA-PERITONEAL FAT TISSUE ON LAPAROSCOPY ASSISTED GASTRECTOMY FOR GASTRIC CANCER

Nobuhiro Kurita MD, Mitsuo Shimada MD, Takashi Iwata MD, Masanori Nishioka MD, Kozo Yoshikawa MD, Jun Higashijima MD, Tomohiko Miyatani MD, Motoya Chikakiyo MD, Toshihiro Nakao MD, Masato Komatsu MD, Department of Surgery, the University of Tokushima

**Introduction:** After adopting preoperative assessment of the perigastric vessels using 3D-CT and standardization of the procedures, obesity still influences smooth laparoscopy assisted gastrectomy (LAG). We evaluated the impact of body mass index (BMI) and area of intraperitoneal fat tissue on the risks of LAG.

**Patients and methods:** The 51 patients who performed LAG for gastric cancer were included. The patients were divided two groups by BMI (< 25 BMI L group: n = 40, > 25 BMI H group: n = 11) and area of intraperitoneal fat tissue (< 100cm<sup>2</sup> AF L group: n = 27, > 100cm<sup>2</sup> AF H group: n = 24), respectively. Fat scan, which was computer software operating on abdominal CT, was used to measure the area of intraperitoneal fat tissue. The incidence of postoperative complications, operation time, intraoperative blood loss and number of dissected lymph nodes were compared between each two groups.

**Results:** BMI; The incidences of postoperative complications of BMI L and H group were 12.5%, 36.4%, respectively (p = 0.08). The mean blood loss were 85 g and 144 g, respectively (p = 0.08). There were no significant differences in operation time and the number of dissected LNs. Area of intraperitoneal fat tissue; The incidence postoperative complications (29.2%) and the mean blood loss (139 g) of AF H group were significantly higher than those of AF L group (8%, 62 g), respectively. The number of dissected LNs of AF H group (25) was significantly lower than that of AF L group (34). There was no significant difference in operation time.

**Conclusions:** In AF H group, the incidence of postoperative complications and intraoperative blood loss were increased, the dissected number of LNs were decreased. The area of intraperitoneal fat tissue was useful to predict risks of LAG and postoperative complications with higher precision compared with BMI.

22820

P201

### COMPLICATIONS OF THE MINI-GASTRIC BYPASS: 10 YEARS EXPERIENCE

R Rutledge MD, Center for Laparoscopic Obesity Surgery  
The Mini-Gastric Bypass (MGB) is increasingly being adopted in countries around the world (England, France, Spain, Turkey, Lebanon, India, Australia, Taiwan, Columbia etc.)

The purpose of this study is to report on the world's largest experience with the MGB and complications that can be expected following the MGB.

**Methods:** Complications in over 4,584 patients followed for a maximum of 10 years were analyzed.

**Results:** Excess weight loss was excellent (79%). 31.6% of patients reported some complication (Minor in 22.7%, Moderate in 3.7%, Severe - > Hospitalization in 5.2%), Ulcer/Gastritis and Anemia in 5%, Gas-Cramps, Nausea/Vomiting 2%, Diarrhea, Leak, Dehydration, Regained Weight, Hernia, Minor Bleeding 1%, Renal Stones, Gall Bladder Removal, Minor Eating-Complaints, Malnutrition, Re-Exploration, Poor Wt Loss, Hair Loss, Low Ca., Pneumonia-Minor, Perforated Ulcer, Hypoglycemia, Thiamine Deficiency, Potassium Deficiency, Revision, Gout < 1%.

**Conclusion:** The MGB leads to massive sustained weight loss in majority of patients. Complications after MGB occur in almost 1 in 3 patients, most are mild. Ulcers/Gastritis and anemia are the most common complications. Early complications are uncommon or mild and long term complications are usually preventable or treatable medically. Long term management includes yearly blood tests, vitamin and mineral supplementation, dietary guidance, avoidance of ulcerogenic agents and early aggressive medical intervention to treat ulcer/gastritis.

23076

P203

### THE IMPACT OF THE TYPE AND ROUTE OF POSTOPERATIVE NUTRITIONAL SUPPORT ON COMPLICATIONS IN MALNOURISHED PATIENTS UNDERGOING UPPER GASTROINTESTINAL SURGERY

Stanislaw Klek PhD, Jan Kulig PhD, Marek Sierzega PhD, Piotr Szybinski, Kinga Szczepanek, 1st Department of Surgery, Jagiellonian University Medical College, Krakow, Poland

**Background:** Malnutrition is a common problem in hospitalized patients, increasing the risk of postoperative complications. The aim of the study was to assess the impact of the type and route of postoperative nutritional support on complication rates in malnourished patients undergoing resection for upper gastrointestinal cancer.

**Material and Methods:** Between June 2002 and December 2005, a group of 207 malnourished patients scheduled for upper gastrointestinal surgery for cancer were subject to preoperative standard parenteral nutrition. Forty-eight patients were subsequently excluded and the remaining 159 subjects were randomly assigned in a 2 x 2 factorial design into 4 study groups, ie, standard enteral nutrition (SEN, n = 40), immunomodulating enteral nutrition (IMEN, n = 39), standard parenteral nutrition (SPN, n = 40), and immunomodulating parenteral nutrition (IMPN = 40). The study was designed to test the hypothesis that immunonutrition and enteral nutrition would reduce the incidence of infectious complications after upper gastrointestinal surgery; the secondary objective of the study was to evaluate the effect of nutritional intervention on overall morbidity and mortality rates, and hospital stay.

**Results:** The overall morbidity rate was 33% and the incidence of individual complications was comparable between all groups. Infectious complications occurred in 17 of 80 patients given standard diets and in 21 of 79 patients receiving immunomodulatory formulas (odds ratio 0.770; 95% CI, 0.370–1.602). There were no significant differences between infectious complications in patients using enteral nutrition (20 of 79 patients) and parenteral formulas (18 of 80, odds ratio 1.134; 95% CI, 0.609–2.113). Neither immunostimulating formulas nor enteral feeding significantly affected secondary outcome measures, including overall morbidity and mortality rates, and hospital stay.

**Conclusions:** Our study failed to demonstrate any beneficial effects of postoperative immunostimulating or enteral nutrition on postoperative outcome in malnourished patients undergoing upper gastrointestinal surgery.

23199

P204

### CONVERSIONS IN ANATOMIC VATS LUNG RESECTION: A METHOD OF ASSESSING REASONS FOR CONVERSION

Sayf Gazala MD, Ian Hunt MD, Azim Valji MD, Kenneth Stewart MD, Eric L Bedard MD, Division of thoracic surgery, University of Alberta, Edmonton, Alberta, Canada

**Objectives:** Following analysis of why VATS lobectomy cases were converted to open procedures we propose a simple method of classifying reason for conversion that allows monitoring during the implementation & development of a minimally invasive thoracic surgery program. **Background:** Lung cancer remains one of the commonest causes of cancer death in North America. Lung resection offers the best chance of cure. Anatomical lobar resection or lobectomy remains the standard of care. non-rib spreading. Video Assisted Thorascopic surgery (VATS) offers an alternative to open thoracotomy. Published data would suggest conversion to open thoracotomy occurs in 3–20% of minimally invasive lung resections. An analysis of rates and reasons of conversion has not been previously published **Results:** 220 consecutive VATS lobectomy cases were analysed. Overall conversion rate was 12.7% over 3 years. Conversions were classified according to whether conversion was due to Vascular (V), Anatomic (A), Lymph node related (L) or Technical problems (T) & whether 'opening (VALT-open)' was Elective, Controlled or Uncontrolled. 4 out of 5 cases converted through extension of trans-axillary port (anterolateral thoracotomy). 1 out of 5 cases required a posterolateral thoracotomy via separate incision. Conversion rates decreased by 50% over the first 3 years despite a significant increase in VATS cases. The indication for conversion changed with fewer vascular injuries to the Pulmonary Artery & fewer conversions for 'poor visualization'

**Conclusions:** Reductions in the number & nature of conversions reflect appropriate development in surgical experience and patient selection while implementing a minimally invasive thoracic procedure. The 'VALT open' classification system allowed qualification of reason for & controlled nature of conversion to open case. The 'VALT open' classification system can be used as a 'quality assurance' tool in monitoring development of a VATS lobectomy program.

23200

P205

### ENDOSCOPY IN THE MANAGEMENT OF CERVICAL SPINE PLATING-RELATED ESOPHAGEAL INJURY

Michael A Sawyer MD, Videendoscopic Surgical Institute of Oklahoma, Comanche county Memorial Hospital, Lawton, Oklahoma

**Report of first case:** A 52 year old man was referred for progressive dysphagia, involuntary 30 lb. weight loss, chronic cough and episodic upper chest pain of one year's duration. He described food sticking at the lower cervical level. He had anterior cervical discectomy with plating six years previously. He was counseled for esophagogastroduodenoscopy (EGD).

**Report of second case:** A 57 year old man underwent revisional anterior cervical plating. He had worsening neck pain and turbid drainage from a cervical drain on the first postoperative day. He became febrile to 101.8F. Barium swallow was negative. His surgeon requested consultation for EGD.

**Techniques:** EGD in the first case demonstrated gross erosion of the cervical plate into the esophageal lumen. A PEG tube was placed and the patient kept NPO until surgery. The cervical plate and screws were removed. A complex esophageal injury was identified and repaired with Alloderm soft tissue matrix.

The patient was kept NPO and fed via the PEG tube for four weeks. EGD was performed in the second patient and identified a small esophageal injury on the right, approximately 3 cm distal to the cricopharyngeus muscle. He was made NPO and central venous access established for TPN.

**Results:** Repeat EGD in the first patient demonstrated healing of the injury over the Alloderm tissue matrix. The PEG tube was removed and an oral diet started. His symptoms resolved and he has returned to his pre-morbid weight. The second patient was kept on antibiotics and TPN for a week as his drainage decreased. He remained afebrile and the drain was removed 10 days after EGD. He remained well at 4 months of follow up.

**Discussion:** EGD and related techniques are critical in the diagnosis, therapy and follow up of suspected and proven esophageal injuries of any etiology. These cases support the use of EGD in such clinical situations. The second case exemplifies the superior sensitivity of EGD versus radiologic methods for detection of anatomically small, yet clinically significant injuries.

23211

P206

### CHYLOTHORAX – A RISK FROM LAPAROSCOPIC NISSEN FUNDOPLICATION

Charles Woodham MD, Mark Burbridge MD, Mark Lytle MD, Craig Kolasch MD, Keesler Medical Center, Department of Surgery

Chylothorax is a rare complication from a Lap Nissen Fundoplication for treatment of GERD. Two weeks post-op, the patient returned for follow up and was found to have a pleural effusion. Further evaluation, including thoracentesis revealed a chylothorax. The patient was given a trial of conservative management but ultimately required a thoracotomy for mass ligation of the thoracic duct and then lymphoscintigraphy with embolization of the chyle leakage.

In the presentation of a chylothorax after a Lap Nissen Fundoplication, surgical drainage is required. Though conservative measures can be successful in the treatment of some chylothoraces, it may become necessary to perform a thoracotomy to surgically ligate the damaged lymphatic channels. Imaging and interventional radiology may be necessary to obtain cure in a patient with a persistent leakage of chyle even after a surgical intervention. It is important to recognize that, though rare, a Lap Nissen Fundoplication can be the cause of a significant injury to the lymphatic channels leading to the development of a chylothorax.

23399

P207

### HEALTH UTILITY DETERMINATION FOR TRANSVAGINAL AND TRANSGASTRIC CHOLECYSTECTOMY: HOW DO PATIENTS VALUE COMPLICATIONS OF NATURAL ORIFICE TRANSLUMENAL ENDOSCOPIC SURGERY?

Benjamin K Poulouse MD, Joseph A Trunzo MD, Raymond P Onders MD, Michael J Rosen MD, Jeffrey L Ponsky MD, Jeffrey M Marks MD, University Hospitals Case Medical Center; Vanderbilt University Medical Center

**Introduction:** Critical to the evaluation of NOTES procedures is the perceived benefit of scarless surgery weighed against its unique complications such as gastric leak (GL), gastric hemorrhage (GH), pelvic cellulitis (PC), pelvic abscess (PA) and pelvic hemorrhage (PH). The goal of this study was to calculate health utility (HU) values for these complications, to provide a metric that reflects patients' willingness to accept the risks of NOTES cholecystectomy for its potential benefits. HU evaluations are not surveys but are tools based in utility theory that provide a quality of life measure that is comparable across disease states. HU are valued on a scale of 0 (state equivalent to death) to 1 (state of perfect health). For comparison, the published HU of patients with acute cholecystitis is 0.77.

**Methods:** Patients with symptomatic cholelithiasis were prospectively enrolled in the study. Patients were administered standardized scenarios explaining the potential benefits of transvaginal (TVC) and transgastric (TGC) cholecystectomy along with the unique complications of these approaches and the management involved (GL, GH, PC, PA, PH). Rating scale (RS), standard gamble (SG), and time trade-off (TTO) methods were used to determine the value of HU for each of these complications.

**Results:** Sixteen patients (81% women, 69% Caucasian) were evaluated with a mean age of 56 ± 2.8 years (mean ± standard error) and mean body mass index of 32 ± 1.5. HU values for all NOTES complications ranged from 0.71–0.89. Data are summarized in the table.

	RS	SG	TTO
GL	0.71 ± 0.07	0.74 ± 0.06	0.75 ± 0.04
GH	0.73 ± 0.05	0.75 ± 0.06	0.73 ± 0.06
PC	0.85 ± 0.06	0.79 ± 0.08	0.82 ± 0.05
PA	0.87 ± 0.06	0.68 ± 0.08	0.67 ± 0.09
PH	0.71 ± 0.07	0.74 ± 0.07	0.80 ± 0.06

Data are mean ± standard error

**Conclusion:** With this study, initial HU values for complications after NOTES cholecystectomy have been established. In general, NOTES complications were similar in value to that of acute cholecystitis. When scenarios involved risk (SG, TTO), women tended to value complications of PC and PA worse. These results can be used to compare how patients value these unique complications with other known disease states and can be used to perform cost-effectiveness analyses to evaluate NOTES procedures.



23528

P208

### THE USE OF A MODIFIED CYANOACRYLATE-BASED SYNTHETIC GLUE IN DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY CASES

Andronikos Karasakalides BA, Sofia Triantafillidou BA, Kostas Ligasis BA, Marina Chatzopoulou MD, Kostas Kapoutsis, Giannitsa General Hospital, Giannitsa, Greece

**INTRODUCTION:** Laparoscopy cholecystectomy is the treatment of choice for gallbladder. Unfortunately it is not without complications. The complication rates listed in the literature is low and only increase in the more complex cases or when a less experienced surgeon performs the procedure. Other than the bile duct injuries, the more common complications which are seen include bleeding and bile leakage. In the past, the routine use of drains in laparoscopic cholecystectomy was an accepted practice. However this was associated with increased hospital stay, pain and fever and many surgeons now prefer not to drain or drain only the difficult cases. In the abdomen, the beneficial effects of fibrin sealant have been reported in both experimental and clinical practice. We present our experience with the use of surgical glue in difficult laparoscopy cases.

**Methods and Procedures:** During a 9 month period 134 patients presented with gallbladder disease which required laparoscopic cholecystectomy. A total of 47 cases had bleeding, adhesion formation and bile leakage during the procedure. Of these, 22 cases had a closed suction drain placed in gallbladder fossa and electrocautery was used in the bleeding sites. In addition to electrocautery, the remaining 25 patients had the application of a synthetic acrylic surgical glue [N-butyl-2-cyanoacrylate] modified by addition of a monomer [methacryloxysulfolane] placed in the gallbladder fossa and bleeding sites without the use of drains. Postoperative complications including pain, fever, and length of hospitalization were recorded. The patients were all evaluated 2 weeks postoperatively with a follow-up questionnaire and exam.

**Results:** Results: Of the 22 complicated cholecystectomy cases where drains were used, 3 patients had a low grade postoperative fever, and the average length of stay was 2.3 days. In the group that had the synthetic glue (25 patients), 1 patient had a low grade postoperative fever and the average length of stay was 1.6 days. A significant reduction of pain and earlier return to normal activity was noted in those patients treated with the synthetic glue.

**Conclusion:**The use of N-butyl-2-cyanoacrylate synthetic glue in the gallbladder fossa is associated with less post-operative pain and hospital stay and may be beneficial in the difficult laparoscopic cholecystectomy cases.

23557

P209

### SALVAGE ENDOSCOPIC ANTEGRADE DILATION ON TIGHT OR COMPLETE COLOANAL ANASTOMOTIC STRICTURE VIA ILEOSTOMY

Norio Fukami MD, John M Skibber MD, George J Chang MD, 1. Division of Gastroenterology and Hepatology, University of Colorado at Denver Health Sciences Center, Aurora, CO, USA 2. Department of Surgical Oncology, University of Texas MD Anderson Cancer Center, Houston, TX, USA.

**Background:** Dilation of tight or complete coloanal anastomotic strictures has a risk of potential false tract formation and anastomotic disruption. Use of endoscopic dilation is limited by alternated anatomy. Here, we report our experience of three cases of colonoscopic antegrade dilation for coloanal anastomotic stricture via loop ileostomy using pediatric colonoscope.

**CASES:** Three patients underwent low anterior resection for locally advanced rectal cancer after the completion of chemoradiation with loop ileostomy. Case 1: 65 yo man was found to have anastomotic stricture prior to ileostomy takedown 9 mos later. The anastomotic opening was small and eccentric in position. Blind dilation was not attempted. Antegrade colonoscopy was performed via ileostomy. The anastomosis was identified without a visible lumen. With the aid of digital retrograde palpation, recanalization was achieved by cut current using the tipped snare followed by balloon dilation. Patient did well subsequently with retrograde dilations as needed and the ostomy was closed 2 mos later. Case 2: 78 yo had loop ileostomy reversal 7 months later. Several days after ileostomy closure, she developed abdominal distension. Her anastomosis was closed and retrograde dilation was not possible. Ileostomy was again created. Antegrade colonoscopy was attempted 2 months later. The anastomotic site was successfully identified with a pinhole opening. A balloon dilator was used over the guidewire and after dilation to 8 mm, retrograde dilation was performed. Ostomy takedown was successful 3 months later. Case 3: 80 yo man found to have complete closure of coloanal anastomosis 6 month after LAR. Antegrade colonoscopy was attempted via ileostomy. His colon contained abundant mucus complicating the advancement of the scope. Pediatric colonoscope did not reach the anastomosis and it was exchanged to an enteroscope. Despite the prolonged effort, anastomosis was not reached. The patient developed significant abdominal distension and later intraabdominal free air was confirmed. The patient underwent colonic decompression tube placement via ostomy under fluoroscopy. After decompression, the patient became asymptomatic. The patient recovered uneventfully without surgical intervention.

**CONCLUSIONS:** Colonoscopic antegrade dilation of coloanal anastomotic stricture is a viable option for tight or complete anastomotic strictures with good clinical outcome avoiding surgical revision and it assists in transition to ostomy takedown. Complete closure of anastomosis has a risk of potential barotrauma with excessive distension of colon with air and adequate decompression is mandatory if recanalization fails.

23749

P210

### PREDICTING MARGINAL ULCERS AFTER LAPAROSCOPIC ROUX EN Y GASTRIC BYPASS

N Bhayani MD, Judith Y Richardson MD, Tolulope Oyetunji MD, David Chang PhD, Terrence M Fullum MD, Howard University Hospital

**BACKGROUND:** Marginal ulcer formation after Laparoscopic Roux en Y Gastric Bypass (LRYGB) is a known complication. Few studies have clearly identified risk factors and recommendations for prophylaxis have been controversial. **METHODS:** From July 2001 until January 2006, 764 patients underwent LRYGB for morbid obesity. Prospectively collected data were reviewed and demographic information, comorbidities, and Body Mass Index (BMI) were retrieved. Bivariate analysis was performed to determine the association between each pre-operative factor and the occurrence of marginal ulcers. Multivariate regression was then performed adjusting for demographics, BMI, and co-morbidities.

**Results:** Fourteen of the 764 patients developed marginal ulcers (1.83%). From the bivariate analysis, patient demographics were not significant predictors for the development of marginal ulcers. Patients with marginal ulcers were more likely to have hypertension (85.7% vs. 56.8%,  $p = 0.03$ ), hyperlipidemia (57.1% vs. 30%,  $p = 0.029$ ) and sleep apnea (50% vs. 17.9%,  $p = 0.002$ ). Multivariate analysis showed that patients with hyperlipidemia were 3.33 times more likely to develop marginal ulcers (95% CI: 1.02–10.81), while the odds of marginal ulcers in patients with obstructive sleep apnea quadrupled (OR: 4.5, 95%CI: 1.33–15.17).

**Conclusion:** Our data suggests that a subset of the bariatric population having the comorbidities of hyperlipidemia, sleep apnea, and hypertension may have an increased risk of developing marginal ulcers. Consideration should be given to implementing ulcer prophylaxis in these subsets of patients.

23887

P211

### "INADVERTENT VAGOTOMY": WHAT DOES THIS MEAN FOR THE PATIENT AND SURGEON?

Matt B Martin MD, Kristen R Earle MD, Central Carolina Surgery, PA; Moses H. Cone Hospital Systems

**Objective:** 'Inadvertent vagotomy' is often discussed from the podium of national meetings as a cause of complications of Nissen fundoplication. Sometimes the tone of the comments borders on inferring medico-legal liability in such cases. The goal of this review is to see if there is a valid correlation with vagotomy and the suggested complications.

**Methods:** 300 sequential laparoscopic hiatus hernia repairs were reviewed to assess the incidence of disabling bloating, diarrhea, or dumping. 50 patients who had undergone truncal vagotomy without drainage in combination with laparoscopic adjustable gastric band placement were queried to determine the incidence of these complications.

**Results:** Of the 300 laparoscopic antireflux/diaphragm repairs, only 2 required takedown or some revision for severe bloating and diarrhea. There was no correlation between the hernia complexity and type of repair and the subsequent symptoms. Of the 50 patients who had vagotomy alone, there have been no complaints of diarrhea, dumping, gastric outlet obstruction, or significant bloating. They have all experienced an ablation of their hunger and in preliminary review, they have lost more weight than their cohorts who had lap band alone.

**Conclusions:** Results of this review of laparoscopic Nissen funduplications/hiatus hernia repairs and truncal vagotomy without drainage does not support the commonly ascribed complications of gastric outlet obstruction, diarrhea, or dumping. 'Inadvertent vagotomy' should not be blamed for complex complaints that sometimes occur following antireflux/hiatus hernia surgery.

23896

P212

### PREDICTORS OF MORTALITY IN LAPAROSCOPIC FOREGUT, HINDGUT AND END-ORGAN SURGERY

D C Trottier MD, S Doucette MSc, H Huynh MD, C M Soto MD, J Mamazza MD, E Poulin MD, R P Boushey MD, University of Ottawa

**INTRODUCTION** A number of studies have identified predictors of perioperative mortality for open surgery and include variables such as ASA score, ascites, electrolyte abnormalities, and surgeon experience. In comparison, predictors of 30-day mortality in patients undergoing laparoscopy have yet to be defined. This study aims to identify factors predictive of 30-day mortality in patients undergoing advanced laparoscopic abdominal and thoracic procedures. **METHODS** A large prospectively-collected database of 2032 laparoscopic procedures was reviewed. Contributions from five surgeons working in four academic institutions were recorded from 1991–2008. There was no observed selection bias as all patients were offered a minimally invasive approach for their procedures. The primary outcome was 30-day mortality. Interventions were divided into foregut (Nissen fundoplication, gastrectomy, and Heller myotomy [355 patients]), hindgut (colectomy [1375 patients]) and end-organ procedures (adrenalectomy, nephrectomy, splenectomy and pulmonary lobectomy [302 patients]). Variables analyzed included diagnosis, medical comorbidities, as well as procedural factors such as operative time, intra-operative and post-operative complications. A univariate regression model was utilized to identify predictors of mortality. **RESULTS** A total of 34 (1.7%) mortalities were observed in the 30 days following surgery. A breakdown of mortality by anatomic site revealed 2 deaths in the foregut category (1 gastrectomy, 1 Heller myotomy [0.6%]), 27 deaths in the hindgut category [2%] and 5 deaths in the end-organ category (all following splenectomy [1.7%]). The observed causes of death for foregut were duodenal stump leak (1) and esophageal perforation (1). In the hindgut group they included cardiac arrest (9), leak (6), pulmonary embolus (3), stroke (2), hemorrhage (2), as well as various other rare causes (liver failure, ischemic gut, aspiration pneumonia). For end-organ, observed deaths were limited to the splenectomy group and included sepsis, pancreatitis, intra-cranial hemorrhage and cardiac arrest. Analysis revealed that age, perforation/leak, a past history of heart disease as well as post-operative cardiac and pulmonary complications all increased a patient's chances of dying following laparoscopic abdominal surgery. For both foregut and hindgut categories, age and intestinal perforation or leak were the greatest predictors of death. A subgroup analysis in the end-organ category suggested that 30-day mortality was greatest in patients with hematologic malignancies and was independent of the surgical indication. Surgical experience was not a predictor. **CONCLUSION** While the total number of mortalities in this cohort is acceptably small, this study provides important insight into predictors of 30-day mortality. It allows for identification of higher risk individuals and also permits potential optimization of these factors.

23991

P213

### COMPLICATIONS RELATED TO THE ACCESS-PORT IN 435 CASES OF LAPAROSCOPIC ADJUSTABLE GASTRIC BINDING

Gustavo Franco MD, Manish Singh MD, Kuldeep Singh MD, St. Agnes Hospital, Baltimore, MD.

**Objective:** To establish the frequency and nature of complications related to the access-port in patients who underwent Laparoscopic Adjustable Gastric banding (Allergan, Inc., Irvine, CA). **Methods:** We reviewed the medical records of 435 patients who underwent laparoscopic adjustable gastric banding in our institution to ascertain the complications related to the access-port. The complications data were collected both by hospital readmission and reoperations as well as prospective collection of data in surgeon's office as COE (Centers of excellence) requirement. **Results:** from April 2005 to June 2008, the rate of complications related to the access-port occurred in 1.4%, corresponding to 6 cases. Those included: infection requiring removal of the port and subsequent re-placement in a different area: 3 cases (0.7%); infection which responded to medical treatment, 1 case (0.2%); port flip over, 1 case (0.2%) and leak around the port, 1 case (0.2%). **Conclusion:** In our experience, complications related to the access-port are not as frequent as compared with published studies, but in most of cases (83%) required surgical intervention. Efforts should always be made to achieve a sterile technique and appropriate anchoring to the fascial plane in order to prevent them efficiently.

24012

P214

### RECTUS SHEATH FLAP CLOSURE OF PERSISTENT ENTEROCUTANEOUS FISTULA: A NOVEL APPROACH

Kalyana C Nandipai MD, James Satterfield MD, Kenneth Francis MD, Shyam Allamaneni MD, Kap-Jae Sung MD, Mary Immaculate Hospital; New York Medical College

**Introduction:** Enterocutaneous fistulas most commonly develop as a postoperative complication of bowel surgery, though in 15% to 20% of cases fistulas occur spontaneously. Management of a patient with enterocutaneous fistula is very difficult. Intra-abdominal surgical repair of these fistulae is very difficult. Coils of intestine are plastered together. Dissection is extremely difficult and time consuming. Local tissue transfer and muscle flaps have been described before. In this case we report a new technique of successful closure of enterocutaneous fistula. **Case report:** A 44 years old male underwent exploratory laparotomy for small bowel obstruction in 2007. Patient had a significant past surgical history as he underwent exploratory laparotomy for gunshot wound to chest and abdomen 15 years ago. Patient presented now with a complete small bowel obstruction. He underwent exploratory laparotomy with extensive adhesiolysis. Patient recovered well for 2 days. However, later he developed enterocutaneous fistula on day 7. He was managed conservatively with wound protectors initially. His output significantly reduced initially. Later he was diagnosed with jejunal fistula without distal obstruction. Patient discharged home with as he tolerating regular diet. Patient continues to have persistent high output and non healing fistula. He was scheduled for re-exploration after 6 months of conservative management. At exploration his abdomen was plastered with no plane available. At this time we performed an anterior rectus sheath medial rotation and flap closure. Middle segment of anterior rectus sheath was mobilized and reflected medially. Flap was used to buttress the suture closure of fistula. Patient recovered well with no recurrence of fistula in the postoperative period. **Summary:** Enterocutaneous fistulas are difficult post operative complication. Local flap rotation and closure is a reasonable option for selected patients. Rectus abdominal muscle buttress closure is one of the local flap closure, useful in patients with dense intraabdominal adhesions.



22474

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### DEVELOPMENT OF A NEW COMPUTER AIDED DIAGNOSIS SYSTEM TO DETECT LYMPH NODES IN THE ABDOMEN: FURTHER UTILITY FOR SENTINEL-NODE NAVIGATED LAPAROSCOPIC SURGERY IN GASTROINTESTINAL CANCERS AND ITS EDUCATION

Mitsuo Shimada MD, Nobuhiro Kurita MD, Masanori Nishioka MD, Kozo Yoshikawa MD, \*Fumiaki Masakiyo PhD, \*Mitsuru Kubo PhD, \*Noboru Niki PhD, Departments of Surgery and Optical Science and Technology \*

**Introduction:** Preoperative imaging is highly useful to make a planning of operation and preoperative simulation. Recently, sentinel-node navigated surgery has been advocated in gastrectomy for gastric cancer to minimize surgical stress without curability. Little has been reported about computer aided diagnosis system (CADS) to detect lymph nodes (LNs). We herein introduce our new CADS. **Methods:** Our CAD system was made based on the previous CADS for lung cancer using MD-CT [1,2]. The flow of the CADS is as follows: step 1, image registration of MD-CT; step 2, selection of region of interest (ROI) including primary tumor and LNs; step 3, preparation (pixel spacing, making a teaching template); step 4, clued extraction and 3D-template matching; step 5, assessment and classification of shape and size of LNs. Twelve patients with rectal cancers, who underwent operation, were used as test cases to improve predictability of LNs by our CAD system. The LNs detected by the CADS were compared with those by 2 surgeons and 2 radiologists. **Results:** The CADS could detect LNs from 6 to 25 LNs per patient. The CADS detected total 176 LNs in all patients, whereas the doctors did total 64 LNs. Forty seven out of 64 LNs by doctors could be detected by the CADS. Therefore, the sensitivity of detecting the LNs related to colon cancer was 73%. Interestingly, in one patient, the CADS could detect a lymph node, which could be never detected by the doctors. Now, the algorithm for diagnosis of LNs is being trained to improve the accuracy of predictability of the LNs. **Conclusions:** Those data suggested that our CADS is a promising tool to automatically detect the LNs related to gastrointestinal cancers in the abdomen and the pelvis, although further data training should be necessary for clinical application. Furthermore, the utility of our CADS is expected to extend to sentinel-LN navigated laparoscopic surgery as well as valuable education tool for laparoscopic surgery for gastrointestinal cancers.

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22505

P220

### ENDOSCOPIC SURGICAL SKILL QUALIFICATION SYSTEM IN JAPAN: FOUR YEARS OF EXPERIENCE IN THE DIGESTIVE FIELD

T Kimura MD, T Mori MD, F Konishi MD, M Kitajima MD, The Japan Society for Endoscopic Surgery, Tokyo, Japan

To reduce the complications of endoscopic surgery, The Japan Society for Endoscopic Surgery (JSES) established a committee for the Endoscopic Surgical Skill Qualification System (ESSQS) in 2001. The committee decided that qualified surgeons should have sufficient competence to act as mentors for endoscopic surgery. Here we report the methods and results obtained with ESSQS over four years in the field of digestive surgery. The first review was performed in 2004, and examinations have been conducted once a year since then. Applicants should be the board certified surgeons and should have performed at least 50 laparoscopic cholecystectomies or 20 advanced laparoscopic procedures as the chief surgeon. They must submit a list of patients on whom they have performed surgery (including complications) and an unedited video showing one of the relevant surgical procedures. The initial judging committee consisted of 25 experienced surgeons who were recommended by the JSES and mutually reviewed videos submitted by the other surgeons. They were divided into six groups (esophagus, stomach, colon, biliary tract, spleen, and endocrine/others). For assessment of the videos, the judging committee prepared "common criteria" (60 points) and "procedure-specific criteria" (40 points). Assessment of videos was done by two judges. If both judges assigned a score of 70 points or more, the applicant passed. If the two judges disagreed, a final decision was made by either obtaining the opinion of a third judge or by group assessment. Over four years, there have been 1,111 applicants and 518 (46.6%) have been successful. The main problem with this system has been relatively low inter-rater agreement (kappa value: 0.31-0.40) between the initial two judges. However, it seems to obtain valid results because the incidence of complications was significantly lower in patients treated by successful applicants (4.2% vs 0.3%) than in those treated by failed applicants (5.5% vs 0.4%) ( $p = 0.0295$ ). To improve inter-rater agreement, consensus meetings of judges have been held, and the assessment criteria have been modified and made more detailed. Although the ESSQS still has some problems, this system should promote training and decrease complications.

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### INTERN BOOT CAMP: ONE DAY MAKES A DIFFERENCE

Marnelle Alexis PhD, Aurora D Pryor MD, Rebecca Prince-Petersen MD, Danny O Jacobs MD, Bryan M Clary MD, Duke University Medical Center

**Introduction:** Surgical simulation is becoming a more widely used method in the training of residents as it enables the honing of technical skills and exposes residents to new procedures resulting in the reduction of error in the operating room and increases in patient safety. The inequities and inconsistencies of the cognitive and technical skill levels of incoming resident interns are of increasing concern. We therefore implemented a one day boot camp in our surgical skills training lab to assess the cognitive and manual skills acquisition of our general surgery first year interns and to standardize their level of preparedness for surgery.

**Methods:** The study cohort consisted of 12 surgery interns ( $n = 10$  general surgery,  $n = 2$  urology). Subjects were exposed to a didactic session consisting of related topics proctored by general surgery attendings and advanced residents. Subjects practiced PEG transfer, camera driving and knot tying skills. Subjects were administered written and manual skills pre and post tests with the same components. Descriptive statistics are displayed as median scores and range. Comparative statistical analyses were performed using the Wilcoxon match-pairs signed-rank test.

**Results:** The didactic training was associated with a significant improvement in PEG transfer time, knot tying time and written test scores, and a trend toward improved camera time (Table).

Test	Pre-test median (min,max)	Post-test median (min,max)	p-value
Peg Transfer Time (secs)	388 (141,904)	176 (98,303)	0.002
Pegs Dropped (n)	3 (0,7)	1 (0,5)	0.105
Camera Time (secs)	49 (35,120)	44 (33,79)	0.065
Knot Tying Time (secs)	26 (18,36)	21 (17,33)	0.002
Test Score(%)	40 (20,100)	85 (60,100)	0.007
Secure Knot(%)	10/12 (83%)	11/12 (92%)	0.833

**Conclusion:** A one-day didactic and practical course in the surgical skills training of interns improves manual proficiency and assures a basic fund of knowledge of residents.

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### TEACHING LAPAROSCOPIC CHOLECYSTECTOMY IN DEVELOPING COUNTRIES – A SAFE, COST EFFECT, AND TIME-EFFICIENT MODEL

Bob J Wu MD, Stephanie Strauss MD, Stephen Heneghan MD, Craig Henson MD, Randall S Zuckerman, Bassett Healthcare, Cooperstown, NY. Hospital of Saint Raphael, New Haven, CT

**Introduction:** We present a laparoscopic training program for the developing world that emphasizes safety and sustainability, which has been successfully implemented in two countries. This is to counter significant barriers to the adoption of laparoscopic cholecystectomy, including the local infrastructure, the high cost of laparoscopic equipment, lack of skilled preceptors, and concerns regarding the safety of these operations in inexperienced trainees.

**Methods:** A laparoscopic cholecystectomy training program was developed by the surgical staff at Bassett Healthcare in Cooperstown, NY, and executed in the Dominican Republic and in Anguilla. The program was conceived and executed in three phases. Phase one included scouting potential locations to assess sustainability and to determine the commitment and ability of local surgeons. Phase two was carried out over five days and included a day of didactic sessions, practicing on a low cost laparoscopic trainer, and a series of preceptored cases. Phase three was a repeat trip 4-6 weeks after the initial training to trouble-shoot. Equipment was donated from the hospital as well as industry sponsors. Careful consideration was given to issues of sustainability, and disposables were kept at a minimum. Local surgeons completed proctored cases with the goal of having them operate independently. Patient data was collected to track outcomes.

**Results:** Thirty-one laparoscopic cholecystectomies were performed under the auspices of this program. Twelve were completed independently by the local surgeons since the implementation of the program. Of these 12, the median length of stay was 8 hours. There were no conversions to open, bile duct injuries, or deaths in this series. Both programs are still in operation 18 and 9 months after our last visit.

**Conclusion:** With a well designed program emphasizing safety and sustainability, a cost-effective laparoscopic cholecystectomy training program can be conducted in developing countries, with safe and long-lasting impact to the local community.

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### DEFICIENCY OF KNOWLEDGE IN GENERAL SURGERY RESIDENTS ON SURGICAL STAPLING DEVICES: THE ROLE OF A FOCUSED INSTRUCTIONAL SESSION

Artan Reso MD, Shahzeer Karmali MD, Bradford Scott MD, Mary J Brandt MD, Francis Brunicaardi MD, Vadim Sherman MD, Baylor College of Medicine

**Introduction:** There is a paucity of knowledge on the application and usage of common surgical stapling devices by general surgery residents. Our study aimed to elicit the deficiencies that exist in this particular area and assess a short term teaching strategy to determine if a didactic review of stapling devices would improve knowledge and skill in the application of these surgical devices.

**Methods:** A 20 question multiple choice questionnaire was designed to assess three realms of questions regarding surgical staplers: circular, linear and laparoscopic. The questionnaire was administered to all available Clinical General Surgery residents at Baylor College of Medicine Residency program at a weekly academic teaching session. The residents were not aware of the reason for the meeting and were not allowed to pre-research or prepare for the questionnaire. The residents were assigned random numbers and were allotted 20 minutes to complete the questionnaire and the questionnaire was collected by a blinded data analyst and placed into envelope #1. Thereafter a 40 minute didactic session on surgical staplers was given by an attending general surgeon at the Baylor College of Medicine and one industry representative. Upon completion of the session the same questionnaire was re-taken by all attending surgical residents and 20 minutes was allotted for completion of this questionnaire. All questionnaires were collected by a blinded analyst and placed into envelope #2. Analysis was completed by the data analyst who was blinded to the timing of the test and the identity of surgical residents. Results: Twenty six of thirty nine General Surgery Residents (67%) attended. Pre-test average score was 53% (Mean = 10.6; Median = 10) and post-test average score was 77% (Mean = 15.4; Median = 16). A paired samples t-test was computed and a statistically significant difference (Mean Difference = -4.77) was found between test scores from pretest and posttest,  $p < .001$ . An independent t-test was performed to compare mean scores of R1-R2 ( $n = 10$ ) with R3-5 residents. A statistically significant difference was found between the two groups in the pre-test ( $p = 0.046$ ), but there was no statistically significant difference between the two groups at post-test assessment ( $p = 0.12$ ).

**Conclusion:** Despite their frequent use, there is still insufficient knowledge amongst General Surgery Residents on surgical stapling devices. Didactic focused teaching sessions are efficacious and significantly improve the level of knowledge on surgical stapling devices.

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### LAPAROSCOPIC SKILLS ACQUISITION IN A SHORT TERM STRUCTURED TRAINING FOR LAPAROSCOPIC CHOLECYSTECTOMY IN A PHANTOM MODEL USING PORCINE GALL BLADDER

Virinder K Bansal MS, M C Misra MS, H K Bhattacharjee MS, V Jindak MS, C Lal BA, Minimally Invasive Surgery Training Centre, Department of Surgical Disciplines, All India Institute of Medical Sciences, New Delhi, India

**Introduction:** Laparoscopic skills training outside the operating room is becoming the standard for educating surgical residents. There are various methods of training outside the operation theatre ranging from inanimate models, virtual simulation and training on cadavers. The best method of training has not yet been established. This study prospectively evaluates the laparoscopic skills acquisition in a short term, intensive, focused training in a phantom model using porcine gall bladder.

**Materials and Methods:** 62 surgeons with no prior experience of performing laparoscopic cholecystectomy undergoing training in the Minimally Invasive Surgery Training Centre at our Institute were enrolled for the study. Participants during the training course perform 10 laparoscopic cholecystectomies in a porcine gall bladder integrated in a specially designed MIC Tuebingen trainer. The trainer is designed in the human anatomical form of an insufflated abdomen and the equipment and hand instruments are same as that used in the human beings. The laparoscopic skills acquisition was evaluated in terms of operation time, cystic duct dissection, and cystic artery dissection, plane of dissection (liver injury) and gall bladder perforation. These parameters were objectively assessed on a scale of 1-5. Technical laparoscopic skills acquisition was assessed by modified Global Operative Assessment of Laparoscopic Skills (GOALS) system based on depth perception, bimanual dexterity, tissue handling, efficiency and autonomy. Data are expressed as mean  $\pm$  SD; statistical analysis was performed by repeated measure ANOVA.  $p$  value less than 0.05 was considered significant.

**Results:** Mean time taken for the first case was 49 minutes which reduced to 31.5 minutes in the tenth case ( $p$  value  $< 0.001$ ). Mean scores in identification and dissection of cystic duct improves from 1.7 in the first case to 4.1 in the tenth case and for cystic artery it improves from 1.9 to 3.5 ( $p$  value  $< 0.005$ ). The gall bladder perforation rate does not show a statistically significant improvement. 78% of trainees works in wrong surgical planes in their first case making liver injury while 75% of trainees find out the proper plane of dissection in tenth case. Improvement in mean score in depth perception (1.9 to 4.8), bimanual dexterity (1.4 to 3.6), tissue handling (1.9 to 4), efficiency (2.2 to 4.3) and autonomy (2.7 to 4.1) are statistically significant. ( $p$  value  $< 0.001$ )

**Conclusions:** Short term, structured training helps the trainee to effectively acquire laparoscopic skills in a short time. This type of training may help the novice surgeons in reducing the learning curve.

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### ASSESSMENT OF INTRACORPOREAL SUTURING SKILLS – A COMPARISON OF FOUR TOOLS USING THE FLS TASK MODEL

Neil Orzech MD, Vanessa Palter MD, Rajesh Aggarwal PhD, Allan Okrainec MD, Teodor Grantcharov PhD, 1. Division of General Surgery, University of Toronto, St. Michael's Hospital, Toronto, Canada. 2. Division of General Surgery, University Health Network, Toronto Western Hospital, Toronto, Canada. 3. Department of Surgery, Imperial College, London, UK

**Objective:** To compare various previously validated assessment tools for intracorporeal suturing. The aim of the study was to evaluate the correlation between 4 assessment tools and review the advantages and disadvantages of each of them as a tool for objective assessment. **Methods:** The study included fifteen senior (PGY3-5) general surgery residents participating in a workshop in advanced laparoscopy. After a demonstration of laparoscopic suturing technique, all participants were asked to perform an intracorporeal suturing task using the standard Fundamentals of Laparoscopic Surgery (FLS) model. Resident performance was evaluated using 1) the FLS scoring system; 2) a 29-point laparoscopic suturing checklist; 3) the Objective Structured Assessment of Technical Skills (OSATS) global rating scale; and 4) the Imperial Collage Surgical Assessment Device (ICSAD). Assessment was performed by 2 laparoscopic surgeons with extensive experience with intracorporeal suturing. Spearman's rank correlation coefficient was used to compare the scores generated by each of the assessment tools.

**Results:** There was a significant correlation between the FLS normalized scores and scores from the Moorthy's Laparoscopic suturing checklist ( $r_s = 0.838$ ,  $p = 0.01$ ). Similarly, the FLS scores correlated significantly with scores obtained using the OSATS global rating scale ( $r_s = 0.874$ ,  $p = 0.01$ ). Finally, FLS normalized scores had a strong negative correlation with the various measures of analysis of motion as recorded by the ICSAD ( $r_s = -0.986$ ,  $p = 0.01$  for total time (seconds);  $r_s = -0.961$ ,  $p = 0.01$  for total path length (meters); and  $r_s = -0.883$ ,  $p = 0.01$  for total number of movements).

**Conclusion:** The performance metrics used to evaluate the FLS Intracorporeal Suturing Task correlate with other valid assessment tools for laparoscopic suturing. This finding supports the validity of the existing FLS metrics. A disadvantage of the present FLS score is the insufficient feedback it provides to the trainee. This limits its usefulness as a training tool. A possible solution may be the design of a hybrid assessment tool including the FLS scores with any of the other available valid scores. Future research should evaluate the training potential of this approach and its impact on laparoscopic skills acquisition.

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### RESIDENT PERCEPTIONS REGARDING CURRENT METHODS TO TEACH LAPAROSCOPIC SUTURING

Vanessa Palter MD, Neil Orzech MD, Rajesh Aggarwal MD, Allan Okrainec MD, Teodor P Grantcharov MD, Division of General Surgery, St. Michael's Hospital, University of Toronto, Ontario, Canada. Division of General Surgery, University Health Network, Toronto Western Hospital, Toronto, Canada. Department of Surgery, Imperial College, London, UK.

**Objective:** To explore surgical residents' perceptions regarding their current laparoscopic training, and to determine their opinions regarding the current methods of teaching laparoscopic suturing in a surgical skills laboratory.

**Methods:** This study included 16 senior general surgery residents participating in a workshop in advanced laparoscopy. Four training tools were used in the course curriculum: the Fundamentals of Laparoscopic Surgery (FLS) black box suturing model, a Synthetic Nissen Fundoplication model, a Virtual Reality (VR) Simulator Suturing Task (LapMentor, Simbionix Ltd., Cleveland OH, USA), and a porcine jejuno-jejunostomy model. After the workshop, residents were asked to complete a questionnaire relating to their experience with laparoscopic surgery and their opinions regarding the 4 training models. Descriptive statistics were utilized for data analysis.

**Results:** Fourteen (9 male) of the 16 residents enrolled in the workshop completed the questionnaire. The majority of the residents had observed and performed over 40 laparoscopic cases. On average, residents act as primary surgeons on laparoscopic cases 2-5 times per month, as first assistant 1-5 times, and as observers 1-5 times. The participants had performed over 10 laparoscopic cholecystectomies and appendectomies, > 8 laparoscopic colorectal procedures and no laparoscopic foregut surgery. Half of the residents felt that their exposure to advanced laparoscopy was insufficient. The vast majority of residents felt that they had not received adequate instruction in laparoscopic suturing (median 1 on a 5 point Likert scale), and did not feel proficient with this technique. At the end of the workshop, residents ranked the animal model as their preferred training tool for laparoscopic suturing, followed by the FLS black box, with the VR Simulator Task being the least preferred tool. When asked to rank each task individually however, the majority of residents ranked each task as being 'moderately helpful' or better (5-7 on a 7 point Likert scale).

**Conclusions:** Training in advanced laparoscopic skills is still suboptimal and needs to be incorporated early in the residency curriculum. Future developments in VR simulation are necessary to provide a realistic experience with intracorporeal suturing.

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### THE ROLE OF AN ENDOSCOPIC SURGICAL SKILL QUALIFICATION HOLDER OF THE JAPAN SOCIETY FOR ENDOSCOPIC SURGERY ON EDUCATION OF LAPAROSCOPY-ASSISTED DISTAL GASTRECTOMY

Jun Higashijima MD, Mitsuo Shimada MD, Nobuhiro Kurita MD, Takashi Iwata MD, Masanori Nishioka MD, Kozo Yoshikawa MD, Tomohiko Miyatani MD, Motoya Chikakiyo MD, Toshihiro Nakao MD, Masato Komatsu MD, Department of Surgery, The University of Tokushima,

Background and aim) Laparoscopy-assisted distal gastrectomy (LADG) has been widely accepted because of its minimum invasiveness. However, it is difficult to develop the techniques of LADG. Recently, skill qualification system of the Japan Society for Endoscopic Surgery is established, and prevalence and progress of techniques is preceded. The aim of this study is to evaluate the impact of an endoscopic surgical skill qualification holder on the learning curve.

Patients and Methods) 15 patients who underwent LADG with lymph node dissection from the beginning to 2008 were divided into two groups; Group A (n = 10) were operated by the skill qualification holder and Group B (n = 5) by a resident under instruction of the skill qualification holder. Operating process was standardized and divided into several parts. In LADG of our institute, 1) division of gastrocolic ligament, 2) division of right gastroepiploic artery and vein (RGEA and RGEV), 3) transection of duodenum, 4) division of right gastric artery (RGA), 5) dissection of lymph nodes around common hepatic artery (CHA) and celiac axis, 6) division of left gastric vein and artery (LGV and LGA), 7) dissection of lymph nodes along lesser curvature, 8) 5 cm midline incision and 9) Roux-en Y reconstruction. Operating time of each part, blood loss, postoperative complications and rate of conversion to open surgery were compared between the two groups.

Results) No significant difference in total operating time between the two groups was observed (Group A vs Group B : 295 ± 35 vs. 320 ± 13 min). There was no significant difference in blood loss (28 ± 10 vs. 35 ± 15 ml). There was no postoperative complication in Group A and one case in group B had retention of stomach. No conversion to open surgery was found in the both groups. In Group B, the time in the part from division of RGA to division of LGA was longer than that in Group A (73 ± 14 min vs 55 ± 25 min). In the other parts, there were no significant differences between two groups.

Conclusion) Instruction by the skill qualification holder is useful for residents to acquire techniques of LADG.

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### CAN A NINTENDO WII BE CONSIDERED HOMEWORK AND DOES IT IMPROVE PERFORMANCE ON A SURGICAL SIMULATOR?

Dmitry Nepomnayshy MD, Jill Zalieckas MD, Robert Litchfield, Rebecca Liberman MPH, Lee Sillin MD, Lahey Clinic

Background: Computer based simulators are increasingly being used to assist trainees in the acquisition and development of surgically relevant psychomotor skills. Work hour restrictions and other educational demands have made achieving adequate practice on these simulators challenging, and others suggest that experience playing video games translates into improved performance on surgical simulators. We hypothesized that providing a modified video game console for home use, 'homework', would improve overall practice times and translate into improved surgical simulator performance without adding to the work hour burden of the surgical resident.

Methods: We conducted a pilot prospective randomized trial with 8 surgery residents. Three residents were given a modified Nintendo Wii™ based on the 'WiiMote' by Smith and Kahol and the game 'Marble Mania' to take home for 4 weeks (Group A). The remaining 5 residents were provided unlimited access to the same video game in the Simulation Lab (Group B) for the same time period. Video game practice times for all participants were recorded. Both groups underwent pre and post test performance evaluation using the Promis™ Surgical Simulator utilizing the circle cutting and the suturing and knot tying tasks. Statistical significance was determined using the Wilcoxon sign rank test (p < 0.05)

Results: Right hand instrument path efficiency during suturing and knot tying was significantly improved after video game play in both groups. Video game practice times were longer for Group A compared to Group B, 256 ± 60 minutes vs 197 ± 95 minutes respectively. Time to task completion trended lower for both groups.

Conclusion: In this pilot study we demonstrated that residents with home access to this particular video game statistically improved right hand path performance (efficiency?), and that they tended to practice more than those with access only at 'work'. Our inability to demonstrate that residents with access to a modified video game at home, 'homework', performed better than residents that were able to practice at work only was likely due to a small sample size and possibly due to poor translation of this particular video game to the skills being tested.

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### THE NEWLY DEVELOPED ENDOSCOPIC SURGICAL SKILL ASSESSMENT SYSTEM - EVALUATION OF SCOPE POSITION CHANGES TASK PERFORMANCE -

Daisuke Sumitani MD, Masazumi Okajima PhD, Hiroyuki Egi PhD, Masanori Yoshimitsu PhD, Takao Hinoi MD, Satoshi Ikeda MD, Makoto Yoshida MD, Yuji Takakura MD, Haruka Takeda MD, Yasuo Kawaguchi MD, Manabu Shimomura MD, Masakazu Tokunaga MD, Tomohiro Kawahara PhD, Takeshi Takaki PhD, Hideki Ohdan PhD, Department of Endoscopic Surgery and Surgical Science, Graduate School of Biomedical Sciences, Hiroshima University

Introduction: Equipment of operating theater is very important, especially in endoscopic surgery. It is well known that location of image display was influencing perceptual processing and endoscopic manipulation. The aim of this study is to evaluate whether difficulties of task performances in endoscopic surgery will be changed or not by scope position.

Methods and Procedures: The expert surgeon (who has experiences more than 300 laparoscopic colorectal surgeries) of endoscopic surgery participated in this study. Hiroshima University Endoscopic Surgical Assessment Device (HUESAD) which analyzes the direction-dependent dexterity for an objective assessment was used on this examine. We previously reported that HUESAD was able to track the movements of the tip of endoscopic instrument precisely while participants were doing some tasks on the experimental table. The distance from fulcrum to the tip of endoscopic instrument by optical sensor and micro encoder, and time taken were recorded. This system shows the orbits of the tip of the instrument. The task 1 to place the tip of the endoscopic instrument on the top of these poles from the proximal to distal side pole, and then returned from distal to proximal. And this task was performed under two scope positions which were set up at 0° and 90° of misalignment to the participant's left side. The task 2 was to place the tip of the endoscopic instrument on the top of these poles from the proximal to distal side pole, and then returned from distal to proximal, and from the left to right side pole, and then returned from right to left under one condition that scope was fixed at 90° of misalignment to the participant's left side

Results: Analyzed data of the task 1 showed that the 0° position required significantly shorter execution time and significantly smaller deviation than those of the 90° misalignment position (p < 0.0011) (p < 0.0001). The data of the task 2 showed that the execution time and deviation of the movement from the left to right side pole, and then returned from right to left were significantly smaller than those of from the proximal to distal side pole, and then returned from distal to proximal (p < 0.0106) (p < 0.0001).

Conclusion: Our data confirmed that task performance is changed by the scope position. This result revealed that we are able to do safety endoscopic surgery by changing scope position for every situation during operation.

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### THE IMPACT OF MODELING ON LAPAROSCOPIC SKILL PERFORMANCE

Giselle G Hamad MD, Julio A Clavijo-Alvarez MD, Sung W Cho MD, University of Pittsburgh

Introduction: Modeling is a cognitive process during which the trainee encodes information about a skill during observation. The purpose of this study was to evaluate the effect of modeling on laparoscopic skill performance.

Methods: Twenty-four medical students with no prior laparoscopic experience participated in the study. Participants viewed an instructional video of a laparoscopic skill mimicking running the bowel ('rope task'). They were videorecorded performing this skill and were randomly assigned to observe their own video ('self') versus observing a video of an expert ('expert') performing the task. They were videorecorded repeating the task. The videos were scored by two blinded reviewers using a task-specific checklist and global rating scores. The time to complete the task and enumeration of errors were also recorded. Data were analyzed using repeated measures of ANOVA.

Results: There were no significant differences between the self and expert groups in the task-specific checklist scores, time for task completion, or errors. Among the global ratings scores, there were no significant differences in instrument handling, accuracy, bimanual dexterity, or economy of motion between groups. The group that viewed the expert video had a greater improvement in rope handling compared to the group that viewed themselves (p = 0.02).

Conclusions: Observing a video of a skilled expert is more effective than observing one's own performance in improving laparoscopic object handling.

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**ER TO OR FOR ACUTE APPENDICITIS: BEFORE AND AFTER THE 80-HOUR WORKWEEK**

Raghid S Bitar MD, Geoffrey P Kohn MD, David W Overby MD, Mark J Koruda MD, Anthony A Meyer, MD, PhD, Timothy M Farrell MD, The University of North Carolina at Chapel Hill, School of Medicine, Department of Surgery

**Introduction:** In 2003, the Accreditation Council for Graduate Medical Education (ACGME) mandated duty-hour restrictions for US general surgery training programs "80-hour workweek". At that time, our program initiated a night-float rotation to cover new general surgery consultations between the hours of 6PM and 6AM, Mondays through Fridays. Daytime and weekend consultation coverage remained the responsibility of the service-assigned residents on a rotating schedule. The aim of this study was to assess variations in the efficiency of care for appendicitis patients treated at a single academic medical center before and after implementation of the 80-hour workweek and night-float system.

**Methods:** Time to definitive treatment for acute appendicitis was the primary outcome. Hospital, emergency room (ER) and operating room (OR) databases were queried for all appendectomies from calendar years 2002 and 2007, before and after the 80-hour workweek respectively. Average time from ER to OR and duration of operation were compared between 2002 and 2007 using the unpaired t-test. In addition, subgroup analyses were performed for patients presenting on weekends and weekdays, and on weekdays 6AM to 6PM and 6PM to 6AM.

**Results:** Mean ER to OR time was 621.8 minutes in 2002, and 607.8 minutes in 2007 (p = NS). Mean appendectomy time was 68.1 minutes in 2002, and 73.6 minutes in 2007 (p = NS). From 2002 to 2007, ER to OR times trended lower on weekdays (p = NS) and higher on weekends (p = NS), with a statistically significant improvement on weekdays during nights (table below).

	2002	2007	p-value
Weekday 6AM-6PM	564.0 minutes	613.3 minutes	NS
weekday 6PM-6AM	716.0 minutes	580.4 minutes	0.04

**Conclusion:** ER to OR time for patients with appendicitis was not significantly different before and after implementation of the 80-hour workweek and a night-float resident coverage system. Improvement in ER to OR efficiency on weekday nights could be credited to the dedicated presence of night-float residents with worsening trends on weekends and weekdays when resident coverage is stretched thin. The effect of duty-hour regulations on patient care outcomes should be assessed with a goal of improving resident staffing during high volume periods and providing respite during low volume periods.

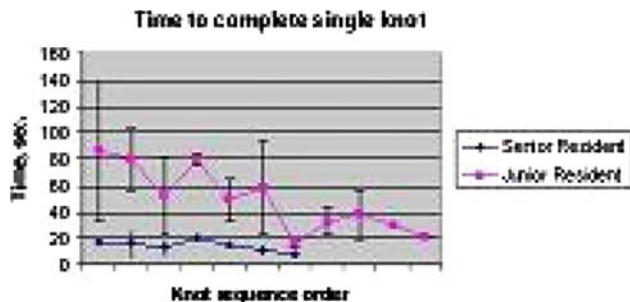
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**VALIDATION OF A VIRTUAL REALITY TRAINER FOR THE ENDOSTITCH DEVICE**

Constance Lee MD, Sergei Kurenov BS, Sukitti Punak PhD, Juan C Cendan MD, University of Florida College of Medicine

**VALIDATION OF A VIRTUAL REALITY TRAINER FOR THE AUTOSUTURE® ENDO-STITCH® DEVICE.** Lee, C, Kurenov S, Punak S, Cendan J. University of Florida College of Medicine. **Objective:** The Endostitch® device (Covidien, CT) is difficult to learn. In particular, the handle requires the use of a toggle which is unique in this instrument. We have developed a virtual reality trainer for the device that offers the use of the actual instrument handle while creating a visible virtual instrument tip complete with virtual needle and suture on a monitor. This report represents the initial validation experiments for the device. **Description:** A virtual reality and haptic enhanced interface using the Endostitch® device has been developed. The necessary software and hardware modifications were wholly developed or constructed in our laboratory. Residents with clinical experience with the instrument (4 senior residents) and those naive to the instrument (3 junior residents) were tested in an effort to validate the ability of the instrument to discriminate between these groups. Residents were timed while creating a slip-knot using software based metrics tracking. The order sequence of knots and level of resident were codified. Comparisons were made using two-tailed Student's t-test and statistical relevance identified at p < 0.05. **Preliminary Results:** Senior residents were able to complete slip-knots using the trainer much faster than junior residents (20 +/- 8.2 sec vs. 59.5 +/- 32.1 sec, p < 0.001; graphic). With repetitions we saw improvement in time-to-completion for junior residents such that the last 10 knots tied by juniors averaged 31.2 +/- 10.0 sec, much closer to the initial results for the seniors and significantly improved from their initial knots (p < 0.001).



**Conclusions:** We believe that this simulation is internally valid demonstrating the ability to discriminate between naive and experienced users. Early data also suggests that practice with the module enhances task completion. Future development will include: 1) a virtual tutor for the device, 2) taking those residents that have been trained with the virtual trainer to the box-trainer for demonstration of translation of the skill into a customary testing apparatus, 3) defining and tracking secondary objective measures of performance such as efficiency of motion and error rate.

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**TELE-MENTORING FOR ADVANCED ENDOSCOPIC SURGERY USING SOFT CADAVERS BETWEEN THAILAND AND JAPAN**

Kazuo Tanoue MD, Satoshi Ieiri MD, Kozo Konishi MD, Yoshihiro Kakeji MD, Yuichi Fujino PhD, Yukihiko Ueda, Patpong Navicharern MD, Pornarong Chotiwan MD, Morimasa Tomikawa MD, Makoto Hashizume MD, Department of Advanced Medicine and Innovative Technology, Kyushu University Hospital,

**BACKGROUND:** Endoscopic surgery has developed dramatically during the past decade because of its several advantages. Endoscopic surgery requires new unique skills that differ from those in open surgery, and therefore, a professional education / training is very important. However, since there is not necessarily an excellent instructor anywhere, the difference of surgical skill level between areas or countries occurs. The tele-mentoring that an instructor indicates in real time from a distant place or the foreign country may solve such problems.

**METHODS:** Two human soft adult cadavers, which rendered the muscles, soft tissues, and neurovascular structures soft and pliable, resembling fresh tissues, were prepared in the operation room of the surgical training center, Chulalongkorn University, Thailand. A high speed Internet, JGN2 (Japan Gigabit Network 2) was used as an information transmission channel in this tele-mentoring between Thailand and Japan supported by NTT Communications. We selected laparoscopic gastrectomy as a training subject, because this operation was flourishingly performed in Japan, but was not almost performed in Thailand at that time. The Japanese expert surgeon who was familiar with the laparoscopic gastrectomy instructed the procedures of the operation, and gave advices about the surgical anatomy, the method of making a proper surgical view with assistants, the direction of dissection, the point of resection, etc.

**RESULTS:** The surgical anatomy, the tissue consistency and anatomical plane were well preserved, and all procedures were completely performed in both tables. All Thai surgeons were satisfied with understanding the detail procedures of the operation or usage of the instruments, by the tele-mentoring from Japan. The quality of the operative view sent from Thailand was enough feasible to recognize the anatomy or operative procedures. The time delay was about 0.6 seconds, but the delay did not produce any problem in exchange of each information during the operation. The department of surgery in Chulalongkorn University clinically introduced the laparoscopic gastrectomy for gastric cancer after this tele-mentoring mission, and they performed the operations in six patients in 6 months with satisfactory results.

**CONCLUSION:** In the present trial, the results indicated that the tele-mentoring in the long distance (3750 km) using the soft cadavers was satisfactory to both countries. We proposed that such training system could contribute to improvement in the level of surgical skills in endoscopic surgery internationally.

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**VENOUS AIR EMBOLISM: PREVENTING A LAPAROSCOPIC PHENOMENON?**

Jeffrey E Carter MD, Thomas W Kendall MD, Alexis D Smith MD, Carl J Westcott MD, Wake Forest University Baptist Medical Center

**Introduction:** Venous air embolism (VAE) is a rare but potentially devastating complication of laparoscopic surgery. The patient outcomes from VAE are poor with a reported 50% mortality and the event represents a significant risk of malpractice risk exposure for hospitals and physicians. The infrequent occurrence and severity of this event make it a perfect target for team based simulation training. At our institution, we sought to improve patient safety through conducting an interdisciplinary training scenario (ITS) directed at VAE. Our goal was to create an ITS that successfully recreated the setting of a VAE and to compare the institution's cost of developing and performing an ITS to the average indemnity award of VAE. **Methods:** A focus group consisting of a faculty minimally invasive surgeon, faculty anesthesiologist, surgical resident, simulation coordinator, two nurse educators, and personnel from risk management and patient safety designed and conducted four VAE ITS. All OR training scenarios were performed in a simulated operating room with a team of OR nurses (one circulator, one surgical technician), anesthesiology and surgical residents, and a "high fidelity" mannequin. The scenario was designed after performing a through needs assessment and reviewing accounts of VAE from indemnity awards. Over 30,000 attorney-submitted indemnity award summaries published in the monthly journal Medical Malpractice from 1989-2006 were reviewed for evidence of VAE. Average award costs were then compared to the costs of ITS development and performance at our institution.

**Results:** 23 cases of venous air embolism were identified in 1,222 indemnity awards. 6/23 cases involved laparoscopic surgery by gynecologists or general surgeons. The remaining cases involved open or percutaneous procedures. The mean indemnity award for a venous air embolism was \$2.6 million (range \$119,900-\$24,700,000). In contrast, the total cost to design and perform the ITS at our institution was \$2,994 (\$1,436 design, \$1,558 performance). ITS performance costs were averaged after 4 VAE scenario performances. Our results demonstrate that for the mean cost of one VAE indemnity award, an institution could design and perform 1,667 training sessions allowing healthcare providers to practice preventing, diagnosing and managing a VAE.

**Conclusions:** Venous air embolisms are preventable, and can lead to sizeable indemnity awards. In contrast, development and performance of an interdisciplinary surgical simulation scenario is relatively inexpensive and can lead to the avoidance of VAE as well as identification of the event and subsequent management protocols. Our analysis demonstrates that VAE occur in many other settings than laparoscopic surgery and that the average design and performance costs of an ITS was less than 0.1% of the average VAE indemnity award. These findings argue that prevention with education and training could be a cost effective and potentially life-saving intervention for surgeons and operating room teams performing laparoscopic surgery.

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### COMPLETION OF A NOVEL VIRTUAL REALITY-BASED ADVANCED LAPAROSCOPIC CURRICULUM IMPROVES ADVANCED LAPAROSCOPIC SKILLS IN SENIOR RESIDENTS

Lucian Panait MD, Nancy J Hogle MS, Dennis L Fowler MD, Andrew J Duffy MD, Saint Mary's Hospital, Waterbury, CT, Columbia University, College of Physicians and Surgeons, New York, NY, Yale University School of Medicine, New Haven, CT

**Introduction:** Virtual reality simulators have been shown to contribute to basic laparoscopic skill acquisition. More advanced skill development, as measured by the Fundamentals of Laparoscopic Surgery (FLS), has not yet been shown to be improved with these trainers. We have customized novel basic and advanced curriculums for the LapSim® trainer (Surgical Science, Göteborg, Sweden). Successful completion of these programs is required of our residents. We hypothesize that successful completion of our advanced curriculum will result in significant improvement of our residents' advanced laparoscopic skills as measured by the FLS skills scores.

**Methods:** Twenty-three surgical residents (PGY1-4), who had already passed our basic skills curriculum, completed our advanced LapSim® curriculum. All underwent FLS skills testing before and after completing the training. Laparoscopic case experience during the training period was documented for all trainees. FLS scores were analyzed by t-test and controlled for case experience.

**Results:** Post-training FLS scores demonstrate a significant increase for all residents from 57 to 66 ( $p < 0.02$ ), especially for seniors (PGY 3-4): 56 to 68 ( $p < 0.01$ ). Operative laparoscopic case volume ranged from 1-90 (mean 30) for juniors (PGY 1-2) and 12-76 (mean 50) for seniors during the training period. Junior resident FLS improvement was dependent on case numbers, specifically, at least 30 cases while training: 0 vs. 15 point improvement, respectively ( $p < 0.01$ ). Senior resident FLS score improvement was independent of case numbers during the training period.

**Conclusions:** Completion of our advanced LapSim® curriculum results in improved advanced laparoscopic skills in senior residents as measured by FLS scores. This skill improvement is independent of laparoscopic case experience. Continuing to mandate the use of this skills curriculum should improve our residents' performance in advanced laparoscopic surgical procedures.

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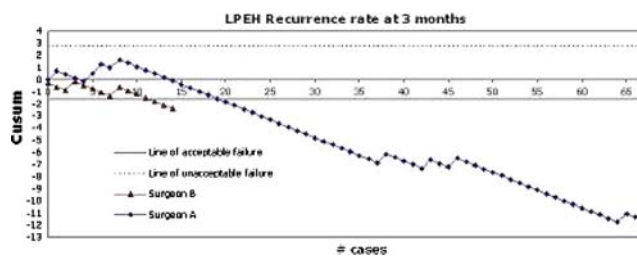
### MINIMIZING THE LEARNING CURVE FOR LAPAROSCOPIC PARAESOPHAGEAL HERNIA REPAIR –THE FELLOWSHIP EFFECT

Gideon Sroka MD, Liane S Feldman MD, Alan Okrainec MD, Pepa Kaneva MSc, Raad Fayed MD, Lorenzo E Ferri MD, Gerald M Fried MD, Steinberg-Bernstein Centre for Minimally Invasive Surgery, McGill University, Montreal, Quebec, Canada.

**Introduction:** Laparoscopic paraesophageal hernia (PEH) repair is technically demanding with anatomic recurrence rates as high as 20-40% reported from leading centers. The learning curve is an important factor in these failures. Our aim was to estimate the effect of MIS fellowship training on the learning curve for this procedure.

**Methods:** We analyzed data accrued prospectively from 92 consecutive patients undergoing elective primary LPEH repair from 1999-2008. Routine barium UGIs were ordered 3-mo postop. Any evidence of a PEH was considered an anatomic failure. Cumulative Sum (CUSUM) analysis of 3-mo recurrence was performed for 2 surgeons, 1 self-trained before the fellowship era (Surgeon A,  $n = 76$ ), the other having completed an advanced MIS fellowship supervised by surgeon A (Surgeon B,  $n = 16$ ). For the purpose of these CUSUM analyses, acceptable and non-acceptable failure rates were set at 20% and 40% respectively. Type I error was set to  $\alpha = 0.05$  and power to 80%.

**Results:** 82 patients (89%) had barium studies at a median of 105 days postop (IQR 82-150). Overall failure rates were 8/66 (12.1%) for surgeon A and 2/16 (12.5%) for surgeon B. For Surgeon A, recurrences were observed in 4 of first 10 cases, but only 7% thereafter. The CUSUM curves (see graph) reach the line of 'acceptable' failure rate after 20 cases for surgeon A versus 12 cases for surgeon B. Whereas the CUSUM curves showed an initial rise for surgeon A, consistent with early experience failures, this pattern was not observed for surgeon B. The patients were similar in terms of age, ASA, hernia size, operative time, estimated blood loss, and length of stay.



**Conclusion:** CUSUM analysis of early recurrence after laparoscopic PEH repair shows a clear difference in the curves between a fellowship and non-fellowship trained surgeon. Fellowship training allows the trainee to benefit from the experience of his mentor and to reduce the higher failure rate observed as the surgeon acquires experience.

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### USE OF A LOW-COST, HIGH FIDELITY, LAPAROSCOPIC VENTRAL HERNIA SIMULATOR TO ASSESS INTRA-OPERATIVE DECISION MAKING

Carla M Pugh MD, Stephen Plachta BS, Aurora D Pryor MD, Departments of Surgery at Northwestern University, Chicago, IL and Duke University Medical Center, Durham, NC

**Objective:** Previous studies using simulation technology have largely focused on technical skills. The objective of this study was to assess the usefulness of a newly developed laparoscopic ventral hernia (LVH) simulator to assess intra-operative decision making.

**Methods:** Participants included fourth year surgical residents attending a two day laparoscopic hernia course. The materials included a newly developed LVH simulator, background and post-use surveys. The simulator had a reconfigurable 10 x 10 cm hernia defect. On day one, the defect was located in the midline 5 cm above the umbilicus. On day two, the defect was located in the right upper quadrant.

**Results:** Background surveys revealed residents ( $N = 24$ ) had performed, on average, 8.5 previous LVH repairs as primary surgeon. On a 5-point scale (1 = not difficult & 5 = extremely difficult) the residents rated the day one simulator as 'difficult' (2.61/5.0) and the usefulness as 'very useful' (3.61/5). On day 1, prior to formal, course training, only 12.5% of residents were able to successfully repair the hernia defect. On day two after a didactic session and animal lab, 100% of the residents were able to repair the defect. The day two simulator was rated as 'somewhat difficult' (1.88/5) and 'useful' (3.38/5). The decisions residents made that contributed to their success on day two include: 1) Port placement, 2) willingness to re-purpose a port, 3) willingness to place additional ports, 4) use of mesh anchoring stitches, and 4) having a systematic approach to tacking the mesh.

**Conclusions:** The newly developed LVH simulator can be used to assess residents' decision making skills. Our results indicate that didactic sessions and animal labs in a two day SAGES course appear to improve resident decision making. Our findings warrant further investigation of this simulator as a training and assessment tool.

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### MIS TRAINING IN CANADA: A NATIONAL SURVEY OF GENERAL SURGERY RESIDENTS

Alia P Qureshi MD, Ashley Vergis A MD, Carolina M Jimenez BS, Jessica Green BS, Aurora D Pryor MD, Christopher M Schlachta MD, Allan Okrainec MD, 1. University of Toronto, Division of General Surgery, Toronto, ON, 2. University Health Network, Toronto Western Hospital, Toronto, ON Canada, 3. Duke University Medical Center, Durham, NC, 4. University of Western Ontario, Departments of Surgery

**Objective:** General surgery trainees perceptions regarding their own laparoscopic training remains poorly defined. The objective of this survey was to identify and evaluate learner experiences with laparoscopic procedures in general surgical programs on a national level.

**Methods:** 284 residents were identified and contacted at English speaking general surgery programs across Canada. Each was asked to complete a web or paper based survey regarding their demographics, experiences with basic and advanced MIS procedures, and perceived barriers to training.

**Results:** 239 of 284 (84%) surveyed residents responded. 87% of residents had access to a skills lab that taught MIS techniques, however standardized MIS curricula were implemented only 53% of the time. 80% of residents felt skills lab training translated to improved performance in the OR. Although 90% of residents felt they would be comfortable performing basic laparoscopic procedures, only 8% stated they would be comfortable performing advanced procedures at the end of their training. While 90% of general surgery residents felt that it was the academic surgical departments responsibility to teach advanced procedures, only 35% felt their surgical program was meeting this requirement. 50% of residents felt they had limited opportunity to be primary surgeon because an MIS fellow was present.

**Conclusion:** There exists a wide disparity between the expectations of residents and their actual experience. The majority of residents are concerned that they will not acquire sufficient laparoscopic skills during their training to perform advanced cases in practice. Additionally, the role between resident and fellow level cases needs to be more clearly defined as the majority of respondents identified the presence of a MIS fellow as a negative learning influence. Finally, although most centers had a surgical skills lab, the perception of most respondents that standardized curricula are not available should be addressed.

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### DEVELOPMENT AND IMPLEMENTATION OF AN ADVANCED LAPAROSCOPIC SKILLS LAB

Christine M Gresik MD, Vidya Shankaran MD, Piero Marco Fisichella MD, Raymond Joehl MD, Luke P Brewster MD, Gerard Abood MD, Loyola University, Stritch School of Medicine, Department of Surgery, Maywood, IL

**Introduction:** The objective of this study is to determine whether skills acquired by simulation-based learning are enhanced with multi-modal curriculum including visual, auditory and kinesthetic and tactile techniques.

**Methods:** A survey was administered to 27 general surgery residents at our program, levels PGY2 through PGY8, to determine their perceived skill, expertise and comfort level with advanced laparoscopic skills. The residents were then tested on an objective set of intracorporeal knot tying skills using box trainers. Following the completion, the residents were debriefed in a structured curriculum setting including booklet of instructions, a live demonstration by laparoscopically trained faculty and a video demonstration. The residents were then retested on the same skill set. Time to completion of the task and post-test survey were completed.

**Results:** Of the 27 residents studied, only 3 were able to successfully complete the intracorporeal knot tying skills prior to a formal debriefing session. Pre-test surveys revealed that these residents were not confident in their laparoscopic skills and believed that previous laparoscopic training models were inadequate. Following the formal debriefing at least 50% of each resident level class was able to successfully complete the task and all residents surveyed reported improved confidence in their laparoscopic skills set.

**Conclusions:** Novel laparoscopic educational models such as this one may serve as a useful addition to resident education in surgery residency programs, particularly in addressing improvement in resident skills and confidence prior to performing similar skills in an operative environment. Reliability of this multi-modal model may be enhanced by addressing significant variability and training practices that exist in other training labs. Approaching laparoscopic training through a multi-modal approach addresses the variability in learning needs amongst a diversified group of residents.

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### WHAT IS THE COST ASSOCIATED WITH THE IMPLEMENTATION OF THE FLS-PROGRAM INTO A GENERAL SURGERY RESIDENCY?

Phuong H Nguyen MD, Ajita S Prabhu MD, Yuliya Y Yurko MD, Christina Acker BS, Amy E Lincourt PhD, B. Todd Heniford MD, Dimitrios Stefanidis MD, Carolinas Medical Center

**Introduction:** The Fundamentals of Laparoscopic Surgery (FLS) program was designed to teach the physiology, fundamental knowledge, and technical skills required in basic laparoscopic surgery. Under the auspices of SAGES and industry support the program was recently made available to all US general surgery training programs. Nevertheless, the implementation cost of the program is unknown. The objective of this study was to evaluate the cost associated with the implementation of the FLS program into the curriculum of a busy general surgery residency.

**Methods:** All general surgery residents (n = 15) followed a proficiency-based laparoscopic skills curriculum based on the FLS program during the academic year. All residents watched the FLS CD-Rom and trained to proficiency on the 5 FLS tasks (Peg transfer, Pattern cut, Ligating loop, Intracorporeal and Extracorporeal knot tying). Training occurred in one-hour weekly supervised sessions and resident attendance and performance were recorded. The cost associated with the implementation of the FLS program was assessed based on supplies, equipment, and personnel involvement needed. To decrease cost, task 3 (ligating loop) was modified to allow multiple uses of each endoloop.

**Results:** Resident skills lab attendance averaged 51% (range 16–84%) for a total of 211 hours. Fifty three percent (8/15) of residents achieved proficiency in at least 3 of the tasks (peg transfer, pattern cut, & ligating loop) after a total of 577 repetitions during the study period. The overall cost associated with the FLS program was \$11,626. Personnel cost was \$3,338, equipment cost was \$4,967 and supplies cost was \$1,750 with the majority needed for suture (\$1,242) and endoloops (\$329). With the modification of task 3, each endoloop was used on average 9 times leading to \$2,577 cost savings.

**Conclusion:** This is the first study to describe the cost associated with the implementation of the FLS program in a general surgery residency. It further demonstrates cost savings by the modification of the ligating loop task to allow for multiple uses of each endoloop without compromising task quality. This information may be useful to programs trying to implement FLS into their curricula.

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### IS VIRTUAL REALITY WORTH IT? A COMPARISON OF BOX VERSUS VIRTUAL REALITY TRAINING

Christopher J Myers MD, Basil M Yurcinis MD, Kfir Ben-David MD, Juliet G Holder-Haynes MD, Alexander Perez MD, Rebecca Prince-Petersen MD, Lindsey Sharp MD, Alfonso Torquati MD, Eric J DeMaria MD, Aurora D Pryor MD, Duke University

**Objective of the Study:** To determine if a difference exists between virtual reality (VR) training and laparoscopic box trainer (BT) in skill acquisition of surgical residents.

**Methods and Procedures:** This is a prospective, randomized, blinded, controlled trial that enrolled twelve surgical interns to scheduled training with a VR simulator (n = 6) or to a control group of BT (n = 6). All study participants underwent a baseline testing of their laparoscopic skills at the zero time point in a live porcine model for five separate laparoscopic skills. The two groups were assigned to a similar number of mandatory training repetitions with their respective training modality (BT vs. VR simulator). They subsequently underwent assessment at two further time periods in a live porcine model at 2 months and 6 months to assess skill development. Each intern was asked to demonstrate proper use of a 30° camera, needle transfer, object tracking, vessel clipping and cutting, and finally intra-corporeal suture tying. Two blinded reviewers independently scored the intern's performance at each of the specified time intervals.

**Results:** The average composite scores for the five skills at the end of six months showed a significant increase in both the VR (4.72 to 6.98; p = 0.04) and BT (4.72 to 6.55; p = 0.02) trained residents. The difference in average composite scores achieved in the computer simulator group versus the laparoscopic box trainer group was not significant at the 6 month time period (6.98 vs. 6.55; p = 0.46)

**Conclusion:** This study demonstrates that surgical training with laparoscopic simulation is an effective method of transferring skills to surgical interns. This study indicates that both BT and VR are effective in achieving this goal. With the significant cost associated with current VR simulators, the use of BT may be an effective, economic alternative for surgical residency programs.

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### IMPACT OF VIDEO-BASED TEACHING OF INTRACORPOREAL SUTURING ON LEARNERS' SELF-REPORTED CONFIDENCE LEVELS

John T Paige MD, Tong Yang MD, Nicole Sharp BS, Sheila W Chauvin PhD, Louisiana State University Health Sciences Center

**Background:** Simulation-based teaching of basic skills in minimally invasive surgery (MIS) has become an important component of general surgery residency curricula. Of these skills, intracorporeal suturing is one of the most difficult to teach. Optimizing learners' ability to acquire this skill efficiently is beneficial. Increased self-confidence is the first step toward skill acquisition. We examined the impact of video-based teaching of intracorporeal suturing on learners' self-confidence levels.

**Methods:** During the 2007–2008 academic year, a total of 7 senior level (post-graduate year [PGY] 4 and 5) general surgery residents underwent video-based instruction in intracorporeal suturing on an inanimate box trainer during a single session. Participants completed pre- and post-session attitudinal questionnaires using a 5-point Likert-type scale focusing on self-confidence in performing various targeted intracorporeal suturing skills. Total mean scores and mean gains were calculated from the questionnaires. Paired t-test was used to determine the impact of the video instruction on self-confidence levels.

**Results:** Self-confidence ratings were complete for all 7 forms. Statistically significant gains were demonstrated for 4 out of 12 intracorporeal suturing skills on the questionnaire. The range of mean score change was 0.8 units (p = 0.04) to 1.2 units (p = 0.03) on a 5-point Likert-type scale.

**Conclusion:** Video-based teaching in intracorporeal suturing appears to have a positive impact on senior resident self-confidence levels. Further research is needed to determine whether such an increase in self-confidence levels translates to improved skill performance.

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### IMPACT OF ADVANCED LAPAROSCOPY COURSES ON PRESENT SURGICAL PRACTICE

Bhavin C Shah MD, Matthew R Goede MD, Rhonda J Prewitt BS, Irene H Suh MS, Corrigan McBride MD, Dmitry Oleynikov MD, Department Of Surgery, University of Nebraska Medical Center, Omaha, NE

**Introduction:** The introduction of new techniques makes training in advanced laparoscopic procedures a necessity for the practicing surgeon but acquisition of new surgical skills is a daunting task. SAGES has defined guidelines for training and practice of laparoscopic procedures. Recently introduced laparoscopic techniques have created a new teaching paradigm focused on animate courses and preceptor instruction.

**Aim:** To know if surgeons attending advanced laparoscopy courses increase their laparoscopy case load.

**Methods:** After obtaining IRB approval, we performed a survey of surgeons in practice who participated in instructional laparoscopy colon and hernia courses conducted by our department from January 2002 to December 2007.

**Results:** Out of the 109 surgeons, who participated in laparoscopy courses, 79 surveys were administered and 47(59%) responses were received from 41 male and 6 female surgeons. 93% surgeons were in private practice. 58% reported a change in practice after our courses. Of these, 25% surgeons had limited residency laparoscopy exposure of less than 50 cases. The total number of colon procedures for all participants increased six fold and there was an increase in the number of laparoscopic hernia procedures in surgeons who took colon courses. The increase in procedures was statistically significant in surgeons with laparoscopic residency experience of more than 50 cases compared to those with minimal exposure of less than 50 cases. This increase was not found between surgeons with residency experience of 50–200 cases compared to those with more than 200 cases. Future interest in advanced laparoscopy courses was noted in 65% surgeons and was more pronounced in surgeons with more than 50 cases in residency.

**Conclusions:** Advanced laparoscopy courses significantly increase the number of course specific procedures but also increase other laparoscopic surgeries. Laparoscopy experience of more than 50 cases during residency is a strong predictor of increase in number of cases after attending courses.

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### DEDICATED LAPAROSCOPIC SKILLS ONE MONTH ROTATION FOR GENERAL SURGERY INTERNS

Ray I Gonzalez, Atul K Madan MD, Jose M Martinez MD, Danny Sleeman MD, Diya I Aladeen MD, Emanuele Lo Menzo MD, Alberto R Iglesias MD, Alan S Livingstone MD, Division of Laparoendoscopic and Bariatric Surgery, University of Miami Miller School of Medicine

**Introduction:** Laparoscopic skills acquisition is an important part of residency training. Early training may help with more advanced laparoscopic skills acquisition. Thus, we feel that laparoscopic skills should be taught to first year general surgery residents. This study investigated the hypothesis that a one month dedicated laparoscopic skills rotation would yield appropriate laparoscopic skill levels as defined by the technical skills portion of the Fundamentals of Laparoscopic Skills (FLS) test.

**Methods:** First year general surgery interns that underwent a dedicated laparoscopic skills one month rotation were included in this study. The one month rotation included didactics, recorded procedures observation, FLS module, box trainers, virtual reality trainers, and porcine procedures. All interns were administered the technical skills portion of the FLS test by a certified FLS proctor.

**Results:** There were 8 general surgery interns included in this study. At the end of the rotation, 100% of the general surgery interns passed the technical component of the FLS test. Mean technical skills portion score was 80 (range: 66 to 87).

**Conclusions:** A one month dedicated laparoscopic skills rotation results in 100% success rate for the technical portion in the FLS test. This dedicated rotation could serve as an example for other general surgery residency that desire to implement early laparoscopic skills acquisition for their trainees.

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### ADVANCES IN VIRTUAL REALITY FLS (FUNDAMENTALS OF LAPAROSCOPIC SKILLS)

Henry Lin MD, Ganesh Sankaranarayanan PhD, Venkata S Arikatla BS, Maureen Mulcare BS, Likun Zhang MSc, Suvranu De PhD, Cao Caroline PhD, Benjamin E Schneider MD, Alexandre Derevianko MD, Robert Lim MD, David Fobert BS, Steven D Schweitzberg MD, Daniel B Jones MD, Beth Israel Deaconess Medical Center, Rensselaer Polytechnic Institute, Tufts University

**Objectives:** The aim of our study was to evaluate the face and construct validity of VBLaST (Virtual Basic Laparoscopic Skills Trainer), a virtual reality simulator version of Fundamentals of Laparoscopic Surgery (FLS).

**Methods:** 31 subjects were categorized into 2 groups: 14 experts (PGY 5/fellows/faculty) & 17 novices (PGY 1–4). Subjects were randomized to perform 3 basic tasks (peg transfer, pattern cutting, and loop ligature) in both FLS box trainer and VBLaST haptics simulator. Questionnaire used a 5 point Likert scale to establish face validity and assess overall realism of tools and images, quality of force feedback, and the subjects' ability to trust the simulator for performance measures. For construct validity, the FLS scoring system was utilized for both the FLS and VBLaST. Proctors calculated the FLS score, while software automatically scored for VBLaST tasks.

**Results:** For face validity, the quality of images were rated high (mean of 4.0), followed by realism of equipment (mean of 3.67). Quality of force feedback rating was at 2.64 and trust in the simulator at 2.83. Mann-Whitney U test between the 2 groups showed no significant difference of opinion between the expert and novice groups ( $p > 0.51$ ).

**Construct validity scores from peg transfer and loop ligature tasks showed that VBLaST differentiated the 2 groups ( $p = 0.028$ ). FLS did not differentiate between the 2 groups with just 2 tasks ( $p > 0.2$ ) but did when pattern cutting was included ( $p = 0.004$ ). VBLaST peg transfer alone was able to differentiate between the 2 groups ( $p = 0.027$ ).**

**Conclusions:** Face validity scores demonstrated excellent image quality and overall realism. Higher fidelity is needed in force feedback quality to make this simulator acceptable as a scoring device. Construct validity results demonstrated that this VBLaST prototype is capable of differentiating between novices and experts but not at the fine resolution of FLS. Differences may be due to experts adapting more successfully to the VBLaST system. This is a significant first step towards a virtual reality FLS system.

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### STRESS IMPAIRS THE PSYCHOMOTOR PERFORMANCE OF LAPAROSCOPIC NOVICES

S Arora BS, N Sevdalis PhD, R Aggarwal PhD, P Sirimanna, R Kneebone PhD, A Darzi PhD, Imperial College, London

**Introduction:** Evidence suggests that surgical performance is impaired by stress although there is little to directly quantify its effects on surgeons' technical ability. Moreover, surgeons' individual differences in managing stress have not been examined. The present study aims to establish a direct empirical link between stress and surgical performance and explore the relationship between trait Emotional Intelligence (a personality characteristic known to affect how people manage emotions) and stress in surgeons.

**Methods:** Twenty laparoscopic novices participated in the study. Participants carried out a laparoscopic task on a MIST-VR simulator. Validated dexterity parameters were obtained from MIST-VR (path length, time taken, number of errors). Stress was assessed pre-, intra-, and postoperatively using the validated Stait Trait Anxiety Inventory (STAI). Participants also completed the Trait Emotional Intelligence Questionnaire - short form (TEIQueSF). Data was submitted to correlational analyses.

**Results:** Technical performance was assessed for all subjects ( $n = 20$ ) regarding time taken (median = 50 +/-18 secs), economy of motion (4.90 +/-1.37) and number of errors (75.0 +/-43.32). Stress levels peaked intra-operatively ( $M = 10.60 +/-2.23$ ) compared to pre-operatively ( $M = 9.15 +/- 2.89$ ;  $t(19) = 2.26$ ,  $p < 0.05$ ), and post-operatively ( $M = 8.60 +/- 2.24$ ;  $t(19) = 4.53$ ,  $p < 0.001$ ). Significant correlations were obtained between the three dexterity parameters ( $r_s 0.68-0.90$ ) and between stress levels across procedure stages ( $r_s 0.57-0.58$ ). Stress correlated positively with economy of motion ( $r = 0.48$ ) and number of errors (0.51), indicating that higher stress levels were associated with worse performance. EI correlated with stress ( $r = 0.14$ ), but weakly.

**Conclusions:** This is the first study to demonstrate direct impairment of surgical performance associated with stress. Higher EI was associated with higher stress levels, but the link was not clear. Further research should replicate these findings in expert surgeons and explore the role of EI in surgical stress management.

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### IMPROVING PATIENT OUTCOMES AND RESIDENT EDUCATION SIMULTANEOUSLY: INTRAOPERATIVE ENDOSCOPY FOR LAPAROSCOPIC GASTRIC BYPASS FIRST 100 PATIENTS IN A SINGLE CENTER EXPERIENCE

Michael Kohlman MD, Jeffrey Slayden MD, John Price MD, G. Brent Sorensen MD, University of Missouri, Kansas City

**Background:** Morbid obesity is a growing problem in the United States. As a result, now more than 100,000 laparoscopic roux-en-y gastric bypasses (LRYGB) are performed annually. A large portion of these are performed at teaching institutions. This procedure carries with it known complications, the most feared, is a leak at the gastro-jejunostomy. Intraoperative endoscopy (IE) has been shown to increase detection of this problem so it can be corrected at the time of surgery. Concomitant with this rise in bariatric procedures is an increased endoscopic requirement for surgical residents. The American Board of Surgery requires surgical residents to become familiar with flexible endoscopic techniques, but how they are to gain this experience is not formally outlined for program directors. Recently the Accreditation Council for Graduate Medical Education (ACGME) has increased the amount of both laparoscopic and endoscopic procedures required during residency. Although the increase in numbers required for laparoscopic procedures seem attainable, the same cannot be said for flexible endoscopy. On average, residents are performing 26 upper endoscopies during surgical residency and now will be required to have 35 upper endoscopies. The requirement for colonoscopies has also been raised to 50 where the average is around 36 for most surgical programs. Currently most surgeons yield endoscopies to the gastroenterologists, which makes an increased volume for the residents a problem. We have recently instituted IE in our bariatric program. This has been beneficial in detecting gastrojejunostomy leaks and has at the same time has provided a means to improve the endoscopic experience for our surgical residents.

**Methods:** Starting on September 25th 2007, our bariatric program initiated IE for our LRYGB patients. At the same time, resident participation was encouraged. A 12 month retrospective review of our database was performed.

**Results:** Of our 100 patients who received LRYGB, 6 intraoperative leaks were discovered. These were corrected intraoperatively, with no post-op complications. The average length of stay was 2.33 days. Of the first 100 patients who had undergone LRYGB, residents performed the IE in 83 of those cases.

**Conclusion:** IE for LRYGB has been shown to improve patient outcomes. In doing so, it has also provided needed endoscopic experience for our surgical residents. The shift in requirements for laparoscopic cases is a reflection on what is already being taught at most institutions. Endoscopy, however, will likely require a significant change at many programs to meet these requirements. Based on this, we recommend that IE be performed during LRYGB. IE is not only a means to detect leaks, but also improves the endoscopic skills and experience vital to the training of young surgeons.

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### TELEGRADING OF TECHNICAL SKILLS PORTION OF FUNDAMENTALS OF LAPAROSCOPIC SURGERY

Ray I Gonzalez, Atul K Madan MD, Leonardo Real, Diya I Aladeen MD, Alberto R Iglesias MD, Emanuele Lo Menzo MD, Jose M Martinez MD, Division of Laparoendoscopic and Bariatric Surgery, University of Miami Miller School of Medicine

**Introduction:** Fundamentals of Laparoscopic Surgery (FLS) is considered a validated educational module for basic laparoscopy. Recently, FLS and its testing have become available at no cost for all general surgery residency programs. Unfortunately, there are a relatively limited number of testing sites. This investigation studied the hypothesis that the technical skills portion of FLS test could be graded live over the Internet.

**Methods:** The FLS technical skills test was administered and graded by a live observer (a FLS certified (proctor). Two camera feeds were simultaneously transmitted via teleconference software through the Internet. One feed was directly to the FLS box and the other feed was a standard webcam set up to view the test taker. An away observer (a laparoscopic surgeon with vast experience in teaching FLS) viewed the feeds from a site away from the test center. Both live and away observer recorded times via the live feeds. The endoloop and the two tied sutures were measured by the live grader. Both the circle and the gauze (for the pattern cut exercise) were photocopied before the live observer graded the task. The photocopies and the sutured materials (after being numbered) were placed into a bag to be sent to the away observer.

**Results:** Ten sample tests (50 sections) were administered included in this study. During one of the sections, there was an issue with the Internet connection which was not included in the study. The overall correlation was extremely high for overall score ( $r = 0.997$ ;  $p < 0.0001$ ) and time ( $r = 0.9996$ ;  $p < 0.0001$ ). More importantly, the overall score and time never differed more than 1 and 3 respectively between live and away observers. Penalties were measured similar by both observers as well. All five sections had high correlations between live and away observers.

**Conclusions:** Telegrading for the technical skills portion FLS of the test correlates similar to live testing. Distance grading via the Internet may provide a novel approach for FLS certification.

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### A NOVEL AND PRECISE EVALUATION MODEL FOR PSYCHOMOTOR SKILLS IN ENDOSCOPIC SURGERY

Satoshi Ieiri MD, Kazuo Tanoue MD, Kozo Konishi MD, Yoshiro Kawabe, Takanori Nakatsuji MD, Daisuke Yoshida MD, Shohei Yamaguchi MD, Go Aneagawa MD, Kenoki Ohuchida PhD, Hideo Uehara MD, Naotaka Hashimoto MD, Munenori Uemura, Takefumi Yasunaga PhD, Jaesung Hong PhD, Hajime Kenmotsu, Takahshi Maeda MD, Makoto Hashizume MD, Department of Advanced Medicine and Innovative Technology, Kyushu University Hospital

**Purpose:** Psychomotor skill is absolutely necessary for endoscopic surgeons. We devised tasks and parameters to evaluate psychomotor skills during endoscopic surgery and investigated their validity.

**Methods:** Sixteen novice medical students (N) and ten expert surgeons (E) who had performed over 50 endoscopic surgeries participated in the study. We evaluated psychomotor skill by asking the participants to move forceps in a straight-line space. Three-dimensional position measurements of the forcep tips were analyzed with an electromagnetic tracking system (AURORA; Northern Digital Inc. CANADA). The following parameters were evaluated: efficiency of spatial distance, summation of spatial deviation, integration of deviation, motatsuki time, and motatsuki distance. Motatsuki means hesitation in achieving the desired goal point. Data are expressed as mean  $\pm$  SD. A two-way repeated measure ANOVA and the Bonferroni method for multiple comparisons were used to identify differences at a significance level of  $p < 0.05$ .

**Results:** There was no difference in the efficiency of spatial distance with the dominant (right) hand (N: 1.8 ? 0.8; E: 1.2 ? 0.1) but there was a significant difference ( $p < 0.001$ ) with the non-dominant (left) hand (N: 1.7 ? 0.2; E: 1.2 ? 0.1). The summation spatial distance (mm) between the dominant (N: 716.1 ? 425.2; E: 130.9 ? 137.0) and the non-dominant hands (N: 579.1 ? 176.8; E: 119.7 ? 87.4) was significantly different ( $p < 0.05$ ). Moreover, the integration of spatial distance (mm<sup>2</sup>) was significantly different ( $p < 0.01$ ) between the dominant (N: 929.9 ? 374.8; E: 319.9 ? 137.0) and non-dominant hands (N: 790.2 ? 141.7; E: 258.4 ? 102.0). The motatsuki time (s) of the dominant (N: 1.1 ? 0.4, E: 0.5 ? 0.2,  $p < 0.05$ ) and non-dominant (N: 1.0 ? 0.2; E: 0.6 ? 0.3,  $p < 0.01$ ) hands was significantly different. The motatsuki distance (mm) of the dominant hand (N: 25.6 ? 4.4; E: 19.7 ? 3.7) was significantly different ( $p < 0.05$ ) but there was no difference with the non-dominant hand (N: 22.4 ? 4.0; E: 18.4 ? 2.1).

**Conclusions:** Our evaluation task model discriminated the level of psychomotor skill required for safe and precise endoscopic surgery. We suggest that the dexterity required for endoscopy can be evaluated using this simple and sensitive testing procedure.

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### REMOTE ROBOTIC TELEPRESENCE IS EFFICACIOUS IN THE MENTORING OF RESIDENTS AND STUDENTS IN THE FUNDAMENTALS OF LAPAROSCOPIC SURGERY

K S Blair MD, J T Perry MD, R K Lehmann, M I Haque MD, K S Azarow MD, R M Rush MD, Department of Surgery and the Andersen Simulation Center, Madigan Army Medical Center, Tacoma, WA 98431

**Objective:** To determine that remote robotic telepresence can be used to evaluate and train surgical residents and medical students in the fundamentals of laparoscopic surgery (FLS). This project is a precursor to providing real time intraoperative video tele-consultation to surgeons deployed in remote areas in support of the Global War on Terrorism.

**Methods:** A control group of 15 and a robotic telepresence study group of 6 surgical residents and medical students underwent training and evaluation in FLS. FLS is an essential set of various tasks (peg transfer, circle pattern cut, endoloop placement, extracorporeal suture, and intracorporeal suture placement) with well studied proficiency time guidelines and noted relevance for laparoscopic surgical skill set development. Subjects viewed a live demonstration by a board-certified general surgeon of the 5 FLS tasks either in person or via robotic telepresence using the Remote Presence 7 (RP7) robot by In Touch Health. Instruction and data acquisition of the time to complete FLS tasks were recorded by the supervising surgeon. Subjects with prior FLS experience were eliminated from analysis. Standard statistical evaluation was performed to determine any differences between groups. A post-study satisfaction questionnaire was provided at the conclusion of the training to student, residents, and supervising surgeons.

**Results:** The FLS peg transfer data revealed the following mean times (seconds) for the control group at repetition 1, 2, 3, and 4 respectively: 107  $\pm$  28, 100  $\pm$  29, 88  $\pm$  21, and 79  $\pm$  24. FLS peg mean transfer times (seconds) for the RP7 group at repetition 1, 2, 3, and 4 respectively were 98  $\pm$  7, 91  $\pm$  18, 54  $\pm$  21, and 55  $\pm$  11. Repeated measures analysis of variance was performed and revealed no statistical difference between control and RP7 groups ( $p > 0.05$ ). Next, FLS intracorporeal suture data revealed the following for mean times (seconds) at the denoted repetition for the control group at repetition 1, 2, 3, and 4 respectively: 190  $\pm$  70, 163  $\pm$  67, 104  $\pm$  28, and 78  $\pm$  11. The FLS intracorporeal suture data revealed the mean times (seconds) for the RP7 group at repetition 1, 2, 3, and 4 respectively: 161  $\pm$  130, 142  $\pm$  38, 124  $\pm$  29, and 113  $\pm$  17. Again, no statistical difference ( $p > 0.05$ ) existed between the control and the RP7 groups by repeated measures analysis of variance. Finally, a satisfaction survey was provided to medical students, residents, and supervising surgeons. All of the 6 of 6 residents and students surveyed reported 'strong agreement' that RP7 was an effective and interactive instruction method. The 2 of 2 supervising surgeon surveyed reported 'strong agreement' that RP7 was an effective means to supervise and train students and residents and saved time in travel to and from the training site.

**Conclusion:** Remote robotic telepresence appears to be equivalent to in-person supervision, training, and evaluation with regards to the fundamentals of laparoscopic surgery training. Students and residents expressed more than satisfactory learning with both types of training. The supervising examiners noted a restriction on data acquisition with the remote robotic telepresence because only one subject could be evaluated at a time. In short, remote robotic telepresence offers an efficacious method for supervision of surgical based procedures.

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### LAPAROSCOPIC SKILL ACQUISITION WITH LAP SIM® VIRTUAL SIMULATORS: A COMPARATIVE STUDY

Christian Villeda MD, David Velázquez-Fernández PhD, Patricio Santillán MD, Miguel F Herrera PhD, Juan P Pantoja MD, Mauricio Sierra MD, National Institute of Medical Sciences and Nutrition Salvador, Zubirán.

**Objectives:** Virtual simulators have been validated as training tools for development of laparoscopic skills and as an instrument of discrimination between novice and senior surgeons. Whilst formal training programs for inexperienced surgeons are lacking; there is no information about the use of these simulation devices in order to obtain optimal results.

**Material and methods:** We present a quasi-experimental multi-variate study using the Lap SIM® laparoscopic surgery virtual simulator (Surgical Science®) with the Lap SIM Basic Skills 3.0 software (11 tasks). Results from the performed exercises by 20 subjects (undergraduate students and first and second year residents) without previous exposition to laparoscopic surgery techniques (10 repetitions of each task, one hour per day, 10 hours of total exposure) were analyzed.

**Results:** 11 tasks with progressive difficulty were analyzed using the following variables 'global score', 'total time', 'mistakes' and 'tissue damage'. The first seven tasks required only 5 repetitions in order to achieve a significantly improved score from the baseline ( $p < 0.05$ ). The last 3 tasks required 9 or 10 repetitions in order to achieve the same skill improvement ( $p < 0.05$ ). The most sensitive variables for detecting skill acquisition were 'total score' followed by 'total time' ( $p < 0.05$ ).

**Conclusion:** Laparoscopic surgical skills are significantly improved after training with the Lap SIM virtual simulator. An efficient training program should include 4–5 repetitions of the first 7 tasks; with 9–10 repetitions of tasks 7 thru 11 due to their complexity. 'Total time' and 'global score' seem to be the most important variables helpful in the skill acquisition progress. This curriculum would seem optimal for novice surgeons searching to acquire basic laparoscopic surgery skills.

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### IMPACT OF TRAINING WITH AUTHORIZED TECHNICAL EXPERTS ON COLO-RECTAL LAPAROSCOPIC SKILLS; HANDS ON TRAINING AND STEP BY STEP TRAINING

Takashi Iwata MD, Mitsuo Shimada MD, Toshihiro Nakao MD, Tomohiko Miyatani MD, Jun Higashijima MD, Kozo Yoshikawa MD, Masanori Nishioka MD, Nobuhiro Kurita MD, Dept. of Surgery, The Tokushima Univ.

**Introduction:** Laparoscopic skills training outside the operating room is becoming the standard for educating surgical residents. Because of the specific procedure, and the difference from open surgery, it is imperative to establish unique training system to promote efficiency of learning laparoscopic skills. Recently in Japan, Japanese Society for Endoscopic Surgery (JSES) authorized technical experts who were certificated their laparoscopic skills. The aim of this study was to evaluate the efficiency of learning laparoscopic skills with or without authorized experts of JSES during "Hands on training" and "Step by step training"

**Methods:** Among patients who underwent laparoscopic surgery for colo-rectal cancer from May 2004 to July 2008 at the Tokushima Univ., 30 patients during early period and 10 patients during late period of induction of laparoscopic surgery, 12 patients who underwent laparoscopic surgery by resident under the guidance of authorized technical experts of JSES, and 30 patients who underwent laparoscopic surgery by authorized technical experts of JSES were investigated. Preoperative simulation using virtual images with MD-CT, PET-CT and diffusion-weighted MRI (DW-MRI) were performed everytime to ensure the anatomy. Each procedure was then broken down into its key components (exposure internal approach, outer approach, isolation of the vascular pedicle, dissection of the lymph nodes, and anastomosis), operation time, amount of blood loss, intra- and post-operative complications, and conversion to open surgery were investigated. There was no significant difference between resident and expert in duration of each part of procedure, whereas there was significant prolongation in early period compared with late period, resident and expert.

**Results:** Operative procedure: colon resection: 12: 5: 5: 9 (early period: late period: resident: expert), high anterior resection: 2: 2: 4: 6, low anterior resection: 12: 2: 3: 12, Miles operation: 4: 1: 0: 3. Operation time: 477: 333: 262: 220 min., amount of blood loss: 494: 73: 21: 20 ml, and complications: ileus: 0: 1: 0: 0, leakage: 1: 1: 3: 0, neurologic disturbance: 2: 1: 0: 0.

**Discussion:** Instruction by authorized technical experts of JSES is helpful to avoid pitfalls which not seen in open surgery, such as a small working space, limited instrument movement, decreased tactile sensation, and counterintuitive manipulation of instruments in a 2-dimensional visual field.

**Conclusions:** Intra-operative step by step instruction by authorized technical experts of JSES is very helpful to learn laparoscopic skills more effectively than without expert.

24078

### RANDOMIZED CONTROLLED TRIAL: COMPARING THE EFFECT OF TWO HIGH FIDELITY COMPUTER GAMES ON THE LEARNING CURVE IN LAPAROSCOPIC SURGERY

Julian J Leong MD, Alexander Hills MD, Mariam Rana MD, Daniel R Leff MD, Peter J Brown, Thanos Athanasiou MD, Ara W Darzi MD, Department of Biosurgery and Surgical Technology, Imperial College London

**INTRODUCTION:** There is no clear consensus on the effect of computer games on laparoscopic surgical performance, this maybe due to the type of games used. This study aims to compare two high fidelity computer games, and their effect on the learning curve in laparoscopic surgery.

**METHODS AND PROCEDURES:** 31 laparoscopic naïve subjects were randomly assigned to 3 groups. All subjects performed a baseline test for laparoscopic performance. Group A and B were then trained on either a tennis or a golf game, respectively, until they reached predefined competency levels, Group C acted as control. All three groups then trained on the Lapsim simulator until previously validated competency levels were attained.

**RESULTS:** There was no difference in the baseline performance. Group A used the least time and total path length at the first post-training attempt in Lapsim ( $p < 0.05$ ) (Groups A, B, C: 143 vs 172 vs 256sec and 2.7 vs 4.2 vs 4.6 m), and had the highest overall score (94 vs 68 vs 61). Group A also required the fewest number of attempts to reach competency in Lapsim (8.5 vs 15 vs 21), though not statistically significant ( $p = 0.07$ ). The transfer efficiency ratio for Game A was 0.60. Group B was not significantly different from control.

The generalized estimating equation was used to model the learning curves, this accounts for within subject correlation of responses of a dependent variable, and showed the effect of group influenced individual learning curves in Lapsim. ( $\beta = -17.7$   $p < 0.01$  SE6.8).

**CONCLUSIONS:** This study has shown that computer games that enhance hand-eye coordination and visuo-spatial awareness can shorten the learning curve in laparoscopic training.

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### LEARNING CURVES IN LAPAROSCOPIC SURGERY – A SYSTEMATIC REVIEW

Julian J Leong MD, Melanie Armitage MD, Ee Ling Heng MD, Sanjay Purkayastha MD, Daniel R Leff MD, Thanos Athanasiou MD, Ara W Darzi MD, Department of Biosurgery and Surgical Technology, Imperial College London

**INTRODUCTION:** Recommendations for assessing learning curves in surgery were published in 2001. This study aims to assess systematically all published learning curve studies in laparoscopic surgery, and determine the impact of these recommendations on the quality of the publication.

**METHODS AND PROCEDURES:** A systematic review was performed on all studies from 1996 assessing learning curves in laparoscopic surgery. Over 20 endpoints were extracted in the categories of study characteristics, statistical methods used, operator characteristics and variables used for analysis. Study quality was determined by the validated methodological index for non-randomized studies (MINORS) score, evaluated by 2 independent reviewers, and the journal impact factor. Logistic regression analysis was used to identify independent predictors of study quality.

**RESULTS:** 85 studies matched the selection criteria and reported on 23100 live procedures. 24% studies used no statistical methods, 60% used simple group comparisons. 31% used indirect measures to model learning curve, and 66% reported the operator experience, of which only 27% used this as a factor in their analysis. The inclusion of direct endpoints, operator experience, impact factor and MINORS score did not change significantly after 2001. In robotic surgery studies, the year of publication negatively influences the impact factor ( $p < 0.05$ ). Multiple regression showed that randomized trials predicted higher impact factor ( $p < 0.05$ ), but not with other study characteristics. Studies using simulated procedures had higher MINORS score ( $p < 0.05$ ).

**CONCLUSIONS:** This study highlighted the lack of recognized structure for reporting learning curves in laparoscopic surgery. Further guidelines for future studies should be recommended by experts in this field.

## Endolumenal / NOTES

22198

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**A NOVEL ACTIVE OVERTUBE FOR ENDOSCOPIC TREATMENT OF COLORECTAL TUMORS**

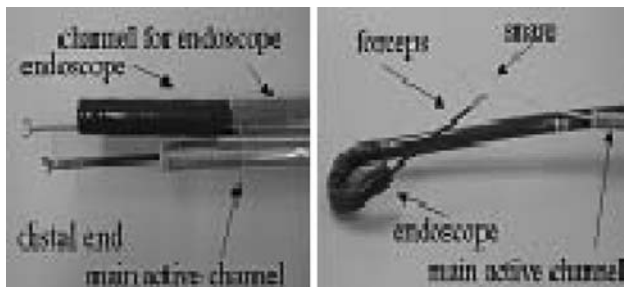
Kazuhiko Shinohara MD, Gennai Yanagisawa MSc, School of Bionics, Tokyo University of Technology

**Objective:** Endoscopic resection for early colorectal tumors is minimally invasive treatment, however it requires long operation times and skillfulness to complete the en-bloc resection in safety. This weak point is caused by the limited access route and manipulating range of the endoscope. To compensate these points, we developed an advanced type of active overtube which can provide adequate counter-traction and multi-directional endoscopic view during the endoscopic resection.

**Description of the device:** This overtube is equipped with one main active channel and one auxiliary channel for the suction. The diameter of this overtube is 20 mm and conventional flexible endoscopes are adaptable through this overtube. Many kinds of treatment devices such as a snare, forceps and electrocautery can be used through the main active channel of this overtube. Distal end of active channel can be bent freely with these treatment devices.

**Preliminary results:** From a preclinical experiment in a mock-up rectum, sufficient coordinative motion of the devices through this overtube and flexible endoscope was confirmed. Moreover, resecting procedure in the rectum can be observed from oral side of the lesion by bending the tip of the endoscope with this overtube.

**Conclusion:** Preclinical work has demonstrated the feasibility and usefulness of this active overtube for endoscopic resection of colorectal cancer were confirmed in this study. Additionally, the concept of this active overtube is applicable to single port laparoscopic surgery and NOTES.



22202

P256

**HUMAN GALLBLADDER MEASUREMENTS AND IMPLICATIONS FOR NATURAL ORIFICE SURGERY**

Edward D Auyang, Edward S Chan BA, Darren B van Beek BS, Khashayar Vaziri MD, Nathaniel J Soper MD, Eric S Hungness MD, Department of Surgery, Northwestern University

**Background:** Natural orifice transluminal endoscopic surgery (NOTES) introduces a paradigm shift in minimally invasive surgery that may benefit patients with decreased post-operative pain, faster recovery, better cosmesis, and less surgical morbidity by reducing abdominal incisions. While several NOTES and hybrid-NOTES cholecystectomies have been performed throughout the world, much research is needed to refine the technique, create instrumentation designedly for NOTES, and better determine which patients are candidates for NOTES cholecystectomies. Our goal in this study was to collect a database of dimensional measurements from human gallbladders, with the intention of providing data to help address these needs as specifically applied to NOTES cholecystectomies.

**Methods:** Prospective data from 57 patients undergoing laparoscopic cholecystectomy were collected. Electronic calipers were used to measure physical dimensions of the gallbladder and cystic duct. The gallbladder was also pulled through sized templates and a commercially available endoscopic overtube (16.7 mm) to determine minimal diameters through which each gallbladder could be pulled through. Basic demographic data such as age, weight, and gender were recorded.

**Results:** There were a total of 57 subjects (46 female, 11 male) with a mean age and BMI of 41.8 years and 30.69 kg/m<sup>2</sup>, respectively. Thirty two (56%) of gallbladders remained intact after resection while 25 (44%) were perforated during dissection. Mean values were calculated for gallbladder length (91.27 ± 19.38 mm), width (32.37 ± 6.91 mm), and depth (14.84 ± 7.94 mm), as well as for residual cystic duct length (3.06 ± 2.49 mm) and diameter (5.74 ± 1.77 mm). The mean gallbladder diameters based on pulling through our template was 22.01 ± 6.43 mm. Nine out of 32 intact gallbladders could be passed through the endoscopic overtube, while 12/26 of the non-intact ones could be passed through. Cystic duct diameters were greater than 6 mm, 7.5 mm, and 10 mm in 60.7%, 92.9%, and 96.4% of the specimens, respectively.

**Conclusion:** This is the first study to document dimensional human gallbladder data that may be useful in the development of NOTES. Our data shows that despite a 44% perforation rate during resection, a majority of resected gallbladders are too large to fit through a commercially available endoscopic overtube, indicating a need to develop an appropriately sized overtube and/or endoscopically deployable retrieval bag. Our data also show that 10 mm endoscopic clips would successfully ligate cystic ducts in the majority of patients undergoing cholecystectomy. Future endeavors include continuing the collection of samples to expand the database, and comparing predicted gallbladder sizes from ultrasound findings with their actual sizes; the latter could help determine if ultrasound analyses may be used effectively to predict eligible candidates for NOTES cholecystectomies.

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**SCARLESS ONE PORT TRANSMUBILICAL LAPAROSCOPIC SLEEVE GASTRECTOMY**

Fernando Arias MD, Nubia Prada MD, Hospital Universitario de la Fundación Santa Fe de Bogota

Laparoscopic sleeve gastrectomy is usually performed using several trocars. We report a case of a single port sleeve gastrectomy in a 42 year-old, female morbidly obese with a BMI of 42 kg/m<sup>2</sup>.



Through a 2-cm single transumbilical incision Triport® was inserted and rotator instruments were used. To retrieve the specimen we partially used the device and then grasped out the abdominal cavity. Next day an upper gastrointestinal contrast study was done without evidence of leaks or stenoses. A full liquid diet was started and after 2 weeks following surgery the patient had lost 23 lbs. Our objective is to report the feasibility of performing a laparoscopic sleeve gastrectomy through a single incision using a multichannel device.

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**NATURAL ORIFICE SURGERY USING THE STOMAPHYX™ ENDOPLICATOR TO TREAT POUCH DILATATION AND GASTROGASTRIC FISTULA AFTER OPEN, NON-DIVIDED RYGB**

Melissa A deWolfe DO, Curtis E Bower MD, ECU Department of Surgery, Brody School of Medicine

**Introduction:** Natural orifice surgery using the StomaphyX endoplicator is an alternative approach to revisional gastric bypass surgery when post-op complications such as dilatation of the gastrojejunostomy, gastrogastic (GG) fistula, and gastric pouch dilation occur.

**Case Report:** A 45-year-old white female presented 12 years after an open, non-divided RYGB. Over the past six months, she no longer experienced early satiety and gained 40 pounds. An upper GI (UGI) revealed dilated gastric pouch and GG fistula, which was confirmed on endoscopy. The pouch was estimated to be 150-200 cc with a 2 cm GG fistula. The GJ stoma was also dilated. The patient elected to proceed with natural orifice surgery using the StomaphyX device. The device did not allow placement of plications directly at the fistula site but did allow placement of full-thickness fasteners in a concentric fashion from the gastrojejunostomy to the gastroesophageal junction. Pouch size was reduced to approximately 30-50 cc. Post-op UGI showed patent GG fistula, delayed flow through the GJ and marked decrease in pouch size. At 2 months post-op, the patient had regained early satiety and lost 25 pounds.

**Discussion:** The StomaphyX device places full thickness fasteners, creating gastric plications. This can be used to shrink stoma and gastric pouch sizes. One potential drawback of the device is that its overall structure and tip length somewhat limit the operator's ability to manipulate it. In our patient, although the gastro-gastric fistula remained open, the dilated gastric pouch and GJ stoma were successfully reduced. As a result, the restrictive portion of her procedure was recreated. Her early satiety returned and she began losing weight. The morbidity and mortality of revision gastric bypass was avoided while the patient's goal of moderate weight loss was achieved.

**Conclusion:** The StomaphyX is an alternative for repair of some post-bariatric complications. With the rapid advances of endoluminal technology and increasing experience with natural orifice surgery, the ability to successfully address surgical problems through less invasive means will continue to improve.

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### NOTES (NATURAL ORIFICE TRANSLUMENAL ENDOSCOPIC SURGERY) INGUINAL HERNIA REPAIR: A SURVIVAL MODEL

Danny A Sherwintner MD, Maimonides Medical Center, Department of Minimally Invasive Surgery, Brooklyn, N.Y.

**Background:** Many of the characteristics of inguinal hernia repair are especially well suited to the transgastric approach. The repair is inline with the transgastric scope vector, bilateral defects are adjacent and the intraperitoneal onlay mesh (IPOM) technique does not require significant manipulation or novel instrumentation. The purpose of this study was to evaluate the safety and durability of natural orifice transluminal endoscopic surgery (NOTES) bilateral inguinal herniorrhaphy (BIH) using the IPOM technique in a survival canine model. **Materials and Methods:** Under general anesthesia five male mongrel dogs weighing 20–30kgs had a dual channel endoscope introduced into the peritoneal cavity over a percutaneously placed guidewire. An overtube with an insufflation channel was used. Peritoneoscopy was performed and bilateral deep and superficial inguinal rings were identified. The scope was removed, premounted with a 4 × 6 cm acellular dermal implant (Lifecell, Branchburg, NJ) then re-advanced intraperitoneally via the overtube. The implant was then deployed across the entire myopectineal orifice and draped over the cord structures. Bio-glue was then applied and the implant was attached to the peritoneum. Following completion of bilateral repairs the animals were survived for 14 days. At the end of the study period the animals were euthanized and necropsy performed. Cultures of a random site within the peritoneal cavity and at the site of implant deployment were obtained. In addition a visual inspection of the peritoneal cavity was performed.

**Results:** Five dogs underwent pure NOTES IPOM BIH. Accurate placement and adequate myopectineal coverage was accomplished in all subjects. All animals thrived postoperatively and did not manifest signs of peritonitis or sepsis at any point. No adhesions or abscesses were found related to the implant deployment site and all cultures had no growth.

**Conclusions:** This study confirms that NOTES IPOM BIH can be performed safely and warrants human trials.

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### WHO'S AFRAID OF NATURAL ORIFICE TRANSLUMENAL ENDOSCOPIC SURGERY (NOTES)?

Danny A Sherwintner MD, Department of Minimally Invasive Surgery, Maimonides Medical Center, Brooklyn NY, USA

**Introduction:** Intraabdominal surgery using a flexible endoscope combines the skills of both gastroenterologists (GI) and minimally invasive surgeons (MIS). Deficiencies in each of these standard training models include the lack of familiarity with complex intraabdominal maneuvers, for physicians with a GI background, and difficulty operating without a fixed horizon, for those with an MIS background. **Materials and Methods:** Nine individuals were tested; four attending gastroenterologists with advanced interventional endoscopy skills (G1), three attending laparoscopic surgeons without significant flexible endoscopy experience (G2) and two members of our NOTES lab (G3) which consists of a multidisciplinary team of surgeons and gastroenterologists. Each individual performed two timed exercises using a flexible endoscope to execute a highly demanding multistep task. The first task was performed with the horizon maintained (orientation 1: O1) and the second task was performed with the scope in retroflexion (orientation 2: O2). A mean time was calculated from 5 repetitions in each orientation.

**Results:** G1 performed significantly better than G2 in both orientations but with repetition G2 was able to perform O1 as well as G1. O2 remained difficult for G2 even with practice. G3, regardless of background, was able to complete tasks in either orientation more rapidly than G1 or G2.

**Conclusions:** Although endoscopy training alone was better than MIS training alone in preparing individuals to perform these specific NOTES tasks, either background when combined with focused NOTES training was superior. This study supports the formation of NOTES training programs with candidates culled from both MIS and GI.

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### TRANSVAGINAL ENDOSCOPIC TUBAL STERILIZATION – CASE REPORT

Alcides J Branco Filho MD, William Kondo MD, Rafael W Noda MD, Anibal W Branco MD, Marlon Rangel MD, Cruz Vermelha Hospital, Curitiba, Paraná, Brazil

**Introduction:** Tubal sterilization is one of the most widely used options for female contraception. It can be performed by laparotomy, mini-laparotomy, colpotomy, laparoscopy, and hysteroscopy. In this paper we report the use of the transvaginal endoscopic approach to perform tubal ligation.

**Methods and Procedures:** The access to the abdomen was obtained by a 1.5-cm colpotomy. The flexible endoscope was introduced into the peritoneal cavity, and carbon dioxide was instilled to get the pneumoperitoneum. Fallopian tubes were identified and electrocauterized with a 40 W coagulation current.

**Results:** Total procedure time was 45 minutes. A single dose of intravenous dypirone was administered for pain. She was discharged 10 hours after the procedure.

**Conclusion:** Transvaginal endoscopic tubal ligation is feasible and can be considered an alternative approach to perform female sterilization.

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### INTRAOPERATIVE CARDIOPULMONARY EFFECTS OF NATURAL ORIFICE TRANSLUMENAL ENDOSCOPIC SURGERY (NOTES) COMPARED TO TRADITIONAL SURGERY

Danny A Sherwintner MD, Department of Minimally Invasive Surgery, Maimonides Medical Center, Brooklyn NY, USA

**Introduction:** Interest in natural orifice transluminal endoscopic surgery (NOTES) is fueled by the possibility that it may represent a less invasive method of abdominal surgery. To objectively evaluate this, we compared the intraoperative cardiopulmonary effects of NOTES versus traditional surgery.

**Materials and Methods:** Nine mongrel dogs undergoing bilateral inguinal herniorrhaphy (BIH) were used for this study. Three subjects underwent standard open BIH, three underwent laparoscopic intraperitoneal onlay mesh (IPOM) BIH and three had their bilateral IPOM mesh placed transgastrically (NOTES). Intraoperative monitoring included heart rate (HR), blood pressure (BP), oxygen saturation (SpO<sub>2</sub>), temperature (Temp) and airway pressures (AP).

**Results:** No statistically significant difference was noted among the groups in any of the evaluated parameters.

**Conclusions:** This study confirms that from a cardiopulmonary standpoint NOTES is not more stressful to the subject than either of the two standard surgical methods.

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### THE DEVELOPMENT AND TESTING OF NEW RIGID AND FLEXIBLE FIXATION STAPLERS FOR NOTES APPLICATIONS

William Fox BS, Sean Conlon BS, Dave Griffith BS, Greg Bakos MS, Michelle T Lewis BA, Kurt R Bally BS, Suzanne Thompson. The NOTES Development Group, Ethicon Endo-Surgery, Cincinnati, Ohio

**Background:** Many of the devices used in early human NOTES procedures were originally designed for intraluminal work and are therefore limited in functionality due to constraints imposed by current flexible endoscopes. The invention of large diameter flexible trocars, however, has opened the door for delivery of true surgical capabilities such as stapling. Additionally, the transvaginal approach to NOTES procedures allows the surgeon to add long, rigid, instruments to his current flexible toolkit. These new capabilities may enable application of NOTES techniques beyond the current interest in cholecystectomy.

**Objective:** Leverage rigid and flexible approaches to develop new box stapling devices for tissue apposition and material fixation, i.e., hernia reinforcement mesh, in NOTES procedures.

**Materials & Methods:** All staplers were used in IACUC-approved acute porcine labs. Laparoscopic vision and manipulation for mesh placement were employed. The devices were used transgastrically (flexible) and transvaginally (rigid, flexible) to affix the edges of 4 cm oval-shaped mesh patches (PROLENE, Ethicon, Inc., Somerville, NJ) to the abdominal wall.

Two rigid box-staple prototypes were used. The first was single-fire, reloadable, 10 mm diameter and 40 cm long, firing a titanium staple into a 3 x 5 mm 'box' shape. The second was a multi-fire, 12 mm diameter device, fitted with a distal articulating, rotating cartridge containing 20 staples that are also formed into 3 x 5 mm shapes.

Three flexible shaft staplers were used through the Steerable Flex Trocar (SFT) from the NOTES Toolbox (Ethicon Endo-Surgery, Cincinnati, Ohio). One device was 12 mm diameter and battery-powered; the other two were 8 mm and 12 mm diameter hand-fired devices. Two of the staplers were single-fire, reloadable, 40 cm long and delivered 2 x 4 mm box staples. The third device was a multifire, 120 cm long device delivering 3 x 5 mm box staples from the same articulating, rotating, cartridge used on the rigid platform. These flexible staplers were grossly guided to the appropriate anatomical location via the articulation capability of the SFT.

**Preliminary Results:** All five stapling devices were used to successfully staple and fix mesh to the abdominal wall. As expected, use of a multi-fire device reduces the amount of time required to affix the mesh. Device rotation and articulation enabled more precise application of the staples. Further improvements in targeting and staple release are still needed. **Conclusions/Expectations:** Transgastric NOTES approaches for affixing hernia mesh to the abdominal wall are feasible using flexible shaft box-stapling devices - described for the first time herein - in conjunction with flexible trocars. Additionally, long, rigid, stapling devices may be used transvaginally. Although additional procedure-specific challenges still need to be addressed, notably sterile mesh delivery, ventral, and potentially inguinal, hernia procedures appear to be feasible from a NOTES approach.

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### TRANSVAGINAL DIAGNOSTIC PERITONEOSCOPY IN WOMEN WITH PELVIC PAIN

Klaus Thaler MD, Kelly M Sullivan RN, Breton F Barrier MD, Brent W Miedema MD, University of Missouri

**Purpose:** Chronic pelvic pain affects many women in reproductive age in the US and laparoscopy is common in the diagnostic algorithm. In the realm of NOTES, a transvaginal approach would be a natural approach to reduce incision sites, postoperative pain and improve cosmesis in this patient population. This is the first report of transvaginal diagnostic peritoneoscopy with tissue biopsy using a flexible GI-endoscope.

**Methods:** The study was designed as a prospective phase I study and approved by the institutional IRB. Inclusion criteria were women of reproductive age over 18 with a minimum 6-month pain history. A 20 year old patient fulfilled the criteria and was enrolled. Under general anesthesia and lithotomy position, a 5 mm transumbilical port was placed for laparoscopic exploration and pneumoperitoneum created. After placement of a 10 mm trocar via posterior colotomy, a conventional gastroscope (GIF-160, Olympus) was inserted into the pelvis and peritoneoscopy performed.

**Results:** Complete pelvic exploration was performed via transvaginal approach including uterus, adnexae, rectosigmoid, cecum and appendix. Pneumoperitoneum was maintained at 6 mm Hg. Exploration of the deep pelvis and biopsy could be achieved with the gastroscope only while laparoscopy would have required additional ports for retraction. Overall operative time was 66 minutes. Time required to gain trans-vaginal access = 17 min. Transvaginal exploration time = 34 min. Colpotomy was closed with a single running suture. The patient was discharged 2 hours after surgery. Postoperative narcotic intake included 2 mg Morphine Sulfate iv and 10 mg oxycodone po. On POD 7, pain score was 0 (VAS 0-10) with no narcotic use, cosmesis score (Dunker) indicated high satisfaction.

**Conclusion:** Transvaginal peritoneoscopy with a flexible GI-endoscope is feasible and safe. It may provide advantages over standard laparoscopy regarding visualization, accessibility, postoperative outcome and potential as an ambulatory procedure in the future.

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### ENDOSCOPIC MYOTOMY OF THE LOWER ESOPHAGEAL SPHINCTER—A MODEL FOR GASTROESOPHAGEAL

#### REFLUX

E A Moran MD, E Rajan MD, J A Murray MD, C J Gostout MD, Mayo Clinic-Rochester, MN.

- Objective of the study: A reproducible animal model for gastroesophageal reflux would aid in advancing endoscopic intraluminal therapies for GERD. In this study we performed a full thickness myotomy through the lower esophageal sphincter (LES) onto the gastric cardia incorporating our submucosal endoscopy with mucosal safety flap (SEMF) technique in efforts to establish a true reflux model.
- Description of the methods: 1 month survival feasibility study with 6 domestic pigs. Under general anesthesia, a diagnostic endoscope (Olympus GIF-160) was advanced into the gastric cardia and the mucosa tattooed with a sterile carbon particle solution. The scope was then withdrawn to 8 cm above the LES. Our previously described SEMF technique created a submucosal working space for insertion of a cap-fitted endoscope. Dissection proceeded within this space from the esophagus onto the gastric cardia (previously tattooed). The muscularis propria was identified and divided inside the submucosal space. The myotomy was carried from 5 cm below the gastroesophageal junction (GEJ) to 5 cm above. The mucosal entry site was closed with clips. Technical feasibility of a tunneled full thickness myotomy was assessed. Esophageal reflux was detected using the Bravo capsule pH detection system (Medtronic, Inc.) at four time points.
- Preliminary results: The SEMF technique successfully accessed the muscularis propria in 5 of 6 animals. In one animal dissection into the GEJ led to perforation through the muscularis prematurely into the mediastinum. In 2 of the remaining 5 animals, submucosal dissections at the level of the GEJ led to mucosal perforation into the gastric lumen. These three animals were euthanized. All remaining animals were noted to have an increase in percent reflux time from pre- to post-myotomy (Table 1).

Table 1 Summary of pH results from pre- to post-myotomy \*indicates early release of the bravo capsule Fraction of time pH < 4%

Animal ID	#1(pre)	#2(post)	#3(2wk)	#4(4wk)
878	3.3*	5.6	14.7	21.9
879	0.4	1.4	3.6	4.3
887	0.6	0	20.3	1.8

- Conclusions: The SEMF technique can provide safe full thickness myotomy of the lower esophageal sphincter. The porcine GEJ may not offer an ideal anatomy to test this methodology given the difficulty extending the submucosal dissection onto the cardia. Until a more ideal animal model is identified, submucosal dissection must be carried out gently and guided posteriorly to prevent perforation into the luminal gastric cardia. This pilot study suggests that this is a feasible technique to provide a reproducible and reliable reflux animal model.

22501

P266

### TRANSESOPHAGEAL MEDIASTINAL LYMPH NODE SAMPLING

E A Moran MD, M J Levy MD, E Rajan MD, C J Gostout MD, Mayo Clinic-Rochester, MN.

- Objective of the study: Improved minimally invasive lymph node sampling for cancer staging and diagnosis of mediastinal lymphadenopathy is desirable. Natural orifice approaches may offer improved minimally invasive options. We have previously reported on the technical feasibility and the potential low risk of transesophageal mediastinoscopy using the submucosal endoscopy with mucosal flap safety valve (SEMF) technique. In this study we evaluated the technical feasibility and safety of transesophageal mediastinal lymph node sampling.
- Description of the methods: 2 week survival study with 4 domestic pigs. Under general anesthesia, mediastinal lymph nodes were identified by endoscopic ultrasound (EUS) and by marked with a sterile carbon particle solution by transesophageal FNA. A standard diagnostic endoscope was then advanced into the esophagus. High-pressure carbon dioxide submucosal injection followed by balloon dissection created a submucosal working space for insertion of a cap-fitted endoscope. Snare resection of the muscularis propria at the distal end of the submucosal tunnel allowed entrance into the mediastinum. Marked lymph nodes were identified by paracrotic and paraesophageal dissection and either sampled with biopsy forceps or removed by snare. The muscular defect was sealed with the overlying mucosal flap, and the offset mucosal entry site was closed with clips.
- Preliminary results: Lymph nodes were located and harvested in three pigs. The fourth animal was euthanized due to intraoperative respiratory distress. Harvested tissue was pathologically verified as nodal tissue and revealed inflammatory changes in 2 of the 3 animals. Endoscopy and necropsy were performed 2 weeks after the procedure. The SEMF technique provided successful access to the posterior mediastinum in all animals. Two pigs survived 2 weeks without clinical complications, and the defects were completely sealed by the mucosal flap. One of these animals had an asymptomatic mediastinal abscess. The third animal expired in the immediate post-operative period. Identification of lymph nodes was difficult in this animal prolonging the procedure. Necropsy of the two deceased animals did not reveal an operative cause of death.
- Conclusions: Transesophageal mediastinal lymph node sampling using the SEMF technique proved feasible. Mechanical ventilation is required intraoperatively to prevent respiratory related morbidity. Discerning marked lymph nodes from vascular structures was challenging due to blue/black marking. New labeling techniques would improve the efficiency and safety of this procedure. Further refinement of this technique may advance cancer staging and diagnosis of lymphadenopathy by offering efficient, safe, minimally invasive tissue harvest.

22560

P267

MAGNETIC RETRACTION OF THE GALLBLADDER DURING NOTES TRANSVAGINAL CHOLECYSTECTOMY IN A PORCINE MODEL: A NOVEL TECHNIQUE

John R Romanelli (1) MD, David J Desilets (1) MD, Tyler E McLawhorn (2) BS, David B Earle (1) MD, (1) Baystate Medical Center, Tufts University School of Medicine, Springfield, MA and (2) Cook Endoscopy Inc., Winston-Salem, NC

Introduction: As the advent of the NOTES era dawns, novel techniques for tissue retraction may be necessary to allow for safe surgical procedures to be performed. There have been multiple case reports of magnets being used to help with retraction during NOTES procedures. Most of these reports employ some type of metallic object placed on the outside of the target organ. Given that the gallbladder is a hollow viscus, we chose to attempt to inject the lumen with a liquid magnetorheologic fluid to see if retraction with this technique was possible.

Methods: In a 35-kg Yorkshire female pig, we gained transvaginal access to the peritoneum with a double-channel therapeutic endoscope. The gallbladder was identified, and was grasped with an alligator forceps. It was retracted in the cephalad direction to bring it into close proximity with the abdominal wall. A 14-gauge needle was used to puncture the abdominal wall and gallbladder. 5 cc of Lord MR (magnetorheological) fluid (Lord Corp., Cary, NC) was injected directly into the gallbladder lumen. A Neodymium iron boron (Nd2Fe14B) magnet measuring 3 x 1.5 x 0.75 in was placed on the outside of the abdominal wall. The gallbladder magnetically attached to the peritoneum successfully and remained there for the entire duration of the case.

Results: We employed a Nd2Fe14B magnet with a maximum flux density of 1.27 teslas resulting in a maximum field strength of 40 megagauss-oersteds. Gallbladder retraction with this strength magnet was successful. We were able to easily move the magnet around on the abdominal wall, and the gallbladder moved in concert with it. We were able to successfully dislodge the gallbladder using endoscopic tools or by lifting the magnet away from the abdominal wall. We completed the NOTES transvaginal cholecystectomy in approximately 60 minutes. No further tools were employed to aid in gallbladder retraction throughout the case. Of note, some of the Lord MR fluid leaked out of the puncture site, and this fluid was magnetically attracted to the abdominal wall, making suctioning and irrigation of this fluid quite easy.

Discussion: While the use of intraluminal magnetorheological fluid is certainly a novel technique, questions about toxicity of the substance remain. A review of the MSDS sheet suggests that the substance can cause skin or lung irritation, but instructions on first aid after ingestion recommends that ingestion of water or milk is sufficient, signifying that exposure to the GI tract may be safe. Survival animal studies, as well as further information regarding toxicity would be necessary prior to human implementation of this technique. Also, storage of industrial strength magnets in the operating room environment could be problematic due to the amount of electronic instrumentation. Nevertheless, the use of intraluminal magnetic fluid as an aid to visceral retraction may have some use in NOTES procedures and should be investigated further.

22589

P268

THE DIAGNOSTIC EFFICACY OF NATURAL ORIFICE TRANSLUMENAL ENDOSCOPIC SURGERY (NOTES): IS THERE A ROLE IN THE INTENSIVE CARE UNIT?

Joseph A Trunzo MD, Benjamin K Poulouse MD, Michael F McGee MD, Mehrdad Nikfarjam MD, Judy Jin MD, Steve J Schomisch BS, Raymond P Onders MD, Alex Chaitoff, Amitabh Chak MD, Jeffrey L Ponsky MD, Jeffrey M Marks MD, University Hospitals Case Medical Center

Background: Evaluation of a potential source of abdominal sepsis in a critically ill patient can be challenging. With flexible endoscopy being readily available in this setting, we sought to evaluate the diagnostic efficacy of a trans-gastric NOTES peritoneoscopy vs. laparoscopic exploration in the identification of common intra-abdominal pathology in a porcine model.

Methods: In this acute study, 15 pigs were randomized to demonstrate 0 to 4 pathologic lesions: small bowel ischemia (SBI), Small bowel perforation (SBP), Recto-sigmoid colon perforation (CP), and gangrenous cholecystitis (GC). Two blinded surgeons were allowed 60 minutes to perform NOTES or laparoscopy (LAP) to correctly identify or exclude each lesion. A prototype endoscope (NOTES-scope, Olympus, Inc), which incorporates two independently mobile channels for aided technical ability, was used in the NOTES arm.

Results: When considering all potential lesions, LAP correctly identified or ruled out pathology only slightly better than NOTES (85% vs. 80%). LAP was also more sensitive diagnostically (77.4% vs. 61.3%), overall. However, NOTES was 100% specific with 100% positive predictive value (PPV) compared to 93.1% and 92.3% with LAP, respectively. Individually, NOTES was best at CP identification and fared poorest for SBP (see table, NPV = negative predictive value).

Table with 4 columns: Lesion, Sensitivity, Specificity, NPV. Rows include SBI, SBP, CP, and GC.

Conclusion: The utilization of NOTES as a diagnostic tool may have an important role in the critically ill patient population when operative intervention is highly morbid. While it may be inferior in detecting all pathology compared to laparoscopy, a positive identification was highly specific with a strong predictive value. Further investigation addressing an improved small bowel evaluation technique, however, would be beneficial and warranted. A human trial considered in the current state would still mandate laparoscopic confirmation.

22648

P269

PERORAL TRANSGASTRIC CHOLECYSTECTOMY: A CASE REPORT OF TWO HUMAN PATIENTS

Chinnusamy Palanivelu MS, Pidigu Seshiyer Rajan, Ramakrishnan Parthasarathi, Palanisamy Senthilnathan MS, GEM Hospital & Research Institute

Aim: NOTES represents an emerging technology, including under its umbrella a variety of approaches and combinations. We present 2 human patients who underwent trans-gastric cholecystectomy. Methods: In April 2008, 2 patients underwent transgastric cholecystectomy at our institute. The procedure entailed the use of a double-channel endoscope, a 3-mm umbilical port for retraction of gall bladder and pneumoperitoneum. Closure of gastrotomy was done with endo-clip in one patient and with suture closure using knot pusher for the other patient using an extra 5-mm port. Results: Average age was 44.5 years and mean BMI 26 kg/m2. The mean operating time was 148.5 minutes. Both patients were started on liquids on the 2nd postoperative day and discharged on the 4th postoperative day. There were no complications. Conclusion: Based on our experience, the transgastric approach seems to be a viable technique of NOTES for cholecystectomy in humans. Since the 3 mm trocar was placed in the umbilicus, there was no visible scar. Minor setbacks include lack of triangulation and cumbersome instrumentation. Currently, adequate gastrotomy closure is the most nagging problem facing the transgastric technique.

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P270

TRANSVAGINAL ENDOSCOPIC APPENDECTOMY IN HUMANS: AN UNIQUE APPROACH TO N.O.T.E.S - OUR INITIAL CASE SERIES

Chinnusamy Palanivelu MS, Pidigu Seshiyer Rajan MS, Ramakrishnan Parthasarathi, Palanisamy Senthilnathan MS, GEM Hospital & Research Institute

Background: NOTES is the newest technique emerging in the field of surgery. We describe the transvaginal approach for endoscopic appendectomy in humans, probably the world's first report. Materials and Methods: Out of a total of 6 patients, a totally endoscopic transvaginal appendectomy was successfully performed for 1 patient. Pneumoperitoneum was achieved via a Veress needle in the umbilicus. Peritoneal access was gained via a transvaginal approach through the posterior fornix. Results: The other 5 patients were either converted to conventional laparoscopy or aided by a laparoscope. The average age of the patients was 29.5 years. The mean operating time was 103.5 minutes. Hospital stay was 1-2 days. The vaginal wound was examined by the gynecologist and found to have completely healed during the first and second follow up. Discussion: So far in humans, trans-gastric appendectomy and cholecystectomy, and transvaginal cholecystectomy have been reported. A transvaginal endoscopic appendectomy in humans has not been reported yet. The technical ease of the procedure and early outcome seem satisfactory, though comparative studies are needed to confirm this.



22704

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### NATIONAL STUDY OF HIGHER SURGICAL TRAINEES AS ENDOSCOPISTS –

David Nasralla MD, S Khan MSc, B Soin MSc, J Ramus MSc, Department of General Surgery, Wexham Park Hospital, Slough, Berkshire, UK

**Introduction:** Surgical training in England is once again in the midst of a vast upheaval. The introduction of the European Working Time Directive (EWTD) combined with shortened training time poses problems with regards to sufficient exposure to procedures for surgical trainees. This clearly has implications with regards to the role of the surgeon as an endoscopist, particularly given the expectation that these same surgeons will lead the development of NOTE surgery. Having already surveyed the views of surgical trainees in the Oxford region in this regard, we now intend to present the findings from extending this questionnaire nationwide.

**Methods:** A web-based questionnaire was designed and forwarded to surgical trainees throughout the UK. This examined trainee's current endoscopy experience including attendance at courses, timetable availability - with potential for further endoscopy training sessions - and perception of importance of endoscopy training compared with other aspects of surgical training.

**Results:** Our nationwide study has very much re-iterated the findings of our preliminary survey of trainee surgeons in the Oxford region, suggesting that GI trainees feel that endoscopy skills are desirable and necessary for future surgeons, particularly given their role in the on-call rota. However, very few are attaining the number of gastroscopies or colonoscopies required by the ISCP. Less than a quarter had dedicated weekly endoscopy sessions, although many trainees did have free time in their timetable, whilst still being EWTD compliant, in which further specialisation could be undertaken.

**Conclusion** It seems clear that in order to retain endoscopic prowess under the restrictions imposed by the EWTD, surgeons need to work towards completing targets set by governing bodies worldwide. In the dawning era of NOTE surgery, the importance of surgeons as endoscopists cannot be undervalued and more emphasis is needed on its training if we wish to advanced as endoscopists, as well as NOTE surgeons, in the future.

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### COMPLETELY TRANSVAGINAL NOTES CHOLECYSTECTOMY IN A PORCINE MODEL USING NOVEL ENDOSCOPIC INSTRUMENTATION

Antonio O Castellvi MD, Shou J Tang MD, Deborah C Hogg BS, Philip W Ho BS, Lisa A Hollett RN, Christopher O Olukoga MD, Jeffery A Cadeddu MD, Daniel J Scott MD, Southwestern Center for Minimally Invasive Surgery, UT Southwestern Medical Center

**Introduction:** Transvaginal NOTES Cholecystectomy has been successfully performed but all reports have required laparoscopic assistance. The purpose of this study was to perform completely transvaginal cholecystectomy in a porcine model.

**Methods:** Pigs 1–5 underwent non-survival and Pigs 6–8 underwent 14-day survival procedures. Through a vaginotomy, a 2T gastroscope and an 18 mm x 38 cm access port were inserted into the peritoneal cavity using a Veress needle-balloon system, a rigid optical obturator, or blunt dissection. A long 5 mm rigid grasper inserted transvaginally was used for tissue manipulation. Percutaneous or endoscopic T-tags were used to fixate the gallbladder fundus to the peritoneum for retraction. Dissection was performed using prototype and conventional endoscopic instruments including a straight or articulating hook cautery, snare, maryland dissector, clip applier, grasper, scissors and injection needle. Values are mean  $\pm$  S.D.

**Results:** Operative time was  $207 \pm 43$  minutes, blood loss was  $90 \pm 136$  cc, and bile spillage was minimal. Procedures were terminated in Pig 1 due to liver bleeding and in Pig 5 due to endoscope malfunction. Six procedures (3 non-survival, 3 survival) were completed, with only partial cholecystectomy achieved in Pig 2 but complete cholecystectomies achieved in Pigs 3–4 and 6–8. Percutaneous T-tags were used only in Pig 1; in Pigs 2–8, endoscopic T-tag suturing required substantial operative time for placement (20–80 min) but provided uniformly successful retraction. The articulating endoscopic hook and snare, as well as the non-articulating maryland dissector, proved most useful for dissection. The long transvaginal grasper (Pigs 2–8) and creation of a saline lift (Pigs 3–8) greatly facilitated infundibulum manipulation and dissection, respectively. A second generation endoscopic clip applier with tightly approximating clips (Pigs 6–8) improved artery and duct occlusion. At autopsy, Pigs 1, 4 & 5 had liver and/or cystic artery bleeding; in all other animals there were no complications and all survival animals thrived post-operatively.

**Discussion:** Transvaginal cholecystectomy without laparoscopic assistances is feasible in a porcine model by combining gallbladder suture retraction, a transvaginal rigid grasper, and novel endoscopic instrumentation. Further improvements in these technologies and operative strategies are expected to improve reproducibility and efficiency.

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### GASTROINTESTINAL BACTERIAL CLEARANCE LEVELIZER FOR NOTES USING A CLEANING UNIT AND A DIGITAL IMAGE ANALYZER WITH A CONFOCAL LASER MICROSCOPE

Takeshi Ohdaira MD, Yoshikazu Yasuda MD, Jichi Medical University Department of surgery

In NOTES, it is mandatory to maintain a high bacterial clearance level in the gastrointestinal tract, the route of access to intraperitoneal cavity. In NOTES that is conducted through the lower gastrointestinal tract that is convenient among routes of access to intraperitoneal cavity, it is very difficult to obtain a bacterial clearance level at which no peritonitis occurs. We invented and hereby report a high-speed cleaning unit that efficaciously cleans the gastrointestinal tract, as well as an evaluation method that uses a confocal laser observation device that can instantaneously evaluate the bacterial clearance level in the gastrointestinal tract after clearance and a digital imaging analyzer.

**High-speed cleaning unit:** It consists of 1) a cleaning pump that has a high-speed rotating fin which cleans the balloon for sealing to ensure bacterial clearance level in the disinfected and cleaned gastrointestinal tract and its anal end, as well as of 2) a short-type straight laparoscope insertion guide for observation. **Laser observation unit to evaluate bacterial clearance level:** A rinse water circulation circuit for observation was designed to lead rinse water present in the gastrointestinal tract after clearance with the high-speed cleaning device onto a slide glass with a microguide for rinse water supply. It is possible to evaluate the microscopic contamination level of rinse water in the gastrointestinal tract that is delivered onto the slide in a real time basis by setting the circuit tip to the water supply nozzle of an endoscope for NOTES. The laser unit uses a digital image analyzer to distinguish bacteria from stool mass or epithelial cells of the gastrointestinal tract. The colon of 5 pigs was used to evaluate the macroscopic clearance level of the gastrointestinal tract and the bacterial count at the microscopic level. Consequently, we successfully verified the operable level for NOTES. This system was considered to be a useful tool for NOTES that requires the sterilization level of the gastrointestinal tract.

22998

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### TRANSGASTRIC ENDOSCOPIC BLOODLESS LIVER RESECTION USING RADIOFREQUENCY THERMAL ENERGY. AN EXPERIMENTAL STUDY

Konstantinos G Tsalis PhD, Emmanuil Christoforidis PhD, Petros Ypsilandis PhD, Konstantinos Blouhos MD, Konstantinos Vasiliadis PhD, Stavros Kalfiadis MD, Kristalia Moshota, Charalampos N Lazaridis, D' Surgical Department, Aristotle University of Thessaloniki Greece, Department of Experimental Surgery Demokritos University of Thrace Greece

**Objective:** To assess the feasibility and safety of transgastric endoscopic assisted hepatectomy using percutaneous radiofrequency thermal energy (PRF) in a porcine model.

**Methods:** Fourteen domestic male white pigs with a mean weight of 17.6 kg (range 15 to 21 kg) were used. Under general anesthesia a standard upper double-lumen endoscope was advanced perorally into the stomach. A needle-knife was used to make an incision into the anterior wall of the stomach, followed by introduction of a guidewire into the peritoneal cavity. An 18 mm over the wire balloon was used to distend the hole, and the endoscope was pushed into the peritoneal cavity. Pneumoperitoneum was created using the channel of the endoscope. Two trocars of 0.5 cm were placed for the introduction of atraumatic graspers to hold the liver. With the porta hepatis not clamped, the preferred lobe each time was divided using PRF. The resected liver was inserted in a plastic bag and pulled out with the endoscope through the esophagus. Finally the gastrotomy was closed using three to four clips. Serum liver enzymes and blood counts were drawn pre and post-operatively. All animals were killed after 1 week.

**Results:** The procedures performed were: 2 wedge resections, 2 left lateral lobectomies, 2 right lateral lobectomies, 2 left medial lobectomies, 2 right medial lobectomies, 2 left hepatectomies and 2 right hepatectomies. The mean time of the procedures was 135 minutes and the mean mass of the resected specimen was 90 g. There were no postoperative complications or deaths.

**Conclusion:** Transgastric endoscopic assisted hepatectomy using percutaneous radiofrequency is technically feasible and safe in the porcine model.

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### EVALUATION FOR DOUBLE BALLOON SEALING OF GASTRIC PERFORATION IN TRANSGASTRIC NOTES

Maki Sugimoto MD, Veterans Affairs Palo Alto Health Care System, Stanford University, Teikyo University

**Introduction:** Transgastric route is one of the most major accesses in NOTES. Gastric perforation has been the major challenge because of the risk of peritonitis and consequent complications. The original gastric incision is usually dilated because of the constant movement of the endoscope, the dislodgement of the endoscope from gastric orifice prolongs the procedure time. To overcome the limitations of transgastric NOTES, we developed novel prototype double balloon multi-bending dual channel flexible endoscope (DBMBDE) in transgastric surgery. We describe the feasibility of DBMBDE in 14 survival animal models. **Methods and Procedures**

We developed a new double balloons system attached to the tip of the multi-bending double channel endoscope. The new double-balloon multi-bending endoscope features two balloons and two angles, one attached between two flexible angles and the other attached to a proximal angle. When inflated with air, the balloons can grip the gastric orifice by sealing it between them. After organ phantom experiments, transgastric peritoneoscopy was performed in 10 survival porcine and canine models. A DBMBDE was inserted per orally under carbon dioxide insufflation. Gastric wall perforation was applied, the endoscope was advanced into the peritoneal cavity. Two balloons attached to the DBMBDE were inflated in and outside of the gastric wall and sealed the gastric orifice. After endoscopic abdominal exploration, jejunal resection, cecal resection, and cholecystectomy were performed, gastric wall was closed using the clips.

**Result:** According to sealing gastric orifice between double balloons, the gastric juice leakage was completely obviated. Gastric injury was decreased due to good vascularization of the stomach. This procedure could allowed the safe performance of a controlled gastric perforation and shorten the procedure time due to fixing available scope position without further injuring the mucosa, or causing leakage of gastric secretion. No peritonitis was observed.

**Conclusions:** DBMBDE allows the performance of a controlled perforation and provides conditions for a safe and easy closure of the gastric wall without further injuring the mucosa, or causing leakage of gastric secretion. The control of pneumoperitoneum may become easier by gastric sealing. This might potentially overcome multiple intraperitoneal limitations in NOTES, and simplifies peroral transgastric surgery, could be used to decrease invasiveness.

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### TRANSGASTRIC ENDOSCOPIC PERITONEOSCOPY FOR EVALUATION OF THE ABDOMINAL WALL, ADHESIOLYSIS AND DIRECTION OF TROCAR PLACEMENT IN THE MORBIDLY OBESE

Peter N Nau MD, Benjamin Yuh BA, Joel Anderson MD, Lynn Happel MD, E. Christopher Ellison MD, W. Scott Melvin MD, Jeffrey Hazey MD, Division of Minimally Invasive Surgery - Department of General Surgery, The Ohio State University School of Medicine, Columbus, OH USA

**OBJECTIVE(S):** Diagnostic transgastric endoscopic peritoneoscopy (DTEP) has been used as a staging tool to evaluate the abdomen via a natural orifice. Visualization of the abdominal wall is excellent after transgastric endoscopic access. We now present our experience with transgastric endoscopic peritoneoscopy (TEP) to direct trocar placement and adhesiolysis in patients undergoing laparoscopic roux-en-y gastric bypass procedures (LSRYGB).

**Methods:** Forty patients scheduled to undergo LSRYGB for the treatment of morbid obesity will participate. There are two arms to the study. The initial 20 patients will undergo preinsufflation of the abdomen prior to TEP. The second 20 will have no preinsufflation. Ten patients in each arm have no history of abdominal operations. The other 10 will have had previous intra abdominal procedures. TEP is performed through a gastrotomy created using an orally placed gastroscope without laparoscopic visualization. Trocars are placed under endoscopic guidance. The gastrotomy is incorporated into the gastrojejunostomy. Diagnostic findings, operative times and clinical course are recorded.

**Results:** Thirty-five patients have completed the protocol to date. The average time for completion of the endoscopic intervention was 19 min. Three patients had limited visualization due to significant intra abdominal and omental fat (1) or adhesive disease (2). Three of the 19 who had no previous surgeries and 13 of 15 with a history of intra abdominal interventions had adhesions visualized endoscopically. Endoscopic adhesiolysis was performed in one and four patients in these groups respectively. Six occult umbilical hernias and one hiatal hernia were noted on endoscopic exploration. There were no complications related to intubation of the stomach, creation of the gastrotomy, or exploration of the abdomen. **Conclusions:** TEP is a safe and accurate means to visualize the abdominal wall, perform adhesiolysis and direct trocar placement in the morbidly obese. Gastric closure remains the sole limitation to its clinical use outside of a protocol necessitating a gastrotomy.

23160

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### NOTES NEPHRECTOMY: SEARCHING FOR THE BEST PATH

Pierre ALLEMANN MD, Silvana PERRETTA MD, Mitsuhiro ASAKUMA MD, Bernard DALLEMAGNE MD, Jacques MARESCAUX MD, IRCAD-EITS, University Louis Pasteur, Strasbourg, France

**Introduction:**Laparoscopic nephrectomy is replacing open radical nephrectomy as the standard of care and it can be performed by a transperitoneal and retroperitoneal approach. Data remain scanty as to whether any objective difference exists between the two approaches. NOTES may shift the decisional paradigm between the two techniques. In the attempt to establish the best way to approach the kidney, the feasibility of right nephrectomy was assessed by 3 different NOTES approaches: transgastric transperitoneal, transvaginal transperitoneal and transvaginal retroperitoneal.

**Materials and Methods:**The procedures were performed under general anaesthesia in three 30-35 kg female pigs. For transgastric nephrectomy, with the pig supine, the peritoneal cavity was entered with a double channel endoscope (Storz®) through a 1.5 cm gastrotomy. The pig was then tilted on a left later decubitus and the dissection of the kidney initiated with a lateral to medial approach opening the posterior peritoneal attachments with progressive isolation of the renal pedicle. For transvaginal transperitoneal nephrectomy, the endoscope was introduced into the peritoneal cavity through a full-thickness posterior colpotomy. After swithching from supine to a left decubitus, the mobilization of the kidney begun at its upper-medial surface and extended towards the hilum. The anterior and inferior aspect of the specimen were mobilized from the underside of the peritoneal envelope. For retroperitoneal transvaginal nephrectomy the retroperitoneum was entered through a postero-lateral colpotomy with preservation of the peritoneal sheet. A retroperitoneal tunnel was subsequently created with endoscopic blunt dissection up to the renal vessels.

**Results:** Transperitoneal NOTES nephrectomy is feasible in the porcine model by all the described techniques. Nevertheless when using transgastric and transvaginal transperitoneal approaches, the bulk of the kidney becomes a significant issue complicating the exposure with resultant cumbersome and time consuming (90 min and 70 min respectively) procedures. Retroperitoneal transvaginal nephrectomy permits a sequential dissection of the anatomical planes with expeditious access to the renal artery and vein and contained operative time (45 min).

**Conclusions:** Among all the explored techniques, transvaginal retroperitoneal nephrectomy offers several unique advantages such as excellent exposure, short operative time and the potential, of a safe transvaginal extraction of an intact organ.

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### NOVEL APPROACH TO NOTES GASTROTOMY CREATION USING THE ENDOSCOPIC CAP SUCTION TECHNIQUE

Denise W Gee MD, Field F Willingham MD, Brian G Turner MD, Dae K Sohn MD, Sevdenur Cizginer MD, Yusuf Konuk MD, Patricia Sylla MD, William R Brugge MD, David W Rattner MD, Massachusetts General Hospital, Boston, MA, USA

**BACKGROUND:** Numerous methods have been described for gastrotomy creation during Natural Orifice Transluminal Endoscopic Surgery (NOTES). These techniques are often blind, difficult to perform, or require temporary placement of a gastrotomy tube. The objective of this study is to create a safer method of NOTES gastrotomy creation.

**Methods:** A novel endoscopic cap suction technique was used for gastrotomy creation in 10 swine (6 non-survival, 4 survival). The prototype cap device (similar to an endoscopic mucosal resection (EMR) cap) was secured to the distal end of a gastroscope and easily inserted into the stomach. At the desired site, the gastric wall was suctioned into the cap. A straight cystotome was advanced through the full thickness of the gastric wall while holding continuous suction. A guidewire was advanced through the cystotome sheath followed by balloon dilatation. The gastroscope was then advanced easily into the peritoneal cavity and peritoneoscopy was performed. In six swine, immediate sacrifice and necropsy were performed. In four survival swine, the gastrotomy was closed with endoclips and necropsy was performed on post-operative day 10.

**Results:** Gastrotomies with easy peritoneal access were successfully created in all 10 animals. At necropsy, there was no evidence of cautery injury to surrounding organs in any of the animals. Two (20%) small splenic hematomas were found that appeared to be due to guidewire trauma. These injuries were subclinical. All 4 survived animals thrived in the postoperative period and gained weight.

**Conclusion:** The endoscopic cap suction technique allows for a controlled, safe method of NOTES gastrotomy creation. Its benefits include ease of gastrotomy site localization from within the gastric lumen, protection from blind advancement of a cautery instrument, and elimination of the need to traverse the abdominal wall. While guidewire injury remains a concern, continued refinement of this approach may eliminate such risks. Larger studies will be needed in the future to study this promising technique.

23307

**TOTAL TRANSGASTRIC APPENDECTOMY: A REALITY**

John J Cullen MD, Kari Thompson MD, Bryan Sandler MD, Adam Spivack MD, Brian Wong MD, Lauren Fischer MD, Mark Talamini MD, Santiago Horgan MD, Department of Surgery, University of California, San Diego

**Objective:** Natural orifice surgery is evolving into viable option for surgeons to have in their armamentarium. Totally NOTES operations have remained elusive due to safety concerns. The ability to safely enter the abdominal cavity blindly has remained a challenge therefore requiring one to multiple ports through the abdominal wall to observe entrance into the abdominal cavity. In our clinical NOTES cases we have placed a 3 mm trans-umbilical port for visualization of entrance into the peritoneal cavity. In a porcine model we have developed a safe, reliable and reproducible technique for a total transgastric appendectomy.

**Methods:** Five female pigs 45–55 kg were anesthetized under standard IACUC protocols. Using the USGI transport system we entered the abdominal cavity after balloon dilating our gastrostomy site. The transport system was introduced into the peritoneal cavity and maneuvered into the pelvis for a salpingectomy, mimicking an appendectomy. The operation was completed using exclusively endoscopic instrumentation. The transport device was then retracted from the peritoneal cavity into the stomach. The original balloon, used for gastrostomy site dilation, was inflated and used to tamponade the opening to maintain pneumogastrium, while the gastrostomy site was closed using a g-Prox device.

**Results:** All five pigs were euthanized at the end of the operation. Necropsy was performed at the conclusion of the operation. There was no damage to any of the surrounding tissue or organs from entry into the peritoneal cavity. The gastrostomy sites were closed tightly without evidence of leak.

**Conclusions:** Safe entrance and closure of the gastrostomy site during NOTES remains a critical aspect of the further of this technique. Clinically, to maintain safety, laparoscopic ports have been placed to watch the entrance and closure. This technique allows for safe entrance and closure of the gastrostomy site as a total NOTES procedure without the use of external ports.

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**DEVELOPMENT OF A PANCREATIC TUMOR ANIMAL MODEL AND ASSESSMENT OF FEASIBILITY OF NOTES™ TUMOR ENUCLEATION AS A MULTIDISCIPLINARY APPROACH – A NOSCAR™-FUNDED PROJECT**

Kai Matthes MD, Shyam J Thakkar MD, Suck-Ho Lee MD, Robert B Lim MD, Johannes Janschek MD, Alexandre Derevianko MD, Stephanie B Jones MD, Daniel B Jones MD, Ram Chuttani MD, Department of Surgery, Gastroenterology and Anesthesiology, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA

**BACKGROUND:** Laparoscopic distal pancreatectomy is associated with a high morbidity and mortality. We could demonstrate the feasibility of endoscopic transgastric distal pancreatectomy in the porcine animal model. NOTES tumor enucleation may provide an alternative to distal pancreatectomy. The goal of this study was to determine the feasibility of NOTES tumor creation and enucleation as a multidisciplinary approach.

**METHODS:** Six Yorkshire swine underwent general anesthesia with continuous measurement of cardiac output (CO), peripheral vascular resistance (PVR), and extravascular lung water (EVLW) using PiCCO technology (Pulsion Medical Inc). A linear-array EUS endoscope (Olympus America Inc.) was used to inject the thermo-sensitive alcohol-copolymer ReGel (Protherics Inc.) mixed with methylene blue through the stomach wall and into the distal pancreas using a 22-gauge EUS needle (Cook Medical Inc.). Due to its thermosensitive character, the ReGel solidifies in response to body temperature creating an artificial tumor. The relation of gel depot to the pancreatic duct was identified by EUS. A double-channel gastroscopy (Olympus America Inc.) was used to create a gastrostomy according to the PEG-technique as described by Kantesevov et al. Endoscopic tumor enucleation was performed using an electrocautery knife, snare, and forceps (Olympus America Inc.). The pancreatic duct was spared to reduce the risk of pancreatic duct leakage. The closure of the gastrostomy was performed with an investigational closure clip ('bear trap', Ovesco Inc.) using an over-the-scope technique. The non-survival animals were sacrificed after the closure of the gastrostomy and a laparotomy was performed to assess the tumor resection.

**RESULTS:** The pancreatic tumor was successfully created and resected via a transgastric endoscopic approach in 3/6 animals. In three animals, the tumor was visible by EUS, but was unable to be localized endoscopically. Distal pancreatectomy could still be performed successfully in those three animals. In post mortem study, no animals were identified showing tumor residual. All animals successfully underwent continuous measurement of CO, PVR, and EVLW using PiCCO technology.

**CONCLUSIONS:** The continuous impact of a complicated NOTES procedure on hemodynamics can be successfully monitored. The creation of pancreatic tumors by EUS-guidance is feasible but challenging. NOTES tumor enucleation is technically feasible and could be an alternative to distal pancreatectomy. The survival series of this study is currently in progress.

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**HYBRID TRANSVAGINAL NOTES SLEEVE GASTRECTOMY IN A POCINE MODEL USING A MAGNETICALLY ANCHORED CAMERA AND NOVEL INSTRUMENTATION**

Antonio O Castellvi MD, Shou J Tang MD, Richard Bergs MS, Juan Paramo BS, Deborah C Hogg BS, Philip W Ho BS, Lisa A Hollett RN, Raul Fernandez PhD, Jeffrey A Cadeddu MD, Daniel J Scott MD, Southwestern Center for Minimally Invasive Surgery, University of Texas Southwestern Medical Center

**Introduction:** The purpose of this study was to determine the feasibility of transvaginal NOTES sleeve gastrectomy using novel instrumentation in a porcine model.

**Methods:** Anesthetized pigs (non-survival (n = 7), 14-day survival (n = 1)) underwent sleeve gastrectomy procedures. Under endoscopic visualization, a 25 mm x 40 cm access port was inserted through a vaginotomy into the peritoneal cavity using blunt dissection (n = 5) or a rigid optical obturator (n = 3). A Magnetic Anchoring and Guidance System (MAGS) video camera was deployed intra-abdominally and used for subsequent visualization. A long 5 mm rigid grasper inserted transvaginally outside of the access port and a 3 mm laparoscopic grasper inserted through a transabdominal left flank trocar were used for tissue manipulation. Percutaneous T-tags were placed at the gastric fundus for retraction. A transorally placed gastroscope was used for gastric tube calibration. Prototype long (61–82 cm) transvaginal staplers were used for stomach and vascular division. Alternatively, an endoscopic bipolar sealing device was used for vascular division (n = 3). Values are mean ± S.D.

**Results:** Operative time was 169 ± 46 minutes and blood loss was 156 ± 109 cc. The entire procedure was completed in 4 of 8 cases. Incomplete procedures were due to stapler malfunction (3 cases) and esophageal transection (1 case). Gastric division was completed in 5 of 8 cases; in 4 cases, acceptable tube geometry and volume (165 ± 34 cc) were achieved with no staple line leaks detected in 3 cases. Stapled short gastric vascular division was completed in 7 of 8 cases; bipolar vascular sealing was ineffective in 3 of 3 attempted cases. The MAGS camera was used for 100% of the procedure in 8 of 8 cases but required flexible endoscopic assistance for illumination in 2 cases when the onboard LED's failed; significant fogging was encountered in 2 cases. At autopsy, there were 2 rectal injuries due to instrument insertion outside of the access port, 1 bladder injury due to optical obturator insertion, and 1 splenic vessel injury due to T-tag penetration. The survival animal thrived post-operatively and had no complications.

**Discussion:** Transvaginal sleeve gastrectomy appears to be feasible in a porcine model but complications may occur when instruments are inserted without appropriate visualization or protection within a transvaginal access port. Additional device development may yield improved outcomes.

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**NOTES TRANSGASTRIC CHOLECYSTECTOMY: ONE-YEAR FOLLOW-UP**

Michael M Awad MD, Peter M Denk MD, Timothy Kennedy MD, Michael B Ujiki MD, Christy M Dunst MD, Lee L Swanstrom MD, Legacy Health Systems, Portland, Oregon, USA

**Objective:** Natural orifice transluminal endoscopic surgery (NOTES) is still a new and investigative technique. To date, published short-term outcomes have been promising. Little is known about the long term effects of novel access routes for standard surgeries. Here we present long-term data of the first human transgastric cholecystectomies performed one year ago.

**Methods:** Four patients underwent transgastric cholecystectomy between May 2007 and October 2007. Each completed SF-36 quality of life questionnaires at one month and one year after their procedures. One month and one year SF-36 data were analyzed according to RAND SF-36 methodology and compared to 1998 U.S. norm-based data. Responses are grouped into standard 8 categories: physical functioning (PF), role limitations due to physical health (RP), bodily pain (BP), general health perceptions (GH), vitality (VT), social functioning (SF), role limitations due to emotional problems (RE), and general mental health (MH). Each patient was also asked two questions: 1) Would you go through this procedure again? and 2) Would you recommend this procedure to others?

**Results:** SF-36 scores are reported as (general population norms, 4-week mean, one year mean). PF(83.0, 82.5, 85.8) RP(77.9, 83.0, 84.0) BP(70.2, 85.8, 91.0) GH(70.1, 82.0, 81.5) VT(57.0, 73.3, 82.5) SF(91.0, 85.3, 89.0) RE(79.0, 74.0, 76.8) MH(80.0, 75.8, 78.5). Three of four would undergo the procedure again and all would recommend the procedure to others. One would not go through the procedure again because of pre-existing throat problems, but would still recommend the procedure to others.

**Conclusions:** Four weeks after undergoing transgastric cholecystectomy, patients in our series reported high quality of life scores, comparable to the general population. These scores continued to improve one year later. Satisfaction with the procedure was excellent. Transgastric cholecystectomy appears to be a safe procedure with good long-term outcomes. It will be important to see how these results translate to larger patient populations.

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### TRANSVAGINAL REPAIR OF A CHRONIC PORCINE VENTRAL HERNIA USING SYNTHETIC MESH

Ben Powell MD, Sharon Bachman MD, J Astudillo MD, Emanuel Sporn MD, Brent Miedema MD, Klaus Thaler MD, University of Missouri

**Background:** In the era of laparoscopic surgery ventral incisional hernias still remain a common surgical problem. Natural orifice transluminal endoscopic surgery (NOTES) may enable intraperitoneal access without the need for abdominal wall incisions with possible faster recovery and less complications. We tested the feasibility of transvaginal placement of a large synthetic mesh (Proceed, Ethicon Inc.) without laparoscopic support to repair a porcine hernia. **Methods:** Three pigs were used in this survival model. Each animal had a 5 cm hernia defect formed using a standardized technique. One month later the animals had transvaginal repair of the hernia defect. Colpotomy was performed and a 12 mm trocar inserted into the peritoneal cavity. A single channel gastroscope (Olympus 8.7 mm single channel) was used for visualization. The mesh was cut to size assuring a 5 cm overlap and corner stitches were placed in the mesh with 2-0 polypropylene. The mesh was then rolled and inserted through the trocar. The preplaced sutures were externalized using a suture passer (GraNee) and an endoscopic grasper. Additional sutures were placed every 5 cm under endoscopic guidance. Outcome measures were feasibility, operative time and complications. **Results:** Mesh repair was feasible in all three pigs. Hernia sizes at time of mesh placement were 7 x 7 cm, 6 x 9 cm, and 9 x 15 cm. Time from colpotomy to completion of mesh placement was 136 min. on average. The transvaginal access was time consuming with a mean time of 60 minutes from time of colpotomy until introduction of mesh. Other difficulties included intraperitoneal handling of the mesh under endoscopic vision, fixing the mesh to the abdominal wall, and passing the suture from the endoscopic grasper to the suture passer. No intraoperative complications occurred and no postoperative complications were observed over a period of 3-7 days.

**Conclusion:** Preliminary results show that transvaginal placement of a large synthetic mesh to repair a porcine ventral hernia using NOTES is challenging but feasible and could be performed safely. Ongoing investigation will focus on improving techniques and evaluating for mesh infections.

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### INDICATIONS FOR NATURAL ORIFICE TRANSLUMINAL ENDOSCOPIC SURGERY IN SURGICAL ONCOLOGY

Sascha S Chopra MD, Karl Mrak MD, Michael Huenerbein MD, Department of General-, Visceral- and Transplantation Surgery, Charité Campus Virchow Clinic, University Medicine Berlin; Department of Surgery and Surgical Oncology, Charité Campus Buch, Universitätsmedizin Berlin, and Helios Hospital Berlin

**Introduction:** Recent publications suggest that transluminal interventions may be a promising alternative to laparoscopy in the field of minimal invasive surgery. Until now it remains unclear which endoscopic technique should be applied and which access route is considered safe and feasible. Possible indications for natural orifice transluminal surgery (NOTES) are still under discussion.

**Methods:** From May 2007 to August 2007 a series of 474 patients undergoing cancer surgery were analyzed regarding possible applications of transluminal endoscopic surgery. Particular interest was directed towards technical aspects, indications and intraoperative feasibility. In suitable cases intraoperative endoscopy was performed and evaluated.

**Results:** A potential indication for transluminal surgery was observed in 64 of 474 patients (11 %) undergoing abdominal cancer surgery. Staging of gastrointestinal tumors was considered the main indication (45 %) followed by splenectomy (11 %) and diagnostic excision (11 %). As a potential access path the transgastric approach was chosen in 42 patients (66 %) and the transcolonic approach in 18 patients (28 %). Approximately 19 possible NOTES patients (30 %) presented with significant intraabdominal adhesions which would have resulted in a more complicated procedure. Intraoperative orientation was considered difficult in 13 cases (20 %).

**Conclusions:** Although some indications for NOTES procedures in surgical oncology have been suggested these techniques have to be assessed cautiously. A future implementation of NOTES in surgical oncology is currently challenged by technological difficulties, restricted intraoperative orientation and frequent abdominal adhesions in this clientele.

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### NOTES SPECIMEN RETRIEVAL USING NOVEL ENDOSCOPIC INSTRUMENTATION

Rohan A Joseph MD, Michael A Donovan MS, Matthew G Kaufman BS, Nilson A Salas MD, Patrick R Reardon MD, Brian J Dunkin MD, Department of Surgery, The Methodist Hospital, Houston- Texas

**Introduction:** Currently, there is no ideal specimen retrieval bag for NOTES. This study tested the efficacy and reliability of a novel through-the- scope (TTS) retrieval bag.

**Methods:** Eleven NOTES retrieval bags (Ethicon Endo Surgery) 5.5 x 2.5 cm in size and 3.6 mm in diameter were used for these experiments. The impermeable bags have a 3.5 cm wire-supported articulating/rotating opening with cinching mechanism. Tests were conducted by an expert surgical endoscopist using a transgastric porcine model of NOTES appendectomy (uterine horn, n = 2), oophorectomy (uterine horn and ovary, n = 5), and cholecystectomy (n = 4). Success of specimen capture, time, and malfunctions were recorded.

**Results:** There were no problems with introduction and removal of the bag and no structural defects were observed. The ease of optimal positioning alongside the specimen was acceptable utilizing the articulation and rotation features and all specimens were captured successfully. Time to secure closure averaged 2 min.10 s (range 40 s to 4:11 min). During 2 trials, the bag failed to close properly due to malfunction of the cinching mechanism. Both trials were salvaged using the flexible grasper.

Intro & Removal	Acceptable
Positioning	Acceptable
Time	Acceptable
Deployment	Acceptable
Cinching	Not Acceptable
Bag Integrity	Acceptable

**Conclusion:** This study demonstrates acceptable performance of a novel TTS NOTES retrieval bag. Further work is needed to optimize closure and ensure consistency in manufacturing this prototype device. Such a bag may not only be useful for NOTES, but also endoluminal procedures where TTS deployment and an impermeable covering may be of particular advantage.

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### FLEXIBLE ENDOSCOPIC SCISSORS: A COMPARATIVE STUDY

Rohan A Joseph MD, Michael A Donovan MS, Matthew G Kaufman BS, Nilson A Salas MD, Patrick R Reardon MD, Brian J Dunkin MD, Department of Surgery, The Methodist Hospital, Houston- Texas

**Introduction:** The long length and small diameter of endoscopic working channels present significant design obstacles for instruments such as endoscopic scissors that require reliable function and strong closing force. This study compares the function of four endoscopic shears.

**Methods:** Endoscopic scissors from four companies were trialed - the Olympus FS-3L-1 (Olympus, Tokyo, Japan), EES Prototype Device (Ethicon Endo Surgery Cincinnati, OH), LSVP 1203-L2H (LSVP International Inc, Los Altos, CA) and the TeleMed cutters (Teled Systems Inc, Hudson, MA). Each scissors was tested while cutting materials of varying characteristics (Dental Dam, Mesh, Esophageal Tissue, Suture). Two scissors from each of 4 manufacturers were evaluated for a total of 30 cuts with each device (6 per test material, then 6 more of dental dam to test durability). Each scissor was introduced through a gastroscope and the test material presented to the full length of the blades. Ability to cut the test material, total cut length, and cut length as a % of blade length were measured. A one way ANOVA was performed to compare efficacy of the various shears.

**Results:** Conclusion: The Ethicon scissors performed significantly better in all measured parameters (p < 0.046). The comparative performance of these devices may be useful when doing endoluminal and transluminal procedures that require accurate and reliable division of tissues and structures.

Comparison of Average Length of Cut (mm)

Olympus	Ethicon	LSVP	Teled
Dam - 0.0	3.9	0.0	1.5
Mesh- 0.9	3.8	0.0	0.1
Tissue-1.9	2.5	1.9	0.3
Dam - 0.0	4.0	0.0	1.3
% BL*-14 (0-43)	70 (49-87)	9 (0-42)	37 (5-64)

\* Cut as% of blade length

23592

### NOTES APPROACH TO ENDOSCOPIC GASTROPEXY: FEASIBILITY STUDY IN DOGS

Lynetta J Freeman, Mohammed Al-Haddad MD, Emad Y Rahmani MD, Toni Kwan, Cynthia Harris MD, Don J Selzer MD, Stuart Sherman MD, Peter D Constable, 1Purdue University School of Veterinary Medicine, West Lafayette, IN, USA.; 2Department of Medicine, Division of Gastroenterology, Indiana University School of Medicine, Indianapolis, IN, USA.; 3Mafraq Hospital-SEHA, Abu Dhabi, UAE; 4Department of Surge

NOTES procedures are more invasive than traditional endoscopy because they involve exiting the lumen of a hollow organ, tissue manipulation, and closure of the access site. We proposed that a novel endoscopic gastropexy utilizing a NOTES approach results in secure adhesions with few complications. To further study the impact of NOTES, we chose to evaluate the degree to which the NOTES endoscopic gastropexy affected the animals' postoperative activity level versus traditional upper GI endoscopy. A feasibility study with cross-over design was undertaken in 10 healthy dogs randomly assigned to general anesthesia and either NOTES endoscopic gastropexy (n = 5) or upper GI endoscopy (n = 5). Gastric access to the abdominal cavity was achieved with PEG technique for balloon dilation. An electrocautery device was used to create an incision in the right lateral abdominal musculature. The gastric wall was secured to the abdominal wall with five to six pairs of T-fasteners deployed and secured from inside the stomach. The gastric mucosal incision was closed with the same device. A single postoperative dose of hydromorphone (0.05 mg/kg) was given. As a control, animals underwent upper GI endoscopy for examination only, with no postoperative analgesia. After a minimum of 2 weeks, the animals were crossed over to receive the other procedure. Pre- and postoperative activity monitoring was performed in both groups with a collar mounted accelerometer device (Actical® Physical Activity Monitoring System; Respironics, Inc).

The median procedure time was 75 (range 52 to 182 minutes) for the gastropexy and 15 (range 8 to 40) minutes for the endoscopic examination. There were no deaths or significant complications. Preliminary statistical analysis revealed that animals undergoing the gastropexy procedures took 3 days to recover to their pre-surgical activity levels as compared to 1 day for upper endoscopy. Endoscopic evaluation two weeks after the procedure revealed intact gastropexy sites with minimal inflammation of the gastric mucosa around the suture sites. NOTES endoscopic gastropexy appears to be a reasonable alternative to traditional surgery in dogs and results in minimal impact on postoperative activity levels.

23594

### GASTRIC BYPASS POUCH REVISION AND STOMA PPLICATION: A NOVEL TECHNIQUE USING A NEW ENDOLUMINAL SUTURING DEVICE

Andrew S Wright MD, Renato V Soares MD, Martin I Montenovio MD, Joo Ha Hwang MD, Brant K Oelschlager MD, University of Washington

Weight regain following gastric bypass has been associated with enlargement of the gastric pouch and with dilation of the gastro-jejunal anastomotic stoma. We developed a new technique for revision of the pouch and stoma using a novel endoluminal suturing device in an ex vivo model porcine stomach model. The novel prototype device is a flexible Endo Stitch® (Covidien Surgical Devices) suitable for endoluminal or NOTES applications. Barbed sutures are used to obviate the need for knot-tying.

Methods: We created an 8 × 8 × 10 cm gastric pouch from porcine gastric explants, then an anastomosis using a 31 mm circular stapler. We measured the volume of the pouch at 30 mm H2O pressure and then measured the stoma diameter using a graduated cone. Under endoscopic guidance, we first plicated the anastomosis with a goal of reducing the diameter to between 15–18 mm. We then plicated the gastric pouch using a running suture along the lateral aspect of the pouch, with a goal of reducing the pouch size by at least 1/3. Following plication we re-measured the pouch volume and stoma diameter in the same manner. In order to assess the holding strength of the knot-less plications made with the novel knotless suture we then tested each pouch under a manometer to assess the leak pressure.

Results: Stoma plication and pouch volume reduction was feasible in all ten explants. In leak pressure testing all specimens failed at the staple line rather than along the plication, at a mean leak pressure of 58.9 ± 24.7 mmHg.

	Pre Plication	Post Plication	% Reduction
Diameter (mm)	27 ± 2	16 ± 2	40 ± 11
Volume (ml)	134 ± 83	72 ± 36	40 ± 10

Conclusions: Gastric pouch reduction and stoma plication is feasible and straight forward in an ex vivo model using a novel flexible suturing device and knot-less suture. While further testing in vivo will follow, the device and technique promises to be a substantial improvement upon those currently being used clinically. Device under development. Not for sale.

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### FUNCTIONAL AND COMPARATIVE EVALUATION OF FLEXIBLE MONOPOLAR ENDOSCOPIC SCISSORS

E A Moran MD, C J Gostout MD, J Bingener MD, Mayo Clinic-Rochester, MN.

- Objective of the study: The success of natural orifice transluminal endoscopic procedures requires reliable, accurate tissue dissection and suture cutting comparable to current laparoscopic tools. A prototype flexible endoscopic scissor for tissue biopsy, dissection, enterotomy creation and suture cutting was evaluated.
- Description of the methods: Acute study in 2 domestic pigs. Laparoscopic access provided overview and allowed comparison with laparoscopic shears. The endoscopic scissors (Apollo Endosurgery, Inc.) consist of cutting blades with a flexible wire catheter assembly (OD 3.1 mm). The device is cautery compatible, rotates with a 1:1 response and is for use within a therapeutic channel. Transgastric peritoneal access was obtained and maintained using a prototype transgastric port (Apollo Endosurgery, Inc.). A dual channel colonoscope was advanced through the gastrotomy into the peritoneal cavity. With the aid of a grasping forceps, multiple peritoneal biopsies were obtained which required the scissors to perform in a variety of endoscope positions. Cautery (Monopolar 18–30 W) was then attached to the scissors and gallbladder dissection proceeded. Once complete, the device was used to perform two small bowel enterotomies. A timed comparison of this function was made with laparoscopic enterotomy. Finally 3-0 Vicryl suture was passed through the endoscopic port and retrieved laparoscopically. At two different small bowel sites laparoscopic stitching was completed and the suture cut using the endoscopic scissors.
- Preliminary results: Peritoneal biopsies, average size 2 cm, were obtained from multiple abdominal locations and endoscopic positions. The scissors cut effectively and accurately; cutting performance was enhanced with parallel counter traction provided by grasping forceps passed through the second endoscopic channel. The use of cautery with the scissors controlled small vessels. With the use of cautery, the gallbladder was partially dissected from the hepatic bed. This dissection required transabdominal passage of the Carter-Thompson for tissue triangulation. Small bowel enterotomy, large enough for stapler passage, was created in an average time of 4 min 54 sec. Laparoscopically this was completed in 1 min 22 sec. Suture was cut in a controlled, reproducible fashion on first attempt in all attempts.
- Conclusions: Controlled suture cutting and enterotomy creation can be performed efficiently and reproducibly with the endoscopic scissors. The 1:1 rotational control improved accuracy and functionality of the scissors comparable to current laparoscopic techniques. The use of cautery worked well to seal small vessels and aided in tissue dissection. Endoscopic tissue dissection and enterotomy creation was completed effectively though less efficient compared to laparoscopy primarily due to parallel device use imposed by the dual channel endoscope.

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### NOVEL OVER-THE-SCOPE CLIP SYSTEM FOR NOTES GASTROTOMY CLOSURE: AN EX VIVO COMPARISON STUDY

RP Voermans BA, MI van Berge Henegouwen BA, WA Bemelman BA, C-N Ho MSc, P Fockens MD, 1 Dept. of Gastroenterology and Hepatology, 2Dept. of Surgery, Academic Medical Center, Amsterdam, the Netherlands 3OVESCO Endoscopy AG, Tuebingen, Germany

Introduction: Secure transluminal closure remains one of the fundamental barriers to the clinical introduction of NOTES. Current NOTES closure modalities do either not result in secure closure or are too challenging to apply in vivo. Gastrotomy closure using a novel over-the-scope clip (OTSC)(Ovesco) may result in secure closure and may be easy to apply. Aim was to assess the technical feasibility of gastrotomy closure using the OTSC and to compare burst strength with the surgical suture in a previously described ex vivo porcine stomach model(1).

Methods: Stomachs were harvested from freshly slaughtered adult pigs. Standardized gastrotomies were made by dilating a full thickness stab incision with an 18 mm balloon for 60 seconds. After closure security was evaluated using a custom apparatus consisting of a pressurized lower chamber and saline filled upper chamber, which were separated by the sutured test specimens. After fixing the test specimen in the apparatus air was infused into the lower chamber until air bubbles could be seen coming through the gastrotomy or the adjacent gastric tissue tore. A pressure gauge and two cameras recorded the leak pressure and mode of failure respectively, with data being captured in real time by computer. Fifteen control gastrotomies were closed with #3-0 PDS in simple interrupted. This resulted in a mean leak pressure of 206 mmHg (SD 59),(1) Using a non-inferiority design a sample size of 11 specimens needed to be included in the experimental group. Closure procedure consisted of 3 steps: (1) Approximation of serosal layers using a flexible twin grasper (2) Pulling the tissue into the OTSC cap at the tip of the scope and (3) Releasing the clip. Results: Closure was successful in all specimens in a median of 3 minutes. Closed gastrotomies using the OTSC showed air leakage at a mean pressure of 224 mmHg (SD 61), which was non inferior in comparison with the predetermined gold standard (p = 0.003). Conclusion: Use of OTSC for gastrotomy closure is feasible, easy to apply and provides burst pressures comparable with hand-sewn closure. In vivo survival experiments will need to be performed to further evaluate the technique in real life.

(1) Voermans RP, Worm AM, van Berge Henegouwen MI et al. In vitro comparison and evaluation of seven gastric closure modalities for natural orifice transluminal endoscopic surgery (NOTES). Endoscopy 2008; 40: 595–601.

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### CLINICAL FEASIBILITY OF A NEW COLONIC ACCESS DEVICE (MEGACHANNEL™) FOR INTERVENTIONAL PROCEDURES AT COLONOSCOPY: A PROSPECTIVE, MULTICENTER TRIAL

Gerd Silberhumer MD, Arnulf Ferlitsch MD, Wayne Noda, Tudor Birsan MD, Nestor A Gomez PhD, Gerhard Prager PhD, Devendra Desai PhD, Ajay Kumar PhD, Guduru Rao PhD, Christoph Gasche PhD, Departments of Surgery, Gastroenterology and Hepatology and Medical University of Vienna, Austria; Minos Medical Inc, Irvine, CA; University of Guayaquil, Guayaquil, Ecuador; Hinduja Hospital, Mumbai, India; Indraprastha Apollo Hospital, New Delhi, India

**Background:** Megachannel® is a new colonic access system that was originally developed for colonoscopic appendectomy. Once in place, the reinforced wall protects the colon from perforation risks during rapid, multiple passes of the colonoscope to the right colon. The 20 mm working channel allows the rapid and safe delivery of bulky instruments such as EUS, banders, suction cups and staplers. Additionally this large working channel also allows the removal of large specimens piece by piece. After completion of animal and cadaver tests, the aim of this study was to evaluate safety and clinical feasibility in patients undergoing colonoscopy.

**Methods:** Patients scheduled for colonoscopy due to suspected right colonic polypoid lesions were screened and included after written informed consent. The colonic access device (22 outer diameter, 100 cm in length) was constructed of a wire reinforced polyvinylchloride plastisol tube with a thermoplastic distal tip and a proximal hub with integrated scope seal. A rounded introducer plug was fitted onto the distal tip and formed a smooth solid surface between the overtube and colonoscope to prevent tissue entrapment. For all studies, the overtube was loaded onto a 160 cm lower GI endoscope (Pentax and Olympus) and introduced via colonoscopic guidance.

**Results:** The Megachannel® was applied in 40 patients (19 female, mean age 48a) undergoing colonoscopy. The cecum was reached in 34/40 patients within 16 min (3 to 35 min), with 73 cm (60 to 90 cm) of the overtube being inserted into the colon. Mild tissue bruises were observed in 9 patients, mild to moderate pain was reported in 5. In 27 patients the Megachannel® assisted the removal of multiple polyps as tissue was repeatedly retrieved through the device. In one patient a EUS scope was delivered for evaluation of tumor wall infiltration before submucosal resection, in another patient a suction cap was successfully delivered to the right flexure for removal of an incomplete-lifting polyp.

**Conclusions:** This new colonic access system (Megachannel®) can be safely applied into the right colon and is useful for a variety of colonic interventions that require multiple insertion of the scope (such as removal and retrieval of multiple polyps) or delivery of bulky instruments such as EUS, suction caps or banding devices. This instrument might support NOTES procedures and removal of colonic stents. The final instrument length was changed to 80 cm.

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### CLINICAL RESULTS OF ALTERNATIVE TECHNIQUE FOR N.O.T.E.S. TRANSVAGINAL CHOLECYSTECTOMY

Luiz DeCarli, Ricardo Zorron, Alcides J Branco, Fernando C Lima, Sergio R Pioneer, Marcos Tang, Jose I Sanseverino, Idilio Zamin, Rodrigo Seben, Andre Bigolin, Michel Gagner, Department of Surgery - Complexo Hospitalar Santa Casa de Porto Alegre - Brazil; Department of Surgery - Mount Sinai Medical Center- Miami; Department of Surgery, University Hospital Teresopolis HCTCO-FESO, Rio de Janeiro, Brazil

**Objectives:** Transvaginal NOTES is a new diagnostic and potentially therapeutic method of surgical endoscopy, and clinical experience is still limited. A preliminary experience with NOTES transvaginal method for cholecystectomy is described.

**Methods:** IRB approval was obtained at the institution for transvaginal NOTES clinical trials. The technique of transvaginal NOTES cholecystectomy was clinically applied in 15 patients with symptomatic cholelithiasis. Informed consent was obtained. Transvaginal NOTES access was obtained with an open posterior colpotomy after CO<sub>2</sub> insufflation with a Veres needle transumbilically. The Double Channel Endoscope (GIF-2T160) Olympus Optical was introduced in the abdominal cavity transvaginally, as well as a 10 mm trocar in parallel, also transvaginally. There was combined endoscopic and laparoscopic dissection. There were 2 umbilical punctures for use of 3 mm laparoscopic equipment. The posterior colpotomy was closed with chromic sutures.

**Results:** Operative time ranged from 85–260 min. Mean operative blood loss was estimated of 44 ml, mostly from vaginal access. Mean abdominal CO<sub>2</sub> pressure was 13 mmHg. The total abdominal incision lengths was 2 × 3 mm on umbilical scar. There was also 3 of the gallbladder done from top down because the rigid instruments from the vagina limit the exposure of the gallbladder. The patients recovered well postoperatively, oral intake was began on the next day. The first four patients were dismissed on the third postoperative day, and the last patient was dismissed on the first postoperative day. There was need of Tramadol 50 mg in 4 patients, and one patient claimed of vaginal discomfort. There were no postoperative complications.

**Conclusions:** Transvaginal NOTES is a feasible and safe alternative method for cholecystectomy in this preliminary clinical experience. Available technology is still limited for natural orifice surgery, however this approach strongly suggests better cosmetic results and less pain.

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### TRANSGASTRIC ENDOSCOPIC PERITONEOSCOPY DOES NOT LEAD TO INCREASED RISK OF INFECTIOUS COMPLICATIONS

Joel B Anderson MD, Bradley J Needleman MD, Dean J Mikami MD, Vimal K Narula MD, Peter N Nau MD, Rebecca Dettorre, Sebastian V Demyttenaere MD, Brian J Winkleman MD, W S Melvin MD, Jeffrey W Hazey MD, The Ohio State University Medical Center, Center for Minimally Invasive Surgery

**Introduction:** As the field of natural orifice transluminal endoscopic surgery (NOTES) develops it remains important to determine the risk of clinically significant bacterial contamination and infectious complications of the peritoneal cavity. We report herein the bacterial contamination of the peritoneum in patients undergoing transgastric endoscopic peritoneoscopy (TEP) during laparoscopic roux-en-y gastric bypass (LRYGB) to perform adhesiolysis and direct trocar placement.

**Methods:** Under human IRB approval for 40 patients, TEP was performed on LRYGB patients to assist with trocar placement and identification/lysis of intra-abdominal adhesions. TEP was performed in all patients without laparoscopic guidance. Stomach sterilization was not performed. Pre-gastrostomy gastric aspirates and post-gastrostomy peritoneal samples were obtained and cultured for identification and comparison. These results were compared with sterile peritoneal samples from 50 similar LRYGB patients previously studied. Patients were followed for infectious complications.

**Results:** Thirty-one patients were prospectively studied averaging 45 years of age. Mean operative time was 100.5 minutes, endoscopic time 19.4 minutes and transgastric time 8.1 minutes. Mean bacterial counts from the gastric aspirate were significantly greater compared to the peritoneal samples (3,885,837 vs. 2626 CFU/ml,  $p < 0.05$ ). There was no significant difference between the sterile peritoneal samples taken in the previous study and post-gastrostomy peritoneal samples (75.5 vs. 2626 CFU/ml,  $p = 0.1$ ). Patients on PPI's had higher bacterial counts in their gastric aspirate (8,659,290 vs. 1,933,060 CFU/ml,  $p = 0.1$ ). Documented cross contamination of the peritoneal cavity as a result of TEP occurred in 5 of 31 patients. There were no infectious complications.

**Conclusions:** Contamination of the peritoneal cavity does occur with TEP. However, this is statistically and clinically insignificant and does not lead to increased risk of infectious complications.

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### A SIMPLE AND EFFICIENT TECHNIQUE FOR NATURAL ORIFICE TRANSLUMENAL ENDOSCOPIC SURGERY (NOTES) GASTROTOMY CLOSURE UTILIZING ENDOSCOPIC CLIPS AND LOOPS FACILITATED BY TEMPORARY TRANSFASCIAL SUTURES

Joseph A Trunzo MD, Leandro T Cavazzola MD, Michael F McGee MD, Jamie Andrews BS, Steve J Schomisch BS, Jessica Bailey BS, Young-Joon Lee MD, Alex Chaitoff, Jeffrey L Ponsky MD, Jeffrey M Marks MD, University Hospitals Case Medical Center

**Background:** A current limitation in utilizing the stomach as a primary point of access for NOTES is the availability and reliability of the closure devices. The majority of devices described in recent reports are at an investigative or prototype only stage. Here we describe a reliable closure technique using readily available on-shelf endoscopic tools with a modified 'clip-and-loop' closure in a porcine model.

**Methods:** Animals were placed under general anesthesia in a supine position. First, a Seldinger technique was used to endoscopically place a guidewire in the anterior stomach. Two transfascial sutures were then percutaneously passed into the stomach on either side of the guidewire using a laparoscopic suture-passer. Their tails were tagged loosely and left extracorporeally. The gastrotomy was then created adjacent to the guidewire using needle knife cautery and a dilating balloon to facilitate passage of the endoscope. A brief peritoneoscopy was performed, and the endoscope was returned into the stomach. Tension was then applied to the transfascial sutures which tented the gastrotomy against the anterior abdominal wall to improve gastric insufflation. Next, endoscopic clips (Quick-clip, Olympus Inc.) were placed in pairs opposite each other at the edges of the gastrotomy. Then finally, using an endoscopic loop (Poly-Loop, Olympus, Inc.), the individual pairs were encircled and cinched together closing the gastrotomy in a zipper-like fashion. Transfascial sutures were removed at the completion, and an upper gastrointestinal fluoroscopy was performed to confirm seal. Repeat fluoroscopy was performed on days 2 and 7 post-operatively. Gastric burst tests were performed on post-operative day 14 at necropsy.

**Results:** Ten animals were studied and survived for 14 days. Mean procedure times were 02:20 (minutes:seconds) for placement of the pre-gastrostomy transfascial sutures and 16:53 for the closure ( $n = 9$ ). One procedure time was lost due to technical malfunction in recording. Two sets of pairs (4 clips and 2 endoscopic-loops) were required for closure in all but the first animal which took 3. Thirteen clips were lost secondary to misfire with 7 attributed to the first animal when developing the technique. Fluoroscopy images were negative for all animals. Necropsy results revealed no abscesses, though gastrotomy site granulomas ( $n = 3$ ) and adhesions ( $n = 1$ ) were sporadically found. Bursting pressures ranged from 32–108 mmHg with a mean of 81.7 mmHg. **Conclusion:** A modified clip-and-loop closure using endoscopic loops to zipper clips together provided a simple and efficient closure in this animal model. The utilization of temporary transfascial sutures certainly enhanced insufflation ability, and thus provided an improved working environment for the closure. Continued investigation into improved techniques implementing tools readily available in the endoscopy suite could improve the slow progression of NOTES that is currently dependent mainly on investigative devices. Furthermore, the application of transfascial sutures may improve other technically challenging closures where insufflation ability plays a major role.

23993

**DEFINING THE HOST IMMUNE RESPONSE TO NOTES**

Ward J Dunnican MD, Vinay Sood DO, Warner Wang MD, T P Singh MD, Susan Harrington PhD, Amy Hahn PhD, Ashar Ata MPH, Karen Krause DVM, Amee Mapara-Shah MD, Albany Medical College

Before natural orifice transluminal endoscopic surgery (NOTES) can be safely introduced for human use in the United States, several technical and physiologic factors need to be elucidated. Among these are the host systemic and peritoneal responses to inflammation. The inflammatory response to laparoscopy (LAP) has been well characterized, and has been shown to favorably alter immune function when compared to laparotomy. However, the immunologic effects of NOTES are yet to be determined. In addition, the introduction of contaminants via the host oropharynx, combined with an endoscopic gastric closure, may alter host peritoneal flora. We have characterized the effect that NOTES will have on porcine systemic and peritoneal immune function.

Twenty-four pigs were divided into three groups: Group A (upper endoscopy-control), Group B (LAP), and Group C (NOTES). Group A underwent general anesthesia with upper endoscopy, Group B transabdominal pneumoperitoneum and closure, and Group C endoscopic gastrotomy, transgastric pneumoperitoneum and endoscopic closure. All animals had blood (systemic) and peritoneal lavage (peritoneal) samples collected for cytokine analysis, drawn preoperatively (time 0), at the termination of the first procedure (60 minutes), and at 48 hours. The endoscopic gastric closure was inspected at 48 hours. Interleukin-1 (IL-1), interleukin-6 (IL-6), interleukin-10 (IL-10), tumor necrosis factor alpha (TNF alpha), and interferon gamma (IFN gamma) levels were quantified using enzyme linked immunosorbent assay (ELISA). Paired t-test and Wilcoxon signed-rank test were used to compare the cytokine levels at various times after each of the surgical procedures. Peritoneal lavage samples were cultured and identified by group and time of collection.

For all groups, TNF alpha levels were elevated at 60 minutes, and subsequently returned to baseline at 48 hours ( $p < 0.01$ ). IFN gamma, IL-6, and IL-10 were not found above assay levels in any group. IL-1 levels were found in substantial amounts at  $t = 0$  and  $t = 60$  minute samples only in the NOTES group. At 48 hours, similar IL-1 levels were found between the LAP and NOTES groups. Similar microbiologic contaminants were found between all groups. At 48 hours, the NOTES group did not exhibit infection, and culture counts returned to baseline.

Not all cytokines were found in appreciable levels in porcine serum or peritoneal fluid. For measurable cytokines, the NOTES peritoneal cytokine response was not significantly different from the LAP group. NOTES did not carry a significantly increased amount of microbiologic contamination compared to LAP at 48 hours. These data suggest that the peritoneal immune response to NOTES does not significantly differ from LAP in a porcine model.

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**NATURAL ORIFICE TRANSLUMINAL ENDOSCOPIC SURGERY (NOTES) IN THE SETTING OF ACUTE ABDOMEN:**

Brian K Wong MD, Mark Talamini MD, Garth Jacobsen MD, Adam Spivak MD, Kari Thompson MD, Lauren Fischer MD, Santiago Horgan MD, University of California San Diego

**Objective:** Laparoscopy has provided a means to assist in the decision-making process for patients with acute abdominal pain. Conditions such as appendicitis, diverticulitis, cholecystitis, small bowel obstruction, perforated viscous, endometriosis, and ovarian cysts can now be safely diagnosed and treated via laparoscopy. With Natural Orifice Transluminal Endoscopic Surgery (NOTES) considered as the next frontier in minimally invasive surgery, our goal for this project was to examine the role that NOTES may have in the setting of emergency surgery.

**Methods:** Transvaginal appendectomy was performed in two patients that were diagnosed in the emergency room by a general surgeon. Time from emergency room to operating room was documented along with operating times and outcomes. Laparoscopic assist (Hybrid Technique) was used in both patients through a single 5 mm umbilical port. Special attention was paid to sources of delay that apply to NOTES approach.

**Result:** Both patients were found to have acute suppurative appendicitis. CT scans were performed in both patients by the emergency room physicians. Average time from emergency room to operating room was 180 minutes. Average operating time was 88 minutes. Both patients were discharged on post operative day number 2 without complications. Delays related to NOTES include patient positioning and having a sterile endoscope available for surgery.

**Conclusions:** In the absence of hemodynamic instability and serious co-morbidities, laparoscopic procedures can be safely performed on abdominal pathology requiring emergency surgery. With appropriate selection of patients and an experienced surgeon, we believe that NOTES can be a safe diagnostic and therapeutic alternative in the setting of an acute appendicitis.

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## Ergonomics / Instrumentation

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### COMPARISON OF TWO DIFFERENT ENERGY-BASED VASCULAR SEALING SYSTEMS FOR THE HEMOSTASIS OF VARIOUS TYPES OF ARTERIES IN A PORCINE MODEL - EVALUATION OF LIGASURE FORCETRIAD -

Goutaro Katsuno MD, Masaki Fukunaga MD, Hidenori Tsumura MD, Kazuyoshi Sugiyama MD, Kumihiro Nagakari MD, Masahiko Sugano MD, Yoshifumi Ri MD, Shuichi Sakamoto MD, Masaru Suda MD, Yoshito Iida MD, Seichuro Yoshikawa MD, Masakazu Ouchi MD, Yoshitomo Itou MD, Yoshinori Hirasaki MD, Kiichi Nagayasu MD, Juntendo University Urayasu Hospital

**Background:** Bipolar electro-surgical and ultrasonic devices are routinely used for hemostasis in open and advanced laparoscopic surgery. Currently available ultrasonic and bipolar electro-surgical instruments with tissue sensing technology can seal blood vessels with efficacy equal to that obtained with surgical clips or ligatures. Recently, a new generator (ForceTriad™) has been developed. This new electro-surgical generator is of improved quality and demonstrates efficiency in blood vessel sealing. **Aim:** To compare currently available 10-mm laparoscopic electro-surgical devices with the LigaSure™ Vessel Sealing System and the ForceTriad™ generator (Valleylab, Inc., Boulder, CO; a division of Tyco Healthcare), especially with regard to burst pressure, seal time, failure rate, and thermal injury. **Methods:** Blood vessels of various types and diameters were harvested from three pigs under anesthesia using three instruments: LigaSure Atlas™ with LigaSure™ Vessel Sealing Generator (LSA), LigaSure Atlas™ with Force Triad™ Generator (LSAFT) and Endoclip™ II (Autosuture, USSC, CO; a division of Tyco Healthcare). The inferior mesenteric, splenic, hepatic, renal, iliac, and femoral arteries were obtained. In total, 40 arteries were harvested and fatty and connective tissues were removed from the adventitia before sealing. The diameter of each vessel was measured with digital calipers from the outside edge of the adventitia. The diameters of the vessels, speed and adequacy of the cutting and sealing process, burst pressure, and burst point were compared. Burst pressure was measured in mm Hg. An additional set of specimens was sealed and then histopathologically examined to assess the degree of thermal injury.

**Results:** The mean burst pressure was significantly higher in the LSAFT group than in the LSA group ( $p < 0.01$ ). The mean burst pressure did not differ significantly for 2-4 mm or 4-7 mm vessels. The sealing process was significantly shorter with LSAFT ( $p < 0.001$ ). As for the degree of thermal injury, adventitial collagen denaturation and proximal thermal injury of the smooth muscle in the media were less common with LSAFT; however, the number of vessels examined was too small for statistical analysis.

**Conclusion:** Both the LSA and LSAFT proved useful regardless of the vessel size and sealing resisted pressures well above the physiologic levels. The LSAFT can be used more confidently in vessels up to 7 mm. Our findings indicate that LigaSure Atlas™ with Force Triad™ Generator is a safer and more effective means to attain hemostasis during advanced laparoscopic surgery.

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### A NEW TECHNIQUE FOR FASCIA CLOSURE

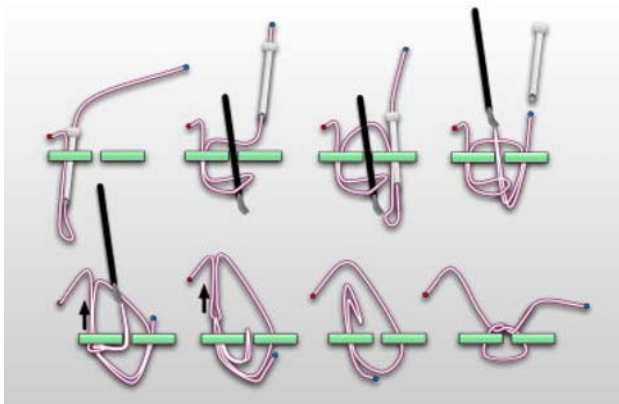
Masahiro Ikeda MD, Tadateru Takahashi MD, Seiji Sadamoto MD, Kazuhiro Toyota MD, Satoshi Shibata MD, Tamaaki Nakatani MD, Noriaki Tokumoto MD, Koichi Akayama MD, Yasufumi Saito MD, Kazunori Uchida MD, National Hospital Organization Higashihiroshima Medical Center, Higashihiroshima, Japan

**Introduction:** Because of the risk of herniation, all port sites are recommended to be closed after laparoscopic surgery. However, port-site closure is difficult especially in obese case. Full-thickness closure of trocar wound is a time-consuming and frustrating task. A lot of devices for this closure have been introduced. However, they are not cost-effective. We report a new simple technique for this troublesome task.

**Methods:** An inner needle of 16-gauge venous catheter is used for this technique. To reduce the risk of bleeding and of cutting the suture, the tip of the needle is blunted by using something. A 75 cm 2-0 absorbable bladed suture is placed through the needle. The both ends of the suture are pulled back in the direction of the hub. The trocar is removed. Pneumoperitoneum is maintained with a finger. The needle and the suture are introduced into the peritoneal cavity sufficiently through the fascia under laparoscopic monitoring. The needle is then pulled back slightly and a loop is made by the friction of the suture. A laparoscopic grasper is inserted into this loop through the trocar site. The needle still holding the suture is pulled out and is reintroduced into the peritoneal cavity through the opposite side of the fascia. The 2nd loop is made as described above. This loop is held and is pulled out from the trocar site through the 1st loop by the grasper. Next, the 1st loop is withdrawn outside the abdomen, and the 2nd loop and its edge come along with it. Finally, both edges of the suture are tied up to close the fascia.

**Results:** This technique was applied to both 5 mm and 12 mm trocar sites successfully. It took about 2 minutes to close each site.

**Conclusion:** This technique provides a simple, easy, and inexpensive fascia closure for all trocar sites after laparoscopic surgery.



### A PAIN IN THE NECK! THE RELATIONSHIP OF VIDEO MONITORS TO SURGEON'S STRESS

Gyusung Lee PhD, Nora Meenaghan MD, David Dexter MD, Tommy Lee MD, F. Jacob Seagull PhD, Carlos Godinez MD, Adrian Park MD, University of Maryland

**Introduction:** Surgeon-technology interfaces are a vital factor contributing to ergonomic risk. The display monitor is one such interface associated with physical eye and neck symptoms experienced by laparoscopic surgeons. The development of new technologies has permitted the traditional CRT display stationed on an instrument cart to be replaced by LCD system located on a boom. In the largest North American survey of its type to date, we investigated whether laparoscopic surgeons really benefit in terms of better ergonomics and reduced physical symptoms from the newer display systems.

**Methods and Procedures:** 317 laparoscopic surgeons currently in practice participated in this online survey study. This comprehensive, 23-question survey addressed four categories: demographics, physical symptoms, ergonomics, and environment/equipment. Data were analyzed using chi-square and logistic-regression.

**Results:** Neck stiffness (49%) and eye fatigue (31%) were among the most prominent symptoms. 67.4% of participants reported using an LCD system though 25% of participants still have the monitor cart mounted. Surprisingly, our study data showed that the percentage of participants experiencing eye strain and neck stiffness did not differ in terms of display type or mountings ( $p > 0.05$ ,  $p > 0.05$ ). 71% of stationary display users as well, surprisingly, as 48% of those with mobile mounts still requested improvements in regard to monitor positioning. While 65% of CRT users asked for better resolution, it is notable that 48% of LCD users also wanted to have improved resolution. No significant differences were found between CRT and LCD users in terms of their demands for improvements regarding display monitor size, color, and number.

**Conclusions:** Monitor placement has been assumed to be a major factor contributing to ergonomic risk. The LCD display mounted on a mobile boom has been considered to offer the best ergonomic option available. That MIS surgeons, however, still report eye and neck issues and demand improvements both in terms of the currently used boom mount and higher resolution LCD display technology suggests that more ergonomic research in addition to such feedback being delivered to industry partners are necessary in the face of this still unresolved and ergonomically risky surgeon-technology interface.

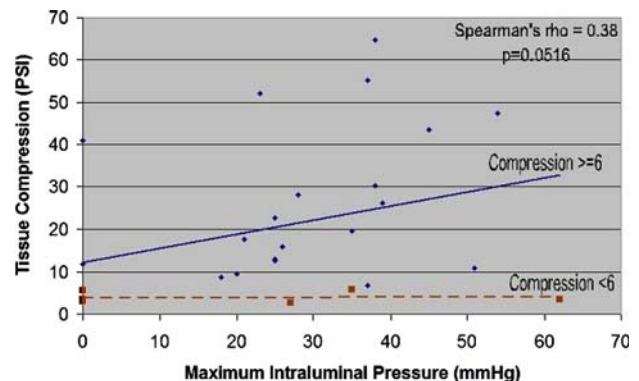
### THE EFFECT OF TISSUE COMPRESSION ON STAPLE LINE FAILURE

S Myers MD, W Rothermel MD, E Dominguez MD, O Ruiz MD, J Hill MD, M Durbin MD, M Palasek RN, C Noble BS, Riverside Methodist Hospital, Columbus, Ohio

**Introduction:** Circular staplers are often used to form a gastrojejunostomy. However, leaks occur 0.1-3% of the time resulting in serious morbidity and mortality. The purpose of this study is to evaluate the effect of tissue compression on the acute strength of a stapled anastomosis.

**Methods:** Twenty-seven freshly harvested porcine stomachs and segments of small intestine were randomly assigned to three groups of 9, each set at different closed staple heights: Group A (2.5 mm), Group B (1.75 mm), Group C (1.0 mm). Tissue compression (TC) was measured before circular stapled gastrojejunostomy was performed, while maximum intraluminal pressure (MIP) was determined following the formation of the anastomosis.

**Results:**



MIP reached  $\geq 18$  mm Hg in 18 of 20 (90%) of samples where TC was  $\geq 6$  PSI, compared to 3 of 7 (43%) of samples where TC was  $\leq 6$  PSI:  $p = 0.0239$  (Fisher's exact test). After the threshold of 6 PSI was reached, increasing TC at the time of staple line formation correlated with higher MIP. **Conclusion:** There is a positive correlation between tissue compression and maximum intraluminal pressure; adjusting tissue compression can decrease the risk of failure and increase the acute strength of a stapled anastomosis.



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### BROAD-VIEW CAMERA SYSTEM FOR ENDOSCOPIC SURGERY

Tomohiro Kawahara PhD, Masazumi Okajima MD, Idaku Ishii PhD, Takeshi Takaki PhD, Daisuke Sumitani MD, Makoto Yoshida MD, Department of Endoscopic Surgery and Surgical Science, Graduate School of Biomedical Sciences, Hiroshima University

**Introduction:** The disadvantage of endoscopic surgery (laparoscopic surgery, NOTES, etc.) is the narrow operative field provided by a single endoscope. The broad-view camera system (BVCS) has been developed with the aim of providing a wide-ranging view by using miniature camera units located on the inside of the patient's body. The BVCS can automatically record not only the overview of a surgical operation but also the movements of the surgical instruments by using quantitative analysis based on image processing.

**Methods/Procedures** The BVCS consists of several camera units, a display, and a PC. The newly developed camera unit is composed of a small CMOS camera (8.7 × 8.7 × 10.0 mm) and an indwelling needle for fixing to the body wall (phi 0.8 × phi 1.3 × 100 mm). In a preliminary animal experiment that simulated laparoscopic surgery, a single camera unit was used to verify the feasibility of the BVCS. First, the camera unit was inserted through a 10 mm trocar. Next, the needle was punctured up to the abdominal wall of the pig by using forceps and the unit was fixed on the inner wall of abdomen. Subsequently, the 3 wires of the camera (image signal, 12 V, and GND) were pulled through from the needle protruding from the pig's body, and connected to the display and the PC.

**Results:** The visualized area using the BVCS was approximately 6 times larger than that visualized using an endoscope. Through the operation, the endoscope, the 2 forceps, and the colon of the pig were continuously monitored. It was confirmed that the trajectory of forceps can be detected in real-time by a PC that processes the captured images. During this experiment, lens of the camera did not mist over because of the surgical conditions such an incision with a radio knife.

**Conclusions:** We confirmed the usability of the BVCS in animal experiments. We think that the proposed system has momentous potential for use as a visual-navigation system during endoscopic surgery. In the future work, several camera units will be used in preclinical experiments.

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### SIMPLE TECHNIQUE OF LESS

Jyotsna S Kulkarni MS, Sanjay B Kulkarni MS, Ajit Dumawat MS, Kulkarni Endo Surgery Institute, Pune, India

**Introduction:** Laparoscopy is now established as a surgical treatment of choice for many abdominal problems. Laparo Endoscopic Single Site Surgery (LESS) has emerged as a novel laparoscopic surgical technique. Ports for LESS are under development. We have developed a simple technique of performing LESS.

**Methods and Procedures:** A curvilinear sub-umbilical incision was made. An incision was made in the linea alba and 5 mm port was inserted under vision. Pneumo peritoneum was created. 5 mm 30 degree telescope was passed. Two more 5 mm ports were inserted on either side. They were spaced as much apart from each other as the incision allowed. A grasping forceps was manually bent into gentle S shape. The left port was pulled out and the bent grasping forceps was inserted directly into the abdomen. Through the right port, 5 mm harmonic shear and 5 mm hemo clip applicator were used. We have performed total 12 procedures - 5 cholecystectomies and 7 appendectomies. Additional 2 mm port was inserted in the upper abdomen for difficult cholecystectomy.

**Results:** All the procedures were successfully completed. The disadvantage was that the instruments clashed. The LESS scar in the umbilicus healed so well that at the end of 7 days, the abdomen looked scarless as in NOTES.

**Conclusion:** Laparo Endoscopic Single Site Surgery is an evolving technology, which is showing great promise for patients who need minimally invasive surgery.

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### EFFECT OF LAPAROSCOPIC SURGERY ON SURGEONS' HEALTH

Istvan Gal PhD, Zoltan Szabo PhD, Telki International Privat Hospital, Budapest-Telki, Hungary, M.O.E.T. Institute San Francisco, CA, USA

A lack of understanding the ergonomics of laparoscopic surgery has a potential to pose health problems for the surgeons. This study was planned to assess the prevalence of ergonomic problems associated with laparoscopy. Questionnaires designed to assess the frequency and degree of physical discomfort practicing surgeons during laparoscopy were evaluated in 210 cases. The average age of surgeons was 48.2 years (28-65), 31.5% of them play any racket sports. Most of them (79.5%) use single monitors and can't alter the height of the monitor (85.2%). The camera is usually held by assistant surgeon (71.2%). The answer for number of operative/advanced laparoscopic procedures per months were as follows: 1-5 (35.8%), 6-10 (38.5%), 11-15 (17.5%) and more than 15 (8.2%). The following problems were experienced during or after performing laparoscopic procedure: eye strain (63.9%), neck ache (58.5%), upper back pain (55.2%), lower back pain (52.1%), numbness or tingling in the palm or fingers (51.1%), wrist pain (32.2%), varicose veins (34.2%)

Authors conclude; surgeons performing laparoscopy have ergonomic problems: eye strain, neck ache, upper or lower back pain, numbness or tingling in the palm or fingers. These findings indicate that laparoscopic surgical technique is more taxing on the surgeons. Designers should consider these facts for the newly developed equipments.

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### COMPARATIVE ANALYSIS OF THE OPTICAL CHARACTERISTICS OF A FIXED-ANGLE, FLEXIBLE-TIP, AND VARIABLE-VIEW LAPAROSCOPE

Michael C Yip BS, Eric D Jenkins MD, Lora Melman MD, Kathryn L Cook, Margaret M Frisella RN, Brent D Matthews MD, Department of Surgery, Section of Minimally Invasive Surgery, Washington University School of Medicine, St. Louis, Missouri

**Objective:** Standard rigid laparoscopes have a fixed-angle of view and flexible-tip laparoscopes require external deflection of the tip to alter the viewing angle; therefore requiring additional room for maneuverability in restricted spaces. The purpose of this study is to compare the optical properties and characteristics of fixed-angled laparoscopes and an externally deflectable, flexible-tip laparoscope to an internally deflectable, variable-view laparoscope.

**Methods:** A forward-viewing (0-degree), forward-oblique (30-degree) and flexible-tip laparoscope (LTF-Type V3, Olympus) were compared to a variable-view, internally deflectable laparoscope (EndoCameleon®, Karl Storz Endoscopy). Quantitative comparisons of optical properties were evaluated at 3 cm from a scaled target (Table). Subsequently, 17 medical personnel [surgery attendings (n = 3), medical students (n = 5), surgery residents (n = 9)] utilized a Likert scale [1-lowest, 5-highest] to evaluate image size, image clarity (25%/100% light intensity) and image border, color reproduction and close-up (3 cm from target) and distant (10 cm from target) focus in an inanimate abdominopelvic model (Pacific Research Laboratories, Washon, WA). The ease and range of distal tip deflection was compared between the flexible-tip and internally deflectable, variable-view laparoscope. Data are given as means. Statistical significance (p < 0.05) was determined using Friedman's non-parametric test and analysis of variance.

**Results:** The flexible-tip laparoscope was rated lower (p < 0.05) than the 30-degree laparoscope in color reproduction, 0-degree laparoscope in close-up focus, the 0-degree and 30-degree laparoscopes in distant view focus and image border, and the 0-degree, 30-degree and variable-view laparoscope in image clarity with 25% light intensity. All laparoscopes had similar (p = ns) image clarity with 100% light intensity. The 0-degree laparoscope had a better (p = 0.01) image size than the variable-view laparoscope. The variable-view laparoscope was rated as significantly (p < 0.01) better in regards to distal tip deflection than the flexible-tip laparoscope.

	Field of View	Image Size	Image Range*
0-degree	4.0 cm	14.8 cm <sup>2</sup>	N/A
30-degree	3.7 cm	13.3 cm <sup>2</sup>	N/A
Flexible Tip	3.8 cm	14.1 cm <sup>2</sup>	10.8 cm
EndoCameleon	3.4 cm	11.2 cm <sup>2</sup>	12.8 cm

\*measurements with active deflection

**Conclusions:** The image range (cm) with internal deflection of the variable-view laparoscope is greater than that with external deflection of the flexible-tip laparoscope. The fixed-angled and variable-view laparoscopes were rated similarly and would not be discriminated against in regards to optical characteristics. The externally deflectable, flexible-tip laparoscope had poor optical characteristics compared to a 0-degree, 30-degree and variable-view laparoscope.

23179

### USEFULNESS OF CO<sub>2</sub> GAS CONDITIONER IN LAPAROSCOPIC SURGERY

Shuji Takiguchi MD, Yoshiyuki Fujiwara MD, Makoto Yamasaki MD, Kiyokazu Nakajima MD, Toshiro Nishida MD, Mitsugu Sekimoto MD, Masaki Mori MD, Yuichiro Doki MD, Dept. of Gastroenterological Surgery Osaka Univ.

**Background:** Cloudiness and dirt on a tip of endoscopy are one of the causes to stop an operation. An operator feels great stress from this trouble in order to perform a best operation. In this paper we present a new system to solve this problem. There are two kinds of problem on the tip of endoscope, one is cloudiness, the other is attachment of suspended matter, such as mist or smoke. Especially mist produced by a laparoscopic coagulation sears is severe problem. Many surgeons often open a valve to remove mist from an abdominal cavity and ventilate CO<sub>2</sub>. The temperature of abdominal cavity goes down because CO<sub>2</sub> gas from an inflator is around 18 centigrade. This causes the lens of scope tend to more cloudiness.

**Material and Methods:** We developed CO<sub>2</sub> gas conditioning system to recycle CO<sub>2</sub> gas and insufflate warm CO<sub>2</sub> gas at 40 l/min. The performance of this system was evaluated in the pig lab. The temperature and humidity were recorded at the outlet and inlet. The lens stain was checked in the various situations, such as around electrocautery and LCS.

**Results:** The lens was not stained by a mist even at the 3 cm in front of activated LCS, because CO<sub>2</sub> gas made protector around a lens like an air curtain.

**Conclusion:** This system will be generally used in the laparoscopic surgery, not only because ordinal trouble of laparoscopy was cleared, but because of prevention of global warming.

P305

23401

### OPTIMIZED VESSEL SEALING UTILIZING TEMPERATURE CONTROL

Peter C Ng MD, Yale D Podnos MD, Linda S Oleson, James A Baker, SurgRx, Redwood City CA

**Introduction:** Temperature-controlled vessel sealers generate strong vessel welds and maintain a high safety profile. Combining focused bipolar RF energy, tissue compression, and time these devices forge collagen welds in 7 mm vessels with a burst strength averaging 800 mmHg. A novel technology enables precise temperature control at a molecular level, thus preventing overheating, char, and local thermal spread. This study compares temperature-controlled and uncontrolled bipolar devices against high conductive, collagen rich (arterial) and low conductive, collagen poor (venous) systems, seeking to distinguish differences in heat characteristics, energy delivery, and seal consistency.

**Methods:** Using identical power sources in a side-by-side bench model, a 5 mm temperature-controlled bipolar vessel sealer (EnSeal®, SurgRx®) and a 5 mm temperature-uncontrolled bipolar vessel sealer (Ligasure®, Valleylab®) were used to seal harvested porcine vessels. First, ten 6 mm arteries were sealed and each vessel sealer was individually supplied with continuous uniform energy for 2 minutes. Ten veins (3–5 mm) were then similarly tested. In each vessel type, current, voltage, impedance, and power were measured (ThermaCam® Researcher Pro). Temperature measurement and heat output were assessed by high definition infrared camera (FLIR ThermoVision® A320G).

**Results:** This experiment demonstrated superior thermal control in both arteries and veins for the temperature-controlled device. It maintained a consistent  $100^{\circ}\text{C} \pm 20\%$  compared to a continuous rise in temperature to  $190^{\circ}\text{C}$  in the uncontrolled device during the allotted energy delivery ( $p < 0.05$ ). The impedance curves demonstrated more efficient energy transfer in the temperature-controlled device, maintaining a constant power output. The uncontrolled devices, in contrast, produced high voltage spikes with regular variance in tissue impedance.

**Conclusions:** This experiment demonstrated the superior ability of temperature-controlled devices to affect and maintain optimal safe tissue temperatures for vessel sealing. By doing so, the incidences of superheating tissues and unintended power surges are mitigated. Safety is improved, as the formula for safe and effective vessel sealing includes dense tissue compression, a targeted heating process to effect collagen denaturation, and the ability to maintain consistent desiccation temperatures over time.

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## Esophageal / Gastric Surgery

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**THE COST OF ACHALASIA: QUANTIFYING THE EFFECT OF SYMPTOMATIC DISEASE ON PATIENT COST BURDEN, TREATMENT TIME AND DECREASED WORK PRODUCTIVITY**

Rahima N Nenshi MD, Julie Harnish MSc, Stacey Stegienko MSc, Binu Jacob PhD, Paul Kortan MD, Wayne Deitel MD, Audrey Laporte PhD, Gail Darling MD, David R Urbach MD, Department of Surgery, Toronto General Hospital

**OBJECTIVES** - Achalasia is an uncommon disease of esophageal motility, characterized physiologically by failure of the lower esophageal sphincter to relax upon swallowing, and the absence of effective peristalsis in the body of the esophagus. Although the incidence of achalasia is low, the burden of suffering is high because it is a chronic incurable disease that predominantly affects young persons. This paper aims to describe the impact of achalasia on patient cost burden, time dedicated to treatment and work productivity.

**METHODS AND PROCEDURES** - Consecutive patients from 4 general surgery practices across Canada (whose clinical and manometric diagnosis was confirmed) were invited to participate in a clinical trial comparing laparoscopic myotomy with pneumatic dilatation. Baseline data collection at enrollment involved a selection of standardized patient-reported outcomes instruments including the Healthcare Utilization Questionnaire (HUQ) and the Achalasia Severity Questionnaire (ASQ).

**RESULTS** - Questionnaires were completed by 49 patients (mean age = 51.0, 49.0% male). Patients had been experiencing symptoms for a mean of 4.4 years and 44.7% were on medication for symptom relief. 72.9% of patients reported that their disease limited their lifestyle. Patients spent an average of \$35.8 (CAD) a month on medication. 37.5% reported that their disease interfered with their work, and patients missed an average of 10.5 days/6 months. Patients also spent an average of \$23.1 (CAD) on transportation to and from each clinical appointment.

**CONCLUSION** - Achalasia substantially limits the lifestyle of patients with the disease. It also impacts on the financial burden of care for patients and leads to decreased work productivity.

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**LAPAROSCOPIC TOTAL GASTRECTOMY FOR CARDIA CANCER WITH ESOPHAGEAL INVASION**

Tsukasa Oyama MD, Takeshi Omori MD, Katsuhide Yoshidome MD, Masayuki Tori MD, Shigeyuki Ueshima MD, Masaaki Nakahara MD, Hiroki Akamatsu MD, Osaka Police Hospital

**Background:** Total gastrectomy is the standard therapy for resectable gastric cancer, including cardia cancer. A number of cardia cancers are invasive to esophagus, which requires extensive resection of esophagus. In some cases, division of esophagus should be placed in thorax so as to secure margin of tumor. Division of esophagus and esophago-jejunostomy in Roux-en-Y anastomosis is a critical procedure in total gastrectomy. The more proximal the site of esophagus division is, the more difficult it is to perform the procedures successfully under the historical open laparotomy. Here, we demonstrate that under laparoscopic total gastrectomy those procedures are much more easily completed.

**Patients and Procedure:** Among thirty-five laparoscopic total gastrectomy cases during the last eighteen months, we have six cases with esophageal invasion. Operation was performed with five ports. Esophagus was separated from diaphragm and thoracic esophagus was pulled down into abdomen. Before division of esophagus, an anvil head of a circular stapler was placed on esophagus by EST (efficient purse-string stapling technique) method (Omori, T., Am J Surg, in press). Briefly, incision was made on the anterior wall of the esophagus. This incision was placed at 1 cm-distal from a point to be divided. The anvil head bearing, on a trocar attached to its center rod, 2-0 monofilament suture with needle was inserted into proximal esophagus. The needle was put through the anterior wall to outside of the esophagus at 0.5 cm-proximal from the point of division. The esophagus was divided with linear stapler and finally the anvil head was secured at the end of the proximal esophagus. After total gastrectomy, the resected stomach was removed and Roux-en-Y anastomosis with a circular stapler was performed through a 4 cm transrectal laparotomy. In all of the cases at least 4 cm of esophagus was resected, which made the esophago-jejunostomy placed at the same level of the esophageal hiatus or in the thorax.

**Results:** No leakage or other infective post-operative complication was observed in the six cases. No anastomosis stenosis requiring ballooning occurred. The patients began oral intake on 4-POD. **Discussion:** Vision around esophageal hiatus and lower thorax was much better in surgery under laparoscopy than open laparotomy. This enables surgeons to safely pursue adequate lymphadenectomy around esophagus, division of esophagus and esophago-jejunostomy.

**LAPAROSCOPIC EXPERTISE INCREASES HOSPITAL VOLUME OF SURGICAL THERAPY FOR ACHALASIA**

Brittany N Jones, William W Hope MD, Charles J Dolce MD, Amy E Lincourt PhD, Timothy K Kuwada MD, Kent W Kercher MD, B. Todd Heniford MD, Carolinas Medical Center

Laparoscopic Heller myotomy is the preferred approach for the treatment of achalasia. The purpose of our study was to evaluate the number of laparoscopic Heller myotomies performed before and after the implementation of a minimally invasive gastrointestinal surgical program (MIP) in 1998.

A retrospective chart review was conducted on all patients who underwent laparoscopic Heller myotomy from 1993-2007. Data collected included hospital volume, average distance traveled, and outcomes and was compared for three different time periods: group I (1993-1997), group II (1998-2002), and group III (2003-2007).

Our sample consisted of 137 patients, 74 (54%) males and 63 (46%) females. The annual volume of cases increased considerably over the three time periods, with 8 cases in group I, 58 cases in group II, and 71 cases in group III; a significant increase between groups I and II, corresponding with the establishment of laparoscopic expertise ( $p < 0.0001$ ). Laparoscopic surgical technique increased significantly ( $p < 0.0001$ ) from 2 cases (25%) in group I to 54 cases (93%) in group II; and continued to increase in group III to 64 cases (90%). The average distance traveled to the hospital was equivalent for groups I and II (13.5 + 7.3 miles vs. 38.9 + 64.8,  $p = NS$ ), but significantly different between groups I and III (13.5 + 7.3 miles vs. 44.4 + 48.1 miles,  $p = 0.03$ ). Overall complication rate was 10.2%, with only 1 case (0.7%) requiring a repeat operation. There were no esophageal perforations with 99% of patients stating they would undergo the operation again.

The implementation of a MIP has significantly increased the number of surgical procedures for esophageal achalasia at our institution. These cases can be performed with a low morbidity and conversion rate. Initially, we saw a significant increase in number of procedures from the local population. Over time and with increasing volume we have witnessed a significant increase in distance traveled as our facility has become a regional referral center.

**INTRA-OPERATIVE OESOPHAGEAL MANOMETRY AS A PREDICTOR OF POST-OPERATIVE DYSPHAGIA**

Mansoor A Khan, Elghellal Khaleel, Smythe Anne, Globe Jenny, Ackroyd Roger, Royal Hallamshire Hospital, Sheffield, UK

**Abstract**

**Background:** Many trials have undertaken Intra-oesophageal manometry (IEM) as a measurement of adequacy of fundoplication. The aim of this pilot study was to assess the value of IEM in predicting post-operative dysphagia.

**Methods:** Forty patients underwent IEM studies prior to operative correction of gastro-oesophageal reflux disease and repeat studies 3 months post procedure. During the procedure, IEM studies were undertaken prior to pneumoperitoneum being established, post pneumoperitoneum, post pneumoperitoneum with fundoplication and post fundoplication without pneumoperitoneum. All patients were followed up at 1, 6 and 12 months post procedure to assess for persistent symptomatic reflux and post fundoplication dysphagia.

**Results:** Three patients demonstrated persistent dysphagia at the 12 month follow up point. There were no statistically significant differences in the pre-operative manometry studies in the dysphagia/non-dysphagia groups, with the dysphagic group having higher pressures. However, at operation, there were statistically significant differences in the lower oesophageal sphincter pressures: Post anaesthetic and no pneumoperitoneum (30.3 vs. 13.4)  $P = 0.002$ , post anaesthesia with pneumoperitoneum (40.3 vs. 18.3)  $P < 0.001$  and post fundoplication with pneumoperitoneum (47.3 vs. 23.4) ( $P = 0.001$ ). No statistically significant differences were demonstrated in post-operative manometry at the 3 month follow up point.

**Conclusions:** Intra-operative manometry may be useful tool compared to post operative manometry in identifying patients who may suffer from post fundoplication dysphagia.

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### OUR POUCH ROUX-Y RECONSTRUCTION TECHNIQUE AFTER LAPAROSCOPICALLY ASSISTED TOTAL GASTRECTOMY

Koji Hattori PhD, Yukio Terashita PhD, Ryouta Mori PhD, Shinichi Saito MD, Nagoya Kyoritsu Hospital Nagoya-city Japan

[Introduction] In laparoscopically assisted total gastrectomy (LATG), Roux-Y (RY) reconstruction has been performed. We have performed pouch with Roux-en-Y (PRY) reconstruction in LATG on eight cases since 2007. We demonstrated the techniques in the surgical procedure by photos and compared them with those used in the RY method.

[Point of the procedure] Under the laparoscope, the jejunum was marked at the position of 20 cm and 80 cm from the Treitz ligament (Treitz lig.), and a 6 cm midline incision was made in the epigastric region. The 20 cm jejunum from the Treitz lig. was dissected outside the incision, forming a Y-shaped anastomosis to the 80 cm jejunum, which was placed back in the abdominal cavity. An inverted J-shaped pouch 15 cm in length was formed outside the incision, which was anastomosed to the esophagus under direct vision. A His' angle was formed, and the elevated jejunum was connected to the duodenal stump with sutures.

[Results] The average reconstruction time during the operation was 78 minutes in the PRY method and 53 minutes in the RY method; both methods had no postoperative complications. The average durations of postoperative hospitalization were 6.2 days in the PRY method and 5.8 days in the RY method. Six months after the operation, the oral intake of one meal was more than two-thirds in all cases who underwent the PRY method compared with that before the operation.

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### ONE YEAR SYMPTOM SCORES AFTER LAPAROSCOPIC ANTI-REFLUX SURGERY: IS THERE A LEARNING CURVE?

Kazuto Tsuboi MD, Juliana Gazallo MD, Fumiaki Yano MD, Rudolf J Stadlhuber MD, Sumeet K Mittal MD, Department of Surgery, Creighton University Medical Center, Omaha, Nebraska, USA

Introduction: Laparoscopic anti-reflux surgery is the gold standard for surgical treatment of GERD and a well defined learning curve for the procedure has been described. Aim of this study is to assess if the surgeons experience has an effect on one year symptom scores and patient satisfaction.

Methods: All patients undergoing anti-reflux surgery are entered into a prospectively maintained database, including one year post-operative symptom scores. The database was queried in May 2008 to identify patients who had had one year follow-up. To decrease variability patients with large HH (> 5 cm), Para-esophageal hernia, required Collis gastroplasty or underwent trans-thoracic procedure were excluded.

Results: From September 2003 to May 2007 215 consecutive patients underwent primary anti-reflux surgery, of these 171 patients (103 women, mean age was 51.5 ? 14.0, 18–87) met inclusion criteria and were divided into 3 equal groups: early (9 / 2003–11 / 2004), mid (11 / 2004–12 / 2005), and late (12 / 2005–3 / 2007) group. There was significant decrease in mean-operative time ( $p < 0.05$ ), hospital stay ( $p < 0.02$ ) and post-operative complications ( $p < 0.05$ ) with experience. Additionally the number of patients who required re-operative intervention also decreased significantly with less patients requiring re-operative surgery as experience increased. There was no difference in one year patient reported symptom scores for heartburn (mean; 0.3 ? 0.7, median; 0), regurgitation (mean; 0.1 ? 0.4, median; 0) and dysphagia (mean; 0.3 ? 0.6, median; 0). Overall patient reported satisfaction was (mean; 8.9 ? 1.9, median; 10) ( $p = 0.54$ ) (scale of 1–10) and 13.6 (19 / 140) % of patients reported use of acid suppression medications.

Conclusion: Decrease in need for re-operative procedures is noted with increasing procedures however patient reported symptom scores do not change with experience. A high degree of one year patient resolution and satisfaction can be achieved even early in experience.

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### MINIMALLY INVASIVE ESOPHAGECTOMY: INITIAL EXPERIENCE

Stephanie G Worrell MS, Seemal Mumtaz MD, Kazuto Tsuboi PhD, Sumeet K Mittal MD, Creighton University School of Medicine

Objective: Since 2006 we have incorporated minimally invasive (MIE) esophageal resection in our operative armamentarium in the surgical treatment of esophageal cancer. The aim of this study is to examine trends in operative technique, extent of resection including lymphatic dissection and post-operative outcomes with increasing surgeon experience.

Methods: All patients undergoing esophageal resection are entered into a prospectively maintained database. Database was queried to identify patients who underwent MIE. Trends in operative and post-operative data were analyzed as the surgeon's experience with MIE increased.

Results: Twenty-two patients underwent MIE resection from 2006–2008, during the same period a total of 71 esophageal resections were performed. There were two conversions in the first four patients. Mean operative time was 431minutes, with no significant change over the period of study. There was a noticeable decrease in EBL, post-operative complications and ICU stay over the period of the study. All patients had an R0 resection and the average number of lymph nodes harvested increased from a mean of 11.2 in first 5 patients to 20.8 in the last 5 patients. There was one mortality (4.5%) due to ARDS.

Conclusions: MIE can be safely incorporated into an esophageal resection program provided expertise in minimally invasive surgery already exists. With experience there was an increase in the number of lymph nodes harvested. There is also a decreased incidence of post-operative complications, ICU days and EBL with experience.

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### CLINICAL PROGNOSSES AFTER LAPAROSCOPIC ASSISTED GASTRECTOMY FOR 76 CASES WITH EARLY GASTRIC CANCER

Hiroshi Kawahira MD, Hideki Hayashi MD, Yoshihiro Nabeya MD, Takashi Akai MD, Takanori Nishimori MD, Toshiyuki Natsume MD, Hisahiro Matsubara MD, Department of Esophago-Gastro-Intestinal Surgery, Chiba University Graduate School of Medicine

- (1) Objective of this study. Although Laparoscopic assisted gastrectomy (LAG) is has been accepted procedure for early stages of gastric cancer, the morbidity and modality are not clear compared to open gastrectomy (OG). We show our patients' prognoses after LAG. This is a retrospective and single facility report.
- (2) Methods and procedures. We have performed 76 LAG and 94 OG cases of clinical Stage IA and IB early gastric cancer from January 1999 through December 2005. Follow-up terms were from 2 years and 8 months through 5 years. Total gastrectomy were not included. The exclusion criteria specified cancer suitable for endoscopic mucosal resection (EMR) or endoscopic submucosal dissection (ESD).
- (3) Results. No statistical significances between LAG and OG patients about their backgrounds (age, gender), major morbidity and mortality. The details were 51 male, 25 female for LAG, and 68 male, 26 female for OG. The mean ages were 55.6 years of LAG and 58.7 years of OG. In LAG group, three cases were converted to open surgery. The reasons of the conversion were tumor advances for two cases and intra-operative hemorrhage for one case. The severe morbidities and mortalities were observed in 12 LAG cases; one small bowel obstruction, one multiple liver abscess, one cancer incidence of the remnant stomach, one death caused by cancer recurrence, 6 cases of other organ cancer incidences and two death cases of other organ cancer. For OG group, 16 cases were observed; one small bowel obstruction, one cancer in the remnant stomach, one death caused by cancer recurrence, 10 cases of other organ cancer incidences and three death cases of other organ cancer respectively.
- (4) Conclusions based on the results. We could not prove the statistical significances concerning the oncologic safety of the laparoscopic approach to gastric cancers. A follow-up term of at least 5 years is essential for a reliable estimation of recurrent disease, and the number of patients enrolled did not confer enough statistical power for the detection of small group differences in survival.

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### LAPAROSCOPY-ASSISTED DISTAL GASTRECTOMY FOR GASTRIC CANCER IN ELDERLY PATIENTS AGED 75 YEARS OR OLDER

Hidenori Fujii MD, Yoshiyuki Kawakami MD, Toshiharu Aotake MD, Koji Doi MD, Yuki Hirose MD, Fukui red cross

**Background:** The average life expectancy of the Japanese is 79 years in males and 85 in females; accordingly Japan is among countries with the longest life expectancy. Malignant neoplasm is the most prevalent cause of deaths, while gastric cancer ranks high among malignant tumors. We encounter quite a few opportunities to operate on elderly patients for gastric cancer.

**Subjects and Methods:** We studied the safety of laparoscope-assisted distal gastrectomy (LADG) for gastric cancer in elderly patients aged 75 years or older. In our institution, there were 60 cases that received such operations during the 4-year period from September 2004 to August 2008 and 13 cases of them were 75 years old or older. Group A included patients aged 74 years or younger (young old patients), while group B 75 years or older (old old patients). There was no significant difference in BMI between the two groups: the median value in group A was 22.5 (mean 21.6); and that in group B was 22.2 (mean 21.7). No significant difference was found in the disease stage nor in the extent of lymph node dissection between the two groups. (following the Japan Handling Rules for Gastric Cancer)

**Results:** There was no difference in the operation time nor in the amount of bleeding between the groups: the median operation time in group A, 298 min (mean 315 min), in group B, 293 min (mean 291 min); the median amount of bleeding in group A, 103 mg (mean 184 mg), in group B, 145 mg (mean 137 mg). Postoperative complications occurred in 4 cases in group A (8.5%) and 1 in group B (7.7%), showing no higher incidence in old old patients.

The frequency of postoperative analgetic use showed no difference between the groups: 1.13 times on the average in group A; and 0.62 in group B. There was no difference in the first walk after operations between the groups: day 1.65 in group A; and day 1.92 in group B. Flatus was observed on day 2.41 in group A and day 3.08 in group B or the old old group, the difference being significant.

However, most patients in both groups could take water on day 12 (mean 14) and start to ingest food on day 4 as scheduled in the critical path of our hospital.

There was no difference in the postoperative stay in hospital between the age groups; 12 days (mean 14) in group A; and 13 (mean 15.3) in group B.

No recurrence of the cancer has been observed in either group at the present moment. **Discussion** We consider LADG is a safe operative procedure for elderly patients.

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### SUBMUCOSAL TUMORS AT THE GASTROESOPHAGEAL JUNCTION: THE LAPAROSCOPIC APPROACH

Raymond J Gagliardi MD, Almudena Moreno Elola-Olaso MD, Jody J Johnson DO, Amber Allen MD, Center of Minimally Invasive Surgery, Department of General Surgery, University of Kentucky Medical Center, Lexington, Kentucky

**Introduction:** The objective of this study is to determine the feasibility of laparoscopic management of gastric submucosal tumors located at the gastroesophageal junction.

**Methods and Procedures:** A retrospective, longitudinal study was designed including 13 patients operated on in our department from November 1999 to December 2007. Fifty three percent of patients were males, mean patients' age was 57.4 ± 13.8 years and mean BMI was 31.1 ± 4.5 kg/m<sup>2</sup>. Preoperative work-up included EGD, CT-Scan, EUS (FNA in 5 patients).

**Results:** One patient who had a 3 cm tumor located posteriorly required conversion to open surgery because of difficult exposure and visualization of the tumor. All other cases were completed laparoscopically, and surgical procedure was a wedge resection in 7 patients, enucleation in 4 and laparoscopic transgastic resection in 1. Endoscopic assistance was used in all cases except one. Mean operative blood loss was 142.5 ± 111.8 ml. Mean operative time was 243.7 ± 84.8 minutes. None of the patients developed postoperative complications and all of them tolerated oral diet after a mean of 1.67 ± 0.78 days. Mean postoperative stay was 2.58 ± 0.99 days. Surgical pathology revealed a leiomyoma in 6 patients, GIST in 2, lipoma in 1, and non-specified stromal tumor in 1. All GIST tumors were c-kit and CD-34 positive. Mean tumor's size was 3.7 ± 1.2 cm. The non specified stromal tumor was not studied with immunohistochemical analysis as was operated on 2000, and immunohistochemical study was not performed. Nevertheless, the absence of mitotic activity, tumor necrosis or atypia confirmed the benign nature of the tumor. During follow-up none of the patients have developed a recurrence of the disease.

**Conclusions:** Laparoscopic management of submucosal tumors at the gastroesophageal junction should be attempted. Wedge resection and enucleation are safe procedures, avoiding the need of performing a gastrectomy. This approach is related to a fast recovery and low morbidity. The combination of laparoscopy and endoscopy is useful for tumor localization.

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### ROUX-EN-Y RECONSTRUCTION FOR FAILED FUNDOPLICATION

Konstantinos I Makris MD, Sumeet K Mittal MD, Department of Surgery, Creighton University Medical Center

**Objective:** Post-fundoplication recurrence of symptoms occasionally requires surgical correction. Our objective is to review our initial experience with Roux-en-Y (RNY) reconstructions for failed anti-reflux surgery.

**Method:** After Institutional Review Board approval, a retrospective review of data was performed on patients who had undergone RNY gastrojejunostomy or esophagojejunostomy, with or without gastric resection, after failure of previous funduplications.

**Results:** Twenty-two patients underwent re-operative procedures with RNY anastomoses either to the esophagus (n = 4) or to a small gastric pouch (n = 18) from January 2004 to September 2007. Recurrence of reflux (n = 7) or severe dysphagia (n = 7) were the main indications in the majority of patients (62%) requiring reoperation. Most patients had 1 previous procedure, while 6 patients had two and 2 patients had three previous anti-reflux procedures. Sixteen (73%) of our RNY reconstructions were done via laparotomy and six (27%) with a laparoscopic approach. Ten patients (45%) had major or minor complications within the 30-day postoperative period. No post-operative mortality was observed. At a mean follow-up of twenty-three months, the mean heartburn score was 0, the regurgitation score was 0 and the mean dysphagia score was 1. The mean post-operative BMI was 25.4 compared to a preoperative BMI of 31.

**Conclusion:** RNY reconstructions are effective and safe as remedial surgical procedures in a select group of patients with previously failed anti-reflux surgeries. They are associated with a significant morbidity.

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### THE TECHNIQUE SENTINEL LYMPH NODE BIOPSY IN LAPAROSCOPY-ASSISTED DISTAL GASTRECTOMY AND ASSESSMENT OF USEFULNESS COMPARED TO OPEN SURGERY

Yasushi Rino MD, Norio Yukawa MD, Hitoshi Murakami MD, Takashi Oshima MD, Naoto Yamamoto MD, Tsutomu Sato, Michiko Fukahori, Munetaka Masuda, Toshio Imada, Department of Surgery, Yokohama City University, School of Medicine

**Introduction:** Recently some studies suggested that sentinel node biopsy (SNB) can be also applied to gastric cancer. We apply sentinel lymph node biopsy in laparoscopy-assisted distal gastrectomy (LADG) to perform it as safe limited surgery. Limited surgery is a procedure in which the extent of lesion resection and lymph node dissection is reduced. We demonstrate that intraoperative diagnosis of lymph node metastasis is useful in this regard. Surgical procedures: Patent blue (1%) is injected submucosally into 4 to 5 different sites at 1 mL per site around the primary tumor. Blue-stained lymphatics and lymph nodes (BNs) can be seen by turning over the greater omentum and lesser omentum extraperitoneally. If blue nodes are found, biopsy is performed at this point. Since BNs identification takes time as mentioned above, no specific time restriction is set for the procedures from submucosal injection of patent blue to BN biopsy.

**Subjects and methods:** SNB has been performed in our institution since November 1999. The study was conducted in 95 gastric cancer patients with a preoperative diagnosis of T1 or mp invasion. Informed consent was obtained from all the patients. There were 64 males and 31 females with a mean age of 64.0 years. Tumor invasion of m, sm, mp, ss, and se was identified in 44, 38, 7, 2, and 4 patients, respectively. All patients underwent open distal gastrectomy (DG) or LADG and Billroth-I reconstruction. **Results:** The mean number of BNs dissected was 4.5 (0-18) in DG cases, and 3.8 (0-15) in LADG cases. Intraoperative identification and biopsy of BNs could be performed in 34 of 35 DG patients and in 57 of 60 LADG patients. Of the 34 patients in whom BNs were identified, 5 (9.7%) had metastases in BNs confirmed by intraoperative frozen section diagnosis in DG cases. However, in one SE invaded patient, postoperative diagnosis revealed lymph node metastases. False negative rate was 3.4%. On the other hand, of the 57 patients in whom BNs were identified, 5 had metastases in BNs confirmed by intraoperative frozen section diagnosis in LADG case. False negative rate was 0%. Metastasis to Group 2 lymph node was observed in 1 of the 5 patients (N2). **Discussion:** In the present LADG, the mean number of BNs dissected was 3.8(97.1%). The number of BNs dissected in DG was 4.5(95.0%). Therefore, SNB can be performed in LADG as well as in DG. However, whether the extent of lymph node dissection may be reduced to less than D1 needs to be studied in the future.

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### COMPREHENSIVE SINGLE CENTER REVIEW OF IMPACT OF BODY MASS INDEX ON SYMPTOMATIC RESULTS OF LAPAROSCOPIC NISSEN FUNDOPPLICATION

Christopher S McCullough MD, Jon D Gabrielsen MD, Iswanto Sucundy MD, Nathan Lee, Audrey G Bolanowski MD, Ravi J Chokshi MD, Anthony T Petrick MD, Geisinger Medical Center, Danville, PA

**Introduction:** Laparoscopic Nissen fundoplication is accepted as a standard and effective therapy for refractory GERD; however, controversy exists regarding the efficacy of Nissen fundoplication in obese patients. We report on the results of symptomatic outcomes of a series of obese and non-obese patients with GERD receiving laparoscopic Nissen fundoplication.

**Methods:** A single center retrospective review of initial adult laparoscopic Nissen fundoplication from November 2001 through May 2008. Weight, QOLRAD questionnaire (Quality of Life in Reflux and Dyspepsia), antacid use and symptoms were recorded pre-operatively, and at 3 months and 12 months post-operatively. An antacid use index was constructed based on the type and multiplicity of use. A symptom score index was determined based on the presence of: heartburn, regurgitation, dysphagia, bloating, epigastric pain and/or respiratory symptoms. Statistical analysis of groups was performed using two-tailed t-test.

**Results:** 289 patients (F = 169, M = 120), with a mean age of  $49.5 \pm 13.6$  years (20–83 years) underwent initial laparoscopic Nissen fundoplication for GERD. Length of hospital stay (LOS) was 1.14 days (STD 0.53). There was no operative mortality. Reduction in BMI, antacid use and symptoms, and improvement in QOLRAD score at twelve months was statistically significant. However, there were no statistically sig-

	Pre-op	12 Months	p
BMI	30.96 ± 5.6	29.07 ± 5.95	<0.05
QOLRAD	90 ± 34	132 ± 39	<0.05
Symptom Score	3.65 ± 1.45	1.21 ± 1.05	<0.05
Antacid Use	1.27 ± 0.64	0.14 ± 0.41	<0.05

nificant difference in the response of patients with BMI < 35, BMI 35.1-39.9, BMI > 40.

**Conclusions:** Significant improvement in outcomes of Laparoscopic Nissen fundoplication were demonstrated for symptoms score, antacid use and QOLRAD. However, there was not a significant difference in the symptomatic improvement following laparoscopic Nissen fundoplication between obese and non-obese patients.

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### LAPAROSCOPIC MANAGEMENT OF ACHALASIA: MEDIUM-TERM OUTCOMES AFTER HELLER MYOTOMY AND FUNDOPPLICATION

SERGIO DIAZ MD, JESUS VASQUEZ MD, ROGELIO MATA LLANA MD, FELIPE VANEGAS MD, MARIA C ARROYAVE MD, EUGENIA LOPEZ MD, CES UNIVERSITY - CES CLINIC. MANUEL URIBE ANGEL HOSPITAL. MEDELLIN, COLOMBIA.

**Introduction:** Achalasia is an uncommon disease of unknown origin. Management is challenging. Laparoscopic esophageal myotomy is the best treatment option, having variable results. We report the medium-term outcomes on 16 patients after Laparoscopic Heller myotomy and partial fundoplication.

**Methods and Procedures:** This is a descriptive, retrospective study evaluating the clinical outcomes of all patients undergoing laparoscopic Heller myotomy and partial fundoplication for achalasia in two hospitals affiliated to our university from February 2000 to January 2008.

**Results:** A total of 18 patients had surgery for achalasia. 2 patients were lost on follow up. We interviewed and reviewed the medical records of 16 patients. Mean follow-up was 30.6 months (range 3–96). Mean length of hospital stay was 3.1 days (1–5). There was no mortality and no conversion to open surgery was necessary. All patients had subjective improvement of symptoms and quality of life, as evaluated by a visual analogue scale. The mean score was 8.2/10 (range 6–10). After an average of six months, symptoms occurred in 14 patients (87.5%): heartburn in 8 (57.1%), regurgitation in 7 (50%) and dysphagia in 6 (42.8%), all of them considered as mild. Six patients required additional therapy, one (6.25%) needed reoperation for recurrence of symptoms (severe dysphagia), and 5 (31%) received proton pump inhibitors. All patients experienced weight gain (mean 5.8 kg)

**Conclusion:** Laparoscopic Heller myotomy is the treatment of choice for achalasia, with low morbidity and mortality. Despite the high rate of symptoms recurrence, patients perceived an improvement in their quality of life and gained weight. The results of our series compare favorably with other treatment options reported in the literature.

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### LAPAROSCOPIC SURGERY FOR ACHALASIA; A COMPARISON OF HELLER-TOUPET AND HELLER-DOR PROCEDURES

Natsuya Katada MD, Shinichi Sakuramoto MD, Keishi Yamashita MD, Shiro Kikuchi MD, Masahiko Watanabe MD, Department of Surgery, Kitasato University

**Aims:** Our aim of this study is to compare the short-term outcome of laparoscopic Heller-Toupet and Heller-Dor procedures for patients with achalasia from the symptomatic and functional points of view. **Patients and Methods:** Fifty-two patients with achalasia who complained dysphagia were enrolled into this study. All patients had laparoscopic Heller myotomy. The patients were divided into the following two groups according to the fundoplication type added to myotomy; Heller-Toupet group (HT, n = 30) and Heller-Dor group (HD, n = 22). The age was  $41.8 \pm 11.8$  years (mean ± SD) in HT and  $42.6 \pm 16.3$  years in HD (NS; no significant difference). M/F ratio was 12/18 in HT and 11/11 in HD. The symptom and esophageal function were prospectively assessed on the basis of dysphagia score, esophagography and esophageal manometry before and after surgery. **Results:** The dysphagia score one year after surgery decreased to  $1.7 \pm 1.2$  points in HD, and  $2.2 \pm 1.3$  in HD from a preoperative value of 10. The change of the maximum transverse diameter of the esophagus on esophagography before and one year after surgery (before/after) was  $5.5 \pm 1.0 \pm 3.8 \pm 1.1$  cm (p < 0.01) in HT, and  $4.3 \pm 1.0 \pm 2.7 \pm 0.7$  cm (p < 0.01) in HD. The change of LES pressure before and 3 months after surgery was  $35.2 \pm 12.6 \pm 15.0 \pm 6.7$  mmHg (p < 0.01) in HT, and  $38.4 \pm 13.7 \pm 20.9 \pm 6.2$  mmHg (p < 0.01) in HD. The LES pressure after surgery in HT was significantly lower than that in HD (p < 0.01). The change of LES relaxation rate was  $62.4 \pm 16.2 \pm 81.5 \pm 9.7\%$  (p < 0.01) in HT, and  $64.9 \pm 15.0 \pm 78.5 \pm 10.7\%$  (p < 0.01) in HD. The change of lower esophageal body peristaltic pressure was  $19.1 \pm 8.3 \pm 19.5 \pm 11.3$  mmHg in HT (NS), and  $30.5 \pm 13.3 \pm 21.7 \pm 13.2$  mmHg in HD (NS). As postoperative sequelae, two patients (7%) in HT had esophageal diverticula, and two patients (9%) in HD had severe residual dysphagia which required endoscopic balloon dilation. **Conclusions:** Both laparoscopic HT and HD are useful procedures for reducing LES pressure, and relieving dysphagia in patients with achalasia. It is noted that HT rarely causes esophageal diverticula after surgery, and HD can cause severe residual dysphagia after surgery possibly due to relatively high residual LES pressure.

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### A NEW PROCEDURE FOR THE TREATMENT OF GASTRO-ESOPHAGEAL REFLUX DISEASE IN MORBIDLY OBESE PATIENTS

Brian Binetti MD, Tejinder P Singh MD, Bernard Benedetto MD, Ward Dunnican MD, Bryan Bush MD, Albany Medical Center, Albany, NY

**Objective:** Gastroesophageal reflux disease (GERD) is frequently associated with obesity (BMI > 30), being reported in up to 51% of patients. The optimal surgical procedure for the combined treatment of morbid obesity and GERD has yet to be defined. Roux-en-Y gastric bypass has had favorable results on GERD in the morbidly obese but has the disadvantage of potential long-term metabolic derangement. We describe a novel operation combining sleeve gastrectomy with Nissen fundoplication (SGN) for the treatment of GERD in the morbidly obese.

**Methods:** We recruited 6 morbidly obese patients with GERD. We performed a standard laparoscopic Nissen fundoplication over a 56F bougie dilator. With the dilator in place, successive firings of a 60 mm Echelon® stapler were used to perform the gastrectomy preserving the antrum and the fundic wrap. We then introduced an endoscope to verify an intact fundoplication and unrestricted flow to the pylorus.

**Results:** This procedure was successfully performed in all 6 patients. All but one patient was female, with a mean age of 57 years. Mean operative time was 186.1 minutes. Mean starting body mass index (BMI) was 37.8. After a follow-up time of 30 to 150 days, our patients had mean weight loss of 17.5 pounds and an average decrease in BMI of 3.1. There were no complications within the 30-day period. There was no recurrence of GERD symptoms subjectively reported.

**Conclusion:** This operation can be successfully performed with no short-term morbidity. The SGN allows for maintenance of reflux control despite the restriction of the sleeve gastrectomy. Additionally, the trend toward long-term weight loss would favor superior reflux control. Furthermore, SGN preserves the option to convert to another bariatric procedure.

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### CLINICAL RESEARCH OF DIGESTIVE TRACT RECONSTRUCTION PERFORMED WITH THE NICKEL-TITANIUM TEMPERATURE-DEPENDENT MEMORY-SHAPE DEVICE AFTER DISTAL GASTRECTOMY

Xinxiang Li MD, Shanjun Cai MD, Jianxin Ye MD, Zheng Shi MD, Chengzhu Zheng MD, Raul J Rosenthal MD, Department of Colorectal Surgery, Fudan University Cancer Hospital

Clinical research of digestive tract reconstruction performed with the nickel-titanium temperature-dependent memory-shape device after distal gastrectomy  
1,2 Xinxiang Li MD, 1Shanjun Cai MD, 2Jianxin Ye MD, 2Zheng Shi, MD  
3 Chengzhu zheng MD, 4Raul J. Rosenthal MD

1 Department of Colorectal Surgery, Fudan University Cancer Hospital, Shanghai CHINA 200032

2 Department of Surgery, The First Hospital Affiliated To Fujian Medical University, Fuzhou Fujian350004, CHINA

3 Department of Minimally Invasive Surgery, Changhai Hospital of the Second Military Medical University, Shanghai, 200433, CHINA

4 The Bariatric & Metabolic Institute and Section of Minimally Invasive Surgery Cleveland Clinic Florida, Weston, FL 33331, USA

Corresponding author: Xinxiang Li, MD Department of Colorectal Surgery, Fudan University Cancer Hospital, Shanghai CHINA 200032 Tel: +86-021-137 6129 1659 Fax: + 86-021-64035387 lxx1149@163.com

Objective: To evaluate the the safety and efficacy of the compression anastomosis clip (CAC) for gastrointestinal anastomosis.

Method: From January 2006 to December 2007, 84 patients with distal gastric cancer undergoing distal gastrectomy were randomly divided into two groups for billroth II gastrointestinal anastomosis. There were 42 patients in each group. In the research group, CAC was used for side-to-side gastrointestinal anastomosis; Imported disposable metal tube-type stapler was used for side-to-side gastrointestinal anastomosis in the control group. After the operation, anastomotic complications, the time for resumption of intestinal function, and the time for discharge of CAC were evaluated. Results: The postoperative recovery of patients in CAC and stapled anastomosis groups was similar. None of the patients in the two groups had anastomotic complications. The time to resumption of bowel function was similar in both groups ( $p > 0.05$ ). The clip was expelled with stool within 14.0  $\pm$  13.2 days. Endoscopic examination after a 6-mo follow-up showed a better healing at the compression anastomosis

Conclusion: Our result strongly suggests that CAC is safe and reliable for gastrointestinal anastomosis.

[Key words]: Stomach neoplasms; Distal gastrectomy;

Billroth II gastrointestinal anastomosis; Compression anastomosis clip]

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### LAPAROSCOPIC INTRAGASTRIC RESECTION OF GASTRIC MESENCHYMAL TUMOR LOCATED CLOSE TO THE ESOPHAGO-GASTRIC JUNCTION

Akihito Abe PhD, Nobumi Tagaya PhD, Masatsugu Tachibana PhD, Keiichi Kubota PhD, Second Department of Surgery, Dokkyo Medical University

Introduction: Local resection with adequate margins has been an effective treatment for a gastrointestinal mesenchymal tumor (GIMT). However, the treatment strategy for a GIMT that is located close to the esophago-gastric junction (EGJ) remains controversial. We evaluate the surgical techniques and clinical outcomes of laparoscopic intragastric resection (LIR) for GIMT located close to the esophago-gastric junction.

Methods: We performed laparoscopic intragastric resection of GIMT in 10 patients. There were 3 males and 7 females. Their ages ranged from 34 to 75 years, with a mean of 60 years. The tumor measured 1.0 to 6.5 cm in diameter, with a mean of 2.6 cm. One of them had two tumors simultaneously. The mean distance from tumor to esophago-gastric junction was 2.6 cm (range: 1–3 cm). Their locations of the stomach were at the posterior wall side in 5 tumors, at the lesser curvature in 4, and at the greater curvature and anterior wall side in one, respectively. LIR was performed by two or three working ports inserting to the stomach directly. Initially, the abdominal wall and the anterior wall of the stomach were fixed using a double straight needle device. Two or three trocars were inserted into the stomach via the left upper quadrant of the abdominal wall under oral endoscopic guidance. A partial resection of the stomach was performed using a linear stapler so as not to cause any deformity of the EGJ. This resection included the tumor with an adequate margin in all directions. The direction of the cut line was modified so that the EGJ remained clear. The resected specimen was retrieved orally using a plastic bag. The oral gastroscope was used to exclude stenosis at the EGJ. Results: Laparoscopic resection was successfully performed in all patients. The mean operation time was 164 min (range: 110–211 min), and a mean post-operative hospital stay was 8.3 days (range: 4–12 days). One patient had an anemia with unclear origin requiring blood transfusion. Histological diagnoses were GIST in 5 tumors, leiomyoma in 5 and cyst in one, respectively. There was no recurrence during the mean follow-up periods of 93.7 months (range: 7–115 months).

Conclusion: Laparoscopic intragastric resection for GIMT is a safe and effective treatment with minimal complication and no recurrence.

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### LAPAROSCOPY-ASSISTED PANCREAS- AND SPLEEN-PRESERVING TOTAL GASTRECTOMY FOR GASTRIC CANCER AS COMPARED WITH OPEN TOTAL GASTRECTOMY

Shinichi Sakuramoto MD, Shiro Kikuchi MD, Nobue Futawatari MD, Natsuya Katada MD, Mitsuhiro Moriya MD, Keishi Yamashita MD, Masahiko Watanabe MD, Kitatsato University School of Medicine

Background: Laparoscopy-assisted total gastrectomy (LATG) is not widely used for the treatment of gastric cancer located in the upper or middle third of the stomach. To assess the safety and usefulness of LATG, we compared the outcomes of LATG with those of open total gastrectomy (OTG).

Methods: From July 2004 to July 2007, we performed pancreas- and spleen-preserving total gastrectomy with D1 + ?A or D2 lymph-node dissection and Roux-en-Y reconstruction in 74 patients with cancer located in the upper or middle third of the stomach. Of these patients, 30 underwent LATG (LATG group) and 44 underwent OTG (OTG group). Short-term outcomes were compared between the groups.

Results: Operation time was significantly longer in the LATG group than in the OTG group (313 min vs. 218 min,  $P < 0.001$ ). Blood loss (134 g vs. 407 g,  $P < 0.001$ ) and the rate of the use of analgesics (6.8 times vs. 11.8 times,  $P < 0.05$ ) were significantly lower, and the postoperative hospital stay was significantly shorter in the LATG group than in the OTG group (13.5 days vs. 18.2 days,  $P < 0.05$ ). The LATG group had better hematologic and serum chemical profiles, including white-cell counts, C-reactive protein levels, total protein levels, and albumin levels, as well as a lower rate of postoperative body-weight loss. The number of dissected lymph nodes (43.2 vs. 51.2  $p = 0.098$ ) and the rate of postoperative complications (20.0% vs. 27.3%,  $P = 0.287$ ) were similar in the groups. However, major complications such as anastomotic leakage, abdominal abscess, and pancreatic leakage occurred in 6 patients (13.6%) in the OTG group, but none of the patients in the LATG group.

Conclusions: LATG is associated with less severe complications and a better postoperative quality of life than OTG. We believe that LATG is a safe, useful, and less invasive alternative for the treatment of gastric cancer located in the upper or middle third of the stomach.

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### THE USE OF SMALL PORCINE BOWEL SUBMUCOSA MESH, IN THE TREATMENT OF GASTROESOPHAGIC REFLUX. LONG TERM RESULTS

MORRIS E FRANKLIN MD, GUILLERMO R PORTILLO MD, JEFFREY L GLASS MD, JOHN J GONZALEZ MD, MIKE RENFROW MD, EDUARDO A PEREZ, TEXAS ENDOSURGERY INSTITUTE

Introduction: Gastroesophageal reflux disease is present worldwide, it has a ratio of 360 in 100,000 persons, being the most common esophageal disease, accounting for 75% of cases. One of the most common complications after antireflux surgery is the migration of the fundoplication into the mediastinum, leading to recurrent GERD symptoms. To prevent postoperative intrathoracic wrap herniation, some authors have advocated the closure of the hiatus and the use of prosthetic materials. There is debate over what material should be used.

Objectives: Prospective follow up of 6 year experience in laparoscopic treatment of recurrence-prone hiatal hernia with the use of small porcine bowel submucosa (SIS Cook Biotech Incorporated, West Lafayette, IN, USA) at the Texas endosurgery Institute. Methods: All patients submitted to laparoscopic hiatal hernia repair procedures in our institution from January 2000 to December 2008 were included in the study.

The indications for the use of prosthetic material were: Recurrent hiatal hernia, crus defect  $> 5$  cm, obesity, Chronic obstructive pulmonary disease, despaired healing ( $n = 5$ , lupus diagnosis, 80 years or older), or incarcerated hiatal hernia.

Results: In 99 patients laparoscopic Nissen fundoplication and hiatal hernia repair using a bioabsorbable prosthetic mesh was completed. Fifty four females and 45 males, with a mean age of 59 years (range 32–91 years)

Fifty-one patients have a hernia smaller than 5 cm (52%), 50 patients had a hiatal hernia larger than 5 cm (48%). 30 of the patients had a recurrent hiatal hernia (30%), 2 patient had an incarcerated hiatal hernia (2%).

All cases were completed laparoscopically with just one conversion (1.01%) due to severe adhesions present at the hiatal hernia, this patient had prior antireflux surgery. The mean operating time was 175 minutes with a range of 75–400 minutes. 30 patients (34%) had severe adhesions present at the hiatal hernia.

There was a 1.1% complication rate being gastric injury in 1 patients. No other intraoperative complications were reported.

Postoperative complications included atelectasis in 4 patients and wound infection in 2 patients, both treated conservatively. There were no deaths

Conclusions: The laparoscopic placement of small porcine bowel submucosa in the hiatus is safe and effective to prevent recurrence of reflux symptoms.

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### ROBOT-ASSISTED LAPAROSCOPIC BELSEY FUNDOPLASTY FOR GASTROESOPHAGEAL REFLUX

Mohammed Kalan MD, Farid Gharagozloo MD, Barbara Tempesta MS, Marc Margolis MD, Andrew Nasser MD, Claire Edwards MD, Eric Strother BS, Farzad Najam MD, Washington Surgical Institute and Washington Institute Of Thoracic And Cardiovascular Surgery

**Objectives:** Belsey Mark IV fundoplasty is associated with less gas bloat and dysphagia compared to the Nissen wrap. Conventionally, a Belsey Mark IV fundoplasty requires a thoracotomy. Laparoscopic approaches to the Belsey procedure have not been satisfactory. By virtue of 3-D visualization and greater maneuverability, robot assistance can overcome the technical shortcomings of the laparoscopic approach.

**Methods:** From 1/04 to 10/08, 75 patients (41 men, 34 women, mean age 38 +/- 9 years) with gastroesophageal reflux disease underwent robot-assisted laparoscopic Belsey fundoplasty. All patients underwent preoperative manometry and 24 hour pH study. The robotic procedure was performed through the same five ports as conventional laparoscopy. The hiatus was closed anteriorly and posteriorly. The esophagus was intussuscepted into the stomach by 2 cm for 270 degrees. Results were assessed by preoperative and postoperative endoscopy, manometry, 24 hour pH study, UGI study, subjective symptom questionnaire, and objective Viscik grading.

**Results:** Indications: intractability (68), pulmonary complications (7). Median OR time : 3 hours. Median hospitalization : 1 day. Mean follow up was 34 months. Subjective symptomatic improvement: (maximum 12/patient) decreased from 8.6 +/- 0.6 to 0.6 +/- 0.2 (p < 0.05). 61 patients scored 0 and were completely free of reflux symptoms. 91% were Viscik I or II. 69 patients (92%) had transient postoperative dysphagia which resolved by the third postoperative week. There was no gas bloat or long term dysphagia. Recurrent hiatal hernia was seen in 4 pts. (5%).

**Conclusions:** Robot-assisted laparoscopic Belsey fundoplasty is feasible. It is associated with a low incidence of gas bloat and dysphagia. Although greater experience is necessary it may represent an alternative to the Nissen procedure.

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### POSTERIOR PARTIAL FUNDOPLICATION PROVIDES GOOD CONTROL OF REFLUX WITH A LOW INCIDENCE OF MECHANICAL COMPLICATIONS: A PROSPECTIVE REVIEW

M Almond MD, M Emes MD, M S Wadley MD, Upper GI Unit, Department of Surgery, Worcestershire Royal Hospital, Worcester UK

**Introduction:** Laparoscopic Nissens fundoplication is the most common surgical procedure performed for gastroesophageal reflux disease (GERD). It is however associated with a number of mechanical complications with as many as one in three patients experiencing troublesome dysphagia or gas bloat. Partial fundoplication, either posterior or anterior, has been advocated in an attempt to reduce these problems. Our aim was to prospectively evaluate laparoscopic posterior partial fundoplication (Toupet) as the primary surgical treatment for GERD.

**Method:** A prospective review of outcomes following Toupet fundoplication from October 2002 to June 2008. All patients underwent a 270o posterior partial fundoplication with routine crural repair. All procedures were performed by a single surgeon. Pre-operative investigations included endoscopy, pH studies/manometry and contrast studies. Demeester acidity scores, % reflux time and oesophageal motility were recorded. Pre- and post-operative Demeester symptom scores (0-9, DSS) and Viscik grading were used to assess outcomes of surgery.

**Results:** 101 patients were studied. Ages ranged from 17 to 69 years. Median pre-operative DSS of 5 fell to a median of 0 post-operatively. Scores decreased following surgery in all cases. 91 (91%) patients were discharged on the 2nd post-operative day or sooner. 5 (4.9%) patients had prolonged dysphagia (> 3 months), and 8 (7.9%) had mild prolonged gas bloat. A single patient had a recurrence of reflux and required re-do laparoscopic surgery at 2 years. There were no conversions to open surgery.

**Conclusions:** Laparoscopic Toupet fundoplication provides excellent relief of GERD symptoms with a low incidence of postoperative mechanical complications. We would recommend it as the operation of choice for GORD.

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### LAPAROSCOPIC NISSEN FUNDOPLICATION WITH HIGHLY SELECTIVE VAGOTOMY. A PILOT APPROACH FOR THE MANAGEMENT OF GASTROESOPHAGEAL REFLUX DISEASE

Niaz Selim MD, Daniel Buckles MD, Savio Reddymasu MD, Richard McCallum MD, UNIVERSITY OF KANSAS

**Introduction:** Laparoscopic Nissen fundoplication became the standard of care for the surgical treatment of gastroesophageal reflux disease. Its longevity has been under scrutiny lately as the wrap gets looser by time. The hypothesis of adding highly selective vagotomy (HSV), which will reduce gastric acid secretion by 60% and improve the transient lower esophageal relaxations, could help sustain long-term symptom response. Our goal is to compare a cohort of patients with gastroesophageal reflux disease (GERD) who underwent laparoscopic Nissen fundoplication with HSV in comparison to a group who did not undergo HSV during the procedure.

**Materials and Methods:** Over a 2 year period, 17 patients (13 females, 4 males) underwent a Nissen fundoplication with HSV, and 14 (10 females, 4 males) had Nissen fundoplication without HSV for refractory GERD symptoms, particularly nocturnal regurgitation. Life style, dysphagia, recurrence of symptoms and PPI use peri-operatively were studied. Esophageal manometry, esophageal pH monitoring, barium swallowgram and gastric emptying scintigraphy (GES) were performed preoperatively. All patients in both groups were on a PPI (Usually double dose therapy) prior to the surgery.

**Results:** Mean age of patients was 60.4 ± 14.4 years for the Nissen group and 47.9 ± 13.1 years for the Nissen + HSV. No mortality or immediate postoperative morbidity. All patients were discharged home on the next postoperative day. Spontaneously resolved early dysphagia was encountered in one patient (1.4%) in the Nissen group and in 3 patients (5.1%) in the Nissen + HSV group. Mean duration of follow up was 22.3 ± 8.5 months for the Nissen group and 16.4 ± 7 months for Nissen + HSV. One patient (1.7%) in Nissen + HSV group developed a slipped Nissen (21 months) and recurrence of the GERD.

No patients in the Nissen group started on PPI postoperatively, while one patient in the Nissen + HSV group started on PPI due to slippage and recurrence of GERD. None of the patients in the HSV group had symptoms suggestive of gastroparesis postoperatively. **Conclusion:** In this preliminary report with short term followup, the laparoscopic addition of a highly selective vagotomy did not contribute to perioperative morbidity or mortality. This new surgical approach for refractory GERD warrants further objective studies to assess its long term efficacy which would be the real merit for this approach.

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### MOST LIKELY LEVEL OF IMPAIRED BOLUS TRANSIT MEASURED BY MULTICHANNEL INTRALUMENAL IMPEDANCE

Faiz Tuma MD, Leena Khaitan MD, University Hospitals Case Medical Center, Department of Surgery

**Introduction:** Although multiple esophageal motility disorders have been defined manometrically, the underlying esophageal pathology is not always clear. Esophageal function testing (EFT), which combines manometry and multichannel intraluminal impedance (MII), has been increasingly useful in assessment of the Esophageal Motility disorders. MII allows the assessment of bolus transit. Impairments in bolus transit remain poorly understood. This study assesses the most likely level of impaired bolus transit when abnormalities are noted by impedance which can help to further characterize esophageal motility disorders.

**Methods:** Consecutive EFTs done between September 2007 to August 2008 were reviewed retrospectively. Patients underwent 10 liquid and 10 viscous swallows. Data was collected including diagnosis, medication use, symptoms, and EFT results of liquid and viscous swallows. Bolus transit is measured at 5, 10, 15 and 20 cm above the gastroesophageal junction (GEJ). The initial level of impaired bolus exit for each swallow was recorded. Data is reported as mean + SD.

**Results:** One hundred and nineteen patients (48% male) underwent EFTs. One patient could not tolerate catheter insertion therefore is excluded. The most common presenting symptoms were dysphagia (47%); heartburn (44%); chest pain (24.6%) and GERD (18%). The most commonly reported diagnoses were normal manometry (54.2%); ineffective esophageal motility, (11.9%); and achalasia (10.2%). Mean LES pressure was 24 ± 13.9 mmHg. Mean peristalsis was 81 ± 27.5%. Mean contraction amplitude was 84 ± 46.6 mmHg. Of 2358 swallows, 837 (35.5%) were incompletely transmitted. Of 2358 swallows, 837 (35.5%) were incompletely transmitted. Of these, 39%, 41%, 15.6%, 4.4% did not exit at 20 cm, 15 cm, 10 cm, and 5 cm above the GEJ respectively. Of 118 patients, 64 had normal liquid bolus transit (group A), and 54 had abnormal liquid bolus transit (bolus transit < 70%) (group B). Group A had 79 liquid bolus exit abnormalities at channels 15 and 20 cm, and only 17 exit failures at channels 5 and 10 cm; while group B had 230 abnormal exits at the higher level, and 80 at the distal esophagus. Only 117 of the 118 patients had viscous swallows; of those, 55 had normal viscous bolus transit (group C), while 62 had abnormal viscous bolus transit (group D). Group C had 65 abnormal bolus exits at channels 15 and 20 cm, and 13 at channels 5 and 10 cm; while group D had 303, and 46 abnormal bolus exits, respectively.

**Conclusion:** When patients have abnormalities in bolus transit, the most likely level is 15 to 20 cm above the GEJ. Those with abnormal esophageal clearance are more likely to have abnormalities in this portion of the esophagus. This is at the level of the transition zone of striated to smooth muscle. This level of the esophagus should be the focus of future evaluation of the pathophysiology of esophageal motility disorders.



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### LIMITED RESECTION FOR EARLY ADENOCARCINOMA OF THE ESOPHAGO-GASTRIC JUNCTION

Joerg Theisen MD, Marcus Feith MD, Joerg-Ruediger Siewert MD, Hubert Stein MD, Dept. of Surgery, TU Munich, Munich, Germany

**Introduction:** There is still a debate how to treat early carcinoma of the esophago-gastric junction. The spectrum ranges from endoscopic procedures to esophageal or gastric resections. Less invasive but with appropriate radicality is the limited resection as described here.

**Methods:** 134 patients with early carcinomas of the esophago-gastric junction underwent a limited resection of the distal esophagus and esophago-gastric junction, and reconstruction by interposition of a pedicled isoperistaltic jejunal segment. The patients were analysed for extent and multicentricity of primary tumor, the pattern of lymphatic spread, complications, death and outcome of surgical treatment.

**Results:** In more than 60% of the cases multicentric tumor growth could be found in the resection specimen. R0 resection could be achieved in all cases including the entire length of the metaplastic segment. In T1a tumors there were no lymph node metastases, in contrast to app. 20% lymph node metastases in T1b tumors. After a median follow-up of 60 months the Gastrointestinal Quality of Life Index did not differ from that of healthy controls.

The lymph node status showed a prognostic impact whereas T1a or T1b did not. **Conclusions:** Limited resection of the esophago-gastric junction is a safe procedure which has its place within the spectrum of therapeutic option for early cancer of the esophago-gastric junction specifically for the subgroup of patients having tumor growth in the submucosal layer as well as local lymph node metastases.

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### ROBOT-ASSISTED IVOR LEWIS ESOPHAGOGASTRECTOMY FOR ESOPHAGEAL CANCER

Andrew Nasser MD, Mohammed Kalan MD, Farid Gharagozloo MD, Marc Margolis MD, Eric Strother BS, Faisal Al-Mufarrej MD, Barbara Tempesta MS, Farzad Najam MD, Washington Institute Of Thoracic And Cardiovascular Surgery

**Objectives:** Ivor Lewis esophagogastrectomy is a well established oncologic procedure for cancers at or near the gastro-esophageal junction. However, this procedure is associated with significant morbidity related to the thoracotomy, especially following induction chemo/radiation therapy. A thoracoscopic approach may obviate this problem. Currently, thoracoscopic approaches are limited by 2-D visualization and lack of instrument maneuverability. Robotics, by virtue of 3-D visualization and greater dexterity may facilitate the thoracoscopic portion of the Ivor Lewis esophagogastrectomy.

**Methods:** Between 1/04 and 10/08, 36 patients underwent robotic-assisted esophagectomy with intrathoracic esophagogastrostomy (27 men, 9 women, age 37-77). Robot-assisted thoracoscopic esophageal dissection, mediastinal nodal dissection and intrathoracic anastomosis were performed via 4 ports in the right chest.

**Results:** 14 patients had induction therapy. Median operative time: 9 hours (range 8-17 hours). Esophagogastrectomy was performed in the right chest above the azygous vein. There were 8 nonemergent conversions to a thoracotomy due to technical difficulty with the anastomosis. Cell type were 27 ACA, 5 SCCA, 2 poorly differentiated CA, 1 carcinoma in situ, 1 high grade dysplasia. Median hospitalization was 11 days (range 8-60 days). Complications: 1 anastomotic leak (3%), 5 atrial fibrillation, 2 pulmonary emboli, 1 gastric staple line dehiscence > 30 days, 1 ileus, 1 respiratory failure, 1 reversible renal failure, 2 C-Diff colitis. There was one death (3%). Six patients (18%) required dilation of the esophagogastrectomy, 1 (3%) required pyloric dilatation. Follow up was complete in 34 patients (94%). At follow up, distant mets were seen in 6 (17%) patients, there was no local recurrence, and 22 (61%) were alive. Six patients died of their cancer (17%) and 5 died of other causes (17%).

**Conclusions:** Robot assistance significantly facilitates the thoracoscopic mobilization of the esophagus during an Ivor Lewis esophagogastrectomy. Robotic intrathoracic anastomosis is feasible but remains a challenge. More studies and further follow up are necessary to fully assess the role of robotics in the minimally invasive treatment of esophageal cancer.

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### ROBOT-ASSISTED THORACOSCOPIC HELLER MYOTOMY FOR ACHALASIA

Farid Gharagozloo MD, Mohammed Kalan MD, Marc Margolis MD, Barbara Tempesta MS, Andrew Nasser MD, Eric Strother BS, Farzad Najam MD, Washington Institute Of Thoracic And Cardiovascular Surgery

**Objectives:** The surgical treatment of achalasia remains controversial. Controversies include open vs. videoscopic approach, laparoscopic vs. thoracoscopic approach, and the need for an antireflux procedure. Laparoscopic Heller myotomy is hampered by the requirement of an added antireflux procedure. If the hiatus is not opened, thoracoscopic Heller myotomy does not require an antireflux procedure, but is associated with greater rates of residual achalasia. Robotics by virtue of 3-D visualization and greater maneuverability may facilitate thoracoscopic Heller myotomy.

**Methods:** From 12/05 to 4/08, 14 patients underwent robot-assisted thoracoscopic esophageal myotomy for achalasia without an antireflux procedure. Diagnosis of achalasia was confirmed by radiography, endoscopy, and manometry. Patients underwent intraoperative EGD. Robot-assisted myotomy was accomplished through 4 ports in the left chest. Myotomy was extended approximately 1 cm onto the proximal stomach. Success of the myotomy was determined by intraoperative EGD, postoperative contrast radiography, subjective symptom questionnaire, and Viscik grading.

**Results:** There were 4 men and 10 women. 8/14 (57%) patients had undergone botulinum toxin injection. There were no mucosal injuries or conversion to a thoracotomy. Median hospitalization was 4 days. All patients reported improvement in dysphagia. Symptom relief was graded as: 12 Viscik I, 2 Viscik II. 7/12 patients reported symptoms which mimicked reflux. Gastroesophageal reflux was seen in 1 patient.

**Conclusions:** Robot-assistance facilitates thoracoscopic Heller myotomy. Although greater experience is needed, the preliminary results of this study suggest that robot-assisted thoracoscopic Heller myotomy without an antireflux procedure may represent an excellent alternative to laparoscopic myotomy with an antireflux procedure.

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### LAPAROSCOPIC STRATEGY FOR GASTRIC SUBMUCOSAL TUMORS

Ken Hagiwara MD, Minoru Matsuda MD, Motoo Yamagata MD, Shigeoki Hayashi MD, Masashi Fujii MD, Tadatoshi Takayama MD, Department of gastrointestinal surgery, Nihon University, School of Medicine

**Introduction:** Surgical treatment is the best mean for curative therapy of gastric submucosal tumor (SMT) including GIST, however, the preferred operative approaches are still not well established. We would like to present our successful results of laparoscopic procedures according to the location and malignant potential of gastric SMT.

**Operative Techniques:** Operative approach should be decided by the tumor size, location, and malignancy. Basically, laparoscopic wedge resection is performed for the most of gastric SMT as possible. On the other hand, if the tumor was located near esophago-gastric junction, proximal gastric resection is required for the malignant GIST while intra-gastric resection was selected for the low grade malignant or benign tumor.

For the malignant GIST near pyloric ring, we selected pylorus preserving gastrectomy as possible or distal gastrectomy and if the tumor at the same lesion was low grade malignant or benign, laparoscopic wedge resection with preservation of the pyloric function is done.

**Patients:** 11 Patients underwent the laparoscopic resection of gastric SMT from Jan. 1, 2005 to Aug. 1, 2008. There were 7 GIST, 3 leiomyoma and 1 cyst.

**Result:** Laparoscopic procedures were carried out for all patients such as 3 proximal resections, 1 pylorus preserved gastrectomy, 3 wedge resections, 3 intra-gastric resections and 1 partial resection with the intervention of flexible endoscopy. Each mean operative time was 238 min, 160 min, 76 min, 122 min and 119 min and the blood loss was 140 ml, 25 ml, 10 ml, 7 ml and 1 ml respectively. There were no episodes of tumor rupture or spillage and no major peri-operative complications without conversions to the open surgery. All patients had good postoperative courses as well.

**Conclusion:** We thought that the selection of appropriate laparoscopic approach based on the location and malignant potential is very important for the treatment of gastric SMT to maximize the patient's benefit.

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### LAPAROSCOPIC TRANSLUMINAL EXCISION OF GASTRO-ESOPHAGEAL JUNCTION GIST TUMORS

Francis E Rosato, Jr MD, Karen A Chojnacki MD, Ernest L Rosato MD, Bernadette C Profeta MD, David S Tichansky MD, Thomas Jefferson University, Philadelphia, PA

**Introduction:** Laparoscopic excision of GIST tumors is safe and oncologically effective. GIST tumors at the gastroesophageal junction (GEJ) introduce special difficulties due to the complex accessibility of the proximal stomach by laparoscopy and concerns of narrowing the GEJ, while ensuring an oncologic resection. Herein, we examine the feasibility of laparoscopic transluminal excision (LTE) of GEJ GIST tumors to alleviate both of these problems.

**Methods:** Patients identified with GIST tumors within 3 cm of the GEJ underwent LTE. Following laparoscopic exposure of the stomach, intraoperative endoscopy was used to confirm the location of the mass. A transverse gastrotomy was made in the body of the stomach and the GIST tumor directly visualized. A bougie was placed in the esophagus to ensure an oncologic resection was feasible without encroachment on the GEJ. A suture or endoloop was placed around the base of the GIST to retract the tumor and elevate the wall of the stomach at the base of the GIST. GIA staplers were used from within the stomach to fully excise the GIST. The gastrotomy was then sutured or stapled closed.

**Results:** Six patients were successfully treated by LTE of GEJ GIST tumors. There were no open conversions and zero intraoperative or post-operative complications, including dysphagia and reflux. Resection margins in all patients were microscopically negative. There have been zero recurrences.

**Conclusions:** LTE of GEJ GIST tumors is feasible. This approach allows appropriate oncologic resection while providing direct visualization of the tumor, thus decreasing possibility of narrowing of the GEJ or injuring the surrounding structures of the GEJ.

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### USEFULNESS OF ULTRAFLEX STENTS SETTING FOR THE MANAGEMENT OF TRACHEOBRONCHIAL STENOSES IN ESOPHAGEAL CARCINOMA

Yoshifumi Ikeda MD, Junichi Takayama MD, Hiroshi Takami MD, Department of Surgery, Teikyo University School of Medicine

**Introduction:** Airway stents have gained increasing popularity in the management of challenging tracheobronchial obstruction based on the simplicity of their placement and the lack of good alternative approaches. Careful and judicious stent placement has provided significant and life-saving airway improvement in many patients. We present our experience with the use of the ultraflex stents in the management of airway complications in esophageal carcinoma and analyzed the relationships between survival after tracheobronchial stenting and clinical features. **Patients and Methods:** Twelve patients with esophageal carcinoma underwent placement of ultraflex stents for respiratory distress caused by tracheobronchial invasion. Mean age of the patients was 62.3 + 9.4 years (range 51–79 years), and there were 10 men and 2 women. All patients had histologically confirmed squamous cell carcinoma of the esophagus. Tumor resection had been performed in 7 patients, curative surgical intervention in 4 and a palliative operation in 3. Tumor resection had not been performed in 5 patients, bypass surgery in 4 and chemo-radiation therapy in the remaining 1 patient. The sites of stenoses included the trachea in 7 patients, and left main bronchus in 5. The causes of the tracheobronchial stenoses involved primary tumor invasion in 4 patients, mediastinal lymph node invasion in 5, and mediastinal recurrence in 3. The ultraflex stent (Boston Scientific, Tokyo, Japan) was placed using flexible bronchoscopy under local anaesthesia and sedation. **Results:** Since careful and judicious stent placement has provided significant, complications of stent placement was nothing and all patients received chemotherapy after stents insertion. In 2 patients of tracheal stenoses, tracheal intubations carried out by the intensive care unit for complaints of severe respiratory stridor. Another 10 patients had respiratory distress and were admitted to the hospital. After stents insertion, immediate relief of respiratory symptoms was obtained in all patients. The mean survival after stent insertion was 105 + 71 days. Causes of death were re-obstruction in 2, airway bleeding in 2, and cancer progression in 8. Multivariate analysis in age, gender, treatment degree, tumor resection, the site of stenting and the cause of stenosis revealed that tumor resection and the site of the stenting were the significant and independent risk factor for the survival ( $P < 0.05$ ). **Conclusion:** Stents setting can immediately improve patients' quality of life and tumor resection and the site of the stenting were the significant and independent risk factor for the survival.

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### PHYSIOLOGY: THE KEY TO VALIDATING MANAGEMENT TECHNIQUES IN GORD

Piriyah Sivagnanam BS, Lee Hooper PhD, Michael Rhodes MD, Norfolk and Norwich University Hospital NHS Trust, Norfolk, UK

**Introduction:** Most studies validate treatment of gastro-oesophageal reflux disease (GORD) using improvement in symptoms alone. Symptoms are difficult to interpret due to the placebo effect of any intervention. We present data comparing pre and post operative physiology in our series of laparoscopic Nissen's Fundoplication and compare this to a review of the current literature using meta-analytical techniques.

#### Method

All patients who underwent laparoscopic Nissen's Fundoplication for GORD between 1995 and 2008, were entered into a prospective database using Microsoft Excel ©. All underwent preoperative endoscopy, 24 hour pH monitoring and oesophageal manometry and were invited for post-operative oesophageal physiology studies at 4 months after surgery. The results from our series were compared with those from the published literature using RevMan 4.

**Results:** Surgery was performed on 210 patients with a median age of 49 years (range 15–73 years), median weight 83 kg (range 51–126 kg) and median BMI 27 (range 20–38). 193 of 210 patients (92%) had post operative physiology at 4 months post surgery. The weighted mean differences (WMD) were as follows: DeMeester score -37.94 [-44.25, -31.63] ( $p < 0.0001$ ), % time pH < 4 -11.62 [-13.86, -9.38] ( $p < 0.0001$ ) and LOS sphincter pressure (mmHg) 11.83 [10.35, 13.31] ( $p < 0.0001$ ). Overall WMD for all other studies of laparoscopic Nissen were as follows: DeMeester score -62.60 [-67.10, -58.10], % time pH < 4 -6.89 [-8.01, -5.77] and LOS pressure 10.46 [7.12, 13.81].

Meta-analysis of other procedures was not possible, but published results suggest mean reduction in DeMeester score of 60.55 for open Nissen (2 studies,  $n = 97$ ), 44.81 for laparoscopic Nissen (4 studies,  $n = 204$ ), 39.55 for laparoscopic Toupet (3 studies,  $n = 150$ ) and 10.53 for endoscopic gastroplication (Endocinch) (3 studies,  $n = 67$ ).

**Discussion:** Our data compares favourably with the published data on laparoscopic Nissen's Fundoplication. Operative techniques appear physiologically better than endoscopic ones for management of GORD. It is important that any new surgical procedure for GORD be validated using physiological parameters.

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### THE RECURRENCE OF REFLUX ESOPHAGITIS AFTER LAPAROSCOPIC FUNDOPLICATION FOR GASTROESOPHAGEAL REFLUX DISEASE

Fumiaki Yano MD, Kazuto Tsuboi MD, Nobuo Omura MD, Masato Hoshino MD, Akira Matsumoto MD, Hideyuki Kashiwagi MD, Katsuhiko Yanaga MD, Department of Surgery, Jikei University School of Medicine, Tokyo, Japan

**Introduction:** Despite the success rate of laparoscopic fundoplication for gastro-oesophageal reflux disease (GERD) at around 90%, the patients who need maintenance therapy of proton pump inhibitor or re-do surgery for recurrence of esophagitis post-operatively are recognized. The aim of this study was to analyze the characteristics of recurrence cases investigating our experienced patients.

**Methods:** Two hundred and sixty-two consecutive patients underwent laparoscopic fundoplication for GERD in our institution between December 1994 and July 2008. Patients with strictly more than one year follow-up were chosen. Finally, 190 patients (113 men and 77 women, mean age was 53.8?) 16.1; 18–85) remained and were divided into the following 2 groups: 19 patients (10%) with recurrence of esophagitis and 171 patients (90%) with non-recurrence of esophagitis. Their clinical data collected in a prospectively fashion was retrospectively reviewed. The patients' background, pre-operative condition, surgical results, and post-operative conditions were compared between the two groups.

**Results:** Recurrence group was significantly older than non-recurrence group (60.4, 53.1 years old,  $p = 0.04$ ), however, there were no significant differences in gender ratio, BMI, and disease length ( $p = 0.05, 0.37, \text{ and } 0.18$ , respectively). According to the anatomy-functional-pathology (AFP) classification, the degree and type of hiatal hernia (A factor) and the degree of esophagitis (P factor) were significantly worse in recurrence group ( $p = 0.0001 \text{ and } 0.03$ , respectively) but the degree of reflux (F factor) wasn't a statistical difference ( $p = 0.32$ ). There were no significant differences in blood loss and peri-operative complications ( $p = 0.75 \text{ and } 0.92$ , respectively). As to post-operative condition, the degree of hiatal hernia, esophagitis and reflux were significantly aggravated in recurrence group ( $p < 0.0001$ , each).

**Conclusion:** 1) Golden-ager was the risk factor of recurrence of reflux esophagitis. 2) If the patient has deteriorated esophagitis and hiatal hernia pre-operatively, the risk of recurrence was increased but the degree of reflux didn't correlate. 3) The patients in recurrence group had a recurrent hiatal hernia and the degree of esophagitis and reflux were significantly aggravated.

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### MICROSCOPIC FAT PROCESSING WITH HARVESTING OF LYMPH NODES IN GASTRIC CANCER IMPROVES NODAL YIELD AND UPSTAGES N STATUS

CJ Magee MD, R Macadam PhD, M Shrotri MD, D Kerrigan MD, Taylor W, University Hospital Aintree, UK

**Objectives:** The current UICC staging system for gastric cancer relies on number of positive nodes to give N stage, up to a maximum of 16 involved nodes. As most nodal harvesting is based on macroscopically detected nodes there is a real danger that involved nodes may be missed and therefore the disease is understaged. We hypothesised that fat processing and microscopic evaluation of gastrectomy specimens would improve nodal yield, detection of nodal metastases and therefore staging of the disease

**Methods:** 121 consecutive gastrectomy specimens were histologically examined by a consultant gastrointestinal pathologist. All macroscopically enlarged nodes were analysed. In addition fat was processed and microscopic lymph nodes analysed.

**Results:** Median macroscopic nodal yield was 20 (0-58), fat processing increased this to 43 (1-76,  $p < 0.0001$ ). In 58% of cases no additional metastases were identified. In 42% of cases fat processing revealed metastatic lymph nodes. In 15% cases the additional positive nodes identified changed the N stage- (N0- > N1 4 cases, 3.2%, N1- > N2 8 cases, 6.5%, N2- > N3 5 cases, 4% and N1- > N3 in one case 0.8%).

Macroscopic nodal harvesting understages true nodal status for N0, N1 and N2 in 10%, 20% and 25% respectively.

**Conclusions:** Fat processing for microscopic lymph node analysis improves staging in 15% of cases. This has significant implications for prognosis and possible adjuvant therapy. Further work is being undertaken to improve selection of cases for fat processing.

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### LONG-TERM SUBJECTIVE AND OBJECTIVE OUTCOMES OF LAPAROSCOPIC NISSEN FUNDOPLICATION WITH COLLIS GASTROPLASTY FOR SHORTENED ESOPHAGUS. INITIAL EXPERIENCE FROM A SINGLE RURAL INSTITUTION

ISWANTO SUCANDY MD, CHRISTOPHER PFEIFER DOJON GABRIELSEN MD, NATHAN, ANTHONY PETRICK MD, Geisinger Health System

**Background:** Laparoscopic Nissen Fundoplication (LNF) with Collis Gastroplasty has been adopted as the treatment of choice for advanced gastroesophageal reflux disease (GERD) with shortened esophagus. Only few studies have described subjective and objective outcomes of LNF with Collis gastroplasty for this particular condition. Therefore our study is aimed to investigate long-term subjective and objective outcomes of LNF with Collis Gastroplasty and to compare them with those following LNF alone.

**Methods:** Retrospective analysis was performed in all patients undergoing LNF with collis gastroplasty between 2001-2006. Similar number of patients were selected and matched for age, gender and preoperative body mass index (BMI) to serve as a control group. Preoperative 24 hour pH study and esophageal manometry were obtained in majority of patients. Upper gastrointestinal contrast study (UGI) and esophagogastroduodenoscopy (EGD) were compared pre and postoperatively in both groups.

**Results:** 20 patients undergoing LNF with collis gastroplasty were identified during the study period with mean age of 57.4, preoperative BMI of 30.2 and F:M ratio of 3:2. Preoperative pH study showed significantly higher DeMeester score in LNF-Collis group compared to LNF group (111.7 versus 31.8;  $p = 0.023$ ) whereas percentage of pH < 4 was comparable (17.52% vs 19.5%;  $p = 0.77$ ). Preoperative esophageal manometry showed more common abnormality of lower esophageal sphincter pressure and esophageal motility in LNF-Collis group (50% vs 25%;  $p = 0.69$  and 25% vs 20%;  $p = 1$  respectively). Following surgery both groups had major resolution of heartburn (85 vs 100%;  $p = 0.23$ ), regurgitation (80% vs 70%;  $p = 0.71$ ) and epigastric pain (50% vs 25%;  $p = 0.19$ ). A lesser degree of improvement was found on respiratory symptom (25% vs 25%;  $p = 1$ ), dysphagia (15% vs 5%;  $p = 0.61$ ), and bloatedness (2.5% vs 22.5%;  $p = 0.318$ ). Majority of patient in both groups were comparably able to stay off their H2 blocker, proton pump inhibitor and over the counter antacid postoperatively. Pre and postoperative EGD showed notable resolution of esophagitis and hiatal hernia in both groups (50% vs 15%;  $p = 0.082$  and 63% vs 70%;  $p = 0.74$  respectively). UGI contrast study that was also performed pre and postoperatively showed similar result. One patient in LNF-Collis group had gastric perforation requiring emergent return to the operating room for repair and placement of abdominal drain; however length of stay was comparable between both groups (1.25 vs 1.2 days;  $p = 0.77$ ). Operative revision had to be performed in 2 patients in the first group and 3 in the second group. No mortality found in this study.

**Conclusions:** Laparoscopic collis gastroplasty with nissen fundoplication is an effective procedure for patients with shortened esophagus. Subjective and objective outcomes, decrease in medication use, intra/postoperative complications, length of hospital stay, reoperation rate are comparable to those found in patients managed with primary nissen fundoplication.

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### INFLUENCE OF AGE ON LONG-TERM SUBJECTIVE AND OBJECTIVE OUTCOMES OF LAPAROSCOPIC NISSEN FUNDOPLICATION. INITIAL EXPERIENCE FROM A SINGLE RURAL INSTITUTION

ISWANTO SUCANDY MD, CHRISTOPHER PFEIFER DOJON GABRIELSEN MD, NATHAN, ANTHONY PETRICK MD, Geisinger Health System

**Background:** Laparoscopic nissen fundoplication (LNF) is the gold standard for surgical treatment of gastroesophageal reflux disease (GERD) with majority of patients are younger adults. In recent era of aging population, many community surgeons are hesitant to perform this procedure in the elderly due to presumed higher morbidity and poorer surgical outcomes. Therefore this study is aimed to investigate long term subjective and objective outcomes of LNF based on age.

**Methods:** Retrospective review was performed in all patients undergoing LNF between 2001 and 2007 for reflux disorder. Patients were divided into 4 age groups (age < 25(A), 25-45(B), 45-65(C), and > 65(D)) and compared for improvement in objective and subjective findings, medication use, complications, length of hospital stay and reoperation rate. Objective findings were measured by esophagogastroduodenoscopy (EGD) and upper gastrointestinal contrast study (UGI) performed both pre and postoperatively. 24 h pH study and esophageal manometry performed prior to surgery were also recorded.

**Results:** Total of 277 patients undergoing LNF during the study period (Group A = 11, B = 98, C = 131, D = 37). Gender and BMI are comparable among all groups. Preoperative 24 h pH study revealed higher DeMeester score in patient > 65 year of age compared to those in younger groups (66.34 vs 21.2-groupA, 51.61-groupB, 29.29-groupC;  $p = 0.74$ ). Similar pattern was seen on percentage of pH below 4 (13.92 vs 5.23-group A, 13.27-group B, 12.6-groupC;  $p = 0.75$ ). Preoperative manometry showed higher incidence of abnormal esophageal motility in patients > 65 compared to those in younger groups (30% of patients vs 14.3%-groupA, 8.1%-groupB, 15.4%-groupC;  $p = 0.12$ ). Abnormally low lower esophageal sphincter pressure was found most frequently in patients age 25-45 (46.5%-group B vs 0%-group A, 35.3%-group C, 31.8%-groupD;  $p = 0.25$ ). Following surgery, heartburn and regurgitation are 2 symptoms that were most significantly improved by LNF with patients > 65 experienced the highest benefit among all groups (89%;  $p = 0.300$  and 81%;  $p = 0.310$  respectively). Majority of patients in all 4 groups were able to discontinue their H2 blocker, proton pump inhibitor and antacid postoperatively. Objective measurement with pre and postoperative EGD showed highest percentage of resolution of hiatal hernia in patients > 65 compared to those in younger age groups (85% vs 55%-group A, 56%-groupB, 44%-group C;  $p = 0.28$ ). The most significant improvement of esophagitis was endoscopically seen in the youngest age group and at a lower frequency as the age increases (38%-group A vs 34%-groupB, 23%-group C, 12% group D;  $p = 0.035$ ). UGI that was performed pre and postoperatively trended toward similar results. Length of hospital stay was similar among all groups (1.1 day;  $p = 0.980$ ). Reoperation was required in 4 patients in group B (4/98), 4 in group C (4/131) and 1 in group D (1/37). No mortality found in this series.

**Conclusions:** Laparoscopic nissen fundoplication provides a comparable subjective and objective outcomes in the elderly patients to those in younger age. The more frequent anatomic and physiologic esophageal abnormalities found in the elderly patients do not preclude good surgical outcomes.

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### GASTRIC COCAINE "BODY PACKER", SUCCESSFULLY REMOVED BY LAPAROSCOPIC APPROACH

Miguel Garcia-Oria MD, Cornelia Segendorf PhD, Josep Domingo PhD, Mouna Taouragt MD, Maria J Lopez, Montserrat Bolarin MD, Raimundo Toubes MD, Hospital de Figueres

Illegal drug transport is sometimes done by individuals carrying the drug into their body.

"Body Packer" is the term normally used to refer them. Intoxication and bowel obstruction are the main medical problems that may develop. If needed, laparotomy can be performed to remove the drug pack from the body. A wide range of papers have been published reporting that, but little laparoscopic experience has been communicated.

We present a case of gastric cocaine pack of 8 cm in a young male patient. The pack was unable to pass the pylorus in 3 weeks.

In our case, successful surgery was performed by laparoscopic approach. A gastrotomy was done, and the cocaine pack removed from the stomach and from the body through the umbilical port inside a plastic bag.

The postoperative period was uneventful and patient benefit from the advantages of this minimally invasive approach.

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### ACCURACY OF THE ENDOFLIP™ FUNCTIONAL LUMEN IMAGING PROBE

Fran Keating BS, John ODea PhD, Crospon, Galway, Ireland

**Objective:** Impedance Planimetry has been demonstrated as a useful technique for assessing the cross sectional area of hollow lumens in the gastrointestinal tract. EndoFLIP® represents the first commercial implementation of this technique, and provides cross sectional area/diameter measurements at multiple points along the tract simultaneously. This study presents the first accuracy evaluation of the EndoFLIP® system and measurement catheter

**Methods:** The EndoFLIP® balloon catheters used for this study allow 16 diameter measurements spaced 3 mm apart along the axis of the catheter to be measured at the one time and in real time. The initial prototype balloons are specified for diameter measurements up to 25 mm, the upper diameter being chosen to suit measurements made in the gastroesophageal junction for assessment of distensibility of the junction, or for assessment of GEJ diameter pre-, post- or during GERD surgery. Bench testing was carried out using calibrated rigid cylinders with the following diameters (mm) : 5,6,7,8,9,10,12,14,16, 18,20,22,26 . The testing was conducted using 3 different prototype systems, with 10 different catheters and two different temperatures (23 and 37C). With 16 diameter measurements per catheter, this resulted in a sample size of 13,440 diameter measurements.

**Results:** In rigid cylinder testing, the the median difference between measured and actual diameter was 0.1 mm (IQR -0.25 to 0.5) or 0.88% (IQR -2.38% to 3.44%).

**Conclusions:** The EndoFLIP® system is capable of producing accurate diameter measurements in the range of 5–25 mm. The system is currently being used for evaluation of structural modifications to the GEJ via different endoluminal and laparoscopic surgical techniques. By virtue of being able to measure 16 diameters/areas simultaneously, current research is focussing on deriving volume measurements using the technique. This will present a capability in bariatric surgery applications to measure pouch volume as well as stoma diameter.

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### GASTROINTESTINAL STENTING AS BRIDGE TO FUTURE SURGERY

Michael W Cook MD, Aziz Merchant MD, Matthew Shane MD, S. Scott Davis MD, John F Sweeney MD, Edward Lin DO, Emory Endosurgery Unit, Emory University School of Medicine

**BACKGROUND:** Gastrointestinal stenting is most often utilized for end-stage palliation for unresectable malignancy. We propose the concept of gastrointestinal (non-biliary) stenting as a bridge to surgery for benign conditions, as well as, neoadjuvant stenting for malignant diseases.

**METHOD:** All stents were placed in the operating room under general anesthesia, with endoscopic and fluoroscopic techniques. All foregut stents were placed for nutritional repletion in place of parenteral or percutaneous enteral feeding. Colonic stents were placed for strictures or colonic cancer to relieve obstruction.

**RESULTS:** Over 60 enteral stents were placed during a 7 year period, mostly for esophageal cancer palliation. In 13 patients, enteral stents were placed with the intention of performing a subsequent operation; 9 patients had esophageal stenting (5 removable polyester, 4 covered metallic, 4 stents for benign disease), 1 duodenal metallic, and 3 colonic metallic stents. There were no perforations, no aspiration events. All colonic stents underwent resection without colostomy. The patient with duodenal stent was not resectable secondary to metastasis. Three polyester esophageal stents had migration, and were replaced. All esophageal stenting patients underwent successful surgery.

**CONCLUSIONS:** Gastrointestinal stenting is an acceptable strategy as a bridge to planned surgery. Colonic stenting for obstruction may obviate the need for colostomies. Gastroesophageal stenting enhances nutrition during neoadjuvant treatment periods, reducing the need for enteral feeding tubes or parenteral nutrition. The benefits for duodenal stenting in preparation for future surgery are less clear. This is also the first report of temporary gastroesophageal stents placed for benign conditions prior to definitive surgical treatment.

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### ANALYSIS OF FACTORS CONTRIBUTE TO LESS INVASIVENES OF LAPAROSCOPIC GASTRECTOMY COMPARED WITH CONVENTIONAL OPEN SURGERY FOR GASTRIC CANCER PATIENTS

Natsume Toshiyuki MD, Kawahira Hiroshi MD, Hayashi Hideki MD, Nabeya Yoshihiro MD, Nishimori Takanori MD, Akai Takashi MD, Matsubara Hisahiro MD, Matsushita Kazuyuki MD, Nomura Fumio MD, Department of Frontier Surgery, Chiba University Graduate School of Medicine

**Introduction:** We have been reported that analysis of systemic inflammatory indicators showed lower responses after laparoscopic assisted distal gastrectomy (LADG) compared with conventional open distal gastrectomy (ODG)(Hayashi et al., Surg. Endosc., 2005). In order to analyze factors contributed to the lower systemic inflammatory response in patients after LADG, both peritoneal and systemic immune response were measured and compared between patients after LADG or ODG. **METHODS AND PROCEDURES:** Thirty-one gastric cancer patients who underwent distal gastrectomy, at the Chiba University Hospital, between November 2007 and September 2008, were enrolled. Fourteen were LADG and 17 were ODG. Changes of serum C-reactive protein (CRP) levels and Interleukin 6 levels of peritoneal drain fluid were measured and compared between the groups. **RESULTS:** Operation time was 315 ? 44 minutes for LADG and 229 ? 66 minutes for ODG (p < 0.01). Blood loss was 124 ? 99.5 g for LADG and 348 ? 209 g for ODG (p < 0.01). The mean CRP levels for LADG were 5.21, 7.83 and 2.21 for 1, 3, 5 POD, respectively, and those for ODG were 7.74, 9.68 and 2.18 for 1, 3, 5 POD, respectively (p < 0.01 on 1 POD, N.S. on 3, 5 POD). The mean IL-6 levels in the peritoneal drain fluid for LADG were 35693, 13420, and 5962 for 1, 3, 5 POD and those for ODG were 44797, 7777, and 2805 for 1, 3, 5 P.O.D. (N.S.). **CONCLUSION:** Although systemic inflammatory response observed was lower after LADG compared with ODG, local inflammatory response within the peritoneal cavity appeared to be similar between the groups. These data suggested that factors outside the peritoneal cavity could contribute to the less invasiveness of the laparoscope assisted distal gastrectomy.

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### EVOLVING NATIONAL PRACTICE PATTERNS FOR MANAGEMENT OF PARAESOPHAGEAL HERNIA: A POPULATION BASED STUDY

Thai H Pham MD, Kyle A Perry MD, Eugene Y Chang MD, Brian S Diggs PhD, John G Hunter MD, Brett C Sheppard MD, Oregon Health and Science University

Department of Surgery, Oregon Health and Science University, Portland, OR.

**Introduction:** Based on studies from specialized centers, laparoscopic paraesophageal hernia (PEH) repair has proven to be a safe and effective procedure. We hypothesized that during the past decade, both the total number of PEH repairs and the proportion approached laparoscopically have increased. The aim of this population based study was to examine the evolution of national practice patterns for the management of PEH.

**Methods:** The Nationwide Inpatient Sample (NIS) database was queried from 1996–2006 using ICD-9 diagnosis codes for PEH and gastroesophageal reflux disease. Based on procedure codes, PEH repairs were categorized as laparoscopic, transthoracic, or open abdominal. National estimates of inpatient mortality, morbidity, and patient characteristics were computed.

**Results:** An estimated 97,757 PEH repairs were performed during the study period. The number of PEH repairs performed annually increased from 6,957 cases in 1996 to 9,366 in 2001 and then to 10,409 cases in 2006. Overall, 76.7% were performed via laparotomy, 13.5% transthoracic and 9.8% laparoscopically. During the study period, laparoscopic repairs have decreased as outlined in the table below. Laparoscopic repair was associated with significantly improved mortality (0.93%, p = 0.004) and morbidity (7.63%, p = 0.0001) compared to transthoracic (1.37% and 12.8%) and laparotomy (1.32% and 9.77%).

**Conclusion:** As expected, this population based analysis demonstrates a steady increase in the total number of PEH repairs performed annually in the United States. Despite its lower morbidity and mortality, laparoscopic PEH repair has yet to gain national acceptance.

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Open Abd.71.9%72.9%73.7%75.0%77.3%85.4%

TT 13.2%13.4%15.2%14.7%12.4%11.0%

Lap 14.9%13.6%11.0%10.3%10.3%6.6%

TT = Transthoracic; Lap = Laparoscopic

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### LOWER ESOPHAGEAL SPHINCTER PRESSURE CORRELATES WITH OUTCOMES OF LAPAROSCOPIC HELLER MYOTOMY IN PREVIOUSLY TREATED ACHALASIA

Arman Kilic BS, Arjun Pennathur MD, James D Luketich MD, Rodney J Landreneau MD, Matthew J Schuchert MD, The Heart, Lung, and Esophageal Surgery Institute, University of Pittsburgh Medical Center

**Background:** The purpose of this study was to define the distribution of pre-operative resting lower esophageal sphincter pressures (LESP) in achalasia, and to correlate this with symptomatic outcomes following laparoscopic Heller myotomy (LHM).

**Methods:** A single institution retrospective review of patients undergoing LHM for a primary diagnosis of achalasia between 1992–2005. Patients were divided into those receiving prior endoscopic therapy (botulinum toxin injection or dilatation) and those undergoing myotomy as primary therapy. LHM failure was defined as persistent dysphagia requiring reoperation or return of dysphagia to preoperative severity. Normal LESP was 6–26 mmHg as defined by manometric standards. Statistical comparisons were performed using Fisher's exact test, with significance defined as a two-tailed p-value less than 0.05.

**Results:** A total of 140 patients undergoing LHM for achalasia were identified who had pre-operative manometry and available LESP data. Sixty (42.9%) patients underwent LHM as primary therapy, with 29(48%) having a hypertensive LESP. Only 2(3%) primary LHM failures occurred, both in patients with normal LESP (p = NS). Of the 80 (57.1%) patients with prior endoscopic therapy, there were no failures in those with a hypertensive LESP (0%; n = 30) as compared to 11(22%; n = 50) failures in those with a non-hypertensive LESP (p = 0.005).

**Conclusions:** Excellent symptomatic relief is afforded to achalasia patients undergoing LHM as primary therapy, as well as patients with prior treatment whose LESP remains hypertensive. Patients with a non-hypertensive LESP following previous endoscopic therapy appear to be at increased risk of myotomy failure.

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### "Y" FUNDOPLICATION FOR GASTROESOPHAGEAL REFLUX DISEASE: EVALUATION OF 80 CONSECUTIVE CASES

Jorge A Fernandez MD, Iker Leon MD, Gonzalo Vargas MD, Alonso Lopez MD, Hospital Español de México

"Y" Fundoplication for Gastroesophageal Reflux Disease: EVALUATION OF 80 CONSECUTIVE CASES

Jorge Fernandez - Alvarez, M.D., Iker León, M.D., Gonzalo Vargas, M.D., Iker León, Alonso R. López, M.D.

#### Abstract

**OBJECTIVE:** Description of an hybrid laparoscopic fundoplication technique (Nissen plus Guarner) performed in patients with gastroesophageal reflux disease (GERD) in nine years of experience and the results obtained from this technique.

**MATERIAL AND METHODS:** Over a 9-year period retrospective evaluation of our technique performed in 80 patients. Data obtained from the surgery archives of the Hospital Español de México (Private University Hospital). The technique was performed by the same surgical team during this period. We made a telephonic interview to the patients using Visick modified score.

**TECHNIQUE:** French position, 5 ports in a habitual position, conventional dissection of diaphragmatic hiatus, closure of the crura. First knot: Stomach - Stomach in the central part of the fundoplication. Second knot: Left side Stomach - Esophagus - Phrenoesophageal membrane with 3 cm. between this knot and the third one. Third knot: As the second at the right side. Fourth knot: In Gastroesophageal junction stomach-esophagus-stomach.

**RESULTS:** Eighty patients with surgery 31(39%) females and 49(61%) males, median age 41.26 years old (range 17–77). Sixty one patients (76.25%) answered the questionnaire. All the patients had a previous endoscopy which revealed that 100% of the patients had erosive esophagitis and with Barrett metaplasia 17%. Only two patients had atypical symptoms. The median length of hospital stay was 48 hours. There was no mortality reported. One patient had a relapse caused by an acute cough attack and reoperated eight months later.

Median Follow - up was 5.3 years; (range3–113 months). Visick modified score I in 57 patients (93.44%). There were no patients with dysphagia or complications, only 4 patients presented gas bloat syndrome (6.5%) actually 11 (18%) patients take occasionally antireflux medicines.

**CONCLUSIONS:** Our technique is an effective longterm treatment for gastroesophageal reflux disease. It doesn't have postoperative dysphagia, and it has less gas bloat syndrome.

**Keywords:** Antireflux surgery; Laparoscopy; 'Y' Fundoplication; Gastroesophageal reflux disease; Dysphagia; Gas bloat syndrome.

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### LAPAROSCOPIC VERSUS OPEN RESECTION OF GASTRIC STROMAL TUMORS

X Zhi MD, C Wen MD, L Wang MD, G Zhang MD, S Hu MD, A Park MD, 1. Department of General Surgery, Qilu Hospital of Shandong University 2. Department of Surgery, University of Maryland

**Background:** Gastrointestinal stromal tumors (GISTs) represent a rare but distinct histopathologic group of intestinal neoplasms of mesenchymal origin. Although GISTs are found throughout the gastrointestinal tract, the stomach is the site of occurrence in more than half of patients. Surgical resection is required for cure of gastric GISTs. Because extensive resections and lymphadenectomies are usually not required, the laparoscopic approach has been considered reasonable for gastrointestinal stromal tumors (GISTs) of gastric origin.

**Objective:** To compare the relative efficacy of laparoscopic and open resection of gastric stromal tumors and assess the feasibility and effectiveness of the laparoscopic approach.

**Methods:** Sixty-one consecutive patients who underwent laparoscopic or traditional open resection of gastric GISTs at Qilu Hospital from December 2002 to March 2008 were reviewed. Clinical data was divided into two groups: 1) open and laparoscopic, and 2) compared.

**Results:** The incision length, average intraoperative blood loss, the gastrointestinal function recovery time and postoperative hospital stay in laparoscopic group was less than those of the open group(3.3;A1.2 vs 16.6;A3.1 cm, 51.0;A29.0 vs 119.0;A139.0 ml, 2.4;A0.9 vs 4.1;A1.2 day;6.9;A1.9 vs 10.8;A2.7 day).There was significant difference between two groups (P < 0.05).However, the operative time, the rate of the complications, the mortality, the recurrence rate and total treatment cost had no significant difference(141.0;A52.0 vs 144.0;A71.0 min;0G vs 0G, 3.8G vs 17.1G, 3.8G vs 5.7G, 0G vs 2.9G, 21886.0;A3118.0 vs 20201.0;A6724.0 RMB yuan;P > 0.05).

**Conclusions:** Compared with those who had the open procedure, those who had laparoscopic surgery suffered less trauma and recovered more quickly, with both procedures evidencing similar recurrence rates and total treatment costs. The advantages suggest the feasibility of laparoscopic surgery for GISTs.

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### ASSESSMENT OF GASTRIC CONDUIT ISCHEMIA FOLLOWING ESOPHAGECTOMY: THE ROLE OF CT-SCAN VS. EARLY ENDOSCOPY

Arzu Oezcelik MD, Farzaneh Banki MD, Shahin Ayazi MD, Emmanuele Abate MD, Joerg Zehetner MD, Weisheng Chen, Jeffrey A Hagen, Steven R DeMeester, John C Lipham, Tom R DeMeester, Department of Surgery, Keck School of Medicine, University of Southern California

**Background:** Ischemia of the gastric conduit is a rare but devastating complication of esophagectomy. Fear of iatrogenic injury to the anastomosis by early endoscopy has resulted in use of CT scan for diagnosis of this complication which may lead to delay in diagnosis. The aim of this study was to assess the role of CT scan vs. early upper endoscopy to assess ischemia of the gastric conduit following esophagectomy.

**Methods:** Between 2002 and 2007, 704 patients underwent an esophagectomy and gastric pull up at the University of Southern California. Records were reviewed to identify patients who underwent endoscopy for suspicion of ischemic conduit at a median of 7 days (IQR 5-9) and a CT-scan within 24 hours of the endoscopy. The accuracy of CT-scan and endoscopy were compared.

**Results:** Seventy six patients had endoscopy and a CT-scan performed for clinical suspicion of graft ischemia. Endoscopy showed evidence of ischemia in 52 patients. There were no complications associated with early endoscopy. CT-scan showed evidence of ischemia in 10/52 patients (19%). Seven of these patients had air in the soft tissue of the neck/mediastinum, 3 had a perianastomotic or mediastinal fluid collection and all 10 had graft ischemia on endoscopy. The remaining 42 patients (81%) with graft ischemia on endoscopy had normal findings on CT-scan. Seven of these patients had graft necrosis and were all missed on CT-scan. The ischemic conduit was removed in these 7 patients. The remaining patients responded to conservative therapy.

**Conclusion:** A normal CT scan does not rule out the possibility of an ischemic conduit following esophagectomy. Early endoscopy is safe and remains the diagnostic test of choice.

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### UPPER GI CONTRAST STUDY AS PREOPERATIVE PLANNING TOOL IN FUNDOPLICATION PATIENTS

Jessica Evans MD, David Earle MD, Baystate Medical Center

**Objective:** To determine if esophageal manometry added information important for preoperative fundoplication planning compared to upper GI contrast studies (UGIS) **METHODS:** We retrospectively reviewed the records of 323 patients at a single institution who underwent a fundoplication (Nissen or Toupet) for GERD and/or paraesophageal hernia from 2003 to 2007. Of these, we excluded patients younger than 18 or who underwent re-operation. 40 patients had complete results of both esophageal manometry and upper GI contrast study. UGIS were performed with liquid barium and/or barium-coated marshmallows and included information about gastric function. Esophageal manometry was performed with a solid state 5-channel probe. **RESULTS:** 10 patients (25%) had varying degrees of dysmotility on UGIS. Of these 10, 7 had normal manometry, 2 had ineffective esophageal motility (IEM), and 1 had nutcracker esophagus. Only 1/10 of these UGIS demonstrated delay in bolus transport with normal manometry, and underwent partial fundoplication. In manometric studies, 29 (73%) had normal motility. 11(27%) had dysmotility(2-nutcracker; 9-IEM). All with manometric dysmotility had normal bolus transport on UGIS, and only 3 had mention of some dysmotility. All 11 patients underwent Nissen fundoplication. Gastric motility and emptying were specifically mentioned in 33 patients (83%), and there were no patients with gastric outlet obstruction or aperistaltic stomach. **CONCLUSION:** Manometry is often considered most important for preoperative planning in fundoplication. However, UGIS can provide adequate information about esophageal motility and bolus transport. Additionally, UGIS adds information regarding anatomy, gastric motility, and gastric outlet obstruction. Therefore UGIS, if performed properly, is the most important study for preoperative fundoplication planning. However, it is probably still important to obtain baseline manometry information preoperatively.

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### EVALUATION OF INTRAOPERATIVE STRATEGIES AND RECURRENCES AFTER LAPAROSCOPIC PARAESOPHAGEAL HERNIA REPAIR

Ramy H Fouad MD, Patrick Gatmaitan MD, Joseph Talarico MD, Ali Elhorr MD, Philip Schauer MD, Stacy Brethauer MD, Matthew Kroh MD, Bipan Chand MD, Cleveland Clinic, Cleveland, OH

**Introduction:** Patients undergoing paraesophageal hernia repair are known to have recurrence rates as high as 40 %. Preoperative findings on anatomic studies fail to determine intraoperative strategies to decrease this recurrence rate. Current operative techniques to reduce this rate include extensive mediastinal dissection to increase intra-abdominal esophageal length, closure of the hiatus with mesh, sac excision and gastropexy. The aim of this study is to evaluate the effectiveness of intra-operative strategies in decreasing recurrences.

**Methods:** A retrospective review was conducted from 2001–2007 on patients who underwent laparoscopic Para-esophageal hernia repair as either a primary operation or revision. All patients were evaluated with either esophagogastroduodenoscopy or upper GI or both pre-operatively. Intra-operative evaluation of esophageal length after extensive esophageal mobilization dictated if a fundoplication was performed. Patients were grouped according to primary procedure or revision and then compared to each other. An attempt to identify reasons for recurrences was based on operative techniques. Recurrences were diagnosed with post-operative esophagram. **Results:** 122 patients were included, 104 were primary operations and 18 were revisions. There were no mortalities and intra-operative morbidity rate was 5.7%. All revisional operations had at least a fundoplication performed. Of patients undergoing primary operations, 86 underwent a fundoplication, 28 of them also had the hiatus reinforced with a prosthetic mesh. Of the remaining 18 patients without fundoplication, 12 had mesh repairs. All patients underwent anterior gastropexy. Esophagram performed prior to discharge showed no immediate recurrence and 3 esophageal perforations. Follow-up esophagrams were obtained in 63% of patients at an average of 12 of months post-operatively. Only 10 recurrences were documented, all of which were discovered after 12 months. No recurrences were seen at the 6 month esophagrams. Of these radiographic recurrences, 6 were symptomatic. Of the recurrences 2 occurred after revisional procedures. Analysis of intra-operative strategies including mesh reinforcement, sac excision, gastropexy or fundoplication did not predict recurrences. None of the patients with recurrences underwent further surgical intervention.

**Conclusions:** Analysis did not determine which operative strategies lead to our overall decreased recurrence rate. Recurrences on esophagram were not seen on the immediate post-operative period and remained asymptomatic in some.

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### PREOPERATIVE ANGULATION OF THE DISTAL ESOPHAGUS AND OUTCOME AFTER HELLER MYOTOMY AND ANTERIOR FUNDOPLICATION FOR ACHALASIA

Sharona B Ross MD, Kellie M McFarlin MD, Connor A Morton BS, Sarah Eisen BS, Alexander S Rosemurgy MD, University of South Florida

**Introduction:** Achalasia is defined by esophageal dysmotility and obstruction. Over time, obstruction may result in esophageal elongation and angulation of the distal esophagus. The aim of this study was to determine if preoperative distal esophageal angulation correlates with symptom relief after laparoscopic Heller myotomy and anterior fundoplication.

**Methods:** 63 patients undergoing laparoscopic Heller myotomy with anterior fundoplication in 2007 were prospectively followed and outcomes recorded. Patients scored their symptoms (i.e. dysphagia, heartburn, choking, regurgitation, vomiting, chest pain) before / after myotomy utilizing a Likert scale (0 = never/not bothersome to 10 = always/very bothersome). Preoperative Timed Barium Studies were used to measure angulation of the distal esophagus.

**Results:** Symptoms improved with myotomy (Table). Premyotomy angulation of the distal esophagus impacted symptoms before myotomy but not after myotomy (Table).

Table 1

Symp. Severity	Diff. (Swallow)	Food Stuck (Th)	Food Stuck (Ch)
Preop Severity	9 (7 ± 3.7)	8 (7 ± 3.6)	9 (7 ± 3.6)
Postop Severity	1 (2 ± 2.7)	0 (2 ± 2.7)	1 (2 ± 2.6)
P-value	0.0001(+)	0.0001(+)	0.0001(+)
Ang vs Sev (pr)	0.01*	0.03*	0.02*
Ang vs Sev (pt)	0.98	0.68	0.89

+ Wilcoxon Matched Pairs, \* Spearman Regression

**Discussion:** Premyotomy angulation of the distal esophagus correlates with preoperative symptom severity. After myotomy and fundoplication, symptomatic relief of achalasia is dramatic; symptomatic relief is not impacted by premyotomy esophageal angulation. Notable angulation of the distal esophagus should not deter application of myotomy and fundoplication.

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### ACHALASIA COMPLICATED BY EPIPHRENIC DIVERTICULUM IS WELL TREATED BY LAPAROSCOPIC DIVERTICULECTOMY, HELLER MYOTOMY, AND ANTERIOR FUNDOPLICATION

Kellie M McFarlin MD, Sharona B Ross MD, Connor A Morton BS, Emily Kramer BS, Andrew Tanelus, Alexander S Rosemurgy MD, University of South Florida

**Introduction:** An epiphrenic esophageal diverticulum is a consequence of severe long-standing achalasia and can further exacerbate the symptoms of achalasia. This study was undertaken to determine the operative complications and long-term outcomes after laparoscopic diverticulectomy, Heller myotomy, and anterior fundoplication for achalasia complicated by epiphrenic diverticulum.

**Methods:** Of 440 laparoscopic Heller myotomies, 25 patients have undergone laparoscopic diverticulectomy, Heller myotomy, and anterior fundoplication. Before and after operative intervention, patients scored the frequency/severity of symptoms utilizing a Likert scale (0 = never/not bothersome to 10 = always/very bothersome). Data are reported as median (mean +/-SD).

**Results:** Patient age was 73 years (68 years +/- 13.6); 52% of patients were male. Duration of preoperative symptoms was 5 years (7 years +/- 6.0). Preoperative dysphagia and regurgitation were particularly frequent and severe. After laparoscopic diverticulectomy, Heller myotomy, and anterior fundoplication, 14 patients experienced pleural effusion (5), capnotherax (4), gastrotomy (2), occult contrast extravasation at the staple line (2), and pneumonia (2). Length of stay was 2 days (4 days +/- 3.8). Follow-up is 35 months (37 months +/- 29.3). At last follow-up, dysphagia, choking, chest pain, vomiting and regurgitation had significant improvement (p < 0.05, Wilcoxon); symptoms were not notable in frequency or severity after diverticulectomy. Diverticula recurred in 3 (12%) patients. 2 patients (8%) are dissatisfied because of recurrent or persistent dysphagia; though for each, myotomy is adequate.

**Conclusions:** Epiphrenic diverticula occur in older patients with very symptomatic long-standing achalasia. Although concomitant diverticulectomy adds morbidity to laparoscopic Heller myotomy and anterior fundoplication, patients experience salutary relief from symptoms of achalasia. Diverticula can recur, therefore, we now cover the staple line with an anterior fundoplication. Laparoscopic diverticulectomy, Heller myotomy, and anterior fundoplication are encouraged for patients with esophageal diverticula and severe symptomatic achalasia.

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### USE OF LAPAROSCOPIC INTRA-CORPOREAL SUTURING IN ESOPHAGOJEJUNOSTOMY FOR RE-ESTABLISHING GASTROINTESTINAL CONTINUITY AFTER GASTRECTOMY: REPORT OF TWO CONSECUTIVE CASES

Fariba Dayhim MD, Timothy Oppermann MD, Patrick Reardon MD, Craig Fischer MD, Brian Dunkin MD, Shanda Blackmon MD, Garth Davis MD, Robert Davis MD, The Methodist Hospital

Acute gastric volvulus secondary to paraesophageal hiatal hernia can be a life-threatening condition, causing gastric necrosis, perforation and sepsis. Emergency surgery with total or partial proximal gastrectomy, obligates the patient to a second challenging procedure to re-establish gastrointestinal continuity.

Laparoscopic esophagojejunostomy is a technically demanding procedure; this is especially true when the procedure is the second stage for reconstruction following an emergency total gastrectomy for gastric necrosis and perforation.

We present two cases of paraesophageal hiatal hernia, with intrathoracic, upside-down stomach and extensive gastric necrosis. Both patients were successfully treated with gastrectomy (one total and the other proximal subtotal), distal esophageal stapling, placement of a feeding jejunostomy and endoscopic, ultrasound-guided cervical esophagostomy.

Gastrointestinal continuity was reconstituted a few months later, with laparoscopic esophagojejunostomy.

For the laparoscopic reconstruction, the mean estimated blood loss was 1075 ml, the mean operation time was ten hours and 49 minutes, and mean length of stay was nine and half days.

Table: Results for laparoscopic (second) stage

	Operation time	EBL	LOS
Case 1*	10 hr, 5 min	2000 ml	14 days
Case 2	11 hr, 32 min	150 ml	5 days
Mean	10 hr, 49 min	1075 ml	9.5 days

EBL: Estimated blood loss, LOS: Length of stay

\* Case 1 suffered from coronary artery disease and was on Aspirin and Plavix. We present these two cases with the technical details of the procedure and a review of the literature.

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### LYMPH NODE DISSECTION IN OPEN VERSUS LAPAROSCOPIC GASTRECTOMY FOR GASTRIC CANCER

Ricardo Yañez MD, Ricardo Funke MD, Gustavo Pérez MD, Camilo Boza MD, Luis Ibáñez MD, Fernando Pimentel MD, Alex Escalona MD, Department of Digestive Surgery, Faculty of Medicine, Pontificia Universidad Católica de Chile

Background: The development of laparoscopic surgery has been allowed its incorporation in the surgical treatment of gastric cancer. The number of lymph node dissected is one of the tools used to evaluate the quality of lymph node dissection in gastric cancer. The aim of this study was to compare the quality of lymph node dissection after laparoscopic and open gastrectomy. Patients and Methods: Review of prospective database of all patients who underwent laparoscopic gastrectomy for gastric cancer with curative intent in our institution. Patients underwent D1 + β or D2 lymph node dissection according to preoperative staging. They were matched according to age, gender and TNM staging with patients who underwent open gastrectomy for gastric cancer in the same period. Results: From May 20005 to April 2008, 16 patients were underwnt laparoscopic gastrectomy for gastric cancer. The mean age was 63 years (40–80), nine (56%) were male. Total and distal gastrectomy were performed in 10 and 6 patients respectively. The mean operative time was 240 minutes in patients who underwent laparoscopic gastrectomy and 226 minutes in patients of the open group ( $p < 0.51$ ). The mean hospital stay was 6.5 days in patients of the laparoscopic group and 13.7 days in patients of the open group ( $p < 0.03$ ). The mean number of lymph nodes dissected was 32.8 (18–64) and 33 (19–55) ( $p < 0.87$ ) after laparoscopic and open gastrectomy respectively. Postoperative complications were observed in 3 (18.7%) and 4 (25%) patients in laparoscopic and open gastrectomy group. One patient of the laparoscopic group was readmitted and reoperated because of hemoperitoneum. This patient developed a multiple organ dysfunction and subsequent death. According to the histopathological study, 4 patients were in stage IA, 5 in stage IB, 2 in stage II, 4 in stage IIIA and one in stage IIIB. Conclusion: In patients with gastric cancer, the mean number of lymph nodes dissected after laparoscopic gastrectomy was similar to open gastrectomy. A shorter hospital stay operative time was observed in patients after laparoscopic gastrectomy.

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### UPPER GI CANCER STAGING PRACTICES AMONG SURGEONS IN UK

A Vats, K Nagpal, K. Ahmed, M Jenkins, K Moorthy, Imperial College, UK

Background: Staging of gastro-oesophageal cancer is crucial not only in deciding upon the management options but it can also decrease the number of non-curative laparotomies. Therefore it has been an area of much research and controversy. The current practices for gastro-oesophageal cancer staging prevalent among upper GI surgeons in United Kingdom were sought.

Methods: We conducted a survey by handing out structured questionnaires to Upper GI surgeons attending a national conference of Association of Upper Gastro-Intestinal Surgeons in UK.

Results: CT scan was the most commonly used investigation in the staging of all upper GI cancers (100%). Peritoneal cytology was the least widely used investigation among the surgeons. Further are illustrated in the table.

Reported preference for staging investigations

Type of cancer	Oesophageal	O-G junction	Gastric
CT scan	100%	100%	100%
Endoscopic USG	91%	95%	52%
laparoscopy	66%	91%	89%
PET	64%	64%	45%
Peritoneal cyto	20%	34%	36%

Conclusion There is a significant variation in the use of staging investigations for upper GI cancers among surgeons across UK. The investigations used not only depend upon the type of cancer but also the surgeon preferences. Therefore, further research is needed to establish a standard staging practices.

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### OLD AGE DOES NOT AFFECT OUTCOMES OF LAPAROSCOPIC ESOPHAGOMYOTOMY AND DOR FUNDOPLICATION FOR ACHALASIA

Jonathan T Carter MD, Garrett R Roll MD, Sandi W Ma BA, Matthew P Sweet MD, Rene M Ramirez MD, Guillaume M Campos MD, Marco G Patti MD, Lawrence W Way MD, University of California-San Francisco and University of Chicago

Introduction: The effectiveness of esophagomyotomy for improving swallowing in elderly patients with achalasia compared with younger ones has been questioned. This study was designed to provide an answer.

Methods: 139 consecutive patients with esophageal achalasia who underwent laparoscopic esophagomyotomy and Dor fundoplication and who were available for telephone interview were divided into two groups by age: age < 60 years (range 14–59 years, 90 patients) and age > 60 years (range 60–93 years, 49 patients). The primary outcome measures were the severity of dysphagia, regurgitation, heartburn, and chest pain before and after the operation as assessed on a 4-point Likert scale. The need for postoperative dilatation or revisional surgery was also recorded.

Results: Duration of follow-up averaged 66 months (range 1–174 months). Older patients did not differ from younger patients in severity of preoperative dysphagia (mean score 3.7 vs. 3.9), regurgitation (3.0 vs. 2.9), or heartburn (1.7 vs. 2.2), although they were less likely to have chest pain (1.2 vs. 2.5,  $p = 0.001$ ). Upon referral, older patients had a statistically similar degree of esophageal enlargement, number of pre-Heller pneumatic dilatations (21 vs. 36 patients), and number of Botox injections (7 vs. 14 patients).

Older patients benefitted to the same extent as younger patients (mean postoperative dysphagia score 0.8 vs. 1.1, regurgitation 0.7 vs. 0.6, heartburn 0.8 vs. 1.2,  $p = NS$ ) and had less chest pain (0.3 vs. 0.8,  $p = 0.02$ ). Among the 14 patients age 75 or older, dysphagia improved markedly in all but one.

Older patients did not require more postoperative dilatations or revisional surgery for recurrent or persistent symptoms (7 vs. 8 patients,  $p = 0.48$ ). Satisfaction scores did not differ between the two groups, and > 90% of patients in both groups reported they would undergo the procedure again.

Conclusions: Old age is not a contraindication for esophagomyotomy and Dor fundoplication in patients with achalasia. The elderly benefit just as much as younger patients.

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### THE IMPACT OF GASTRIC TIP NECROSIS ON CLINICAL OUTCOMES FOLLOWING ESOPHAGECTOMY

Matthew J Schuchert MD, Ghulam Abbas MD, Brian L Pettiford MD, James R Landreneau MPH, Stephen Spagnol, Marco Santana, Joshua P Landreneau BS, Bilal Piracha BS, Katie S Nason MD, Arjun Pennathur MD, Arman Kilic MD, Alicia Clark-Oostdyk, Blair A Jobe, James D Luketich, Heart, Lung and Esophageal Surgery Institute; UPMC Health System

**Introduction:** Anastomotic complications are frequently encountered in the setting of esophagectomy, with leak rates ranging from 10–20%. Complete necrosis of the gastric tip is a rare complication that can be associated with significant morbidity and impairment of quality of life. In the current study, we evaluated the perioperative outcomes of patients who developed gastric tip necrosis following esophagectomy to review contemporary management strategies and to elucidate the impact of this complication on length of stay, morbidity and mortality.

**Methods and Procedures:** We retrospectively analyzed the clinical course of 823 esophagectomies performed at the University of Pittsburgh from 2001–2008. Patients with confirmed anastomotic leaks (radiographic or clinical) were identified. Gastric tip necrosis was defined as devitalization of greater than 50% of the esophagogastric anastomosis, with obvious necrosis of at least 1 cm of gastric tissue distal to the anastomosis. Primary endpoints included surgical management strategy, length of stay, complications and mortality. Statistical comparisons were performed with the t-test and Fisher's exact test.

**Results:** Gastric tip necrosis was encountered in 14 (1.7%) patients. Median age was 65 (35–80). Only 2/14 (14.3%) patients received neo-adjuvant therapy. Operative approaches included transhiatal (n = 6), totally minimally invasive (n = 6) and retrosternal (n = 2). Among those patients with anastomotic leaks, gastric tip necrosis occurred much more commonly with neck anastomoses (n = 13, 2.7%) compared with those in the chest (n = 1, 0.3%; p = 0.032) [Table]. Eleven patients underwent operative intervention (anastomotic takedown in 5; wide drainage ± flap in 6). The remaining three patients were treated with opening of the wound, packing, antibiotics and TPN or enteral feeds. Associated morbidity was encountered in 8 (57.1%) of patients. There was one death (7.1%). Gastric tip necrosis was associated with longer length of stay compared to those with a leak only (median: 38 vs. 19 days, p = 0.17). The majority of patients (71.4%) were discharged with a drain. Strictures were common (n = 10, 71.4%) following reconstruction or healing (median number of dilations = 3; range: 0–26).

**Conclusions:** Gastric tip necrosis occurs most commonly in the neck, likely secondary to greater gastric wall tension and an attenuated blood supply relative to intrathoracic anastomoses. It is a highly morbid complication associated with a prolonged hospital course. Quality of life is impacted adversely by the need for long-term drains and repeated dilations. Delay in instituting adjuvant therapy may further compromise outcomes. Aggressive surgical intervention to resect devitalized tissue and establish wide drainage remains the hallmark of care, and will salvage the significant majority of patients.

Table Clinical Outcomes of Patients with Anastomotic Leaks

Variable	Location of Anastomosis		Sig (p value)
	Neck (n = 75)	Chest (n = 38)	
Gastric Tip Necrosis	13 (17.3%)	1 (2.6%)	0.032
Length of Stay	25	18	0.600
Complications	35 (46.7%)	20 (52.6%)	0.558
Mortality	7 (9.3%)	3 (7.9%)	1.00
Stricture	58 (77.3%)	28 (73.7%)	0.816

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### UPDATED EXPERIENCE WITH MINIMALLY INVASIVE ESOPHAGECTOMY AT AN ACADEMIC INSTITUTION: COMPARISON BETWEEN OPEN AND LAPAROSCOPIC TRANSHIATAL APPROACHES

Jooyeun Chung MD, Amy Campfield BA, Adam Berger MD, Karen Chojnacki MD, Francis E Rosato, Jr MD, Bernadette Profeta MD, Ernest Rosato MD, Thomas Jefferson University Hospital

**Objective:** Minimally invasive esophagectomy (MIE) is increasingly being incorporated into armamentarium of different techniques for esophagectomy. We report our initial experience with MIE and compare the outcomes to patients who underwent traditional TH approach.

**Method:** A retrospective review was conducted of 14 patients who underwent MIE at a single academic institution from January 2008 to September 2008. These were compared to patients who underwent open transhiatal esophagectomy between 2001 and 2006. The two groups were matched in age, BMI, comorbidities, and tumor stage. The charts were analyzed for demographic information, estimated blood loss (EBL), length of stay, lymph node (LN) retrieval, and post-operative complications. P-values were determined using Student's t-test.

**Results:** All study patients completed a successful MIE. Five patients in the study group and four patients in the control group received neoadjuvant therapy prior to resection. The average age of the MIE group was 63 years (range 50–86) with mean BMI of 26.4 (range 20.1 to 32.1) and the average age of the control group was 64.5 years (range 55–83) with mean BMI of 24.3 (range 18.8 to 37). The mean EBL was significantly lower in the MIE group (50 vs. 495 ml, p = 0.003). The median length of stay for the 2 groups was not significantly different—for the MIE group, 9 days (range 5–28 days) vs. 13 days in the control group (range 7–30 days). The median number of examined LN was higher in the MIE group, median = 10 (range 7–13) compared to 5.5 (range 3–17), although this was not significant (p = 0.087).

The complication rate was the same in both groups (30%), and included one anastomotic leak in each group.

**Conclusion:** Our initial experience with minimally invasive esophagectomy indicates that it can be performed safely with significantly less blood loss, a shorter hospital stay, and similar oncologic efficacy. There was an increase in the operative time with MIE; however, we predict this will decrease as we gain more experience with this technique.

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### COMPARATIVE ANALYSIS OF EFFECTIVENESS OF ENDOSCOPIC SURGICAL TECHNIQUES IN THE MANAGEMENT OF OESOPHAGEAL CANCER

KAMAL NAGPAL MS, D YAKOUB PhD, A VATS, K AHMED, K MOORTHY MD, TATHANASTIOU PHD, G HANNA PhD, Department of Biosurgery & Surgical Technology, Imperial College, London

**Background:** Open transthoracic oesophagectomy is a major procedure which is associated with significant morbidity and mortality. Recently thoracoscopic procedures have offered a potentially advantageous alternative because of less operative trauma compared with thoracotomy. The aim of this study was to compare outcomes of open oesophagectomy (OE) with the best available minimally invasive technique, total minimally invasive oesophagectomy (TMIE).

**Methods:** Literature search was performed using Embase, Medline, Cochrane Library, and Google Scholar databases for comparative studies assessing different techniques of oesophagectomy. Only studies on humans and in English language were considered for inclusion. A random effects model was used for meta-analysis and heterogeneity was assessed. Primary outcome of interest were 30-day mortality and anastomotic leak. Secondary outcomes included technique-related complications, postoperative morbidity and oncological clearance in terms of lymph node retrieved.

**Results:** Out of 281 studies identified, a total of six studies were included in the analysis finally. Studies included a total of 206 patients for TMIE and 333 for open oesophagectomy. There was no significant difference in the 30-day mortality and anastomotic leak between the two groups (OR 0.45; p = 0.10, OR 0.53, p = 0.05). Total morbidity was significantly lower in TMIE group (p = 0.02, OR = 0.47, 95% CI 0.25, 0.87). Sub-analysis of co-morbidities revealed no significant difference in cardio-respiratory complications between the two groups. For all other operative and post-operative outcomes, there was no significant difference between the two groups. In addition, there was no significant difference in terms of lymph nodes retrieved between the two groups.

**Conclusions:** This meta-analysis demonstrated that TMIE decreased total morbidity compared to conventional oesophagectomy. However, 30-day mortality and morbidity in terms of cardio respiratory complications did not improve. Although the results suggest some advantages from the minimal invasive approach, large multi-institution trials are necessary before any claims can be made for the superiority of the minimally invasive approach in normal surgical practice.

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### PERITONEAL CYTOLOGY IN UPPER GI CANCERS-DILEMMA CONTINUES

K Nagpal, A Vats, M Jenkins, K Ahmed, K Moorthy, Imperial College, UK

**Background** Timely and accurate staging of oesophago-gastric cancer can prevent unnecessary surgical intervention and associated patient morbidity. Role of peritoneal cytology in staging of these cancers is not well established. We conducted a survey among Upper GI surgeons to get their views regarding the role of peritoneal cytology in upper GI cancers.

**Methods:** A questionnaire was designed to assess the role of peritoneal cytology. It was distributed via Association of Upper Gastro-Intestinal Surgeons to all its members.

**Results:** Of all the surgeons, 30% use peritoneal cytology for staging of oesophago-gastric cancers. On asking the cause for not using peritoneal cytology, 52% reported low yield as the cause and only 4% believed that it is not a strong predictor of survival. On the contrary, 85% of the surgeons using peritoneal cytology said that they would consider no surgery or palliative surgery if it was positive. Forty-five percent surgeons agreed that peritoneal cytology improves staging accuracy and is a good prognostic marker.

**Conclusion** The study clearly demonstrates that there is a wide variation in the use of peritoneal cytology as a staging modality. Although a limited number of surgeons routinely use peritoneal cytology, it is evident that it has a major impact on the management of these patients. Further research is needed to define its role in Upper GI cancer management.



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**ESOPHAGECTOMY IN THE ELDERLY: A COMPARISON BETWEEN MINIMALLY INVASIVE AND OPEN TECHNIQUES**

Thomas Fabian MD, Jeremiah Martin MD, Desmond D'Souza MD, John Federico MD, Alicia Mckelvey MD, Hospital of saint Raphael

Background: The purpose of this study was to determine if utilization of minimally invasive techniques for esophagectomy in the elderly results in decreased complications compared with traditional open esophagectomy.

Methods: A retrospective, case-control study was performed comparing outcomes after minimally invasive esophagectomy (MIE) and open esophagectomy (OE) in elderly patients (age > 70 years) over a 7 year period (July 2001-Aug 2008). Utilizing a prospectively maintained MIE database comparisons were made to a historical OE control group during the 4 years immediately prior to initiation of our MIE program. Patients who underwent OE during last 3 years were excluded.

Results: Twenty patients underwent MIE and 15 patients underwent OE during the study period. There were no conversions to open in the MIE group. Occurrence of complications were similar between MIE 12 (60%) of 20 and 7 (47%) of 15 and OE groups respectively ( $p = 0.5$ ). Operative mortality was less, but failed to meet statistical significance, in the MIE group 0/20 (0%) than the OE group 3/15 (20%) ( $p = 0.07$ ). Lymph node procurement was higher 15.5 (2-30) nodes in the MIE group than the OE group 6(0-30) nodes ( $p = 0.004$ ). Length of stay however was not different between the two groups 12 (8-34) vs. 10 (8-117).

Conclusions: MIE in the elderly can be performed safely with low mortality. In experienced hands it may be safer than open esophagectomy.

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**LAPAROSCOPIC MANAGEMENT OF A DISLODGED PEG TUBE**

Peter V Cherian, Ravi J Chokshi, Derick J Christian, Saint Francis Medical Center

Percutaneous endoscopic gastrostomy (PEG) tubes have revolutionized patient care. The procedure has relatively few complications and can provide an incredible benefit for patients. However, complications may arise and cause severe morbidity and sometimes mortality.

We present a case of a 39 year old male who came to our institute after suffering severe head trauma from an assault. The patient required a craniectomy to treat his condition and had significant cognitive dysfunction placing at risk his nutritional status. A PEG tube was placed and the patient was steadily improving. Four weeks after the procedure the patient developed severe abdominal distension and pain. CT scan revealed the PEG tube was located in the subcutaneous tissues and a large amount of fluid in the abdomen. The patient was taken to the OR and underwent a diagnostic laparoscopy. At that time it was noted that the PEG had become dislodged and tube feeds were being placed into the peritoneal cavity. Subsequently a laparoscopic abdominal wash out was done and replacement of the PEG under direct visualization.

The use of minimally invasive techniques can be applied to all aspects of surgical practice for the improvement of patients' outcomes. These approaches decrease morbidity of the patient and allow for better outcomes.

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## Flexible Endoscopy

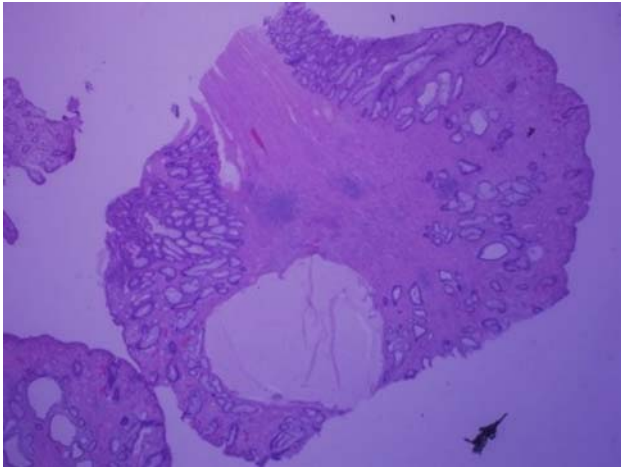
22393

**INFLAMMATORY MYOGLANDULAR POLYP OF THE RIGHT COLON IN A PATIENT WITH HEMATOCHEZIA AND INTERMITTENT RECTAL PAIN**

Courtney T Masse BS, Izaskun M Iglesias MD, Eduardo Smith Singares MD, Rush University College of Medicine, Saint Anthony Hospital

**Introduction:** Inflammatory Myoglandular Polyps (IMP's) are poorly characterized and extremely rare. They present most frequently in the left colon, and may produce symptoms related to this location. We present a case of IMP located in the right colon, associated with rectal symptoms, and offer a review of the available medical literature.

**CASE REPORT:** A 35 year old female was referred for the evaluation of intermittent rectodynia, tenesmus, and occasional hematochezia. The patient stated her condition had been present for at least 2 years. Routine physical examination and anoscopy in the office failed to show any anomalies and she was scheduled for outpatient colonoscopy. During the procedure a large pedunculated polyp was located and removed from the hepatic flexure. Pathological examination showed features consistent with a IMP. The patient reported complete resolution of her rectodynia and as of 1 year of follow up she remains asymptomatic.



**Discussion:** As of September 2008 only 60 cases of IMP have been described in the available medical literature. The etiology of the polyp is unclear, and the overwhelming majority of the reports concern left colon and upper rectum lesions. Accordingly this is the first description of a right sided IMP associated with tenesmus and rectodynia. A review of the current knowledge of this unusual diagnosis is offered.

22703

**40TH ANNIVERSARY OF THE FIRST ENDOSCOPIC RETROGRADE PANCREATOGRAM**

Fredrick J Brody MD, Todd A Ponsky MD, Brian J Dunkin MD, Khashayar Vaziri MD, George Washington University Medical Center, Washington DC, Rainbow Babies and Children's Hospital, Cleveland OH, The Methodist Hospital, Houston TX

2008 marks the 40th anniversary of endoscopic retrograde cholangiopancreatography (ERCP). In 1968, a group of physicians from the George Washington University Medical Center published the first report that documented the initial clinical application of ERCP.

The successful procedure was performed by Drs. McCune, Shorb, and Moscovitz and was predicated on hours of canine research followed by patience and determination in the operating room. Their research began in the late 1950's on imaging techniques of the pancreatic duct. Their initial attempts included a variety of modalities to visualize the pancreatic parenchyma in order to diagnose pancreatic disease including carcinomas. At the time, it was rare to actually diagnose and treat pancreatic carcinoma successfully. Initial efforts included angiography through lumbar tributaries which was successful in a canine model but was not clinically applicable. Ultimately, the group developed a method to visualize the pancreatic duct through endoscopic guidance. Unfortunately, the ideal endoscopic instrument did not exist until it was developed by the Eder Instrument Company. Long thought lost, the original Eder Fiberduodenoscope was recently donated to the George Washington University Department of Surgery by Dr. Shorb. The Eder fiberduodenoscope was specifically designed with a proximal light source, a flexible tip, and a forward and side viewing lens. A small tract was attached to the posterior aspect of the endoscope for a cannula and an endotracheal cuff balloon was placed on the distal aspect of the scope proximal to the lens. With the cuff inflated, the tip of the scope would disengage from the mucosa and allow the lens to identify the ampulla. ERCP was performed on patients after completing an open cholecystectomy for symptomatic cholelithiasis.

The scope was guided past the pylorus manually. With time, patience, and luck, a tangential view of the ampulla was obtained. Once the ampulla of Vater was located, the cannula was passed through the scope. Then the entire scope was advanced distally several centimeters so the side thrusting cannula port was parallel with the ampulla. Subsequently, the cannula was inserted blindly, since the ampulla was not visualized directly. Despite these technical difficulties, the pancreatic ductal anatomy was identified in many patients.

Currently less than 1% of surgeons perform ERCP, however the ramifications of this evolution are salient today with regards to the current developments regarding endoluminal treatments. Much like Drs. McCune, Shorb and Moscovitz, many surgeons are familiar with the patience and persistence required to develop new instruments and techniques. The success of these GW surgeons should encourage future surgeons to continue to develop and refine endoluminal therapies.

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23105

**ENDOSCOPIC TISSUE FUSION FOR WEIGHT REGAIN AFTER GASTRIC BYPASS: DOES IT HELP?**

M Bagloo MD, JK Saunders MD, M Parikh MD, G Fielding MD, C Ren MD, J Cohen MD, M Kurian, NYU School of Medicine

**Background:** Gastric bypass results in significant weight loss in the morbidly obese population. There is however, an incidence of weight regain associated with the procedure. One theory for the weight regain is pouch dilation. StomaphyX is a device which addresses pouch dilation by endoscopically plicating the gastric pouch, resulting in a decreased pouch size. This study represents our initial 6 month data of the effect of the StomaphyX gastric pouch plication on weight regain after gastric bypass. **Methods:** A retrospective review of a prospectively maintained database was performed. Six patients who had previously undergone gastric bypass surgery and suffered weight regain after an initial period of weight loss underwent endoscopic tissue fusion or plication of the gastric pouch using the StomaphyX device. All patients maintained a liquid diet for 2 weeks prior to and after the procedure. The procedure was completed by an experienced endoscopist and bariatric surgeon. A proctor was present for every case. Patients were followed for 6 months. Data points included average weight loss after bypass, weight regain, and weight loss after gastric pouch plication. Subjective endpoint was a change in degree of restriction. **Results:** Six patients status post gastric bypass successfully underwent endoscopic pouch plication. Average initial weight loss after bypass surgery was 131lbs (range 111-190 lbs). Weight regain averaged 52 lbs (38.9 - 86 lbs). The average gastric pouch was decreased from 40 ml to 10 ml. There were no complications, and 5 of 6 patients reported no change in restriction. One patient confirmed restriction. Average weight loss was found to be 8.9 lbs (range: gain of 9lbs to loss of 24.9lbs). Percent of excess weight loss averaged 27% (range: gain of 14% to loss of 84%). Two patients gained weight (9lbs, 4lbs). One patient lost 24.9 lbs, but this patient's course was complicated by a partial small bowel obstruction months after the StomaphyX procedure requiring lysis of adhesions. **Conclusions:** Based on this data, endoscopic plication of the gastric pouch resulted in an average of 27% excess body weight loss over 6 months. This data, however, could be influenced by the liquid diet that was maintained peri-operatively. One patient achieved greater weight loss than the others. This could be attributed to decreased intake surrounding her lysis of adhesions, thus skewing the data to reflect a greater weight loss. Our sample size is small, thus further studies with longer follow-up are necessary to evaluate the efficacy of this procedure in increasing weight loss.

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23144

**DILATION OF ANASTOMOTIC STRICTURES AFTER TRANSHIATAL ESOPHAGECTOMIES**

Diya I Alaedeen MD, Charles Y Ro MD, Alberto R Iglesias MD, Emanuele LoMenzo MD, Atul K Madan MD, Jose M Martinez MD, Division of Laparoendoscopic Surgery, University of Miami Miller School of Medicine

**Objective:** Anastomotic stricture presenting with dysphagia after transhiatal esophagectomy is a common problem. We have reviewed our experience with esophageal dilatations after transhiatal esophagectomies.

**Methods:** We retrospectively reviewed the medical records of all patients who underwent esophageal dilatation after transhiatal esophagectomies. Demographic data, number and methods of dilatations, time between dilatations, and time between surgery and first dilatation were collected.

**Results:** There were 99 dilatations performed on 16 patients by a single surgeon between 3/1/2006 and 9/1/2008 (average of 6.2 dilatations per patient, range 1-19). All dilatations were performed using either the balloon dilator or the Savary-Gilliard bougies (55% and 45% of the time respectively). There were no reported complications. The average time between surgery and first dilatation was 65.3 days (range 22-281 days). The average time between dilatations was 32.8 days (range 6-215 days).

**Conclusion:** Anastomotic strictures present early after transhiatal esophagectomy. Multiple repeated dilatations are needed to alleviate recurrent symptoms of dysphagia. When done properly, dilations of the esophageal-gastric anastomoses can be performed with low morbidity and mortality.

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23311

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### SINGLE INCISION EXPERIENCE AT SAN DIEGO: THE EVOLUTION OF CLEAR IMAGING

Garth Jacobsen MD, Kari Thompson MD, Adam Spivack MD, Lauren Fischer MD, Brian Wong MD, John Cullen MD, Mark Talamini MD, Santiago Horgan MD, Department of Surgery, University of California, San Diego

**Objective:** Classic laparoscopic surgery is based on the ability to triangulate instrumentation to have good exposure and working space. This is done with multiple trans-abdominal ports. Decreasing the number of ports may be beneficial in decreasing pain. In addition elimination of port sites eliminates the risk of herniation at those sites and provides a definite cosmetic benefit. The visualization platform is evolving as our clinical experience broadens. A challenge of visualization with a rigid laparoscope in a single incision operation is collisions between the instrumentation, the camera head and the light cord. This makes triangulation and steady visualization difficult. To eliminate these collisions and stabilize the visualization platform we have adopted the use of a sterile high definition endoscope as our imaging modality of choice.

**Methods:** 3 patients have had single incision surgery using the endoscope as a visualization platform. The patients were 3 females with 2 adjustable gastric bands placed, and 1 cholecystectomy. There were no complications. Patients went home the day of the operation. All were seen in clinic for 1 week postoperative follow up.

**Results:** All patients had successful operations using the single incision technique. None had to be converted to standard laparoscopic technique. Use of the flexible endoscope in place of a rigid endoscope allowed for better visualization, movement of instruments in the ports and ease of surgery.

**Conclusions:** Decreasing the amount of incisions decreases patient pain, risk of port site herniation and gives improved cosmesis. The evolution of visualization from a laparoscope to a flexible endoscope has allowed for increased operating ease for the surgeon by moving the scope out of the close proximity of the surgical instruments. The visualization is also better as the flexibility of the scope allows for superior triangulation. Lastly, the endoscope has the obvious advantage of self cleaning, leading to better image quality and decreased operating time. Thus, we believe that using a flexible endoscope rather than a rigid scope will prove to be a superior in single incision surgery.

23463

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### ENDOSCOPIC ULTRASOUND-GUIDED GASTROSTOMY AFTER ROUX-EN-Y GASTRIC BYPASS: A NOVEL APPROACH

Natasha M Rueth MD, Sayeed Ikramuddin MD, Shawn S Groth MD, Rafael Andrade MD, Division of Thoracic and Foregut Surgery and Division of Gastrointestinal Surgery; Department of Surgery, University of Minnesota

**Objective:** Gastrostomy tube (GT) placement after Roux-en-Y gastric bypass can be challenging. Novel, minimally invasive approaches are needed to access the gastric remnant in these patients. Our objective is to present an innovative method of endoscopic ultrasound (EUS)-guided GT placement.

**Procedure Description:** A 55 year-old morbidly obese female underwent reoperative, open retrocolic Roux-en-Y gastric bypass, and subsequently developed chronic nausea and failure to thrive. We opted to place a GT for gastric decompression and enteral nutrition; however, the gastric remnant was collapsed and not readily accessible percutaneously and a laparoscopic approach was unreasonable due to dense adhesions. We combined EUS and fluoroscopy to access the gastric remnant, and performed this procedure under general anesthesia. Procedural steps:

- (1) EUS identification of gastric remnant: We introduced a EUS scope into the proximal Roux limb, and ultrasonographically identified the posterior wall of the gastric remnant.
- (2) EUS-guided gastric remnant cannulation: We inserted a 19-gauge biopsy needle through the EUS scope and ultrasonographically guided it across the intestinal wall, into the gastric lumen.
- (3) Fluoroscopic confirmation of gastric cannulation: We injected radiopaque contrast material through the biopsy needle to confirm placement in the remnant.
- (4) Gastric remnant insufflation: We insufflated the gastric remnant through the biopsy needle to approximate it to the anterior abdominal wall.
- (5) Fluoroscopically guided percutaneous GT placement: We placed a 12 French GT using Seldinger technique.

The patient had an uneventful recovery from this procedure.

**Conclusion:** We describe a safe, novel, and minimally invasive technique for placement of a GT into the bypassed gastric remnant. To our knowledge, this is the first report of successful EUS-guided GT placement, which has the potential to significantly impact the management of patients following gastric bypass.

23540

P373

### ESOPHAGEAL DILATATION FOR CORROSIVE STRICTURE OF THE ESOPHAGUS

Chadin Tharavej, Chulalongkorn University

Less was known regarding outcome of dilatation in corrosive stricture of the esophagus. The aim of this study was to report the treatment outcome of dilatation for corrosive esophageal stricture.

**Methods:** Medical records of twenty-three patients with corrosive esophageal stricture who underwent esophageal dilatations were reviewed. All dilatations were performed under general anesthesia using Savary-Gillard dilator with fluoroscopy. Outcome of the treatment was analysed.

**Results:** One patients had esophageal perforation and underwent successful surgical treatment. This patient had dilatation 4 weeks after corrosive ingestion. The other 22 patients had multiple dilatations without complication. All patients had good swallow function. Median dysphagia score was 1 after dilatation. Median number of dilatations was 6. Three out of 22 patients had more than 20 dilatations per year. Patients who needed frequent dilatation, long stricture and had laryngeal injury trend to have worse outcome.

**Conclusion:** Esophageal dilatation is safe and effective for the treatment of corrosive esophageal stricture. Forceful dilatation should be avoided within one month of ingestion.

23645

P374

### ACCESSING THE GASTRIC REMNANT AFTER ROUX-EN-Y GASTRIC BYPASS

J Zink MD, J Talarico MD, F Moustarah MD, A Cha MD, M Kroh MD, S Brethauer MD, P Schauer MD, B Chand MD, Bariatric and Metabolic Institute, The Cleveland Clinic

**Introduction:** A minimally invasive method for accessing the gastric remnant to intervene on the biliary and pancreatic system after Roux-en-Y gastric bypass (RYGB) has not been well described. This is a retrospective review describing two surgeons' complete experience with laparoscopic trans-gastric (LaTG) ERCP for biliary and pancreatic duct management.

**Methods and Procedures:** Twelve patients underwent LaTG-ERCP. Indications included choledocholithiasis (5 patients), ampullary stenosis / sphincter of Oddi dysfunction (5 patients), and abdominal pain with dilated biliary system (2 patients). All procedures were completed in the operating room under general anesthesia. Laparoscopy included identification of the gastric remnant and placement of a laparoscopic trocar directly into the gastric remnant under visualization. A side-viewing endoscope was passed through the trocar into the gastric remnant and advanced through the pylorus to access the major papilla. Endoscopic therapy including biliary and pancreatic sphincterotomy, stone removal, and tissue sampling was then conducted. After endoscopic therapy, the gastrostomy was either closed or a gastrostomy tube was placed for potential future therapy.

**Results:** Laparoscopic assisted transgastric access was successful in all 12 patients. Nine patients proceeded directly to LaTG-ERCP, one failed prior laparoscopic CBD exploration, and two failed peroral attempts at ERCP. Endoscopic therapy was successful in all 12 patients. Complete biliary stone removal was successful in five patients. Patients with sphincter dysfunction or dilated biliary or pancreatic ducts had sphincterotomy in 6 cases and stent placement in one. Six patients that had intervention for biliary disease underwent follow-up imaging; five showed no residual stones and one had ductal dilation. All patients with abnormal lab values (LFTs, Amylase, or Lipase) pre LaTG-ERCP showed normalization post-procedure. Improvement in pain was seen in all patients at their first post operative visit. Complications included one patient with melena and one with wound infection. None had biliary or pancreatic complications.

**Conclusions:** After gastric bypass, laparoscopic trans-gastric access of the remnant stomach for biliary and pancreatic ductal manipulation is feasible, safe, and effective.

23765

P375

### THE PREDICTIVE VALUE OF PET/CT FINDINGS SUSPICIOUS FOR COLORECTAL CANCER IN PATIENTS WITH NON-GASTROINTESTINAL MALIGNANCIES

John S Beatty MD, Hady T Williams MD, Angela L Gucwa MD, William T Parker MD, Edward J Kruse DO, Bruce V MacFadyen MD, David S Lind MD, James M McLoughlin MD, Medical College of Georgia

**Introduction:** Positron Emission Tomography/Computed Tomography (PET/CT) performed in the staging and follow-up of patients with non-GI malignancies will occasionally detect a second primary tumor in the GI tract. The purpose of this study was to determine the ability of PET/CT to predict the presence of occult colorectal malignancy in patients already diagnosed with a non-GI cancer.

**Methods:** A query of our IRB approved prospective Nuclear Medicine database was made and merged with a clinical chart review. All PET/CT were read by a board certified Nuclear Medicine Radiologist and all chart reviews were performed by trained clinicians.

**Results:** Between 1/1/2005 and 7/29/2008, 3259 PET/CT were performed on 1923 patients at our institution to evaluate non-GI malignancies. Of the 1923 patients, 40 (1.8%) had findings concerning for an additional colorectal malignancy. Invasive work up was not pursued in 27 patients (68%) secondary to either advanced disease or a plan of close clinical follow up. Colonoscopy was performed on 13 (32%) of these patients revealing: colorectal cancer in 3 (23%), benign adenoma in 6 (46%), no discernable lesions in 2 (15%), hyperplastic polyp in 1 (8%), and inflammatory reaction from chewing gum impacted in the cecum in 1 (8%). Of the 3 patients with a colorectal second primary, 2 patients were found to have disseminated disease upon further staging. The remaining patient had stage I disease and underwent a potentially curative resection. The median age of the patients undergoing colonoscopy was 68 years (range: 52–77) and 10 of these patients never had a prior colonoscopy. The positive predictive value of PET/CT to identify a second primary colorectal malignancy in patients with a non-GI primary cancer was 23%. PET/CT characteristics that correlated with benign and malignant findings were a median of 5.5 SUV (range: 4–12 SUV) and 15 SUV (range: 14–53 SUV) respectively.

**Conclusions:** In our database, the positive predictive value of PET/CT scans concerning for colorectal cancer in patients with non-GI tract malignancies is low. It is known that PET/CT scans may be positive in both benign and malignant colorectal tumors and inflammatory lesions, confirmed in our study. Positive colorectal findings on PET/CT should be investigated with colonoscopy.

23772

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### ESOPHAGEAL ULCERS AT A LARGE URBAN EMERGENCY HOSPITAL: A SEVENTEEN YEAR EXPERIENCE

Hale Wills MD, Akiko Chino MD, Takuji Yamasaki MD, Choichi Sugawa MD, Department of Surgery, Wayne State University, Detroit, MI 48201

**Objective:** In this study, we report the incidence, common etiologies, endoscopic and pathologic findings and clinical outcomes of patients with esophageal ulcers (EU) in our urban population over a seventeen year period.

**Methods:** This is a retrospective chart review of all upper endoscopies (EGD) performed by a single surgical endoscopist at an urban emergency hospital from January 1991 to December 2007. For all patients diagnosed with esophageal ulcer, a thorough review of the paper and electronic medical records was carried out.

**Results:** Out of 12,563 EGD's performed during the study period, there were 198 esophageal ulcers diagnosed (incidence of 1.6 %). The incidence increased from 0.1 % in 1991 to 3.3 % in 2007. The most common etiology was gastroesophageal reflux disease (GERD, 126 cases), followed by medications (drug-induced, 34 cases.) Other causes included candida (7 cases), foreign body (7), ingestion of a caustic substance (5), post-gastrectomy (4), AIDS-related (4), herpes simplex virus (1) and esophageal diverticulosis (1) while nine had no clear etiology. The most common presenting complaints were nausea and vomiting, epigastric pain, and hematemesis (89, 71, and 70 cases, respectively). Thirteen patients

had multiple episodes of EU. There were 21 deaths; however five of those patients who died had multiple episodes of EU prior to death (mortality rate 11.2 %.) Most of those patients who died were either chronically bedridden or critically ill.

**Conclusions:** Esophageal ulcer is a rare cause of upper gastrointestinal symptoms. GERD and drug-induced ulcer are the most common etiologies. Both the incidence and mortality of EU have increased over the study period. In debilitated patients, this diagnosis coincides with a poor prognosis and may serve as a marker for the severity of underlying disease.

23862

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### DUODENOSCOPE CHOICE IN PEDIATRIC ERCP

Jose M Martinez MD, Diya I Alaadeen MD, Oscar Aljure MD, Emanuele LoMenzo MD, Alberto R Iglesias MD, Atul K Madan MD, Division of Laparoendoscopic Surgery, University of Miami Miller School of Medicine

**Introduction:** Although rare, some pediatric diseases may require diagnostic and therapeutic endoscopic retrograde cholangiopancreatography (ERCP). The choice of duodenoscope for pediatric ERCP is not well studied. This study investigated the hypothesis that a therapeutic adult duodenoscope can be utilized safely for pediatric ERCP.

**Methods:** All patients under the age of 18 were included in this study. The charts and operative reports of all patients who underwent ERCP were retrospectively reviewed. Collected data included type of endoscope utilized, ability to advance endoscope into esophagus and the duodenum, and complications related to endoscope size.

**Results:** There were 18 patients who underwent ERCP between January 1st, 2006 to September 1st, 2008. The mean patient age was 11.3 years old (range 1.5–17; median 13). A therapeutic adult side-viewing duodenoscope (tip diameter of 13 mm) was utilized successfully 95% of the time. The youngest patient with successful duodenal intubation using the adult duodenoscope was 17 months old. The pediatric endoscope (tip diameter of 7 mm) was necessary only in one patient (0.06%) who was a 17 months old child with anomalous lower esophageal sphincter that could not be negotiated using the adult duodenoscope. Upper esophageal intubation and duodenal intubation were successful in 100% and 95% of the cases respectively. There were no complications related to use or size of the endoscope.

**Conclusions:** Adult sized therapeutic duodenoscopes can be safely utilized for ERCP in patients as young as 17 months. Endoscopists should preferably use adult sized duodenoscope since the pediatric sized duodenoscopes may limit the intended diagnostic and therapeutic interventions.

23863

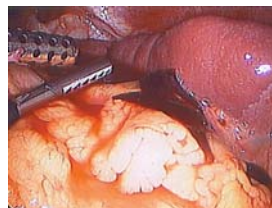
P378

### SPLenic INJURY AFTER THERAPEUTIC ERCP

Subramanian T Suppiah BS, Zohreen Bheriani BS, Carlos Ortega MD, Izaskun M Iglesias MD, Eduardo Smith Singares MD, Rush University College of Medicine, Saint Anthony Hospital

**INTRODUCTION:** Endoscopic Retrograde Cholangiopancreatography (ERCP) is an invasive, but sensitive means of diagnosing and treating biliary disease. Complications range from 5–10%. The most common complications of ERCP are acute pancreatitis and duodenal perforation; but esophageal, splenic and hepatic injury have been reported. Here we report such a splenic injury after ERCP.

**CASE REPORT:** A 29 year old female was referred for diagnostic ERCP for recurrent biliary colic and elevated liver function test. The scope was passed easily and the biliary duct cannulated in the first attempt. The cholangiogram showed choledocholithiasis, and a therapeutic sphincterotomy and lithotomy was performed. Post procedure the patient developed abdominal pain that resolved without intervention. The diagnostic work up was suggestive of post-procedure pancreatitis. The patient received a laparoscopic cholecystectomy upon resolution, the findings included a grade I splenic laceration without active bleeding.



**DISCUSSION:** Although rare, several cases of ERCP related splenic injury have been reported. The first reported case was in 1989, with total of 25 cases reported since then. We discuss the possible implicated mechanism and the alternatives for the management of this unusual complication.

23872

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### EFFICACY AND SAFETY IN PEDIATRIC ERCP BY A SURGICAL ENDOSCOPIST

Jose M Martinez MD, Diya I Alaedeen MD, Oscar Aljure MD, Emanuele LoMenzo MD, Alberto R Iglesias MD, Atul K Madan MD, Division of Laparoendoscopic Surgery, University of Miami Miller School of Medicine

**Introduction:** Pediatric endoscopic retrograde cholangiopancreatography (ERCP) is not routinely performed by most therapeutic endoscopists. The challenges of a pediatric anatomy, pediatric physiology, rare indications, and the need for side viewing endoscope preclude this procedure from becoming popular by pediatric gastroenterologist or laparoendoscopic surgeons. This investigation studied the hypothesis that pediatric ERCP can be performed by an experienced surgical endoscopist efficaciously and safely.

**Methods:** The charts of all patients, younger than 18 years of age, who underwent ERCP by one laparoendoscopic surgeon were retrospectively reviewed. Data collected included age, indications, cannulation rate, stone clearance (if applicable), and complications. Complications were defined as bleeding requiring transfusion or intervention, moderate pancreatitis, or perforation.

**Results:** Eighteen ERCPs were performed on pediatric patients between January 1st 2006 and September 1st 2008. The mean age was 11.3 years old (range 1.5–17, median 13). Indications for ERCP were choledocholithiasis (n = 8), hyperbilirubinemia after liver transplantation (n = 5), choledocal cyst (n = 1), recurrent pancreatitis (n = 2), cholestasis (n = 1), and primary sclerosing cholangitis (n = 1). The adult endoscope was utilized in 95% of the cases. Cannulation rate was 100%. Stone clearance rate for patients who had evidence of filling defects on ERCP was 100%. There was only one complication of delayed bleeding four days after an ERCP with sphincterotomy. Hemorrhage was controlled successfully via a side-viewing endoscope utilizing ampullary injection and clip application. There were no other complications.

**Conclusions:** While pediatric ERCP requires advanced flexible endoscopy knowledge and technical skills, it can be performed by a surgical endoscopist both safely and efficaciously.

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P380

### FEASIBILITY OF TRANSABDOMINAL DIAGNOSTIC PERITONEOSCOPY USING A FLEXIBLE ENDOSCOPE

Kevin M McGill MD, Nikalesh Ippagunta MD, Jawad Latif MD, Konstantinos Rizas MD, Julio A Teixeira MD, St. Luke's-Roosevelt Hospital Center New York, NY

**Objectives:** Diagnostic laparoscopy is an established tool in oncologic evaluation. Standard rigid laparoscopy presents certain limitations in terms of access to various areas of the peritoneal cavity. Other authors have explored the utility of diagnostic laparoscopy with a flexible endoscope via a transgastric or transvaginal approach (NOTES). Our goal is to determine the effectiveness of flexible endoscopy as a tool for diagnostic peritoneoscopy using a transabdominal approach.

**Methods:** Five 25-kg female swine were subjected to general anesthesia. Pneumoperitoneum to 15 mm Hg was achieved with a veress needle. Using a laparoscopic tacking device, 4 tacks were placed on the peritoneum in random locations. A separate surgical team that was not present during placement of the tacks then introduced a 2 channel, Storz gastroscope through a periumbilical incision. The team was asked to localize the tacks using the flexible endoscope.

**Results:** Average time for complete exploration and detection of 4 tacks was 20 ± 10 minutes. Two different surgeons with varying degree of expertise with flexible endoscopy were able to detect all the tacks in 5 pigs with a sensitivity of 100%. The subdiaphragmatic area was visualized in all the cases.

**Conclusion:** Transabdominal diagnostic peritoneoscopy using the flexible endoscope is feasible. Potential benefits may allow us to access areas of the peritoneal cavity that were otherwise difficult to access with rigid laparoscopy.

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### FEASIBILITY OF DIAGNOSTIC PERITONEOSCOPY USING A FLEXIBLE ENDOSCOPE UNDER LOW PRESSURE PNEUMOPERITONEUM

Nikalesh Ippagunta MD, Kevin McGill MD, Jawad Latif MD, Konstantinos Rizas MD, Julio A Teixeira MD, St Luke's Roosevelt Hospital Center New York NY

**Objectives:** Standard laparoscopy requires general anesthesia for muscle paralysis to allow for adequate pneumoperitoneum. Our goal is to determine the effectiveness of diagnostic peritoneoscopy using a flexible endoscope under low pressure pneumoperitoneum.

**Methods:** Three 25-kg female swine were subjected to general anesthesia. Pneumoperitoneum to 8 mm Hg was achieved with a veress needle. Using a laparoscopic tacking device, 4 tacks were placed on the peritoneum in random locations. A separate surgical team that was not present during placement of the tacks then introduced a 2 channel, Storz gastroscope through a periumbilical incision. The team was asked to localize the tacks using the flexible endoscope.

**Results:** Average time for complete exploration and detection of 4 tacks was 30 ± 10 minutes. Two different surgeons with varying degrees of expertise with flexible endoscopy were able to detect all the tacks in 3 pigs with a sensitivity of 100%. The subdiaphragmatic area was visualized in all the cases.

**Conclusion:** Transabdominal diagnostic peritoneoscopy using the flexible endoscope under low pressure pneumoperitoneum is feasible. Potential benefits may allow us to perform diagnostic peritoneoscopy without the need for general anesthesia and muscle paralysis in an office or urgent care setting.

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### CONTRIBUTION OF FLEXIBLE ENDOSCOPY IN TRAUMA REIMBURSEMENT

S Nijhawan MD, R K Chung MD, R Treat MD, N A Ahmed MD, Fairview Hospital (CCHS), Huron Hospital (CCHS)

**Introduction:** The ability of a trauma surgeon to perform flexible endoscopy helps in early and accurate diagnosis of various acute injuries and adds to the bottom line in a predominantly trauma practice. With decrease in operative trauma cases, flexible endoscopy may help to generate enough revenue to sustain trauma practice.

**Methods:** The following data was collected-

- 1) IRB approval retrospective study spread over 3 years
- 2) # of trauma admissions
- 3) % of penetrating injuries
- 4) Total number of trauma operations done by trauma surgeons (excluding sub-specialties)
- 5) Total number of EGD's (including PEGs), flexible sigmoidoscopies, colonoscopies and broncoscopies done by trauma surgeons
- 6) RVU's for #4 and #5

**Results:** 4000 trauma cases were reviewed. Out of these approximately 30 % were penetrating trauma. 255 patients had trauma related general surgery procedures. 71 endoscopic procedures, 7 thoracoscopic and 36 abdominal laparoscopic procedures were performed. The procedure codes for the most commonly done procedures in general trauma surgery were 31.1, 34.02, 34.82, 45.62, 46.73, 46.75, 54.11, 83.14, 83.54 and 86.59. The RVU's associated with these procedures ranged between 1.4 to 59.2, with most procedures falling between 10 and 25. On the other hand, the most commonly associated procedure codes for endoscopies were 33.23, 43.11, 45.23 and 45.24. The RVU's for endoscopies ranged between 2 and 8.

**Conclusion:** Flexible endoscopy accounts for a substantial component of charges billed for care for trauma patients. These procedures are routine and easily performed in a short amount of time. Multiple procedures may be done in a regular work day. As a part of trauma surgeon's armamentarium, they provide for continuity of care. It is thereby worthwhile to promote training in flexible endoscopy and laparoscopy for trauma fellows as an adjunct to their skillset.

24014

P383

### USE OF A NOVEL BEDSIDE ENDOSCOPY CART TO TEACH SURGERY RESIDENTS

Rohan Joseph MD, Brian J Dunkin MD, Rob Todd MD, The Methodist Hospital, Houston, TX

**Introduction:** Bronchoscopy and laryngoscopy have become common bedside procedures in the ICU. Frequently, however, these modalities utilize non-video platforms which make it difficult for novices to perform the procedures independently. This study evaluated a novel ICU bedside procedure cart for performing video laryngoscopy and bronchoscopy to see if junior level residents could be mentored through these cases independent of attending take-over.

**Methods:** A novel, compact video-endoscopy cart designed for bedside procedures was developed. This cart provides video laryngoscopy and bronchoscopy on a combined platform (Karl Storz Endoscopy, Germany). The cart was stored within a surgical ICU in order to foster easy access and to facilitate use. The performance of residents in bedside endoscopy was evaluated to determine independent procedure completion rates and success as well as user satisfaction. Questionnaires were completed at the end of each case by both the trainee and attending and the responses analyzed. Cart malfunction and usefulness as a teaching platform was also evaluated.

**Results:** Eleven evaluations were completed for six bronchoscopies, four percutaneous tracheostomies, and one laryngoscopy/esophagoscopy using the bronchoscope. All procedures were performed by second and third year surgery residents. When an emergent procedure was indicated, less than 10 minutes were required between deciding to do the procedure and initiating it. Nine of 11 procedures were completed successfully. The two 'failed' procedures were not user or device related and, in fact, were due to failure to obtain an adequate broncho-alveolar lavage and oxygen desaturation from intubating a small 7Fr endotracheal tube. None of the diagnostic bronchoscopies required the attending to take over the exam, and 2 of the 4 percutaneous tracheostomies were performed completely by the resident. All resident/attending evaluations ranked the cart at 5/5 usefulness. There were no equipment failures or malfunctions.

**Conclusion:** This novel bedside ICU procedure cart proved valuable to attending and resident surgeons alike in enabling junior residents to independently perform bronchoscopy and percutaneous tracheostomy. This work has led to the addition of gastroscopy to the cart capabilities which should greatly enhance its use.

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### USE OF ENDOSCOPIC STENTS IN THE TREATMENT OF UPPER GASTROINTESTINAL LEAKS FOLLOWING BARIATRIC SURGERY

Diego Awruch MD, Manoel Galvao MD, Fernando Pimentel MD, Almimo Ramos MD, Luis Ibáñez MD, Alan Sharp MD, Alex Escalona MD, Department of Digestive Surgery, Faculty of Medicine, Pontificia Universidad Católica de Chile. Gastro-Obeso-Center. Sao Paulo. Brazil

**Introduction:** Upper gastrointestinal (GI) leaks are one of the most important postoperative complications following bariatric surgery. Standard treatment has been a combination of surgical or percutaneous drainage, parenteral nutrition and antibiotics. The endoscopic approach using flexible stents has been recently proposed as an alternative of treatment. **Methods and procedures:** Restrospective analysis of all patients who underwent endoscopic treatment with self expandable stents of upper GI leaks after bariatric surgery at our institutions. **Results:** 19 patients were analyzed, 14 with gastric leaks after RYGBP and 5 after LSG. 60% were female. Self expandable stents were used in all patients. Immediate symptomatic improvement occurred in 94.7% of them. Median prosthesis on site days were 132 (range 60–280) in the Chilean series and 45 (range 21–91) in Brazil series. Two stent still remains on place (one because of chronic leak and the other by stricture after LSG). One patient needed surgical removal of the stent (5%). Three patients (15%) had broken stents that need to be removed (one by open surgery). Four patients (21%) had stent migration and five patients (26%) had severe reflux symptoms. There were no major complications. **Conclusion:** Minimally approach with endoscopic stent placement is a safe and feasible option of treatment of upper GI leaks following bariatric surgery.

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### ENDOSCOPIC FINDINGS IN PATIENTS WITH UPPER GI SYMPTOMS AFTER ROUX-EN-Y GASTRIC BYPASS

Amy Cha MD, Joseph Talarico MD, Jill Zink MD, Fady Moustarah MD, Allen Mikhail MD, Shaneeta Johnson MD, Vasanth Stalin MD, Matthew Kroh MD, Stacy Brethauer MD, Philip Schauer MD, Bipan Chand MD, Bariatric and Metabolic Institute, Cleveland Clinic Foundation

**Introduction:** Upper endoscopy (UE) is essential in the diagnosis and treatment of complications after Roux-en-Y gastric bypass (RYGB). Patients who have undergone RYGB present with a variety of functional (nausea, pain, and reflux) as well as obstructive (vomiting and dysphagia) symptoms. The primary aim of this study was to correlate symptoms and endoscopic findings with time of endoscopy after RYGB.

**Methods and Procedures:** Records between July 2006 and September 2008 of patients who underwent UE after RYGB were retrospectively reviewed. A non-consecutive series of 466 morbidly obese patients were endoscopically evaluated after primary bariatric surgery between July 2006 and September 2008. The endoscopic findings for this cohort were extracted directly from the patients' original endoscopy report, classified, recorded, and matched with their operative date.

**Results:** Of 466 patients who underwent UE after RYGB, 74% had upper gastrointestinal (UGI) symptoms and 26% had weight regain. Symptomatic patients were divided into three groups based on their time interval from RYGB to initial endoscopy. Group I were patients less than one year from RYGB (n = 176). Group II were patients between one and five years (n = 103). Group III were patients greater than five years from RYGB (n = 66). Group I symptoms were obstructive 42%, functional 24%, and combination 17%. Group II symptoms were obstructive 29%, functional 34%, and combination 24%. Group III symptoms were obstructive 19%, functional 65%, and combination 11%. Common endoscopic findings are listed in Table 1.

Table 1

	Group I (176)	Group II (103)	Group III (66)
Stricture	45 (26%)	12 (12%)	4 (6%)
Ulcer	55 (31%)	27 (26%)	19 (29%)
Mucosal inflam.	14 (8%)	23 (22%)	18 (27%)
Fistula	5 (3%)	11 (11%)	12 (18%)
Normal	19 (11%)	17 (17%)	15 (23%)

Abnormal endoscopic findings were multiple in 10% of Group I, 28% of Group II, and 10% of Group III.

**Conclusions:** Early symptoms after RYGB tend to be obstructive and later symptoms tend to be functional. Although endoscopic findings were noted to change over time, our observation is that the presence of symptoms warrant UE regardless of the timing of presentation post RYGB.

## Hepatobiliary / Pancreatic Surgery

22200

**LAPAROSCOPIC MANAGEMENT OF TYPE VI CHOLEDOCHAL CYSTS**

Edward S Chan BA, Edward D Auyang MD, Eric S Hungness MD, Department of Surgery, Northwestern University

**Introduction:** Choledochal cysts are rare cystic dilatations of the biliary tree. Though their etiology is uncertain, these cysts are usually referred for surgical resection because of their association with developing malignancy. Traditionally, choledochal cysts have been classified under five main types. Not included in this classification are cysts of the cystic duct (Type VI), a condition that is even rarer, with only 14 cases reported in the literature to-date. We describe one such rare case of Type VI choledochal cyst which we successfully treated via laparoscopic resection.

**Methods and Results:** A 41-year old male was found to have a biliary abnormality on a routine follow-up computed tomography (CT) scan for an unrelated medical condition. Further magnetic resonance cholangiopancreatography (MRCP) imaging identified a cystic dilation consistent with a Type II choledochal cyst. Laparoscopic resection was performed using a total of 5 trocars, at which time a cyst of the cystic duct was found instead of the expected Type II choledochal cyst. Intraoperative cholangiogram was used as a surgical adjunct to confirm the anatomy and resection of the Type VI cyst was completed without complications.



**Conclusions:** Laparoscopic excision is a safe and effective technique for treatment of cysts of the cystic duct. Intraoperative cholangiography is a useful adjunct to confirm the biliary anatomy during laparoscopic resection of choledochal cysts. In addition, we recommend modification of the Todani classification scheme to include Type VI choledochal cysts.

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**LAPAROSCOPIC RIGHT PORTAL VEIN LIGATION FOR METASTATIC LIVER TUMORS**

Hitoshi Inagaki MD, Tsuyoshi Kurokawa MD, Tadashi Yokoyama MD, Nobuhiro Ito MD, Manabu Kikuchi MD, Yasuhisa Yokoyama MD, Toshiaki Nonami MD, Yokoyama Hospital for Gastroenterological Diseases

In the case of an extended hepatectomy, percutaneous transhepatic portal vein embolization (PTPE) is necessary for a metastatic liver tumor, in order to enlarge the remnant liver. In a case with a giant tumor occupying the right lobe, PTPE would unavoidably injure the remnant liver. There is a method to perform portal vein branch ligation at primary operation especially in a case with simultaneously metastatic liver tumors. But, because this technique may cause extensive adhesion of the hepatoduodenal ligament, surgical treatment might be difficult around the hepatic hilar region at hepatectomy.

We approach laparoscopically a right portal vein ligation (LRPL). We report one case of LRPL. A patient was a 43-year-old woman with both a descending colon cancer and a giant metastatic liver tumor in the right lobe. After the primary operation which was laparoscopic colectomy, she underwent chemotherapy. Then we planned extended right lobectomy of the liver, but the remnant liver volume was 28%. Then we performed LRPL and the follow-up CT showed remnant liver hypertrophy (39%). Operation time was 70 minutes and the hospital stay after LRPL was 4 days. We performed right lobectomy by laparoscopic-assisted surgery smoothly.

LRPL is feasible technique as one of therapy in a multidisciplinary therapy for colorectal cancer.

We will accumulate more cases and examine the results of this method.

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**SINGLE PORT CHOLECYSTECTOMY**

Brian Binetti MD, Tejinder P Singh MD, Ward Dunnican MD, Dmitriy Yuhvid BA, Albany Medical Center, Albany, NY

**Objective:** As the paradigm of Single Incision Laparoscopic Surgery (SILS) and Natural Orifice Transluminal Endoscopic Surgery (NOTES) advances, novel techniques and equipment are necessary for its progress. There have been various techniques for SILS cholecystectomy. Specifically, there has been no description of a single fascial incision without the addition of other ports or instruments for retraction. Here we describe a single port surgery (SiPS) cholecystectomy.

**Methods:** We recruited 9 consecutive patients with symptomatic cholelithiasis or acute cholecystitis. Making a 2 cm incision through the umbilicus, we introduced a GelPort system to create pneumoperitoneum. A combination of 2 mm and 5 mm graspers were introduced through the GelPort system. A 5 mm or 10 mm flexible-tip laparoscope was used for visualization. We used either traditional or Autonomy Laparo-Angle electrocautery for dissection of the cystic duct and artery. Both the cystic artery and duct were clipped with a 5 mm clip applicator and divided with scissors. The gallbladder was then removed from its fossa with electrocautery and brought out through the wound protector.

**Results:** This procedure was successfully performed in all 9 patients without additional ports. All but two patients were female with a mean age of 46.8 years. Mean operating time was 75.6 minutes. Mean estimated blood loss was 22 milliliters. There were no intra-operative or post-operative complications observed in any patient. Six patients were discharged on the day of surgery. All 9 patients subjectively reported minimal pain post-operatively although no standardized scoring system was used.

**Conclusion:** Our results demonstrated that SiPS cholecystectomy could be safely performed today with current instrumentation. We believe the single port allows greater freedom of hand movements and instrument options. Furthermore, this procedure serves to advance technique development of NOTES by more closely resembling the in-line visualization and working space. Further improvements in the instrumentation should improve the outcomes and adoption of this procedure.

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**PREOPERATIVE EVALUATION OF THE ACCESSORY HEPATIC DUCTS IN THE CALOT TRIANGLE WITH THE 3-DIMENSIONAL CT IMAGE OF CHOLANGIOGRAM (3D-DIC-CT) TO AVOID ITS INJURY AT LAPAROSCOPIC CHOLECYSTECTOMY**

Minoru Kakiyama MD, Eiichi Sugasawa MD, Yoshiki Kajiwaru MD, Yoshitaka Kiyota MD, Toshimichi Takigawa MD, Taichi Satoh MD, Kiyoshi Nishiyama MD, Nobuaki Kawarabayashi MD, Kazuo Hatsuse MD, Junji Yamamoto MD, Department of Surgery, National Defense Medical College, Japan. &amp;#12288;

**Introduction:** Bile duct injury is one of the common problems which should be avoided in the Laparoscopic cholecystectomy. Endoscopic retrograde cholangiogram (ERC) is useful to find them, but it force to the patient burden and pain for more than 20 minutes. For the sake, we have been trying to figure out clear 3 dimensional (3D) images of the bile ducts (3D-DIC-CT) by high spec CT system.

**Materials and Methods:** From August 2006 to August 2008, we have succeeded to construct clear high resolution 3D bile duct images in 183 cases. Just after the drip infusion cholangiography (DIC), patients were transferred to the CT room. 3D-DIC-CT had been taken as follows; the applied CT system is AquilionTM 64 multislice CT (Toshiba Medical systems, 64-row Quantum detector). Average scan time was 5 minutes. The software to make 3D images is ZIOSTATION (ZIOSOFT, INC.).

**Results:** 5 cases (2.7%) showed accessory ducts in the Calot triangle and all of which are joining directly to the common hepatic duct. There were no case of accessory ducts joining to other bile ducts. In 3 cases, accessory ducts were clearly and safely dissected and preserved. In the other 2 cases, accessory duct were not identified through the operation. Post operative bile leaks, stenosis and liver function disorders were not encountered in all cases. The cost of 3D-DIC-CT was ??19140(\$174) in each cases and which was same to ERC(??18100 [\$164.5]) and MRCP (??19120 [\$173.8]).

**Conclusions:** Bile duct injury is still a major problem at Laparoscopic cholecystectomy. Nowadays the expert surgeon can dissect Calot triangle without any injury to the main bile ducts, but should take care to avoid injury to unexpected accessory or aberrant bile duct in the Calot triangle. From such a point of view, preoperative 3D-DIC CT is thought to be more useful for preoperative simulation in compared to ERC and MRCP. For instance, ERC is tough for the patient and its image is simple two dimension, although MRCP is not so tough but its resolution image is rough (Scan time; 30minutes. Slice thickness; 3 mm. Matrix:256\*300 pixels). Contrary, 3D-DIC-CT is less invasive, the unnecessary cost is cleared and its resolution is higher (Scan times; 5minutes. Slice thickness; 0.5 mm. Matrix:512\*512 pixels) in comparison with the MRCP.

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### USEFULNESS OF LAPAROSCOPIC HEPATECTOMY FOR EXTRAHEPATIC PROTRUDING-TYPE HEPATOCELLULAR CARCINOMA

Nobuhiro Ito MD, Hitoshi Inagaki MD, Tsuyoshi Kurokawa MD, Toshiaki Nonami MD, Department of Gastroenterological surgery, Aichi Medical University

**Background:** Hepatectomy is the treatment of choice for hepatocellular carcinoma, but liver function disorders in many cases limit the resectability. Recently, ablation therapy such as radio waves and microwaves are progressing, and the number of nonoperative cases are increasing. However, for protruding-type tumors, the risk of tumor rupture or dissemination has been pointed out. For such cases, laparoscopic hepatectomy provides radical treatment and minimal invasiveness. For a hepatocellular carcinoma protruding out of the liver, in principle the cervix region of the tumor is ablated by microwaves, and excision is feasible using a laparoscopic coagulating shears.

**Aim and Methods:** In our hospital, we started laparoscopic hepatectomy in August, 2000, and 23 cases were performed by May, 2008. 8 of those cases were hepatocellular carcinomas with protrusions outside the liver. We analyzed these cases for the location of the tumor, tumor diameter, preoperative liver function, operation time, amount of bleeding, postoperative complication and postoperative hospitalization days.

**Results:** The mean age of patients was 59.6 years old, with a sex ratio of 3 to 5. As for the location of tumors, there were 5 in the lateral segment, and 3 others were S4, S5, and S6 respectively. Tumor size ranged from 20 mm to 70 mm with an average of 38.3 mm. As for liver function, 6 were 5 in Child-Pugh score and 2 were 7. Mean operative time was 184.1 minutes, mean operative blood loss was 168.1 g, mean excision liver weight was 47.6 g. There was no case of conversion to laparotomy. Postoperative complications were only experienced by 2 patients; one wound infection and one wound bleeding. There was no mortality and the median hospital stay was 17.25 days.

**Conclusion:** Hepatocellular carcinoma with extrahepatic protrusion is a good indication of laparoscopic hepatectomy, because the liver cutting is small and it is rare for a vas to run around the tumor. Operations in our cases were done safely without complications. Laparoscopic hepatectomy for protrusion-type hepatocellular carcinoma is safe and minimally invasive.

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### TRUE DAY CASE LAPAROSCOPIC CHOLECYSTECTOMY IN A DGH: OUTCOMES AND FACTORS LEADING TO OVERNIGHT ADMISSION

Zaher Toumi MD, Sara White BA, S Sharma, Kishore Pursnani, Central Manchester University Hospitals, Lancashire Teaching Hospitals

**Introduction:** A prospective audit was undertaken of true day case laparoscopic cholecystectomies performed by a single surgeon in a DGH. The audit aims primarily to ascertain the outcome of the operation and patients' satisfaction with the experience. Data was analysed to identify factors that led to overnight admissions.

**Methods:** Data collected using audit proformas. Collected data included intra- and post-operative analgesics and antiemetics and a phone survey of patients on the day after the operation. We obtained postoperative complications and admissions data from patients' records.

**Results:** 22 patients were admitted for day case laparoscopic cholecystectomy between June 07 and May 08. 17 (77%) were discharged on the same day. 5 patients (23%) were admitted, of these: 2 (40%) were discharged within 24 h and 3 (60%) were discharged within 36 h. Indications for overnight admission were: optimisation of pain relief (48%) and pyrexia (20%).

All patients were happy or very happy with their anaesthesia and analgesia. No patients required readmission after discharge.

Statistically significant factors leading to admission are: length of operations ( $p = 0.0007$ ), not administering Diclofenac intraoperatively ( $p = 0.003$ ) and post-operatively ( $p = 0.025$ ), administering Cyclizine intraoperatively ( $p = 0.002$ ) and post-operatively ( $p = 0.001$ ), administration of Morphine post-operatively ( $p = 0.004$ ) and not administering Ondansetron postoperatively ( $p = 0.003$ ).

**Conclusions:** This audit showed that day case laparoscopic cholecystectomy service met its objectives with a low rate of overnight admission, and no readmissions. Patients were satisfied with their experience. The audit identified factors that could lead to overnight admission. These require further assessment in a larger cohort.

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### COMPARISON OF LAPAROSCOPIC CBD EXPLORATION, ERCP AND OPEN CHOLEDOCHOLITHOTOMY FOR LARGE CBD CALCULI

Gurvinder s jamu MS, Jammu hospital jalandhar Punjab India

#### ABSTRACT

**BACKGROUND:** CBD calculi is a common complication of cholelithiasis. ERCP and open choledocholithotomy are the two common procedures used to deal with this problem.

Laparoscopic choledocholithotomy is technically demanding procedure because it requires fine endo suturing but at the same time more beneficial and result oriented than the other two methods. In this study laparoscopic CBD exploration was compared in length with other two methods.

**METHODS:** We compared results in 247 patients under going laparoscopic choledocholithotomy, ERCP and open choledocholithotomy over 30 months period.

A retrospective comparative study was carried out in three methods. High definition endovision system with 2 cameras, a uretero reno scope 7 fr and a nephroscope 17 fr was used in addition to routine instruments in cases of lap CBD exploration. Larger stones were fragmented under vision in laparoscopic CBD exploration. Post exploration CBD was checked by cholangiogram or 7 fr ureterorenoscope. CBD was closed with stent in situ or T tube or closed primarily or was anastomosed with intestine.

**RESULT:** Complications in the form of pancreatitis, wound infection, duodenal perforation, bile leakage, and residual stones were least in laparoscopic choledocholithotomy as compared to ERCP and open choledocholithotomy. The anatomy of CBD and rest of bile ducts (R and L hepatic ducts) could be clearly delineated with 7 fr ureterorenoscope. This scope could almost always be negotiated through sphincter of oddi and duodenum could always be anticipated.

**CONCLUSION:** Single stage Laparoscopic choledocholithotomy should be the procedure of choice in choledocholithiasis especially in cases of large CBD calculi.

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### TREATMENT OF LIVER TUMORS USING A NOVEL BIPOLAR RADIOFREQUENCY ABLATION DEVICE

Hisae Aoki MD, Lawrence W Way MD, Carlos U Corvera MD, Department of Surgery, University of California, San Francisco

**Background:** Laparoscopic ablation and resection of liver tumors is rapidly gaining momentum. Well over a decade ago, monopolar RFA devices were introduced and replaced cryoablation as the preferred modality for ablating liver tumors. Bipolar RFA technology which requires placement of two probes works fast and can be used for two distinct purposes. We describe our early experience using laparoscopic bipolar RFA technology for (1) tumor ablation, (2) parenchymal pre-coagulation prior to transection, and in selected cases both applications were used.

**Methods:** We reviewed our prospectively maintained database of patients with liver tumors treated by laparoscopic approach utilizing the bipolar RFA device. We identified 14 patients that underwent laparoscopic RFA of liver tumors, resection or both procedures. RFA alone was used in patients with contraindications to resection or as bridge therapy toward transplantation. We analyzed the indications and operative approach for these operations. Some procedures were done with the patient in the left lateral decubitus and others in the supine position. The liver is fully mobilized off of the retroperitoneum and diaphragm to fully access the tumor bearing segments. RFA was done using the InCircle (RFA-medical) bipolar probes in all cases. During laparoscopic resections, the parenchyma was pre-coagulated using the Monarch probes (RFA-medical) which have linearly oriented deployable tines. In most cases parenchymal division was done using the Gyrus cutting bipolar forceps (Olympus) depending on nature of the liver parenchyma.

**Results:** Of the 14 study patients, 8 underwent totally laparoscopic liver resections and 6 underwent laparoscopic RFA alone. The median age was 64.4 (range 44-82). The indications for surgery included primary liver tumors in 12 cases (hepatocellular carcinoma = 10; cholangiocarcinoma = 1; hepatic adenoma = 1) and metastatic tumors in 2 cases (breast and colorectal). All hepatomas arose in the context of chronic HCV and thus some degree of fibrosis/cirrhosis. Among those patients treated by RFA alone, the average tumor size was 4.0 cm (range 2.3-6). Two patients underwent concomitant procedures (cholecystectomy in 1; placement of gold fiducials in 1). Totally laparoscopic resections were completed in 8 patients. None required conversion to open. The average tumor size was 4.2 (range 2.9-5). Of these, 6 patients underwent anatomic resection (2 formal right hepatectomies, 2 posterior sectorectomies, 2 monosegmentectomies: seg 5, seg 2). Two other patients underwent non-anatomic resections both in segment 6.

**Conclusion:** Laparoscopic Bipolar RFA technology can be used as an adjunct to totally laparoscopic hepatic resections or tumor ablation alone. While multiple energy devices exist for tumor ablation or parenchymal pre-coagulation, only the Bipolar RFA device can be used efficiently for both purposes. Bipolar RFA is an excellent alternative to monopolar RFA technology and may be next in line as the preferred energy for treating liver tumors.



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### LAPAROSCOPIC CHOLECYSTECTOMY IN SITUS INVERSUS ABDOMINIS

Michael A Sawyer MD, Videoendoscopic Surgical Institute of Oklahoma, Comanche County Memorial Hospital, Lawton, Oklahoma

Report of case: A 41 year old woman was referred by a gastroenterologist for chronic abdominal pain of six months' duration. She described pain that occurred frequently throughout the day, typically lasting between 30 minutes and two hours. The pain was mainly epigastric but had a colicky right upper quadrant component also. She described severe postprandial attacks that had limited her alimentation to mainly liquids over the previous two months. She had an involuntary weight loss of 8 to 10 pounds over the six month period. An extensive workup including upper and lower endoscopic examinations, a barium swallow with small bowel follow through and a CT scan of the abdomen and pelvis had been done. Salient findings included situs inversus abdominis. The spleen and stomach were on the right, the proximal jejunum and majority of the small intestine were located on the left, while the entire colon was in the right abdomen. The gallbladder was centrally located between two large hepatic lobes. Based on the patient's symptoms, an abdominal ultrasound and radionuclide hepatobiliary scan were completed. The ultrasound was normal. The radionuclide scan featured normal gallbladder filling and an ejection fraction of 19.8%. A diagnosis of biliary dyskinesia was made.

Technique: The patient was placed in the low lithotomy position with the surgeon positioned between the patient's legs. Abdominal access was gained with a non-bladed 11 mm trocar just superior to the umbilicus. A 30 degree 10 mm laparoscope was used. Additional trocars were placed under direct visualization and included a 5 mm trocar in the right upper abdominal quadrant and two 5 mm trocars in the left upper abdominal quadrant. Anatomical variations included the portal vein crossing anterior to the common hepatic duct and the presence of a very short cystic duct. The dome-down approach was very useful and allowed excellent exposure of critical structures. The cystic duct was isolated, clipped and divided. The gallbladder was removed and the trocar sites closed.

Results: The patient had an uneventful postoperative recovery and was discharged home the same day. She was seen in the office a week later and was doing well. She remains asymptomatic 8 months after surgery.

Discussion: Gallbladder disease in patients with situs inversus abdominis presents a unique set of challenges centering on significant anatomical abnormalities. The laparoscopic approach is safe and effective. Several modifications may be helpful including variations in patient positioning, the use of alternate trocar locations and the dome-down dissection technique.

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### ALTERNATIVE TREATMENT OF ACUTE PANCREATITIS

Alexey V Ligonenko MD, Poltava State Stomatological Medical School, Ukraine

The contemporary approach to treatment of acute pancreatitis (AP) is far from satisfactory. This resulted in the increased number of AP patients as well as increased number of cases that developed complications. Our idea is not an original one since we strictly followed the guidelines of the World and European Pancreatic Societies that recommend obtaining as conservative as possible approach for the AP treatment during the stage of aseptic inflammation. We performed the series of retrospective clinical observations aimed to compare the efficacy of the previous immediate surgical interventions in the case of AP with the tactics of accurate adequate conservative treatment.

Clinical observations were performed during the last 5 years. Surgical treatment was used in the case of the patients general condition worsening. For the new methodology of the non operative treatment we used the intensive medical therapy including antibiotics, antioxidants, antiinflammatory and antinociceptive drugs. Inhibition of pancreatic secretion was also applied. Briefly, the non operative treatment of AP was complex and required day-by-day and week-by-week re-evaluation of the patients' condition with the treatment tailored to the changes that rapidly occurred in critical patients.

From 99 patients operated during the very first days in the hospital, 13 patients improved general condition, 61 patients demonstrated stable clinical manifestation with the mild prolonged shift to the improvement, 19 patients needed repeated operations and 6 patients died.

In the group of 120 patients to whom we applied the intensive conservative treatment, 75 patients recovered soon. Stable clinical manifestation was observed in 33 patients, 9 underwent traditional surgical interventions and 3 patients died.

These data are in strong correspondence with the leading opinion that pancreatic gland sterile aseptic inflammation should not be operated but treated conservatively. Our results are significantly better compared with the results of the AP traditional treatment. This might have important medical and social implications, since the patients with AP often represent the working category of people and it is of crucial importance to restore their working abilities in terms of their quality of life and economic contribution to the society.

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### PYLEPHLEBITIS FOLLOWING INFECTED CHOLEDOCHOLITHIASIS, ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY AND CHOLECYSTECTOMY

Eric A Wieman MD, Anne Kobberman MD, Robert Kenney DO, Kelly Andresen MD, Daniel Margolin MD, 1) University of Kansas City Missouri 2)Saint Lukes Hospital, Kansas City

Objective: Suppurative pylephlebitis or chronic thrombophlebitis of the portal vein is an uncommon but serious complication of intra-abdominal infection. Once common in the pre-antibiotic era, pylephlebitis continues to carry a significant mortality rate. To our knowledge cholangitis secondary to choledocholithiasis has been documented only once in the literature, and never following ERCP or open cholecystectomy. This article reviews the clinical findings, radiological features as well the pathogenesis and treatment modalities involved in the management of this distinctive infectious phenomenon. Methods: This report focuses on the case of a 64 year old man presenting with acute cholangitis secondary to choledocholithiasis. The patient underwent endoscopic extraction of biliary stones and sphincterotomy. Subsequently laparoscopic cholecystectomy was attempted. This was converted to open procedure as a result of severe inflammation of the gallbladder. A small but persistent bile leak was drained percutaneously by interventional radiology. The output from that drain tapered quickly and it was removed shortly before his discharge. He returned shortly four days later complaining of fever, and abdominal pain and was found to have Klebsiella pneumonia bacteremia. CT demonstrated thrombosis of the left portal vein and its branches. Repeat CT scan two days later revealed a persistent bile leak. Percutaneous drainage of the biliary leak was performed and cultures from that fluid tested positive for Klebsiella pneumonia. On discharge the patient was placed on a regimen of antibiotics and anticoagulation. Follow up CT after six weeks showed a degree of resolution of phlebitic inflammation; however no recanalization of the thrombosed aspect of portal vein was noted at that time.

Results: A high degree of clinical suspicion and early CT imaging are imperative in making an early diagnosis of what is both a rare and insidious disease process. This case is unique in that the infection occurred in the delayed post-operative setting for treatment of infected choledocholithiasis. Since pylephlebitis is such an uncommon process the utilization of separate therapies, remains a difficult task in optimizing outcome. Diverse treatment mechanisms have been described including antibiotic therapy, anticoagulation, and percutaneous drainage of the portal venous system. However, limited information exists regarding these the use of these treatments, alone or in combination. Therefore pylephlebitis as illustrated in this report requires keen instinct and proper radiological imaging to make an early diagnosis, but continues to present a therapeutic challenge in modern medical practice.

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### RETROSPECTIVE ANALAYS OF 12 CASES POLYPS OF THE GALL BLADDER

ibrahim m cosgun, mahir m bagci, a.cem m gürgen, türker m bilgin, Etimesgut Asker Hastanesi

Objective: The nature of the polypoid lesions of the gallbladder is difficult to determine preoperatively and indications for surgical treatment still remain controversial. The aim of this study is to review the clinicopathological features of patients with gallbladder polyps.

Material-Method: Patients with preoperative diagnosis of gallbladder polyp, between January 1995 and June 2003, were evaluated retrospectively according to their demographic findings, clinical symptoms, abdominal ultrasonographical features, type of surgical treatment and postoperative pathological results.

Results: Among 1120 patients who underwent cholecystectomy, 25 had preoperative diagnosis of gallbladder polyps by abdominal ultrasonography (2.3%). The most common symptom was abdominal pain resembling biliary colic, existing in all 25 patients. Ultrasonography revealed immobile polypoid lesion attached to the mucosal surface, having posterior acoustic shadow in all cases. Polyps were defined as sessile in 22 (88%) patients and pedunculated in 3 (12%). Co-existing gallbladder stone was detected in 7 patients with abdominal ultrasonography (28%). Cholecystectomy was performed laparoscopically in 18 patients and open technique was used for the first 7 patients. Histopathological examination revealed cholesterol polyps in 9 patients (36%), adenoma in 2 (8%) and gallbladder adenocarcinoma in 1 case (4%). Pathological diagnoses were chronic cholecystitis with gallbladder stones in 13 cases (52%) which were thought to be polyps under ultrasonographical examination.

Conclusion: Preoperative assessment of gallbladder polyps is a challenging issue for both radiologists and surgeons. Once gallbladder polyp is detected and diagnosed surgery is the choice of treatment in all symptomatic cases, when polyp size is greater than 10 mm and in patients older than 50 years of age due to the risk of malignancy.

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### ASSESSING THE POTENTIAL AND LIMITATIONS OF LAPAROSCOPIC ULTRASOUND IN THE STAGING OF PANCREATIC CANCERS

A Samee MD, M Abu Hilal MD, K Moorthy MD, M Deakin MD, MA Kazem MD, CVN Cheruvu MD, University Hospital of North Staffordshire

**Introduction:** Although the role of laparoscopic ultrasound (LUS) during staging laparoscopy for pancreatic cancers is well established there is no consensus as to whether it provides useful information over and above other imaging modalities.

**Aim:** To evaluate the value of intra-operative LUS in the pre-operative assessment of pancreatic cancer.

**Methods:** A retrospective consecutive case series consisting of patients undergoing pre-operative staging for pancreatic carcinoma in two centres (Centre A and B) was carried out over a 5-year period (2000–05). It was routine practice to perform staging laparoscopy for pancreatic cancers considered potentially resectable on multi-planar CT. Staging laparoscopy was performed using a standardised 3-port protocol using a 30-degree laparoscope. Patients in Centre B also underwent LUS using a 7.5 MHz probe. All suspicious lesions were sent for histological assessment for confirmation of malignancy.

**Results:** There were 54 patients in centre A and 51 in Centre B. There were no differences between the two centres for patient demographics and tumour site. There was no difference between the two centres for the detection of metastatic disease using staging laparoscopic assessment alone (A-7.2% vs. B- 7.84%,  $p = 1.0$ ). However, there was a significant difference in additional findings (7.2% vs. 25%,  $p = 0.037$ ) with the use of LUS in Centre B. The additional findings ( $n = 9$ ) were portal vein involvement ( $n = 5$ ) and superior mesenteric vein involvement ( $n = 3$ ), stomach and liver metastasis ( $n = 1$ ) and local extension ( $n = 1$ ). These patients were offered palliative treatment. In the remaining 42 patients who were deemed suitable for resection, 5 patients were found to be inoperable during the laparotomy. 4 patients had an irresectable vascular pedicle involvement [Coeliac trunk ( $n = 2$ ), SMV ( $n = 1$ ), PV ( $n = 1$ )]. One patient had diffuse metastatic disease ( $n = 1$ ).

**Conclusion:** The addition of LUS increased the detection rate of advanced disease by 17%, thus making it a useful pre-operative adjunct staging modality. It is especially useful in assessing vascular involvement. In our series the false negative rate was 11% ( $n = 5/42$ ).

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### LAPAROSCOPIC MANAGEMENT OF PATIENTS WITH EARLY FORMS OF GALLBLADDER CANCER

Xabier de Aretxabala MD, Jorge Leon MD, Ivan Roa MD, Juan Hepp MD, Fernando Maluenda MD, Clinica Alemana Santiago Chile

**Introduction:** Laparoscopy can represent an useful tool in the management of patients undergoing reoperation for gallbladder cancer detected after the study of the cholecystectomy specimen. The aim of this study is to evaluate the feasibility and outcome of a series of patients undergoing initial laparoscopic management .

**Methods and Procedures :** According a prospective protocol, between July 2005 and January 2008, 16 patients (two males, median age 56 years) harboring a gallbladder cancer detected after the exam of the cholecystectomy specimen were admitted. Of these, 11 had invasion of the subserosal layer (T2), four of the serosa, (T3) and one of the muscle layer (T1b). Of the patients, 5 had undergone a previous open cholecystectomy while 11 had a laparoscopic procedure. Lymph node metastasis, peritoneal recurrence and technical difficulties were indications for conversion

**Results:** All patients underwent laparoscopic reoperation. Intervention was finished after the initial exploration in three patients. Of these, in one patient peritoneal recurrence was observed while the other two patients did not have a good general condition to perform the resection. Conversion to an open procedure after a negative exam of the abdominal cavity was performed in 9 patients. Of these patients, in three the open exploration allowed the detection of metastatic tumor undiscovered during the laparoscopic procedure. Main cause of the lack of detection was the presence of dense adhesions in the subhepatic area that made difficult a complete exam. In the rest of patients and after a negative open exploration a lymphadenectomy associated with the resection of segments IVb and V was performed.

In four patients and after a negative laparoscopic exploration, the resection by laparoscopy was attempted. Carbon dioxide pressures were maintained between 8–12 mmHg. In general, 5 ports including two 10/12 ports were employed. Of these patients, in three a complete lymphadenectomy of the hepatic pedicle associated with the resection of the gallbladder bed was performed . In the other patient, the presence of a metastatic lymph node in the hepatoduodenal ligament was the indication to finish the resection after conversion . Laparoscopic liver resection was performed using harmonic and stapling for large vessels. Surgical specimen was extracted through an enlarged port. Neither postoperative morbidity nor mortality was observed in the series . Perioperative blood transfusion was not employed in any of the patients. Among those undergoing resection, recurrence was observed only in one patient, while the rest of patients are alive and free of recurrence with a complete follow-up.

**Conclusion:** Laparoscopy may be employed in the management of patients with early forms of gallbladder cancer undergoing reoperation. Although the presence of adhesions might result in an inadequate exploration, there is a subset of patients in whom is possible to perform a complete exam. Further, laparoscopic lymphadenectomy and gallbladder bed resection is a promising technique in well selected patients. Larger studies are required to confirm its oncologic value.

### FLUORESCENT CHOLANGIOGRAPHY DURING LAPAROSCOPIC CHOLECYSTECTOMY BY INTRAVENOUS INJECTION OF INDOCYANINE GREEN

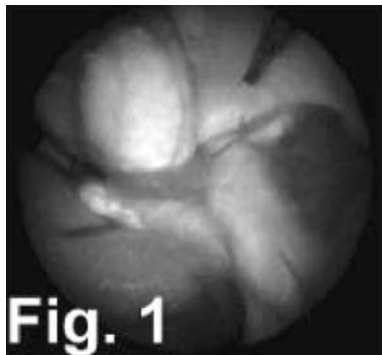
Takeaki Ishizawa MD, Arata Muraoka MD, Masayoshi Ijichi PhD, Koji Kusaka PhD, Masayuki Shibazaki PhD, Yasutsugu Bandai PhD, Norihiro Kokudo PhD, Department of Surgery, Central Hospital of Social Health Insurance

**Objective of the technique:** To delineate bile duct anatomy during laparoscopic cholecystectomy (LC) using fluorescent cholangiography with preoperative intravenous injection of indocyanine green (ICG).

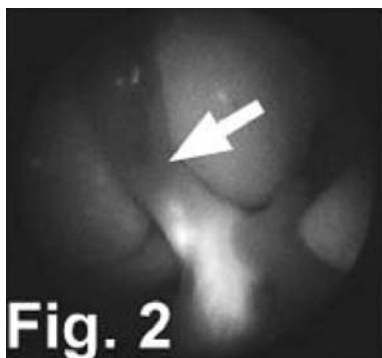
**Methods:** Our fluorescent cholangiography technique is based on the principle that ICG is excreted into bile and that protein-bound ICG emits light with a peak wavelength of around 830 nm when illuminated with near-infrared light. The prototype fluorescent imaging system is comprised of a xenon light source, a small control unit, and a laparoscope 10 cm in diameter with a charge-coupled device camera, which can filter out light with wavelengths below 810 nm. In 5 patients undergoing LC for cholelithiasis, one milliliter (2.5 mg/mL) of ICG was intravenously injected two hours before surgery. The abdominal cavity was insufflated, and the laparoscope was introduced through a subumbilical trocar. After the hepatoduodenal ligament was identified, color images were changed to fluorescent images using a foot switch.

**Preliminary results:** Fluorescent cholangiography clearly delineated the cystic duct and the common bile duct in all patients prior to the dissection of triangle of Calot (Fig. 1). The common hepatic duct was identified in 4 of the 5 patients. In one patient, fluorescent cholangiography delineated gallstones in the cystic duct and the information was helpful to select the optimal point to transect the cystic duct (Fig. 2). The fluorescence of the biliary tract lasted throughout the procedures of LC (72–125 minutes). No adverse reactions to the ICG were encountered.

**Conclusions:** Fluorescent cholangiography using intravenous injection of ICG may become the optimal tools to confirm the biliary tract anatomy during LC because it has potential advantages over radiographic cholangiography in that it does not require irradiation or dissection of triangle of Calot.



**Fig. 1** Fluorescent cholangiography delineated anatomy of the extra-hepatic bile ducts prior to the dissection of triangle of Calot



**Fig. 2** The gallbladder was not fluorescing because of gallstones in the cystic duct (arrow)

### ESTABLISHING ND:YAG LASER BASED LEFT LATERAL LIVER RESECTION: COMPARISON OF OPEN, LAPAROSCOPIC AND HAND ASSISTED APPROACH

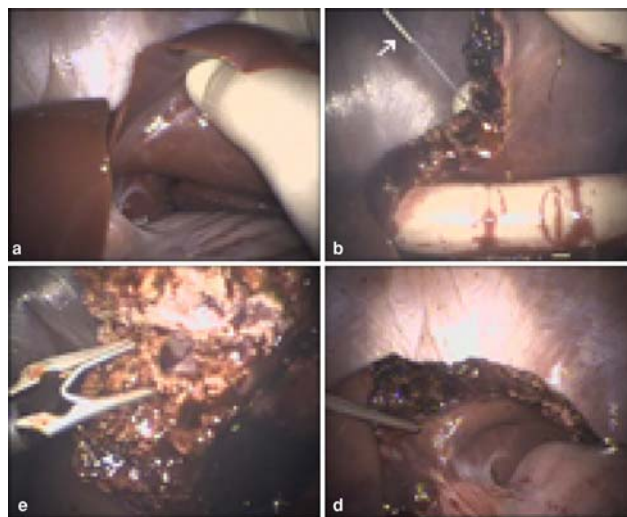
Sascha S Chopra MD, Georg Wiltberger, Sven C Schmidt MD, Ulf Teichgraber MD, Guido Schumacher MD, Department of General-, Visceral- and Transplantation Surgery, Charité Campus Virchow Clinic, University Medicine Berlin; Department of Radiology, Charité Campus Mitte, University Medicine Berlin

**Objectives:** Aim of this study was to assess the feasibility and safety of a 1064 nm Nd:YAG laser for left lateral liver resection in a porcine model. Laparoscopy and hand assisted laparoscopic surgery were evaluated and compared to conventional open surgery.

**Methods:** A group of 15 pigs were randomized for three different approaches of left lateral liver lobe resection. During the postoperative course blood samples and clinical parameters were taken and all animals were killed on day seven. Primary endpoints were intraoperative blood loss, dissection time, laboratory changes and abdominal wall adhesions. Additionally intraoperative cardiopulmonary data, postoperative clinical parameters and necropsy findings were documented and analyzed.

**Results:** Liver resection was successful in all 15 animals without intra- or postoperative mortality. Mean dissection time was 44 min for open and 42 min for hand assisted surgery. Laparoscopic dissection time was significantly increased with 64 min. Average blood loss was 340 ml for open surgery and 320 ml for hand assisted surgery. Blood loss during laparoscopy was significantly smaller with a mean of 180 ml. Adverse events in the postoperative course included transient fever in 4 animals, 3 wound infections and 2 bilioma. Complications were distributed among all groups without significant dominance. Post mortem findings revealed extensive adhesions for open surgery while hand assisted and laparoscopic animals showed limited adhesions in the upper abdomen. Liver enzymes were significantly elevated on postoperative day 1 in both minimal access groups.

**Conclusions:** Nd: YAG laser based liver resection is a potentially safe and feasible technique. The minimal access approaches show comparable results to the open technique with reduced abdominal trauma and less adhesions. Laparoscopy was more time consuming but showed reduced blood loss compared to both other groups.



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### LAPAROSCOPIC TREATMENT OF INTRASPLENIC PANCREATIC PSEUDOCYST

Emanuele Lo Menzo MD, Alberto Iglesias MD, Ann-Christine Brady MD, Diya Alaadeen MD, Jose M Martinez, Seth A Spector MD, Atul K Madan, Miami VA Healthcare System & University of Miami, Miami, FL, USA

**Introduction:** Although pseudocyst formation is common following pancreatitis, their erosion into the spleen is a rare, but potentially life threatening event. We report a case of intrasplenic pancreatic pseudocyst treated laparoscopically with distal pancreatectomy and splenectomy.

**Methods:** A 50 year old African American male, with a past medical history significant for chronic alcohol induced pancreatitis, presented with complaints of a 3 month history of abdominal pain, worsening over the past several days. Initially, the patient was diagnosed with pancreatitis and treated accordingly. Because of the persistent pain, a computed tomography scan was obtained. The spleen was almost entirely replaced by a 9 cm subcapsular fluid collection suspicious for an intra-splenic pseudocyst. The patient underwent electively laparoscopic distal pancreatectomy and splenectomy.

**Results:** There were no intraoperative complications. The patient resumed diet on the third postoperative day and he was discharged home on day 8. The final pathology revealed a benign cystic lesion measuring  $9 \times 6 \times 3$  cm in size which was not in communication with the pancreatic duct. There were also 2 smaller pseudocysts in the pancreatic body and tail. A previous scan did not reveal any abnormalities in the spleen, and showed the other pancreatic pseudocysts. At 8 months, the patient has had no recurrent symptoms.

**Conclusions:** Splenic parenchyma involvement is an unusual complication of pancreatic pseudocyst. The optimal treatment is controversial. Percutaneous drainage carries a high recurrence rate and risk of hemorrhage. Open surgery is effective, but is associated with significant morbidity. The laparoscopic offers an effective method of treatment without the potential complication of a large abdominal incision.

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### CLINICAL OUTCOMES OF LAPAROSCOPIC PYLORUS PRESERVING PANCREATODUODENECTOMY (L-PPPD): COMPARISON OF LAPAROSCOPIC ASSISTED PPPD TO TOTALLY LAPAROSCOPIC PPPPD

Song C Kim MD, Duck J Han MD, Kwan T Park MD, Young H Kim MD, Hae R Ha RN, Hae R Seo RN, Dept of Surgery, Ulsan University College of Medicine & Asan Medical Center

Even though most surgeons are reluctant against L-PPPD for malignant lesion of pancreas head because of oncologic point of view yet, if technical feasibility and safety are verified, L-PPPD can be accepted as an alternative option for open pancreatoduodenectomy. (Purpose) The purpose of this report is to present the clinical outcomes of the L-PPPD to verify the feasibility and safety and to compare the laparoscopic assisted PPPD to totally laparoscopic PPPPD in a single institutional study. (Patients and method) 16 laparoscopic assisted PPPPD and 5 totally laparoscopic PPPPD were performed since May 2007 for 18 benign and 1 endocrine carcinoma and 2 invasive malignant neoplasm. For laparoscopic assisted PPPPD, reconstruction was performed extracorporeally for pancreaticojejunostomy, duodenojejunostomy and jejunojunostomy through the specimen removal wound, and choledochojejunostomy was performed with intracorporeal laparoscopic. For totally laparoscopic PPPPD, all procedures were done intracorporeally with extraction of specimen through the small pubic line. (Results) There was no operative mortality in both groups. Median operative time (from the time of skin incision for the first trocar to the time of skin closure of the last port, including resting time for surgeons) was 9.4hr in laparoscopic assisted PPPPD, and 9.7 hr in totally laparoscopic PPPPD ( $P > 0.05$ ). Postoperative complications were developed in 7 patients (46.6%) in laparoscopic assisted PPPPD including two (13.3%) cases of pancreatic fistula and three cases of biliary fistula, and one case of pseudaneurysm bleeding in laparoscopic assisted PPPPD. There is one case of PJ leak in totally laparoscopic PPPPD. Hospital stay was similar in both groups. High BMI was the only significant factor for postoperative complications (Conclusion) Technically, L-PPPD is feasible with acceptable mortality, and totally laparoscopic PPPPD could be performed with comparable results to laparoscopic assisted PPPPD. However high morbidity in high BMI patient remains as hurdles to overcome for LPPPD to be a standard procedure.

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### LAPAROSCOPIC HEPATIC RESECTION FOR PATIENTS WITH HEPATOCELLULAR CARCINOMA: COMPARATIVE ANALYSIS OF SHORT-TERM RESULTS

Satoru Imura MD, Mitsuo Shimada PhD, Yuji Morine MD, Hirofumi Kanemura MD, Hideaki Uchiyama MD, Nobuhiro Kurita MD, Hidenori Miyake PhD, Department of Surgery, The University of Tokushima, Japan

**Background/Aims:** Recently, laparoscopic hepatectomy (LH) has been a feasible option for hepatic tumors such as hepatocellular carcinoma (HCC) and intrahepatic cholangioma (Surg Endosc. 2001) (Surg Endosc. 2002). Herein, we evaluate the benefits of LH versus open hepatectomy (OH) for HCC patients.

**Methods:** From 2005, 9 consecutive patients with HCC who underwent LH were compared in a retrospective analysis with a historical group of 16 patients who underwent OH (procedures: left lateral sectionectomy, less than subsegmentectomy). Two groups were well matched age, tumor size and location, type of hepatic resection, and grade of cirrhosis. The selection criteria for both groups specified a small (size:  $< 5$  cm), subcapsular tumor located in the left lateral lobe or peripheral right segments of the liver (Couinaud's segment: II-VI). The patients with severe cirrhosis were excluded in this study.

**Results:** One patient in the LH group underwent emergent conversion to laparotomy due to severe hypotension by gas embolism. The mean operative time was similar in both groups (LH: 261 min, OH: 281 min). The mean blood loss in the LH was less than OH group, with significance difference (112 ml [10-240] vs 472 ml [100-900],  $p < 0.03$ ). The mean hospital stay in the LH group was 16 days, was significantly shorter than OH group (23 days). There was no mortality in perioperative period in both groups. Critical complication was not observed except 1 case of gas embolism in the LH group, however, the patient has recovered without getting serious.

**Conclusions:** LH is a procedure of significant risk and is more technically demanding compared to traditional OH, however, LH for HCC in selective patients is a safe, effective procedure with better short-term outcome.

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### PROSPECTIVE EVALUATION OF THE ONCOLOGIC OUTCOME AFTER LAPAROSCOPIC RESECTION OF MALIGNANT LIVER TUMORS

Gurkan Tellioglu MD, John Fung MD, Eren Berber MD, Cleveland Clinic General Surgery

**Background:** Current literature on laparoscopic liver resection has focused on technical aspects and peri-operative morbidity. The aim of this study was to prospectively analyze oncologic outcome in a group of patients with malignant liver tumors.

**Methods:** Within a 2.5-year period, fifteen patients with malignant liver tumors underwent laparoscopic liver resection using a variety of techniques. These patients had liver only disease on preoperative CT scans as well as PET scans in 5 patients. Tumors were peripherally located (segments 2, 3, 4b, 5 and 6). All patients were followed up systematically under a protocol with quarterly CT scans and tumor markers. All data are expressed as mean  $\pm$  standard error of mean.

**Results:** Mean age was  $65.4 \pm 2.4$  years. Pathology included colorectal metastasis ( $n = 11$ ), HCC ( $n = 3$ ) and GIST ( $n = 1$ ) metastasis. Fourteen patients had a solitary lesion, with one patient having 2 lesions. Mean tumor size was  $3.0 \pm 0.4$  cm. Liver metastasis was synchronous in 8 and metachronous in 4 patients. Seven of 11 patients with colorectal metastasis received preoperative chemotherapy. The patient with GIST metastasis received preoperative imatinib. The procedures were performed fully laparoscopic in 6 patients, hand-assisted in 8 patients and using a hybrid technique in 1 patient. Procedures included right hepatectomy ( $n = 1$ ), left lateral sectionectomy ( $n = 6$ ), right posterior sectionectomy ( $n = 1$ ) and segmentectomy ( $n = 7$ ). Mean operative time was  $194 \pm 16$  minutes and estimated blood loss  $265 \pm 111$  ml. Mean surgical margin was  $0.9 \pm 0.2$  cm and microscopically positive in 2 patients. Resections were performed either using a technique of pre-coagulation with radiofrequency ablation (RF) catheters or post-coagulation with the TissueLink to achieve a greater functional resection margin. Hospital stay was  $3.0 \pm 0.4$  days. During a median follow-up of 17 months, all patients were alive. Three patients (colorectal,  $n = 2$  and HCC,  $n = 1$ ) developed new liver lesions and 1 patient pelvic recurrence. There were no recurrences at the resection margin.

**Conclusions:** Although there is a relatively small number of patients with short-term follow up in this study, the lack of recurrence at the resection margin over time indicates that laparoscopic liver resection is oncologically comparable to open surgery. We believe that pre or post-coagulation with RF can potentially decrease resection margin recurrences. Close periodic follow up of these patients is essential to determine complete resection.

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### LAPAROSCOPIC TREATMENT OF HYDATID CYST OF THE LIVER: A SINGLE INSTITUTIONAL EXPERIENCE

Ibrahim A salama MD, Mahameed H Abdelrahman MD, Elamir M Amir MD, Department of Hepatobiliary Surgery<sup>1</sup>, Department of pathology 2, department of parasitology 3National Liver Institute, Menophia University, Egypt  
Ibrahim Abdelkader Salama M.D.1, Mohammed helmy Abdelrahman M.D.2, Elamir Mahmoud Amir M.D.3.  
Department of Hepatobiliary Surgery<sup>1</sup>, National Liver Institute, Menophia University, Egypt  
Department of Pathology<sup>2</sup>, National Liver Institute, Menophia University, Egypt  
Department of Parasitology<sup>3</sup>, National Liver Institute, Menophia University, Egypt

#### ABSTRACT

**Objective:** The aim of this study was to evaluate the safety and efficacy of laparoscopic ally treated hydatid cysts of the liver in single institutional experience. **Methods:** from 2002 to 2007, 28 patients underwent laparoscopic treatment of the hydatid cysts of the liver in National Liver Institute, Menophia University. All patients had chest X-ray, abdominal ultrasound, CT abdomen, chest, brain and hydatid serology. The different stages of procedure were the same as in open surgery, puncture, Aspiration, injection of scoilocidal agent, re-aspiration, removal the proligerous membrane and deroofting, or pericystectomy. **Results:** The patient's age range (7–66 years). The number of the cysts ranged from (1 to 8) hydatid cysts with diameter range from (40 mm to 190 mm). 2 patients had associated splenic cysts and one patient had associated lung hydatid cyst. Conversion to open in one case (3.5%) the case was associated with splenic cyst (splenectomy was done). No mortality. Morbidity in one case in the form of biliary leak treated by ERCP and stent. The mean operative time 65 minutes. Follow-up was carried out from 6 to 38 months (mean 14 months). There was no relapse of the disease. **Conclusion:** Laparoscopy considered as a safe and excellent approach for the treatment of hydatid cysts of the liver. **KEY WORDS:** Hydatid cyst- laparoscopic resection- laparoscopic Hydatid deroofting.

22841

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### INTRAPERITONEAL ROPIVACAINE WASHOUT FOR REDUCTION OF PAIN AFTER LAPAROSCOPIC CHOLECYSTECTOMY : A PROSPECTIVE RANDOMIZED STUDY

In Taik Chang MD, Jun Seok Park MD, Beom Gyu Kim MD, Yoo Shin Choi MD, Hyun Kang MD, Jin Yun Kim MD, Sun Gyoo Park MD, Department of Surgery, Department of Anesthesiology and Pain Medicine, College of Medicine, Chung-Ang University

**Introduction:** There is controversy about the effectiveness of intraperitoneal local anesthesia in laparoscopic surgery. We designed a prospective randomized clinical trial to evaluate the efficacy of intraperitoneal ropivacaine washout (IRW) in the early recovery period after laparoscopic cholecystectomy. **Methods:** A total of 62 consecutive patients undergoing laparoscopic cholecystectomy due to uncomplicated symptomatic gallstones were randomized to the IRW or control group. In the IRW group, ropivacaine at body temperature (30 ml/kg of body weight) was irrigated under diaphragm before surgery. The fluid was evacuated via the passive-flow method through a close drain for 24 hours. Postoperatively, pain was assessed with a 100-point visual analogue scale (VAS) at 2, 4, 8, 12, and 24 hours. The incidence of shoulder-tip pain and total dose of patients controlled analgesics (PCA) were also recorded. **Results:** Mean VAS scores were significantly lower in the IRW group than in the control group from 2 to 8 hours after LC (54.90 versus 31.85;  $P = 0.02$ ). Pre-emptive application of ropivacaine significantly reduced the postoperative dose of PCA at 2, 4, and 8 hours after surgery (32.9 versus 25.4 mg per 8 h;  $P = 0.043$ ). The consumption of PCA as well as the pain score was lower but not statistically significant in patients in IRW group compared with those in control group from 12 to 24 hours following surgery. However, preoperative application of ropivacaine did not reduce the incidence of shoulder-tip pain and complication related with PCA use. **Conclusion:** Intraperitoneal irrigation with ropivacaine to the both hemidiaphragms at the beginning of surgery reduced early postoperative pain and analgesic (PCA) requirement after laparoscopic cholecystectomy.

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### COMPARATIVE CLINICAL ANALYSIS OF 111 CASES CONVERTED TO OPEN PROCEDURE DURING LAPAROSCOPIC CHOLECYSTECTOMY OF 2,523 CASES

Beom Gyu Kim MD, In Taik Chang MD, Yoo Shin Choi MD, Sung Jun Park MD, Seong Jae Cha MD, Jun Seok Park MD, Department of Surgery, College of Medicine, Chung-Ang University

**PURPOSE:** While laparoscopic cholecystectomy is successfully performed on majority of patients, conversion to open procedure is yet necessary in certain cases in the perioperative period. The purpose of this study is to identify the discerning factors that help determine the conversion into open cholecystectomy. **METHOD:** A retrospective review was conducted on the data of 2,523 laparoscopic cholecystectomies performed at Chung-Ang University Hospital from January 2002 to July 2007. Patients' sex, age, height, weight, BMI (Body Mass Index), duration of preoperative hospital stay, preoperative physical examination, laboratory data, radiologic findings, and the reason for conversion to open procedure were evaluated. **RESULTS:** Adhesion was perceived to be the most critical factor for conversion shown in 50.5% ( $n = 56$ ) out of total 111 cases. Bleeding (22.5%), bile duct injury (11.7%), inflammation (9.0%), and uncertain anatomy (6.3%) were followed sequentially. By univariate analysis, factors found to increase significantly the risk of conversion were patient age > 70 years, male sex, previous abdominal operation, preoperative common bile duct stone, tenderness in right upper quadrant, distended shape of gallbladder, and pericholecystic fluid collection. From multivariate analysis, the following factors were identified to be associated with a higher risk: patient age > 70 years ( $p = 0.002$ ), male sex ( $p = 0.012$ ), previous abdominal operation ( $p < 0.0001$ ), and preoperative common bile duct stone ( $p = 0.041$ ). **CONCLUSION:** In case of operations with such discerning factors, surgeons should be more cautious and delicate in all procedures throughout the operative period. Also, to reduce additional severe complications, surgeons need to decide early into conversion.

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### LAPAROSCOPIC ROUX-EN-Y HEPATICO- OR CHOLEDOCHO-JEJUNOSTOMY IN THE ERA OF LAPAROSCOPIC SURGERY

Ho-Seong Han MD, Yoo-Seok Yoon MD, Jai Young Cho MD, Department of the Surgery, Seoul National University Bundang Hospital

**Background:** With rapid development and wide application of laparoscopic procedure in biliary surgery, laparoscopic Roux-en-Y hepatico- or choledochojejunostomy is being performed more frequently than ever since our first report on 2004. **Method:** Between February 1997 and September 2008, 36 patients underwent laparoscopic biliary-enteric anastomosis with the diagnosis of choledochal cyst, recurrent CBD stone, intrahepatic duct stone or biliary stricture. **Results:** The diagnosis of the patients were choledochal cyst in 23, recurrent CBD stone in 8, intrahepatic duct stone in 2, biliary stricture in 2, and Mirizzi syndrome in 1. The Roux limb was divided with an endo-GIA was brought up in the antecolic method. Hepatico- or choledochojejunostomy was performed with intracorporeal suture, and then jejunojejunostomy was done with the endo-GIA. For the patients with choledochal cyst, cyst excision was performed prior to this procedure. The mean operation time were 308.4 minutes. Intraoperative transfusion was needed in one patient 2.8%. The postoperative complication occurred in 5 patients (16.7%), including bile leakage ( $n = 2$ ), aspiration pneumonia ( $n = 1$ ), melena ( $n = 1$ ), intraabdominal fluid collection ( $n = 1$ ) and intraabdominal bleeding ( $n = 1$ ); one patient with intraabdominal bleeding was treated by re-operation and the others were improved by conservative management. The mean postoperative hospital stay was 9.5 days. After a mean follow-up of 17.7 months, 6 patients (16.7%) experienced the anastomotic stricture, which were managed by radiologic intervention in four patients and revision of anastomosis in two patients. **Conclusions:** Laparoscopic Roux-en-Y hepatico- or choledochojejunostomy is a useful option in the treatment for the patients with biliary disease.

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### LAPAROSCOPIC ASSISTED ANATOMICAL LIVER RESECTION UTILIZING THE HANGING TECHNIQUE

Osamu Itano MD, Naokazu Chiba MD, Hideo Matsui MD, Go Oshima MD, Takeyuki Wada MD, Hideki Ishikawa MD, Yasumasa Koyama MD, Yuko Kitagawa MD, Endoscopic Surgery Center, Eiju General Hospital, Tokyo, Japan, Department of Surgery, Tokai University, Kanagawa, Japan, Department of Surgery, Keio University, School of Medicine, Tokyo, Japan

**Purpose:** The purpose of this work was to evaluate the short term results of the laparoscopic-assisted anatomical liver resections utilizing the hanging technique.

**Methods and Procedures:** From August 2006 to July 2008, there were 13 laparoscopic-assisted anatomical liver resection for treatment of primary and metastatic neoplasm of liver: 4 hepatocellular carcinoma, one cholangiocellular carcinoma, 7 metastasis of colon cancer, one metastasis of ovary carcinoma carried out at our hospital. The patients' mean age was 64 (10 years). Tumor mean size was 4.0 (2.5 cm (range: 2 to 10 cm)). The operation consisted of laparoscopic mobilization of the target liver lobe, followed by open liver resection through a 8–12 cm extraction site. The hanging technique was performed in all cases, which was effective for control of bleeding and guide of direction during anatomic parenchymal transection in a narrow space through the mini-laparotomy. The advantage of this operation is that the same technique and instruments for parenchymal transection than used for open surgery can be used. On the other hand, the laparoscopic technique, which we have to learn, only requires mobilization of the liver to perform the same minimally invasiveness in liver surgery as by totally laparoscopic procedure.

**Results:** There were 3 lateral sectionectomy, one anterior sectionectomy, 2 posterior sectionectomy, one left hepatectomy and 6 right hepatectomy. The mean operative time was 376 (130 minutes). The mean blood loss was 626 (627 ml and blood transfusion was required in one case of anterior sectionectomy. There were no intraoperative complications and no conversion to laparotomy. Pathological examination showed R0 resections in all cases. Postoperative complications developed in 2 patients (2 bile leaks, 15.3%), all of which was improved by conservative management. However, there was no postoperative mortality. Recurrence was detected in 4 cases of metastases of colon cancer during a mean-follow-up of 11.8 months. **Conclusion:** laparoscopic-assisted anatomical liver resection is safe and technically feasible. More data may be needed for evaluation of long-term outcome.

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### IS LAPAROSCOPIC SURGERY AS SAFE AS OPEN RESECTION FOR LIVER TUMORS?

Vanita Ahuja MD, Ani Fleisig MD, Partha Ray MD, David Chang PhD, Gagandeep Singh MD, John Wayne Cancer Institute and Johns Hopkins Medical Institute

**Introduction:** Laparoscopic liver resection (LLR) for benign and malignant liver tumors has become a popular modality over the last decade in many centers. The reports from the high volume centers suggest that LLR has shorter hospital stay, lower hospital charge and lower complication rate compared to open charge. We wanted to validate the safety, in-hospital outcomes and cost of LLR as compared to open liver resection (OLR) by using a national database.

**Methods:** Retrospective analysis of the Nationwide Inpatient Sample (representative 20% sample from 37 states) (2000 through 2006). Patients with diagnosis of benign and malignant primary liver tumors were included and then divided into two groups: OLR and LLR. Outcomes measured were related to in-hospital stay which included length of stay, complication, in-hospital death, and hospital charges.

**Results:** A total of 2,509 patients were identified for both cohorts with 73 patients (2.9%) in LLR group. Both groups were comparable ( $p > 0.05$ ) in their demographics in regards to mean age, race, gender and Charlson's morbidity score. Both groups received care in large urban teaching centers (89% LLR vs. 84% OLR,  $p = 0.65$ ). LLR had no complications compared to 4.8% in OLR group ( $p = 0.05$ ). No significant difference was seen in length of stay, in-hospital death and average hospitalization charge between the two groups. On multivariate analysis, the variables to predict in-hospital death by adjusted odds ratio were type of insurance (HMO reference) (Medicare OR 1.95, 95% CI 0.97 – 3.91) (Medicaid OR 2.97, 95% CI 1.26 – 7.0), age (OR 1.04, 95% CI 1.01 – 1.06), Charlson's score (OR 1.14, 95% CI 1.03 – 1.25), hospital

Comparison of in-hospital outcomes measures

Outcome Measure	LLR n = 73	OLR n = 2,436	p value
Length of stay	6 days	7 days	0.06
Complications	0 (0%)	116 (4.8%)	0.05
Hospital Death	4 (5.5%)	141 (5.8%)	1.0
Average charge	\$47,371	\$45,448	0.71

Laparoscopic (LLR) and Open (OLR) liver Resection

cost (OR 2.1, 95% CI 1.74 – 2.53) and male gender (OR 0.53, 95% CI 0.31 – 0.9). Type of resection ( $p = 0.3$ ), laparoscopic vs. open, and complications ( $p = 0.1$ ) were not significant.

**Conclusion:** Patients with benign and malignant liver tumors have similar safety outcome measures regardless of laparoscopic or open liver resection. Both groups, LLR and OLR, had no difference in the length of stay or hospital charge. The choice of operation should be based on surgeon's preference taking into account the experience, tumor biology and best oncologic outcome

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### MAGNETIC RESONANCE GUIDED LAPAROSCOPIC LIVER RESECTION IN A HIGH FIELD OPEN MR

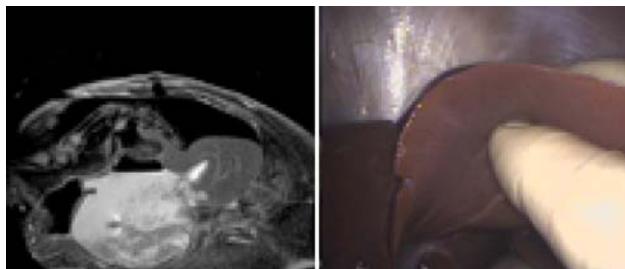
Sascha S Chopra MD, Ioannis Papanikolaou MD, Ivo Van der Voort MD, Ulf Teichgraber MD, Sven C Schmidt MD, Guido Schumacher MD, Department of General-, Visceral- and Transplantation Surgery, Charité Campus Virchow Clinic, University Medicine Berlin; Department of Radiology, Charité Campus Mitte, University Medicine Berlin; Department of Gastroenterology, Charité Campus Virchow CI

**Objectives:** Intraoperative visualization of liver vessels and tumor margins is an important tool during minimal invasive liver surgery. Aim of this study was to evaluate a high field open MR for intraoperative real time imaging as an alternative to laparoscopic ultrasound. In order to realize minimal invasive liver surgery under MR guidance we developed and applied a MR compatible endoscopy unit encompassing a high resolution camera and a non-ferromagnetic laparoscope. Initial experience was gained through phantom models and porcine cadavers. Subsequently liver dissection was performed in two living house pigs.

**Methods:** All procedures were conducted in a 1.0 Tesla open MRI unit (Philips Panorama). During the operation the MR and the endoscopic images were displayed on two separate monitors. A 1064 nm Nd:YAG laser was used for tissue dissection and coagulation. The laparoscope and the endoscopic instruments were introduced into the abdominal cavity through conventional ports. Additionally a MR compatible hand port was inserted for intraabdominal manipulation. Two living house pigs were subjected to a left lateral liver lobe resection and were immediately sacrificed after the operation. Intraoperative MR images clinical outcomes were documented and analyzed.

**Results:** The total duration of the intervention ranged from 126 to 145 min with a dissection time from 11 to 15 min. Both animals survived the intervention with a blood loss of 250 and 170 ml and a specimen weight of 138 and 177 g. A dynamic T2 W fast spinecho sequence allowed real time imaging (1.5 images/s) with a good delineation of major and small hepatic vessels. The newly developed MR compatible instruments and camera system caused only minor interferences and artifacts of the MR image. The laser instrument carried a signal intense marker and was depicted in relation to the resection plane and neighboring vessels. The intraoperative orientation of the surgeon was increased through the additional image information. Present drawbacks include the limited working space and the time consuming positioning of MR image planes.

**Conclusions:** Our preliminary results show that MR guided liver resection is feasible providing additional image information to the surgeon. We conclude that MR guided laparoscopic liver resection improves the anatomical orientation and may increase the safety of future minimal invasive liver surgery.



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### COMPARISON OF LAPAROSCOPIC HEPATICOJEJUNOSTOMY AND OPEN HEPATICOJEJUNOSTOMY IN BENIGN EXTRA HEPATIC BILIARY TREE PATHOLOGIES

Gurvinder Jamu MS, Jammu Hospital, Jalandhar Punjab, INDIA

#### ABSTRACT

**Background:** Strictures of common bile duct and other extra hepatic biliary tree pathologies are sometimes encountered in surgical practice. The aim of the study is to provide in data to establish whether laparoscopic approach for hepaticojejunostomy is better than open hepaticojejunostomy.

**Method:** The data presented in this paper is obtained from a single centre and performed on 28 cases, requiring hepaticojejunostomy due to one of the reasons (stricture CBD, Choledochal Cyst, Injury to CBD during surgery, Mirizzi's syndrome) over a period of three years. The perioperative and post operative course was compared between the two approaches (laparoscopic 17 cases and open 11 cases). In both the approaches, Roux-Y Hepaticojejunostomies was performed.

**Results:** The Intra operative time taken was more in initial laparoscopic hepaticojejunostomies (mean three hours) than the open hepaticojejunostomy (mean two hours) but time reduced after performing few cases (mean two and a half hours). In the post operative period patients were more comfortable with laparoscopic hepaticojejunostomy. The hospital stay was reduced (mean five days) than the open hepaticojejunostomy (mean seven days). The leakage from anastomotic site was far less in laparoscopic technique. The bowel movements returned faster in laparoscopic method. The pain was far less in laparoscopic method than the open. The number of interrupted vicryl sutures applied for hepaticojejunostomy in laparoscopic method were far well placed than the open method.

**Conclusions:** Laparoscopic hepaticojejunostomy is clearly more technically demanding procedure but at the same time yields better results than open hepaticojejunostomy. It is not associated with increased risk of post operative complications and thus demonstrates that the patients requiring hepaticojejunostomy can benefit to a higher extent from the laparoscopic modality.

### CT-GUIDED VS. LAPAROSCOPIC RADIOFREQUENCY ABLATION (RFA): A COMPARISON OF MORBIDITY AND HOSPITAL COST

Maria A Cassera BS, Kevin W Potter MD, Michael M Awad, MD PhD, Timothy J Kennedy MD, Michael B Ujiki MD, Paul D Hansen MD, Providence Portland Medical Center, Liver and Pancreas Surgery Program, Portland, Oregon, USA.

**Background:** CT-guided radiofrequency ablation (CT-RFA) is presumed to be less morbid and less costly than laparoscopic RFA (L-RFA). CT-RFA, however, has a higher treatment failure rate than L-RFA. This analysis looks at the 30-day morbidity and financial data for CT-RFA versus L-RFA for hepatocellular cancer (HCC) and colorectal liver metastases (CRLM).

**Methods:** All patients with the diagnosis of CRLM or HCC who underwent CT-RFA or L-RFA at our institution between 2002–2008, were reviewed retrospectively. Demographics, risk stratification and procedural data were analyzed. Hospital financial data was queried for total cost, reimbursement and itemized departmental charges. Patients with CRLM or HCC were evaluated separately.

**Results:** Twenty-two RFA procedures were performed for the treatment of CRLM (6 CT-RFA; 16 L-RFA) and 15 RFA procedures were performed for the treatment of HCC (5 CT-RFA; 8 L-RFA). For patients with CRLM, there were no significant differences in patient age ( $p = 0.55$ ), ASA ( $p = 0.81$ ), BMI ( $p = 0.91$ ), albumin ( $p = 0.54$ ), bilirubin ( $p = 0.19$ ), tumor size ( $p = 0.17$ ), or tumor number ( $p = 0.17$ ) between those who underwent L-RFA or CT-RFA. For patients with HCC, there were no significant differences in patient age ( $p = 0.49$ ), ASA ( $p = 0.68$ ), BMI ( $p = 0.56$ ), albumin ( $p = 0.60$ ), MELD ( $p = 0.09$ ), Child-Pugh ( $p = 0.60$ ), bilirubin ( $p = 0.13$ ), tumor size ( $p = 0.18$ ), or tumor number ( $p = 0.33$ ) between those who underwent L-RFA and CT-RFA. One patient had a complication in the CRLM group (CT-RFA), and two patients had complications in the HCC group (L-RFA). Immediate local ablation failures occurred in 2/6 of the CRLM CT-RFA patients, 1/16 CRLM L-RFA patients, 1/5 HCC CT-RFA patients, and 0/8 HCC L-RFA patients. Hospital financial data is summarized in Table 1.

**Conclusion:** Patients with CRLM are generally more tolerant of surgery than patients with HCC. Our data suggests that in patients with CRLM, CT-RFA is less expensive but poorly

Diagnosis	Mean hosp. stay	Mean cost	Reimbursement
CRLM (CT-RFA)	1.3 days(SD ± 0.5)	\$5767 (SD ± 2869)	\$4329(SD ± 2870)
CRLM (L-RFA)	1.6 days(SD ± 0.9)	\$9966 (SD ± 1891)	\$11498(SD ± 5702)
HCC (CT-RFA)	1.0 days(SD ± 0.0)	\$6919 (SD ± 4173)	\$8403(SD ± 7881)
HCC (L-RFA)	3.8 days(SD ± 4.3)	\$13033(SD ± 7434)	\$17381(SD ± 7389)

reimbursed, while it is associated with a higher rate of complications and immediate local ablation failures. CT-RFA in patients with HCC, however, is associated with a lower complication rates. L-RFA should be used in most patients with CRLM, but selectively utilize L-RFA in healthier patients with HCC.

### LAPAROSCOPIC TREATMENT FOR HEPATOLITHIASIS

IN SEOK CHOI CHOI PhD, JEA HYUCK LIM MD, HEYN SIK MIN MD, DAE KYUNG GO MD, DAE SUNG YOON, WON JUN CHOI, KONYANG UNIVERSITY HOSPITAL, DAEJEON, KOREA

**Backgrounds and Purposes:** The Hepatolithiasis treatment is widely being used for stone removal with the improvement of conservative treat by the development in operations and endoscopy. Hepatolithiasis, however, has still a problem which is highly possible in a relapse. Furthermore, it also can be the factor giving rise to cholangitis and cholangiocarcinoma. On this, we have studied that the laparoscopic operation would be the safe and effective remedy for the patients with hepatolithiasis.

**Objects and Methods:** 22 people, who have hepatolithiasis as well as choledocholithiasis and who had laparoscopic operation in Konyang University Hospital from January 2005 to August 2008, were researched. The operations were performed with choledocoscope, ESWL and Basket to remove choledocholithiasis. By using retrospective method, this research considered the clinical history, ways of surgery, operation period, hospital day, complication and the clearance rate.

**Results:** The target age range was from 37 to 80 and the average was 58 years old. The spread of men and women was 16 against 8, which had more women(70%). 6 patients had upper abdominal operation scar (2 patients with Lt. lateral sectionectomy for liver cholelithiasis, 3 patients with open cholecystectomy, one case with low anterior resection for rectal cancer). 8 cases with Lt. hemihepatectomy were undergone to the patients who had had Lt. hepatolithiasis, 6 cases with Lt. lateral sectionectomy, 2 cases with sectionectomy(Seg 4, 2&4), 4 cases with CBD exploration and stone removal and 9 patients with IHD stone had also common bile duct stone. There were two open conversions in the case of Rt. Anterior bile duct injury, and post OP adhesion. Each of bile leak and intrabdominal abscess was developed. And there were another case of acute renal failure and two cases of wound infection as a complication, all of these are recovered staying hospital but no further operation or death. After the operation, it was discovered by CT that the rest of IHD stones were remained. This was just one case(0.4%). The average operation time was 415 minutes, the amount of blood loss was 359 cc and the hospital days were 11 days.

**Conclusion:** Laparoscopic treatment for hepatolithiasis can be safe and efficacious for the patients with hepatolithiasis and choledocholithiasis. And this method is good for wound recovery, pain and time for recovery. As the trend that, currently, considers the laparoscope treatment as priority, the laparoscopic approach would be the important guide book for curing the patients with hepatolithiasis through the advance of surgical equipment and operation technique.

### LAPAROSCOPIC CHOLEDOCHOTOMY IN PATIENTS WITH PREVIOUS OPEN CHOLEDOCHOTOMY

Bac Hoang Nguyen MD, Tuan Le Quan Anh MD, Thanh Nguyen Huu MD, University Medical Center Ho Chi Minh City VietNam

**BACKGROUND.** Choledochotomy in patients with previous choledochotomy is technically difficult. Open surgery is usually the first choice in these patients. Laparoscopic choledochotomy seems to be feasible in expert hands.

**OBJECTIVES.** Evaluate the safety and efficacy of laparoscopic choledochotomy in patients with previous open choledochotomy.

**PATIENTS & METHOD.** This is a retrospective study of 40 patients who had previous choledochotomy and underwent laparoscopic choledochotomy from January 2005 to January 2007 at University Medical Center, Ho Chi Minh city. The indication for choledochotomy is failure of common bile duct stone removal via ERCP or common bile duct stones with multiple intrahepatic stones.

**RESULTS.** The mean age is 62.4. Laparoscopic choledochotomy was done successfully in 95% patients. The mean operative time was 166 minutes. The mean hospital stay was 7.4 days. There was no death. The overall complication rate was 7.5%. There was no major complication. Residual stones were removed postoperatively via T-tube tract. Complete stone clearance rate was 85.7%

**CONCLUSIONS.** Laparoscopic choledochotomy is feasible, safe and effective in patients with previous open choledochotomy.

### ANALYSIS OF 9 CASES OF PANCREATICOBILIARY DUCTAL MALJUNCTION WITHOUT COMMON BILE DUCT DILATATION BASED ON INTRAOPERATIVE CHOLANGIOGRAPHY DURING LAPAROSCOPIC CHOLECYSTECTOMY

SHOJI FUKUYAMA MD, HIROMI TOKUMURA MD, AKIHIRO YASUMOTO MD, HIROYUKI SASAKI MD, NAOKI MATSUMURA MD, MITSUO YAMASAKI MD, HIROAKI MUSA MD, KENICHI TAKAHASHI MD, TAKASHI TOSHIMA MD, YUJI FUNAYAMA MD, TOHOKU ROSAI HOSPITAL, DEPARTMENT OF SURGERY

**OBJECTIVE OF THIS STUDY:** In order to diagnose pancreaticobiliary maljunction (PBM), it is necessary to perform direct fluoroscopic examinations of the biliary tract system. However, for patients without symptoms, these examinations are performed only in selected cases. For some cases, it is not until intraoperative cholangiography (IOCG) during laparoscopic cholecystectomy (LC) is performed that a patient of PBM without common bile duct dilatation are appropriately diagnosed. We hypothesized that IOCG in LC has an important practical role for detecting presence of PBM. **METHODS:** 3502 patients who underwent IOCG during LC since 1997 in our institution were analyzed of the clinical features. **RESULT:** 9 patients had the radiological findings of PBM. They consisted of 4 males and 5 females with a mean age of 42.6 years (range: 16–66 years). Preoperatively, 6 were diagnosed as cholelithiasis, 2 were diagnosed as polypoid lesions of the gallbladder and 2 were diagnosed as adenomyomatosis of the gallbladder. Among them 4 patients were diagnosed as PBM preoperatively. And other 5 patients were diagnosed after IOCG with serum amylase measurement. And one patient was diagnosed as cancer of gallbladder by intraoperative pathological examination. As for the types of anomalous arrangement of pancreaticobiliary ducts, 5 patients had P-C Union type, and 4 patients had C-P Union type. 8 patients were performed LC only. Postoperatively, none of all 9 cases had biliary cancer including recurrence. **CONCLUSION:** These results suggest that IOCG in LC must have a practicable role for detecting presence of PBM.

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**LAPAROSCOPIC APPROACH IN THE DISTAL PANCREATIC TUMOR SURGERY**

Emanuele Lezoche MD, Alessandro M Paganini MD, Giancarlo D'Ambrosio, Luciana Barchetti MD, Pietro Ursi MD, Bernardina Fabiani MD, Daniele Scoglio MD, Domenico Vitolo MD, Chirurgia Endolaparoscopica e Tecnologie Avanzate, Department of Surgery -Paride Stefanini-, University of Rome -La Sapienza-, Rome, Italy

Introduction: Laparoscopic resection of the body and tail of the pancreas for benign lesions is an accepted technique but published series are still few. Aim is to evaluate the results of the laparoscopic approach for distal pancreatic tumors. Methods: From January 1993 to June 2008 18 patients (pts) underwent laparoscopic enucleation (EN) (8 pts, 2 males, 6 females, median age 40.8 years, range 25-54 years) or distal pancreatectomy (DP) with spleen preservation (10 pts, 3 males, 10 females, median age 47.4 years, range 20-70 years) in our Department for benign lesions. Results: Mean operative time was 94.3 min (range 80-110 min) for EN and 164 min (range 90-240 min) for DP. Intraoperative bleeding occurred in 4 cases, controlled by laparoscopy without conversion. Morbidity occurred in 2 pts (25%) after EN, including pancreatic fistula (1) and abdominal fluid collection (1). Mean hospital stay was 6.8 days (EN) and 6.5 days (DP). Mortality was nil. Tumor pathology was insulinoma (8, after EN) and mucinous cystic neoplasm (5), serous cystadenoma (4) and lymphoepithelial cyst (1) after DP. At a median follow-up of 53 months (range 3-93 months) no recurrence was observed. Conclusions: In experienced hands the laparoscopic approach for distal pancreatic tumors is associated with excellent results.

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**COMPARISON OF OUTCOMES AFTER LAPROSCOPIC AND OPEN DISTAL PANCREATECTOMIES**

Benny Liliav MD, Vijayasimha R Pothula MD, Charles Choy MD, Gene Coppa MD, Staten Island University Hospital

Introduction: The objective of our study is to compare results of Laparoscopic Distal Pancreatectomy (LDP) and Open Pancreatectomies (OP) performed at Staten Island University Hospital. Despite the first case (LDP) being reported over a decade ago, fewer than 300 cases have been added to the world literature. The largest series to date is the multicenter European retrospective study, in which 82 LDPs, spread over 25 institutions, were reported (1). Materials and Methods: A detailed retrospective review was conducted on all the LDPs and OPs performed at Staten Island University Hospital, between January 2000 to September 2008. A total of 28 patients were studied. 15 LDPs, 8 OPs, and 5 LDPs that converted to OPs were performed. The comorbidities in three groups of patients were similar. Results: The LDP patients had a mean age of 69.8 years range (33-83 years) and 54% were female. The OPs had a mean age 58.6 years range (34-78 years), 53 % were female. The converted pancreatectomies (CP) had a mean age of 59.7 years (32-78), 54% were females. A variety of pancreatic lesions were resected. Postoperatively two patients expired in OP group, no deaths were reported in LDP and CP group. Pneumonia and wound infection were seen in two OP patients. LDP patients had one UTI during the postoperative period. No patients had any major complications or readmissions. The patients were followed for one month postoperatively. Table shows results.

Duration median	168 min	188 min	192 min
Duration mean	292 min	267 min	307 min
EBL median	100 cc	150 cc	150 cc
EBL mean	334.6 cc	315.5 cc	366.8 cc
LOS median	5 days	3 days	6 days
LOS mean	14.6 days	9.8 days	15.2 days

Intraoperative variables in OP, LDP & CP patients

Conclusions: LDP provides patients with the advantages of minimal access surgery and is appropriate for benign and pre-malignant lesions as well as neuroendocrine tumors. Lesions exhibiting a malignant appearance on preoperative imaging or during initial laparoscopy should still be managed by open resection until enough long-term data accumulate

References:

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**LAPAROSCOPIC CHOLECYSTECTOMY (LC) AND COMMON BILE DUCT EXPLORATION (CBDE) IN PATIENTS WITH A PREVIOUS GASTRIC RESECTION**

Emanuele Lezoche MD, Alessandro M Paganini PhD, Mario Guerrieri MD, Ilenia Sarnari MD, Giancarlo D'Ambrosio MD, Luciana Barchetti MD, Pietro Ursi MD, Bernardina Fabiani MD, Daniele Scoglio MD, Department of General Surgery, II Clinica Chirurgica, Università -La Sapienza-, Rome \*Azienda Ospedaliera Universitaria Ospedali Riuniti, Ancona, Italy

Background: An increased incidence of cholelithiasis is reported after truncal vagotomy and gastric resection. Adhesions from previous gastric surgery are often considered a contraindication to laparoscopic surgery. Aim was to evaluate the feasibility and long-term results after LC and CBDE in patients with a previous gastric resection.

Methods: From April 1991 to February 2007, CBD stones were present in 363 out of 3455 patients (10.5%) (139 males, 224 females, mean age 57.6 years, range 12-96 years) who underwent LC. Among these, 19 patients (13 males, 6 females, mean age 66.3 years, range 30-79 years) had a previous gastric resection (18) or gastrectomy (1).

Results	Group 1	Group 2	p
Patients	325	19	
Preoperative failed ES	44(13.5%)	1(5.3%)	<0.05
Conversions	14(4.3%)	1(5.3%)	n.s
Completed laparosc.	311(95.7%)	18(94.7%)	n.s
Transcystic/Chol.tomy	186/125	5/13	<0.05
Morbidity	9(2.9%)	3(16.7%)	<0.001
Mortality	1(0.3%)	0	n.s
Retained CBD Stones	13(4.2%)	4(22.2%)	<0.001
Recurrent CBD stones	5(1.6%)	0	n.s
Overall Success Rate	95.3	76.7	<0.001

Retained CBD stones were safely treated through the biliary drainage sinus tract. At a mean follow up time of 130.8 +/-26.4 months (range 70.6-178.7 months) no biliary stricture at the site of the choledochotomy has been observed. Conclusions: Laparoscopic CBDE during LC for stones in patients with a previous gastric resection is feasible and it does not increase the conversion rate. The presence of complex ductal stone disease is associated with a higher retained stones rate but this may be safely solved postoperatively through the biliary drainage sinus tract avoiding endoscopic sphincterotomy which is often unsuccessful in these patients.

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**WHICH CASE OF PREOPERATIVE SUSPECTED GALLBLADDER CANCER IS MOST APPROPRIATE FOR LAPAROSCOPIC CHOLECYSTECTOMY ?**

Hiroyuki Katagiri PhD, Maki Kitamura MD, Mina Waraya MD, Satoshi Hosoya MD, Kenichiro Ishii PhD, Yoshihito Takahashi PhD, Kazunori Furuta PhD, Masahiko Watanabe PhD, Department of surgery, Kitasato university, School of medicine

BACKGROUND/PURPOSE: The surgical procedure for gallbladder cancer is still difficult to improve a prognosis. Otherwise, laparoscopic cholecystectomy (LC) is possible to get complete cure in some cases of early cancer. The present study aims to clarify the appropriate case for LC by evaluating the preoperative suspected gallbladder cancer and its clinicopathological finding. METHODS: We performed a retrospective analysis of patients with gallbladder cancer who underwent cholecystectomy from 1981 to 2007 at Kitasato university east hospital in Japan. The histopathological finding clarified the horizontal carcinomatous spread and invasion depth in the 53 cases precisely. We classified those macroscopic configuration and the characteristic. Long-term survival was calculated using the Kaplan-Meier method, and differences in group of survivors were compared by the log-rank test. RESULT: 43 cases of protruding lesion and 10 cases of wall thickness and flat invasive lesion (WT) were defined. The protruding lesions were classified into 3 subclass, such as pedicle type (PD, n = 7), nodular type (ND, n = 25) and papillary type (PP, n = 11). ND and PP were sessile lesions. Particularly, the cancer nest was localized in the basal point with PD. On the other hand, the size of cancer spread in ND, PP, WT were 5.8?3.5? ~ 4.0?2.0, 4.8?2.8? ~ 4.0?1.9, 5.6?2.6? ~ 5.1?2.6 (cm), respectively. These sizes of spreading part were 3 to 6 times of the protruding part. The frequency of case beyond pT2 cancer was 0% (PD), 91% (ND), 82.8% (PP), 90% (WT). Patients with pT1 tumor who underwent no additional surgery, are alive without recurrence. In patients with pT2 cancer, the 5-year survival rate was 52.6%. Furthermore, those with pT3 lesions had poor prognoses (MST; 12 months). CONCLUSION: Also the regional lymphadenectomy is necessary for the cases of pT2 cancer. There is much frequency of advanced cancer with sessile lesion and flat lesion. However, all cases with macroscopic pedicle type were pT1 cancer. Thus, the case with pedicle lesion is optimal for the laparoscopic cholecystectomy.



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### THE EFFECT OF COLECTOMY ON PANCREATIC INFECTIONS IN A MODEL OF EXPERIMENTALLY INDUCED ACUTE PANCREATITIS

Taner Yigit MD, Rahman Senocak MD, Ali Harlak MD, Öner Mentem MD, Abdullah Kilinc MD, Armagan Günel MD, Orhan Kozak MD, Turgut Tufan MD, Gülhane Military Medical Academy Dep. of General Surgery, Microbiology and Pathology

**Introduction:** Prevention and treatment of secondary pancreatic infection is currently the main goal of treatment for acute necrotizing pancreatitis. The colon has been considered a major source of bacteria causing infection of pancreatic necrosis in acute pancreatitis. Our aim is to study the role of near total colectomy in reducing bacterial translocation and infection of pancreatic necrosis. **Methods and procedures;** 42 Sprague-Dawley rats were used in this study. Pancreatic ductal infusion of 1 ml/kg Na-taurocholic acid was used for experimental pancreatitis. Study design was as follows; group-1; underwent laparotomy and ductal infusion of saline (control), group-2; laparotomy and ductal Na-taurocholic acid, group-3; near total colectomy and ductal saline, group-4; near total colectomy and Na-taurocholic acid. All animals were sacrificed at 48 hours, and tissue samples were collected from mesenteric lymph nodes, pancreas, spleen, liver and peritoneum for bacteriologic cultures. Additionally, blood and small bowel cultures were also prepared. **Results;** In group-4, small bowel bacterial overgrowth with gram-negatives microorganism such as E.coli, Proteus mirabilis and Enterococcus was observed. Bacterial count of gram-negative rods in the small intestine and pancreatic tissue were also significantly higher in group-4 than group-2 ( $p = <0,001$  for small bowel,  $p = 0,002$  for pancreas). Small bowel bacterial overgrowth statistically correlated with pancreatic infection in group-4 ( $r = 0,836$ ,  $p = 0,001$ ). Morphology of the small bowel showed significant changes such as loss of villus length and altered microvasculature in both group-2 and group-4 compared to controls. **Conclusion;** In contrast of general believe claiming colonic microflora is a potential source of pancreatic infection in acute pancreatitis, the results of this study showed that small bowel plays important role in pancreatic tissue infection on the course of acute pancreatitis via bacterial overgrowth and mucosal morphological changes of small bowel.

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### LAPAROSCOPIC AND ENDOSCOPIC MANAGEMENT OF BILIARY ASCARIASIS ON A 2 YEAR OLD

VIVENCIO JOSE P VILLAFLOR MD, RAY I SARMIENTO MD, ALDWIN G ADIGUE MD, TAWINAT GRAVELA MD, VIVENCIO V VILLAFLOR MD, DAGUPAN DOCTORS VILLAFLOR MEMORIAL HOSPITAL/DELICI

**Objective:** To present a case report of a 2 year old female diagnosed with biliary ascariasis and was managed by laparoscopy and endoscopy. This is a case of a 2 year old female who presented with abdominal pain, fever and jaundice. On abdominal ultrasound, there was tubular echogenic structures at the common bile duct. Working diagnosis was biliary ascariasis. Patient was scheduled for laparoscopy. Intraoperative cholangiogram revealed ascaris bolus on the common bile duct. Choledochotomy was performed and manual extraction of 16 adult ascaris was done. This was followed by cholangioscopy and clearing of ascaris carcass using biopsy forceps. This was followed by primary repair of the common bile duct and cholecystectomy. **Conclusion:** Biliary ascariasis on a 2 year old can be managed safely by using laparoscopy and endoscopy.

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### LAPAROSCOPIC ENUCLEATION OF PANCREATIC TUMORS

ZAHRA SHAFABEE MD, LEAQUE AHMED MD, BRICE GAYET MD, Department of Digestive Diseases, Institut Mutualiste Montsouris and Department of Surgery, Columbia University Medical Center

**Introduction:** In an attempt to reduce the incidence of development of pancreatic insufficiency following subtotal pancreatectomy, lesser procedures (central pancreatectomy, enucleation) are advocated for selected patients. Enucleation of pancreatic tumors carries the risk of pancreatic duct leakage or inadequate resection. We have performed laparoscopic enucleation of pancreatic tumors in selected patients since 1992. We present the feasibility and short term outcomes of this approach.

**Methods:** Since 1992, 28 patients have undergone enucleation of pancreatic tumors at our institution. Laparoscopic enucleation was attempted in 19 patients. We retrospectively reviewed the demographic features, operative indications, conversion rate, operative time, blood loss, average length of stay, postoperative complications and mortality rate.

**Results:** Laparoscopic enucleation was attempted in 19 patients. There were 13 females and 6 males. The mean age was 56 yr (range, 34–74 yr). The average BMI was 24.6 (range, 18.4–34.4). The indications for surgery were neuroendocrine tumor (6), IPMN (4), pancreatic cyst (6), and metastasis from renal cell carcinoma (3). The locations of the tumors were head and uncinat process (9), neck (6) and body (4). Three patients were converted to an open operation (15%) because of inability to identify the lesion (1), posterior location of the tumor (1), and intra operative discovery of liver lesions with metastatic characteristics during intra operative ultrasound (1). One patient underwent concomitant right hepatectomy [for liver metastasis]; another patient underwent esophagectomy [for esophageal carcinoma]. The mean operative time was 193 min (range, 60–450 min). The mean blood loss was 72.5 ml (range 0–500 ml). None of the patients required intraoperative transfusion. The average length of stay was 23 days (range, 4–64 days). The overall complication rate was 57% (pancreatic fistula in 3, pleural effusion in 1, biliary leakage in 2, intra-abdominal bleeding in 3, and intra-abdominal collections in 2). Patients with bleeding needed re-exploration. Biliary and pancreatic leaks were managed successfully by non-operative means. There were no deaths.

**Conclusions:** Laparoscopic pancreatic enucleation is feasible in selected patients with complication rates that compare favorably with equivalent open techniques. Disruption of biliary or pancreatic duct can be managed by conservative methods in the majority of patients. Long term outcome of laparoscopic pancreatic enucleation requires further study.

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### IN THE ERA OF NOTES, A COSMETIC AND SECURE APPROACH TO LAPAROSCOPIC CHOLECYSTECTOMY

Carlos A Schiavon MD, Patricia M Noujaim MD, José Luis L Correa MD, Ricardo V Cohen MD, Baros Institute

**Background:** Since 1993, our group has been doing Laparoscopic Cholecystectomy (LC) using a three-port approach with excellent results. Many papers showed that Needlescopic and two or three 5 mm ports approaches may reduce the postoperative pain, but did not gained popularity.

**Aim:** Describe a variant three-port approach with excellent cosmetic results without losing the benefits and security of conventional LC.

**Methods:** We operated 20 consecutive patients (14 women, 6 men) with a 3 port approach - 1) umbilicus - 5 or 10 mm work channel; 2) sub costal - 3 mm grasper and 3) right from the pubis - 10 mm(0o scope). There are 3 grade I obese patients and 1 patient with a previous open gastrectomy.

**Results:** Mean operative time was 50 minutes, there were no conversions and we did not observe any complications. Postoperative pain and return to normal activities were similar to our previous experience.

**Discussion:** NOTES still an experimental procedure and the potential complications due to an opening in the stomach may not compensate the scar less surgery. Our technique is very similar to a conventional LC, but offers the possibility of better cosmetic results without an increase in complications. It also facilitates the procedure for the patient with a previous gastrectomy, because we entered the abdominal cavity out from the scar adhesions. Obesity is not a contra indication for our method.

**Conclusion:** To improve cosmetic results of laparoscopic cholecystectomy it is not necessary to create a gastrotomy in the stomach. Our technique proved to be very secure and with excellent cosmetic results. It also can be adopted in almost any patient, independent of weight, sex and previous abdominal surgery.

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### IMPACT OF LAPAROSCOPIC CHOLECYSTECTOMY ON OPERATIVE TIME IN THE ELDERLY

Marty Zdichavsky MD, Yasser Bashin MD, Stephan Coerper MD, Gunnar Blumenstock MD, Michael A Kramer MD, Alfred Königstrainer MD, Department of General, Visceral and Transplant Surgery, University Hospital Tübingen, Germany

**Objective of the Study:** Laparoscopic cholecystectomy (LC) remains one of the most frequent surgical therapies for symptomatic gallstone disorders. Although associated with several comorbidities, LC became widely accepted even in the elderly. The aim of this study was to determine factors affecting the operative time of LC.

**Methods and Procedures:** Patient data were retrospectively analysed from a computer database. From April 2004 to November 2007 a total number of 596 patients were included and divided in two groups (Group I:  $n=8804$ ; 65 years, Group II  $> 65$  years). Indications for LC were benign chronic or acute symptoms of gallbladder disorders. An evaluation sheet was developed for systematic review. Age, gender, BMI, ASA-score, preoperative ERCP, operative indications, and surgeon's experience were evaluated. Univariate and multivariate statistical analysis was performed.

**Results:** The mean ( $\pm$  SD) age of the 596 patients was  $52.2 \pm 16.7$  years (range, 16–89 years). Median operative time in Group I patients ( $n = 425$ ) was 80.0 min (range, 57.0–106.5 min) and in Group II patients ( $n = 171$ ) 80.0 min (range, 56.0–116.5 min). Comparing the logarithmic means of the operative time for LC of different age groups, the difference was statistically not significant. Overall, univariate and multivariate analysis showed male gender, obesity, acute cholecystitis, previous upper abdominal surgery and surgeon's experience to be statistically significant predictors for long operative time for LC. Comparing median operative time for LC performed by laparoscopic and none-laparoscopic specialists, significant shorter operative time was found for the laparoscopic specialist group. Rate of intraoperative complications was 1%. Considering acute cholecystitis only, the rate was 1.9%. Postoperative complication rate was 3.5%, and 5.7% for acute cholecystitis alone.

**Conclusions:** Operative time for LC was not prolonged in the elderly. But several predictors for prolonged operative time may identify high risk patients requiring additional anesthesia care. Structured training programs, but also patient's selection should minimize the risk of prolonged surgical intervention and associated complications.

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### THE THERAPEUTIC USE OF LAPAROSCOPY IN THE ICU

Andronikos Karasakalides MD, Kostas Kapoutsis MD, Sofia Triantafyllidou MD, Dimitris Lagonidis MD, Christina Mpoumpourea MD, Kostas Ligasis MD, Giannitsa General Hospital, Giannitsa, Greece

**Introduction:** Early diagnosis and treatment of intraabdominal illness is a challenge in the ICU patient and any delay may have devastating consequences. The aim of this study is to study the role of laparoscopy as a therapeutic tool in the ICU. There are a few studies in the literature describing laparoscopy as a diagnostic tool, but there is only one study describing a single case where laparoscopy was used as a therapeutic tool. We describe our experience with the use of bedside laparoscopy as a therapeutic tool in ICU patients with intraabdominal illness.

**Methods and Procedures:** During a 24 month period, 13 patients (mean age 69 years), intubated and mechanically ventilated, underwent a therapeutic laparoscopy procedure in the ICU. In these patients diagnostic laparoscopy was performed initially and was subsequently converted to a therapeutic laparoscopic procedure at the bedside. Hemodynamic parameters (central venous pressure [CVP], mean arterial pressure [MAP]), ABGs, and respiratory parameters were monitored throughout the entire laparoscopic procedure. These patients were heavily sedated and required hemodynamic support. The ASA, APACHE, and SOFA were documented on the day of the procedure.

**Results:** Of the 13 patients who underwent a therapeutic laparoscopy procedure at the bedside, 8 patients had gallbladder related disease (5 acalculous cholecystitis, 2 empyema, 1 gangrene of the fundus). Six of these patients went on to have a therapeutic procedure at the bedside in the ICU (5 patients had a laparoscopic cholecystectomy and 1 patient a laparoscopic cholecystostomy). Of the remaining 5 patients, 2 patient was found to have a cirrhotic liver with intraabdominal ascites and drains were placed. Periappendiceal inflammation (Plastron) was found in one patient and the abdomen was irrigated and drains placed. Bile leakage from the cystic stump was found in another patient who was admitted after a cumbersome cholecystectomy, clips were applied, drains placed, and the abdomen irrigated. The last patient was found to have murky fluid intraabdominally and on further inspection, a perforation of the antrum was noted. The perforation was sutured with an omental patch and the abdomen copiously irrigated. Of all the parameters recorded during this study only the central venous pressure during laparoscopy was higher and this was statistically significant ( $p < 0.05$ ). Five patients in this study succumbed despite intensive medical therapy. Post mortem exam was performed in 3 patients; in the remaining 2 patients, post mortem was unobtainable because of lack of consent from the relatives. The clinical course and post mortem exam suggested that the cause of death was unrelated to any intraabdominal process or the laparoscopic procedure.

**Conclusions:** The present study shows that the laparoscopy in the ICU has potential as a therapeutic tool. The complications that were observed during laparoscopy were of minor importance and did not influence the morbidity and mortality. We believe that laparoscopy is an accurate and time efficient bedside therapeutic tool that can be performed safely in certain critically ill patients who are too ill and unstable to be transported to the operating room. A greater effort should be made to incorporate laparoscopy as a therapeutic tool in the ICU.

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### THE USE OF INTRAOPERATIVE CHOLANGIOGRAPHY IN PATIENTS WITH EMPYEMA OF THE GALLBLADDER

Andronikos Karasakalides MD, Kostas Kapoutsis MD, Sofia Triantafyllidou MD, Giannitsa General Hospital, Giannitsa, Greece

**Introduction:** In difficult cases involving the gallbladder, the use of intraoperative cholangiography has been shown to be beneficial. The inflammatory reaction that is associated with empyema of the gallbladder is frequently quite severe making laparoscopic cholecystectomy difficult. We present our experience with intraoperative cholangiography in cases which presented with empyema of the gallbladder.

**Methods and Procedures:** We reviewed 16 patients (11 male, 5 female) with a mean age of 64 y.o. who presented with empyema of the gallbladder who underwent laparoscopic cholecystectomy with the use of intraoperative cholangiography. Both medical and surgical records were used to collect pre-operative, intra-operative and post-operative data from these 16 patients who were successfully treated by laparoscopy. Intraoperative findings, cholangiography findings, as well as hospital stay were all recorded.

**Results:** The average duration of the laparoscopic intervention was 122 minutes (80–220 minutes). Laparoscopic cholangiography was successful and defined the gallbladder anatomy in all 16 patients. Anatomic anomalies were found in 3 (18.8%) patients and 1 (6.2%) patient had an inadvertent common bile duct injury which was successfully treated intraoperatively. Choledocholithiasis was ruled out in 12 patients (75%) and confirmed in 4 (25%) with clinically suspected lithiasis. The average time for intraoperative cholangiography was 18 minutes (11–25 minutes). Median blood loss was quantified as 70 ml (28–97). The median length of hospital stay was 4 days. There were no complications associated with the intraoperative cholangiography procedure. **Conclusions:** One use of intraoperative cholangiography is useful in difficult laparoscopic cases involving the gallbladder. Patients presenting with severe inflammation or empyema of the gallbladder should undergo intraoperative cholangiography routinely. It is an inexpensive procedure that is not time consuming and the information obtained is very useful in visualizing the biliary anatomy. It is a safe procedure with negligible risks.

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### TECHNIQUE FOR LAPAROSCOPIC-ASSISTED FORMAL RIGHT HEPATECTOMY, DECONSTRUCTED

Edward Lin DO, Aziz M Merchant MD, Michael W Cook MD, John R Galloway MD, John F Sweeney MD, Juan M Sarmiento MD, Emory Endosurgery Unit, Division of Gastrointestinal & General Surgery, Emory University School of Medicine

**Background:** Laparoscopic formal right hepatectomy remains a technical challenge. We propose that the procedure can be accomplished efficiently with standard laparoscopic techniques, in ordered sequence, using smaller incisions, and having identical outcomes as the open procedure.

**Method:** We reviewed 25 consecutive video recordings of formal laparoscopic right hepatectomy performed over a 4 month period. Instruments include 3 - 4 trocars, and a wound protector-hand port (Gelport). Bipolar (Ligasure) and monopolar cautery, and ultrasonic shears are the primary energy sources. Instruments consist of atraumatic graspers and fine-tip dissectors. The 30- and 45-degree angled videoscope are used. Hepatic vessels are ligated with grey-load endoscopic staplers and white-load staplers are used for liver parenchyma. The technique is parceled into five sequences: (1) hilar dissection to divide cystic duct/artery, right hepatic artery, right portal vein, (2) release ligamentous attachments laterally and superiorly, (3) divide retro-hepatic veins to IVC, (4) isolate/ligate right hepatic vein, (5) divide liver parenchyma. All staplers and sutures are pre-loaded.

**Results:** In all cases of formal right hepatectomy, we have consistently adopted this approach and sequence of dissection for efficiency and teaching. Each case requires two surgeons and total operative times range from 120 ? 150 mins (average time requirements for the five major sequences are: hilar dissection 20 mins, attachments 10 mins, retrohepatic veins 15 mins, right HV 10 mins, parenchyma 10 mins). Typically, 4 grey-load staplers and 5 white-load staplers are used in a case, depending on the size of the liver. The liver lobe and gallbladder are removed through a 7 cm protected midline incision.

**Conclusions:** Efficiency of laparoscopic-assisted formal right hepatectomy with vascular isolation can be enhanced with a consistent approach and sequence. We advocate deconstructing this major operation into smaller parcels for instructional purposes, which also enables the team to prepare and anticipate requirements for each sequence.

23647

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### COMPARISON OF SPLEEN PRESERVING LAPAROSCOPIC DISTAL PANCREATECTOMY WITH EN BLOC LAPAROSCOPIC DISTAL PANCREATECTOMY: 55 VS 90 CASES

Kwan Tae Park PhD, Song Chul Kim PhD, Young Hoon Kim MD, Duck Jong Han PhD, Dept. of Surgery, Asan Medical Center, College of Medicine Ulsan University

**Introduction:** The purpose of this study is to compare clinical results of spleen preserving laparoscopic distal pancreatectomy (SPLDP) with en bloc laparoscopic distal pancreatectomy (LDPS).

**Methods:** From March 2005 to September 2008, 55 cases of SPLDP and 95 LDPS were performed at our institution and compared retrospectively. Enrolled periods were divided to four eras chronologically by 11 months respectively.

**Results:** Demographics including patient's age, gender, BMI were not different between the two groups. Final pathologic diagnosis was diverse including cystic tumor, SPT, IPMN, cancer, neuroendocrine tumor etc and was also not different between the two groups. Tumor location, operative time, tumor size, perioperative transfusion, hospital stay and postoperative complication was not different between two groups, but interestingly pancreatic stump leakage rate was significantly higher in LDPS group (3.8% VS 11.9%,  $p = 0.038$ )

	SPLDP (n = 55)	LDPS (n = 90)	p-value
Body:tail	13:42	25:65	NS
Op. time(m)	184.9	203.7	0.737
tumor size(cm)	3.0	3.86	0.183
transfusion	18.8%	14.4%	0.57
stump leak	3.8%	11.9%	0.038

Mean operative time was gradually shortened by eras (Era 1: 236.3, Era 2: 223.6, Era 3: 192.4, Era 4: 185.4) and proportion of SPLDP was increased by eras from 1.9%, 5.8%, 38.5% and 53.8% respectively.

**Conclusions:** SPLDP might be technically more difficult than LDPS, especially in initial stage of laparoscopic pancreatic surgery. After overcoming learning curve, SPLDP can be performed safely and possibly within shorter time. SPLDP should be tried firstly to give maximal benefits of minimal invasive surgery to patients, whenever possible.

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P431

### LAPAROSCOPIC LIVER RESECTION AND THE USE OF TORSIONAL ULTRASOUND DISSECTORS FOR PARENCHYMAL LIVER DISSECTION

Mohamed Abu Hilal BS, Peter J Swan BS, M W Zuccharo BS, T Scibelli BS, Neil W Pearce BS, Hepatobiliary and Pancreatic Surgical Unit, Southampton General Hospital, UK

**Background:** Recent advances in laparoscopic surgical equipment is one of the most significant factors in the expansion of laparoscopic liver resections (LLR) by increasing its feasibility, safety and efficiency.

Ultrasonic dissectors are the main instrument used for the parenchymal dissection part of a laparoscopic liver resection. Most of the commercially available brands of ultrasonic dissectors use a longitudinal mode of ultrasound vibration. Choice of which particular brand and model is largely down to surgeon preference.

In the UK a new device called LOTUS® (SRA Developments Ltd, Devon, UK) has been developed, using a torsional mode of ultrasonic vibration.

**Aim:** As the largest centre for laparoscopic liver surgery in the UK, we report our series of five years experience of LLRs and during the presentation will show edited video footage to illustrate the efficacy of torsional ultrasound in LLRs.

**Patients and methods:**

Since January 2004 to August 2008, 103 LLRs were performed in our Unit. Torsional ultrasound was the main dissector used in 63 cases. (5 major hepatectomies (MH), 35 left lateral sectionectomies, 10 bisegmentectomies, and 13 segmentectomies) and was one of the principle instruments used in 20 cases (15 MH and 5 LLS).

Median blood loss was 250 ml (50–600). Mean operating time was 180mins (120–242.5) and median hospital stay was 3 days (2–4). There were two major complications, one bile leak and one haemorrhage requiring return to theatre and nine minor complications.

**Conclusions:** Advancements in surgical equipment have contributed significantly to a safe and efficient expansion of LLRs. A reliable ultrasonic dissector is essential in this type of surgery and the torsional mode of ultrasonic vibration has been shown to be an excellent instrument for dissecting liver parenchyma haemostatically.

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### –LAPAROSCOPIC LIVER RESECTION FOR LOCALIZED PRIMARY INTRAHEPATIC BILE DUCT DILATATION

Ibrahim Dagher PhD, Papa Saloum Diop MD, Alessio Carloni MD, Panagiotis Lainas MD, Dominique Franco PhD, 1. Department of General Surgery, Antoine Bécélère Hospital, AP-HP, Clamart, F-92140, France; 2. Univ Paris-Sud, Orsay, F-91405

**Objective of the study:** Primary intrahepatic bile duct dilatation (IHBD) may present as a localized form, in which resection of the affected liver can prevent immediate and late complications. Laparoscopy has gained large interest in liver surgery. It also allows a safe and efficient exploration of the common bile duct. We present here our results concerning the feasibility and safety of anatomical laparoscopic liver resection for localized IHBD.

**Methods and procedures:** We performed 10 laparoscopic liver resections for localized IHBD, on seven women and three men (mean age:  $47 \pm 5$  years). Resections were: two right hepatectomies, three left hepatectomies and five left lateral sectionectomies. Three patients had associated common bile duct stones which were treated through perioperative cholangioscopy. The data collected included: age, sex, localization of disease, type of liver resection, duration of surgery, blood loss, perioperative transfusions, conversion to open surgery, postoperative complications, and length of hospital stay. Values were expressed as means  $\pm$  SEM.

**Results:** Mean operative time was  $303.9 \pm 36$  min. Mean blood loss was  $217.5 \pm 84$  ml. None of these patients required hand assistance or conversion to open surgery. One patient suffered a residual collection which was drained percutaneously. Postoperative course was uneventful in the other patients. Mean hospital stay was  $5.3 \pm 0.8$  days. No recurrence of cholangitis was observed after a mean follow-up of 45.6 months.

**Conclusions based on the results:** The laparoscopic treatment of IHBD combines two specialized procedures requiring knowledge and technical skill in both hepatobiliary surgery and laparoscopy. This procedure is safe and should be performed by teams with expertise in these two areas of surgery.

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### LAPAROSCOPIC CENTRAL PANCREATECTOMY FOR PANCREATIC BODY LESIONS: REPORT OF 6 CASES INCLUDING TOTALLY INTRACORPOREAL TECHNIQUE

Kwan Tae Park PhD, Song Chul Kim PhD, Young Hoon Kim MD, Duck Jong Han PhD, Dept. of Surgery, Asan Medical Center, College of Medicine Ulsan University

**Introduction:** Laparoscopic surgery has been gaining wide acceptance currently especially in distal pancreatectomy, but few study has been reported about laparoscopic central pancreatectomy (LCP) for pancreatic body lesions. So, we herein report our evolving experiences of LCP.

**Methods:** From Sept 2007 to June 2008, 6 cases of LCP were performed for pancreatic body lesion at our institution. Patient's position was supine and camera port was inserted in supraumbilical area and 12 mm working port in left paramedian area, another 5 mm port in RUQ area for operator and 5 mm assistant's port at LUQ respectively. Pancreatic body lesions were dissected and transected proximally and distally using Endo-GIA. For initial 5 patients, the specimen was retrieved through midline mini-laparotomy incision (6 cm) and through the incision mucosa to mucosa pancreaticojejunostomy (PJ) after focal removal of staples around main duct at distal segment and following end to side jejunojejunostomy was done by open method. For last patient, duct to mucosa PJ and jejunojejunostomy was performed by totally intracorporeal suture technique. Two closed suction drains were remained. **Results)** Final diagnosis was 4 cystic tumor, 1 IPMN and 1 neuroendocrine tumor. All the cases had negative resection margins. Mean operation time was 430 minute (393-444). There was no PJ site leakage, but in two patients mild pancreatic juice leak was developed at the proximal pancreatic stump, which was stopped within postoperative 2 weeks with conservative treatment. No surgical complications except postoperative gastrointestinal bleeding requiring distal pancreatectomy in 1 patient were reported. Mean postoperative hospital stay was 15.5 days and they are all doing well now.

**Conclusions:** LCP is technically feasible and could give benefits of preserving pancreas parenchyma and of minimal invasive surgery to patients. But it might be technically challenging and cause higher rate of pancreatic fistula from dual stump sites, so this procedure should be chosen in appropriately selected patients.

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### CLIPLESS MINILAPAROSCOPIC CHOLECYSTECTOMY: A COMPARATIVE COST STUDY FOR A MINIMALLY INVASIVE AND COST EFFECTIVE PROCEDURE

Gustavo L Carvalho PhD, Marco A Cesário MD, José Sérgio N Silva, Pedro Paulo C de Albuquerque, Raphael M Coelho, Frederico W Silva MD, FACULDADE DE CIÊNCIAS MÉDICAS DA UNIVERSIDADE DE PERNAMBUCO (FCM/UPE), CLÍNICA CIRÚRGICA VIDEOLAPAROSCÓPICA GUSTAVO CARVALHO and UNIDADE DE PESQUISA CLÍNICA DO HOSPITAL UNIVERSITÁRIO OSWALDO CRUZ - UNIPECLIN, RECIFE - PE, BRAZIL.

**INTRODUCTION:** For the surgical treatment of gallbladders diseases, the laparoscopic cholecystectomy has been accepted as the gold standard all over the world. Although, it seems to be clear that the needlescopic procedure, called minilaparoscopic cholecystectomy (MLC) is superior in many aspects when it is compared not only to open surgery, but also compared to the conventional laparoscopic cholecystectomy (CLC). **OBJECTIVE:** Evaluate the hospital costs of these procedures and specify the differences concerning the two surgical techniques and its implication in the whole cost of the procedure. **METHOD:** Comparative and retrospective cost study, with 40 consecutive patients, who underwent laparoscopic cholecystectomy in a private hospital in Recife, Brazil. There were two groups with 20 patients each. One group was submitted to conventional laparoscopic cholecystectomy (10-10-5-5 mm with clips) and in the other the needlescopic approach was performed (10-3-2-2 mm clipless). **MLC Technique:** Two trocars of 2-mm, one of 3-mm and one of 10-mm at the umbilical site for the laparoscope are inserted. 3-mm laparoscope, clips, or endobags were not used. The cystic artery was sealed by electrocautery near the neck of the gallbladder and the cystic duct was sealed using surgical knots. Gallbladder removal was carried out through the umbilical site with a glove wrist. All surgeries were performed between July 2006 and December 2007 and some aspects concerning individual differences were standard for all patients. Only the hospital costs were considered in this study and arithmetical medium was reached in the two groups to compare the whole procedures costs. **RESULTS:** The MLC procedures showed no significant difference in the total hospital costs compared to the CLC approach. While US\$ 1.440 were spent in the minilaparoscopic technique, the conventional laparoscopic surgery demands US\$ 1.500 for the whole procedure. **CONCLUSION:** The equivalence of hospital costs on both procedures suggests the MLC should be more used by surgeons. When available, MLC, a procedure with almost invisible scars for the same cost of a CLC, should be offered as an option for the patient.

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### ROBOT-ASSISTED BILIARY RECONSTRUCTION - SHORT-TERM OUTCOMES WITH MINIMALLY-INVASIVE ROUX-EN-Y HEPATICOJEJUNOSTOMY

Mark S Choh MD, Alexandra B Roginsky MD, Francesco M Bianco MD, Enrique F Elli MD, Pier C Giulianotti MD, University of Illinois-Chicago

**Objective:** A minimally invasive approach to hepatobiliary reconstruction can be technically difficult due to the need to suture a fine structure in an enclosed space, intimately related to critical vascular structures, often with significant adhesions or fibrosis. Using the da Vinci surgical system can aid in visualization and maneuverability, facilitating the dissection and anastomosis in this area. We examined our short-term outcomes with robot-assisted laparoscopic Roux-en-Y hepaticojejunostomy reconstruction.

**Methods:** We attempted a minimally invasive approach to biliary reconstruction in 8 patients from June 2007 to August 2008. Data from patients undergoing a minimally invasive approach to roux-en-Y hepaticojejunostomy were prospectively entered into a database, and patient characteristics, indications, operative data, and perioperative outcomes were recorded and analyzed retrospectively. 8 patients were explored laparoscopically with the intention of a minimally invasive biliary reconstruction. One patient underwent conversion to an open operation due to massive adhesions. The remaining 7 successfully underwent a robot-assisted laparoscopic roux-en-Y hepaticojejunostomy. The mean age of the patients was 58 (range 20-82); there were 5 males and 3 females.

**Results:** Indications for reconstruction included 3 benign common bile duct strictures from pancreatitis, 1 idiopathic benign stricture, 1 previous roux-en-Y hepaticojejunostomy reconstruction, 1 retained common bile duct stone after ERCP-related duodenal injury, 1 obstruction from pancreatic cancer, and 1 common bile duct injury after laparoscopic cholecystectomy. Mean operative time was 353 minutes (range 160-510); average estimated blood loss was 70 ml (range 5 to 130 ml). 6 of 8 patients had undergone preoperative biliary decompression. Size of the common hepatic duct ranged from 3 mm to 18 mm. Mean preoperative bilirubin was 1.9; all patients had a normal bilirubin by postoperative day 2. Average length of hospital stay was 4.9 days. There was no postoperative morbidity or mortality. No patients required a blood transfusion. One patient was readmitted for a short stay on postoperative day 3 for dehydration after being discharged on postoperative day 1.

**Conclusion:** A minimally invasive approach to complex biliary reconstructive operations is feasible and can be facilitated with the use of the da Vinci surgical system. The robotic camera provides a stable, magnified view of the operative field, and the Endowrist technology aids in the dissection and suturing of the delicate structures in the hepatic hilum. In addition, the fourth robotic arm is an invaluable tool in achieving extreme, stable retraction of the liver for exposure of the hilum. Further evaluation of long-term outcomes is necessary to determine if results are equivalent to traditional open surgery.

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### SINGLE PORT ACCESS (SPATM) CHOLECYSTECTOMY: PRESERVATION OF THE CRITICAL VIEW

Erica R Podolsky MD, Andrew S Wu MD, Paul G Curcillo, II MD, Department of Surgery, Drexel University, College of Medicine, Philadelphia, PA

The Single Port Access (SPATM) technique utilizes the umbilicus as a single portal of entry into the abdominal cavity. The goal of this access technique is to maintain the current, safe dissection of standard multiport laparoscopic cholecystectomy while performing the entire operation through one incision concealed within the umbilicus. The critical view is a proven paradigm of safe dissection of the cystic duct during laparoscopic cholecystectomy. In May 2007 we performed our first SPA cholecystectomy at Drexel University. Initially, two articulating or one articulating and one rigid instrument were used for retraction and dissection. Over the first year of experience we introduced a third instrument, a rigid grasper for fundal retraction, and began using all rigid instrumentation.

We present a comparison of 10 two instrument SPA cholecystectomies to 10 three instrument SPA cholecystectomies.

Data was collected from 10 consecutive two instrument and 10 consecutive three instrument SPA cholecystectomies. Articulating instruments were used for the two instrument group. Standard rigid instruments were used for the three instrument group.

All procedures in both groups were performed through a 1.8 cm or less umbilical incision. Operative times were extended in the two instrument group. In the two instrument group retraction was more difficult to maintain. In one patient an additional subxyphoid port was required. The three instrument group provided optimal fundal retraction and infundibular manipulation independent of one another. This allowed the primary surgeon to manipulate and dissect the infundibulum and the cystic duct with two hands. Further, the additional retraction clearly allowed more optimal exposure of the 'critical view.' Both groups had similar incision lengths (1.8 or less), minimal blood loss, similar length of stay, and no conversions to open. Neither group has developed umbilical hernias over 9-18 month follow up.

Two and three instrument SPA cholecystectomies can successfully performed. However, the addition of a dedicated fundal retractor instrument consistently provided the important 'critical view' necessary for safe dissection. The three instrument SPA technique better reproduces the standard dissection technique of a multiport cholecystectomy.

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### LAPAROSCOPIC ENUCLEATION OF PANCREAS TAIL OR HEAD LESION: REPORT OF 13 CASES

Kwan Tae Park PhD, Song Chul Kim PhD, Young Hoon Kim MD, Duck Jong Han PhD, Soo Kyoung Jung PhD, Dept. of Surgery, Asan Medical Center, College of Medicine Ulsan University

**Introduction)** Laparoscopic enucleation of pancreas (LEP) can be best treatment option avoiding resection or pancreatic anastomosis, if performed appropriately and safely. But reports regarding LEP have been rare and mainly case report. So, we herein report the largest series of LEP to date.

**Method)** From April 2006 to Aug 2008, total 13 cases of LEP were performed for various pancreatic tumors. 10 cases of LEP for distal lesion, 2 cases for head lesion and 1 case for uncinate process were done at our institution.

**Results)** Final diagnosis were 5 mucinous cystadenoma, 2 serous cystadenoma, 2 islet cell tumor, 2 insulinoma, 1 IPMN and 1 pseudocyst. In 5 patients (38.4) intraoperative USG was used to detect and confirm the tumor location and then to verify mainduct injury. There was no main duct injury and only 1 pancreatic juice leak was developed in the case of insulinoma at pancreas head, which was drained externally. Mean operative time was 188 min (125-240) and mean hospital stay was 9.5 days (6-21).

**Conclusions)** LEP is safe and effective option for appropriately selected patients. Intraoperative USG should be used freely in case of need and LEP should be considered firstly for benign, well defined, superficial pancreatic lesion regardless of tumor location including proximal lesion, especially for cystic tumor and neuroendocrine tumor.

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### SINGLE PORT ACCESS (SPA) CHOLECYSTECTOMY: A COMPARISON TO STANDARD MULTI-PORT CHOLECYSTECTOMY

Erica R Podolsky MD, Andrew S Wu MD, Steven J Rottman MD, Paul G Curcillo, II MD, Department of Surgery, Drexel University, College of Medicine, Philadelphia, PA

Over the last two years the field of minimally invasive surgery has seen the emergence of single port laparoscopic techniques. In May 2007, we performed our first Single Port Access (SPA) cholecystectomy. This technique provides an alternative approach to accessing the abdominal cavity for minimal access procedures. Additionally, it enhances cosmesis and decreases skin incisions. In order to prove that this technique is a viable alternative to standard multiport access techniques, we compare 15 standard multiport laparoscopic cholecystectomies to 15 SPA cholecystectomies.

15 consecutive multiport laparoscopic cholecystectomies and 15 consecutive SPA cholecystectomies performed by a single surgeon at a single teaching institution were analyzed. The fifteen SPA cholecystectomies were performed using our standard technique. Through a 1.8 cm initial incision, a clear 5 mm trocar is centrally placed and two low profile 5 mm trocars are then placed laterally by raising skin and soft tissue flaps. A fourth small fascial defect is made inferiorly to accommodate a rigid grasping instrument for retraction. Fifteen multiport laparoscopic cholecystectomies were performed in the standard fashion, utilizing an umbilical, subxyphoid, and two lateral right upper quadrant trocars. Data was collected retrospectively by chart review. Equivocal blood loss and length of stay were observed in each group. Mean operative time in the SPA cases was 22% longer on average compared to the multiport group. No wound infections were observed in either group. The SPA group developed three seromas at the umbilicus that resolved spontaneously. No port site hernias have been observed in either group.

SPA cholecystectomy is a viable alternative to the standard multiport laparoscopic approach. Operative times are longer in the Single Port Access approach. This may be attributed to a learning curve, assimilation of new instruments and/or technique. As experience grows, this will have to be evaluated. Larger series will be necessary to demonstrate other advantages, if any, to SPA surgery.

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### MICROWAVE ABLATION WITH 915 MHZ VS 2.45 GHZ. WHAT IS THE DIFFERENCE?

Edward W Kubek MD, Michael C Meadows MD, Stephen M Smeaton MD, John B Martinie MD, David A Iannitti MD, Srikanth Padma MD, Carolinas Medical Center, Charlotte, NC

We present preliminary results from an upcoming prospective, non-randomized comparison of patients with liver tumors treated with either a 915 MHz or a 2.45 GHz microwave ablation system. Results from this institution using a commercially available 915 MHz microwave ablation system (ValleyLab, Boulder, CO) for malignant tumors in the liver have been previously published, using both open or transcutaneous antennae. Treatment with a 2.45 GHz system (Microsulis, Denmead, UK) has primarily been available in Europe and, until recently, a transcutaneous antenna was not available. With the arrival of this newer 2.45 GHz system in the United States, we are now able to study the unique characteristics of both systems in the research and clinical settings. This study aims to determine differences in the length of time and number of ablations needed to achieve complete tumor thermocoagulation in patients matched for lesion size and type. Efficacy of ablation and size of ablation site were based on follow-up imaging. Any complications were also documented.

Methods: Patients with either a primary or metastatic liver tumor were treated with either a 915 MHz MWA system with three 13 gauge 22 cm surgical antennae in a clustered array or a 2.45 GHz MWA system with a single 5.6 mm diameter surgical antennae. Data for the number of treatments, time of each treatment, and power measured in watts were collected for each lesion. Follow up CT with contrast was performed at 30 days from date of operation and presence or absence of residual tumor documented. Any complications were also documented.

Results: 20 patients with 38 liver lesions received ablation of each lesion with either 915 MHz or 2.45 GHz. The power used for each system was the same for all lesions, 45 W for the 915 MHz system and 100 W for the 2.45 GHz system. For the 915 MHz system the average primary liver lesion was 3.1 cm (range 1.6 to 7) and the average treatment time was 9.5 min (range 5-10). For non primary lesions the average size was 2.1 cm (range 0.5-5) and treatment time 9.1 min (range 5-10). For the 2.45 GHz system the average primary liver lesion was 2.7 cm (range 0.8 to 6.5) and the average treatment time was 4.25 min (range 3-6). For non primary lesions the average size was 2.2 cm (range 0.5-6) and treatment time 4.5 min (range 2-8). For the 915 MHz system treatment time averaged 3.1 min/cm primary tumor and 4.3 min/cm non primary tumor. For the 2.45 GHz system treatment time averaged 1.6 min/cm primary tumor and 2.1 min/cm non primary tumor. 15 patients (5/11 treated with 2.45 GHz) have had follow up CT and none of those had evidence of residual disease. Complications were a liver abscess in a patient treated with 2.45 GHz and a biloma in the 915 MHz.

Conclusions: As this is a preliminary report a large enough sample size to determine significance has not been obtained. It appears, however, that the data is leaning towards significance in demonstrating the treatment time and number of applications required to treat a liver tumor of a given size and type are less for the 2.45 GHz system than the 915 MHz system. Efficacy and complication rates appear to be similar. This study will continue to evaluate the 2.45 GHz system, including the new transcutaneous 1.8 mm diameter antenna.

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### SINGLE INCISION LAPAROSCOPIC CHOLECYSTECTOMY: SHORT-TERM OUTCOMES

Dennis Eschete MD, Nitin Mishra MD, Matthew Ostrowitz MD, Eugene Rubach MD, Gary Geefler MD, George Denoto MD, North Shore Long Island Jewish Health System, Manhasset NY

Objective of the study: To analyze short term results of a new technique i.e. Single Incision Laparoscopic Cholecystectomy.

Methods: As opposed to conventional laparoscopic cholecystectomies using four access ports, we perform the Single Incision Laparoscopic Cholecystectomy (procedure termed SILC) using a 5 mm flexible laparoscope, endo-roticulating instruments and 5 mm endo-clips. A vertical incision is made at an everted umbilicus for an average length of 2.5 cm. 3 trocars (5 mm each) are inserted through this incision for the dissection. A 2-0 silk suture on a Keith needle is passed at the upper border of the 11th rib at the mid-clavicular line and placed through the fundus of the gallbladder. This is used for gallbladder retraction. Dissection is performed with endo-roticulating instruments. Usual steps of laparoscopic cholecystectomy are followed including obtaining critical view. At the end of the procedure, one of the 5 mm trocars is exchanged for a 10 mm trocar through which an endocatch is introduced for removal of the gallbladder. The fascia is closed with absorbable sutures and umbilicus is reconstructed.

Results: We have performed 28 cases. Average operative time was 64.5 min (range 37 to 90 min). Average length of stay was less than 24 hrs. 2 cases needed conversion to 3 ports (7.1%) to obtain critical view. Two morbidities were encountered: one surgical site infection requiring antibiotic treatment and one cystic duct stump leak requiring ERCP and drainage. There were no conversions to open, no CBD injury, and no mortality.

Conclusion: SILC appears to be a promising alternative to conventional laparoscopic cholecystectomy with acceptable morbidity and mortality. With advancements in surgical instrumentation this procedure will continue to evolve.

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### ARE WE FOLLOWING GUIDELINES FOR THE MANAGEMENT OF ACUTE PANCREATITIS?

KAMAL NAGPAL MS, ANDY HAGGERTY, JIM TIERNAN, Doncaster & Baslaw NHS Trust, Doncaster, UK

Background: In 1998 the British Society of Gastroenterology (BSG) published guidelines for the management of acute pancreatitis, which were further revised in 2003. These guidelines include 11 audit criteria, which allow individual units to appraise their performance, and allow for national comparison. The aim of the study was to assess the adherence of BSG guidelines for the management of acute pancreatitis.

Methods: Sixty five case records of the patients admitted with acute pancreatitis over two years period were studied. Of the 11 audit criteria produced by the BSG 6 were determined to be acceptable to use during this study.

Results: Diagnosis was made in 96% of patients within 48hrs. Etiology could be identified in 65% of cases compared to the standard of 75-80%. Severity stratification was completely done in 8% of the patients which was well below 100% standard. 58% of patients had radiological investigation performed within 48hrs. Mortality was lower compared to audit standard. Definitive management plans within 2 weeks were formulated in only 28% of patients.

Conclusion: This study concluded that despite low mortality, management of acute pancreatitis was significantly below evidence based standards. Current practice requires review and modification as required. Once in place repetition of this study would be useful to assess success of their implementation

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### LAPAROSCOPIC COMMON BILE DUCT EXPLORATION(LCBDE) IN CBD STONES

IN SEOK CHOI PhD, NAK SONG SUNG MD, DAE KYUNG KO MD, HEYN SIK MIN MD, DAE SUNG YOON MD, WON JUN CHOI MD, KONYANG UNIVERSITY HOSPITAL, DAEJEON, KOREA

**Introduction :** With the progress of gastrofiberscopy, the endoscopic sphincterotomy have been performed as a standard therapy for CBD stones. But in the recent studies, the primary laparoscopic CBD exploration is superior or not inferior than endoscopic sphincterotomy in the clearance rate and morbidity rate. And also, there have been many studies about the advantages of laparoscopic CBD exploration in hospital stay and the costs. The authors analyzed of the 79 patients undertaken laparoscopic CBD exploration and evaluated the clinical significance.

**Patients and method :** We retrospectively analyzed 79 patients undertaken laparoscopic CBD exploration at the department of surgery in Konyang university hospital between March 2001 and May 2008. All patients were in failure of endoscopic removal of stones or size of stones  $\leq$  1 cm or multiple CBD stones. The four port technique was performed in all patients. The stones were removed by 1 ~ 1.5 cm sized incision in CBD, then we confirmed the remnant stone in CBD and intrahepatic duct (IHD) using choledochoscope. After the operation, we performed four biliary drainage method. Each of them was T-tube drainage, endobiliary stent, endoscopic nasobiliary drainage (ENBD) and percutaneous transhepatic biliary drainage (PTBD).

**Results :** Of the 79 patients, male were 36(45%) and female were 43 (55%) and mean age was 66 years (18 ~ 90). 29 cases (37%) were trying the endoscopic biliary stone removal before the operation. The mean operation time was 128 minutes. Patients had T-tube drainages (4 cases), internal biliary stent (21 cases), ENBD (18 cases) and PTBD (36 cases). On the average, the diet was started 2.5 days after the operation, and the mean length hospital day was 11 days (3 ~ 30). Conversion to the laparotomy was performed at 2 cases, one was because of the difficulty of complete removal of stones and the other one was because of bleeding by intrahepatic vessel injury (S5). At 6 of 21, endobiliary stent were not extracted spontaneously on follow-up simple abdomen X-ray at 4 weeks later, so endoscopic removal was performed for them. Patients with ENBD or PTBD discharged after removal of ENBD or PTBD and there was no mortality. There were 4 cases of complications, subhepatic seroma (2 cases) and bile leakage (2 cases). All of them with complication were recovered with conservative treatment. 1 case of all the 79 patients was found the remnant stone 1 weeks later after the operation and the stone removed by endoscopic sphincterotomy. CBD stones were recurred in 3 cases of all the patient and removed by re-laparoscopic CBD exploration.

**Conclusions :** On the treatment of CBD stone, it is generally performed to laparoscopic cholecystectomy after CBD stone removal using endoscopy sphincterotomy. But it is need to choice treatment stratege considering hospital stay and the costs. And also, laparoscopic CBD exploration could be performed as the primary treatment in the poor cooperated patients, multiple CBD stones, large sized stones.

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### LAPAROSCOPIC HEPATECTOMY

IN SEOK CHOI PhD, JEA HYUCK LIM MD, DAE KYUNG KO MD, HEYN SIK MIN MD, DAE SUNG YOON, WON JUN CHOI MD, KONYANG UNIVERSITY HOSPITAL, DAEJEON, KOREA

**Backgrounds and Purposes:** Recently, the laparoscopic resection on solid organs is performed in standard operation style with the improvement of the laparoscopic instrument and the developing operation technique. Still, it is not easy to perform liver exploration by using the laparoscope. Because there are still other problems, such as the styptic matter against bleeding, difficulty of the operation technique, insufficient instrument, room and visual field for surgery. As a result, laparoscope operation has limited disease for which medicine is efficacious on some part of it. For this reason, we have studied that liver resection treat by using laparoscope will be the safe and efficient remedy for the patients who suffer from liver cancer spreaded from hepatolithiasis and HCC (hepatocellularcarcinoma), colon cancer.

**Objects and Methods;** We researched 32 people: 20 patients with IHD stone, 4 with HCC (hepatocellularcarcinoma), 1 with cholangiocarcinoma, 7 patients who had colon cancer spread to liver. By using retrospective method, these patients are observed on the clinical history, ways of surgery, time for the operation, hospital day, and complication.

**Results;** The target age range was from 37 to 80 and the average was 61 years old. People aged over 60 was around 62.5%. The spread of men and women was 16 against 16. According to their medical history, 9 patients had experiences for upper abdominal operation. There were 4 patients with three S3 and one for S6, both of them had had HCC (hepatocellularcarcinoma). When it comes to the seven patients, who had colon cancer and spreaded to liver, there were 2 for S3, 4 for S4 and 1 for S7&8. In a operation, 4 to 5 ports were used. And there were 8 cases of Lt. lateral sectionectomy(25%), another 9 cases for Lt. hepatectomy(28.1%) of Lt. hepatolithiasis. 2 cases among the 11 cases of wedge resection of liver, were HCC and 7 cases (2 for S3, 4 for S4, 1 for S7&8) were who had colon cancer with liver metastasis. Lt. lateral sectionectomy was performed for 2 cases of HCC and 1 cases of cholangiocarcinoma were had Lt. hepatectomy. The average period of the operation was 335 minutes, bleeding amount was 404 cc and the average period in hospitality was 14 days. There were 2 cases of bile leak on the part from hepatic resection complication, 1 case of intrabdominal abscess, 1 with acute renal failure after surgery, 2 with wound infection. All of cases were recuperated in hospital and there was no another surgical operation or death.

There was one case remained IHD stone, which had surgical treat for hepatolithiasis. There was also a patient who had peritoneal relapse, which had surgical treat for HCC. And he was detected for in early stage.

**Conclusion;** Hepatectomy with laparoscope have some advantages - less pain after operation, relatively small incision site, the short period of hospital day and less time for back to the routine. It is as effective as laparotomy.

As the trend that, currently, considers the laparoscope treat as priority, the laparoscopic approach would be the important guideline for curing hepatolithiasis and HCC (hepatocellular carcinoma) through the improving surgical instrument and the way of operation.

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### 2MM LAPAROSCOPIC CHOLECYSTECTOMY: THE CORRECT FIRST STEP BEFORE ADVANCING TO NOTES

Timothy Oppermann MD, Fariba Dayhim MD, Brian Dunkin MD, Garth Davis MD, Robert Davis MD, Patrick Reardon MD, Department of Surgery, The Methodist Hospital, Houston, TX

**Background:** The laparoscopic cholecystectomy (LC) has been the standard of care for two decades. LC is usually preformed with two 10–12 mm ports and two 5 mm ports. Some investigators have looked to improve the procedure by limiting the port sizes to improve outcomes. In our Department, a single surgeon and his trainees have been performing 2 mm laparoscopic cholecystectomy (2LC) since 1996. We believe that, before attempting LC by natural orifice transluminal endoscopic surgery (NOTES), the next logical step to improving outcomes in LC, for most surgeons, is to reduce the size and number of ports, as we have by utilizing 2 mm technology.

**Methods:** A retrospective review of a prospectively maintained database of 1309 consecutive LC patients was evaluated. Use of 2LC started in July 1996. Initially, all procedures were started with a 10 mm port and three 2 mm ports. Since 2000, all cases are started with a 10 mm port and two 2 mm ports. All procedures were performed by a single surgeon (PRR), or a senior-level trainee. Data recorded included age, BMI, surgery time (OT), placement of additional ports (AP), enlargement of ports (EP), complications, number of ports used, and indications for the procedure. Data sets were not complete for all patients. Since 1990, all patients requiring cholecystectomy who were not undergoing laparotomy for another procedure were initiated laparoscopically, with no exceptions.

**Results:** 965 consecutive patients were operated on using 2 mm LC at The Methodist Hospital over the last 12 years. Values are reported as Mean  $\pm$  SD, (range), [n]; OT 67.32  $\pm$  0.023 min, (20–420), [965]; Age 53.9  $\pm$  15.9 yr, (16–96), [965]; BMI; 28.85  $\pm$  6.75 kgm<sup>-2</sup> (13.99–74.27), [910]. AP/EP for all cases: 35.3% (341/965); 14 mm cases: 42% (274/652); 16 mm cases: 21.4% (67/313). 2 mm AP for all cases: 13.5% (130/965); 14 mm cases: 19.2% (125/652); 16 mm cases: 1.6% (5/313). EP for all cases: 21.9% (211/965); 14 mm cases: 22.9% (149/652); 16 mm cases: 19.8 (62/313). Major and minor complications were recorded in a total of 42 patients (4.4%): 28 (2.9%) major; 16 (1.7%) minor. There were no conversions to open cholecystectomy.

**Conclusion:** 2LC is safe and effective in treating symptomatic gallbladder disease. Overall AP or EP rate was 35.3%. Only 2 mm non-umbilical ports were used in 77.8% (751/965). No patients required open cholecystectomy. There was a low complication rate of 4.4%. Decreased port size and number, such as in 2LC, should be considered the next logical step, for most surgeons, before progressing to NOTES.

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### LESSONS LEARNED IN SINGLE INCISION LAPAROSCOPIC CHOLECYSTECTOMY

Linda Szczurek DO, Mark Salcone DO, Seema Dhorajia DO, Larry Cohen DO, Marc Neff, University of Medicine and Dentistry of New Jersey SOM

**Background:** Since the first surgical procedure of this type in 1997, single incision surgery for biliary tract disease has been slow to gain popularity. Recent descriptions of SILSTM and SPATM have shown great potential to revolutionize minimally invasive procedures. The average general surgeon still has to face a significant learning curve and to decide how to introduce such novel techniques into a busy private practice.

**Methods:** A consecutive series of patients were brought to the operating in the hopes of performing single incision cholecystectomies. Pathology, time of surgery, BMI, and post-operative course were analyzed for all patients.

**Results:** From August to October 2007, ten patients had attempted single incision surgery. Four successful SPA procedures and two successful SILS procedures were performed. There were four conversions to two port cholecystectomies. Operative time ranged from 30 minutes to 2 hours. Four procedures were for biliary dyskinesia and the remainder for calculous cholecystitis. There were no biliary leaks or biliary duct injuries. There were no complications at the umbilical site of entry.

**Conclusion:** Single incision cholecystectomy is a challenging new operation that will soon become part of the armamentarium of general surgeons. The patient habitus, underlying pathology, and available equipment are key determining factors as to whether or not the surgery will be successful. When the conditions are right, the surgery takes no longer than the average cholecystectomy to perform.

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### THE INCIDENCE OF UNDETECTED MICROCHOLELITHIASIS IN PATIENTS UNDERGOING CHOLECYSTECTOMY FOR BILIARY DYSKINESIA

Mark K Soliman MD, Andrew M Dewitt MD, Physicians Medical Center Carraway

Background: Patients undergoing laparoscopic cholecystectomy for symptomatic biliary dyskinesia without ultrasound evidence of cholelithiasis have been found at our institution to have a significant occurrence of biliary microlithiasis on pathologic inspection.

Methods: A single-institution retrospective systematic chart review of 126 patients with the diagnosis of biliary dyskinesia, with or without chronic

cholecystitis (IC9-5758) having undergone laparoscopic cholecystectomy within the years 2005–2007 was conducted. Patients with a preoperative diagnosis of cholelithiasis or ultrasonic evidence of gallstones were excluded from the study. Individual patient data (CCK-HIDA with EF, ultrasound, preoperative diagnosis, pathologic diagnosis) were collected and pooled to yield the following results.

Results: 126 total patients, 60 patients met exclusion criteria. Of the 66 remaining patients, 42 (64%) had pathologic evidence of biliary microlithiasis (stones < 3 mm); 54 (82%) had chronic cholecystitis; 7 (10.6%) had gallstones.

Conclusion: Patients with symptomatic biliary colic without ultrasound evidence of cholelithiasis or cholecystitis should undergo CCK-HIDA with EF, and patients with symptomatic biliary dyskinesia might benefit from cholecystectomy, thus avoiding potential complications of biliary microlithiasis.

## Hernia Surgery

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### THE COMBINED LAPAROSCOPIC APPROACH TO INCARCERATED INGUINAL HERNIA.

Aviad Hoffman MD, Eyal Leshem MD, Oded Zmora MD, Moshe Shabtai MD, Amarm Ayalon MD, Danny Rosin MD, Sheba Medical Center, Tel Hashomer, Israel

Background: The laparoscopic preperitoneal repair of inguinal hernias is an accepted and widely used approach, and several reports have demonstrated its advantages over an open repair. Incarcerated hernia is still considered an indication for an open repair, for several reasons, including the technical complexity, availability of trained laparoscopic surgeon for an emergent procedure, and the need to examine the incarcerated contents for signs of ischemia.

Aim: To examine our experience with laparoscopic treatment of irreducible inguinal hernias, and present our approach which combines intra-peritoneal laparoscopic exploration, with reduction of incarcerated contents, and totally extra-peritoneal repair of the hernia.

Methods: Over a period of 3 years 14 patients were operated, 9 males and 5 females. In 6 cases the incarceration was chronic, and the hernia contained fat only in four of them. The other 8 patients had acute incarceration, and the hernial sac contained bowel.

Reduction of the incarcerated contents was easily achieved by standard laparoscopy in all but one case, in which an open incision was needed for reduction. The incarcerated bowel, even if was ischemic, recovered in all cases after being returned to the abdominal cavity, and there was no need for resection. After contents reduction, the peritoneal gas was evacuated, and the operation was converted to a standard totally extra-peritoneal repair (TEP), using a pre-preitoneal prolene mesh.

Results: All operations were completed by a laparoscopic repair including the case in which an incision was needed to reduce omentum chronically adhered to the sac. In most cases reduction was straightforward and easy, in contrast to the difficulty in reducing the contents externally before surgery. In all cases the contents was either viable, or quickly recovered from ischemia after reduction, as observed by laparoscopy. Hospitalization was short in all cases (a day or two), and no infectious or other complications occurred.

Conclusion: The combined laparoscopic approach, both intra- and extra-peritoneal, allows for an adequate solution to incarceration of inguinal hernias, with taking advantage of each separate approach. The first part of the procedure enables easy reduction of the incarcerated contents, and controlling its viability. The second part enables a simple and standard repair, similar to an elective case. It should be noted that the intra-peritoneal part does not force the surgeon to continue with this approach (TAPP), and the switch to TEP turns the operation into a familiar, simple and quick procedure.

### EXPERIENCE WITH THE GORE ABSORBABLE PLUG IN LAPAROSCOPIC INGUINAL HERNIA REPAIR

Carl A Weiss III MD PhD, Auburn Memorial Hospital

Intro: Laparoscopic transabdominal preperitoneal hernia repair (TAPP) has traditionally used permanent mesh. Goretex absorbable mesh is an FDA approved synthetic absorbable material approved for use as a tissue reinforcement strategy that resorbs in 2–3 months.

Study Design: Retrospective review of prospectively collected data from a single surgeon experience using laparoscopic TAPP repairs in selected patients. Laparoscopic TAPP repair was performed on 31 inguinal defects in 24 selected patients. Patients were reexamined by the primary surgeon at which time the McGill pain questionnaire was administered.

Data: 22 Patients underwent inguinal hernia repair using the laparoscopic TAPP approach with Goretex absorbable plug. There was one incarcerated femoral hernia and one incarcerated spigelian hernia in the series. There were no instances of chronic pain. Average hospital stay was 1.6 days. There was one trocar site hematoma requiring evacuation and 2 recurrences (one pantaloon defect, one indirect). Average implant time in 16.1 months (1.2–32.3). Average BMI was 26.4 and average age 54 (18–89). Average defect size was 11.4 cm 2 (range 4–25). Average OR time was 36.5 minutes (15–75). 18 patients were discharged same day. There were 2 recurrent inguinal hernias (pantaloon, one indirect).

Conclusion: Early experience suggests that laparoscopic TAPP with an absorbable plug is an option in selected patients favoring small indirect defects or repair in a contaminated field. Long term F/U is ongoing and is important to confirm these preliminary findings.

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### LAPAROSCOPIC REPAIR OF POSTEROLATERAL TRAUMATIC LUMBAR HERNIA, "IT'S WORTH THE WAIT!"

Joey M George MD, Thomas J Schroepel MD, Louis J Magnotti MD, Timothy C Fabian MD, Martin A Croce MD, University of Tennessee Health Science Center

**Introduction:** Posterolateral traumatic lumbar hernias are an uncommon problem. These defects may not be recognized initially, or may develop in a delayed fashion. Immediate and delayed repair have been described. We describe two cases of delayed laparoscopic repair of traumatic posterolateral abdominal wall hernias identified at the time of initial injury. **Case 1:** A 22 year-old male was involved in a MVC resulting in Grade II liver laceration, pulmonary contusions, mandible fracture, and pelvic fractures. There was a palpable right flank bulge and obvious posterolateral disruption on CT. In addition, this patient had a large degloving soft tissue injury over his right flank without evisceration. He underwent operative repair of his mandible and pelvic fractures. Since he was without evisceration or bowel compromise, definitive repair of his posterolateral traumatic lumbar hernia was delayed. The soft tissue defect was allowed to heal by secondary intention. Five months post-injury the wound had healed and he underwent elective laparoscopic repair with PTFE mesh of his posterolateral traumatic lumbar hernia. He was discharged home on post-operative day one. He has returned to full activity and work full time without restrictions at 6 months follow-up. **Case 2:** A 37 year-old female was involved in MVC resulting in a Grade II liver laceration, a Grade III spleen laceration, and a posterolateral traumatic lumbar hernia. She was nine days postpartum at the time of her MVC. The liver and spleen injuries were managed nonoperatively. She had no clinical or radiographic evidence of evisceration or obstruction, so definitive repair was delayed. Nine months post-injury she underwent successful elective laparoscopic repair of the posterolateral traumatic lumbar hernia using PTFE mesh and was discharged home post-operative day one. She has returned to full activities without issue at 18 months follow-up. **Conclusion:** Traumatic posterolateral lumbar hernias are an uncommon problem, but are a known consequence of blunt trauma. If urgent laparotomy is required and the tissue integrity is adequate, the defect should be repaired with mesh. However, if indications for urgent laparotomy are absent or the tissue integrity is poor, then expectant management and delayed repair may be the preferred algorithm. We have described two cases of posterolateral traumatic lumbar hernia resulting from blunt abdominal trauma that were managed expectantly and successfully repaired laparoscopically.

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### PROSPECTIVE RANDOMIZED COMPARISON OF CONVENTIONAL LICHTENSTEIN VERSUS SELF-ADHESIVE MESH REPAIR FOR INGUINAL HERNIA

Ziya A Anadol MD, Ekmel Tezel MD, Gazi University School of Medicine Department of Surgery

Inguinal hernia repair is one of the most common procedures performed during surgical practice. New methods and materials are introduced for a better outcome for this procedure as well as a better quality of life and postoperative period. This study compares conventional Lichtenstein hernia repair with sutureless self-adhesive mesh repair in terms of operative time, postoperative pain, hospital stay, complications and cost. Conventional Lichtenstein and self-adhesive mesh repair were performed in two groups of 24 groin hernia patients. The difference in operative times between groups was statistically significant. Mean pain scores (Visual Analog Score) for the conventional Lichtenstein group was significantly higher than the self-adhesive mesh group at and after 12 hours. Although the first group required a higher dosage of analgesia, the difference was not statistically significant. There was no recurrence in either group during a mean follow-up period of 9 months. Although the cost analysis of the techniques revealed a higher operational cost for the self-adhesive repair, it is too early to talk about an overall high expense of this new material before the long term results of the material. Keeping in mind that suture fixation of the prosthetic materials is the most common cause of inguinal pain and the need for re-exploration after surgery, self-adhesive mesh repair of inguinal hernias may probably overcome this serious long term complication as the early results are very promising.

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### MINIMALLY INVASIVE TENSION FREE REPAIR OF EPIGASTRIC HERNIAS WITH DIASTASIS RECTI

Prasanta K Raj MD, Samuel Bae MD, Fairview Hospital-a Cleveland Clinic Hospital

#### Abstract

**Background:** Repair of ventral epigastric hernias with diastasis recti can be a challenging problem because it may require a large incision thereby leaving a visible scar in the upper abdomen. This scar may not be cosmetically acceptable to the patient. This large scar line is in a highly visible position of the upper abdomen which can make this elective surgery an undesirable procedure.

**Methods:** A series of 30 consecutive patients starting in January 2005 with primary ventral epigastric hernia with diastasis recti was performed in our institution. The patients presented for elective repair due to discomfort and visible bulging of the upper abdomen and underwent a minimally invasive tension free repair that was extraperitoneal in nature.

**Results:** Of 30 patients undergoing primary repair for epigastric hernias with diastasis recti, there were no major complications in the short term follow up period. The scar line was minimal with good cosmetic result. The patients experienced minimal post operative pain. The surgery was performed in an outpatient surgery setting with minimal recovery time with full recovery in 1 week.

**Conclusions:** Short-term follow up of 30 patients with the Raj repair has given good results with no major complications. Additionally, risks of intrabdominal injury or adhesion formation are not encountered since this is an extraperitoneal repair. This procedure will also allow future open abdominal and laparoscopic procedures to be easier since the peritoneal cavity has not been violated. The most important aspects of this repair are the superior cosmetic results, lowered economic costs, minimal postoperative pain, and earlier return to work.

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### LAPAROSCOPIC TOTAL EXTRA PERITONEAL INGUINAL HERNIA REPAIR, A SOUND, SAFE AND SUPERIOR REPAIR

Ragui Sdaek MD, Jarred Marshal, Centra State Medical Center

**Background:** Laparoscopic Total Extra Peritoneal (T.E.P) has been discussed in the literature, and it's agreed that it may be a better procedure for recurrent and bilateral hernias. Laparoscopic hernia repair (TEP) in our opinion is a better repair in the hands of well trained laparoscopic hernia surgeons. **Methods:** In the period of Jan 2006- Jan 2008 100 laparoscopic (TEP), inguinal hernia repairs were performed, using the same technique. These were compared to a group of 90 patients who underwent open hernia repair. Age ranged from 16-90y old, 95% of patients were males and 5% were females. A standard questionnaire was used to obtain data. Data was analyzed using T test analysis.

**Results:** Recurrence rate was 2% in the TEP group vs. 1.5% in the open group ( $p < 0.05$ ). Return to daily activities was significantly faster in the TEP group 2-6 days vs. 4-9 days in the open group, pain levels were also significantly different, on a scale from 1-10, ten being the worst pain, the TEP group averaged 5 while the open group averaged 7 ( $p < 0.05$ ).

**Conclusion:** TEP is a better procedure than open hernia repair, the recurrence rate is almost the same but the pain and return to activities is significantly better. Looking at these results, we believe that there should be no age limit for the TEP procedure, and this procedure should be offered to patients by a well trained laparoscopic hernia surgeon, this will guarantee better results.



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### IS PROPHYLACTIC LAPAROSCOPIC TOTAL EXTRAPERITONEAL INGUINAL HERNIA REPAIR ON CONTRALATERAL SIDE JUSTIFIED: A COMPARATIVE STUDY OF BILATERAL TO UNILATERAL REPAIR IN 1754 HERNIAS

Mohamed Ismail MS, Pankaj Garg MS, Moulana Hospital, Perianthamma, Kerala, India; MM Institute of Medical Sciences and Research, Mullana, Haryana, India; Fortis Super-Specialty Hospital, Mohali, Punjab, India

**Objective-** To study the outcome and morbidity parameters of total extraperitoneal (TEP) repair in patients with recurrent inguinal hernia and assess as how they are different from the primary inguinal hernia repair.

**Patients & Methods-** A retrospective analysis was carried out over a three-year period in 937 patients in whom TEP was done. The recurrence rate, pain scores at 24 hours, 1 week and 4 weeks, hospital stay, days to resume normal activities, seroma formation and urinary retention rates were noted. Pain scoring was done as -1=no pain, 2 = mild pain, 3 = moderate pain, 4 = severe pain and 5 = intolerable pain. The mean pain scores were calculated.

**Results-** In 937 patients, 52 patients underwent recurrent and 885 patients underwent primary hernia repair. Mean age was 48.4 ± 14.5 yrs and 46.1 ± 14.2 yrs in the recurrent and primary groups respectively (p = 0.2, NS, t-test). Follow up range was 12-40 months (median-25 months). The mean operating time was more in the recurrent group (32.7 ± 6.3 minutes) compared to the primary group (30.1 ± 6.1 minutes) (p = 0.015, t-test). The mean pain scores at 24 hours were similar in both the groups (2.28 ± 0.5-recurrent vs. 2.20 ± 0.4 - primary group, p = NS, t-test). However the pain scores at one week were significantly higher in the recurrent group (1.35 ± 0.5) than the primary group (1.20 ± 0.4) (p = 0.017, t-test). The hospital stay and the days taken to resume normal activities were significantly longer in the recurrent than the primary group. (Hospital stay- 1.19 ± 0.4 vs. 1.07 ± 0.3 days, p = 0.002; Resume normal activities- 8.62 ± 2.6 vs. 7.67 ± 1.4 days, p < 0.0001, t-test). The urinary retention rate in the recurrent (9.6%, 5/52) was statistically comparable to the primary group (5.4%- 48/885) (p = 0.16, Fisher's exact test). The rate of seroma formation (3.8%-recurrent & 3.5%-primary, p = 0.5, Fisher's exact test) was also similar in both the groups. There were two recurrences and two conversions to open procedure in the primary group and none in the recurrent group.

**Conclusions-** Laparoscopic TEP repair of recurrent inguinal hernia is safe and effective with recurrence and conversion rates similar to the primary hernia repair. However, operative time, pain at one week post-operatively, hospital stay and days taken to resume normal activities were significantly longer in the recurrent hernia repairs. The post-operative pain at 24 hours, urinary retention rate and seroma formation was similar in both the groups.

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### LAPAROSCOPIC VENTRAL HERNIA REPAIR HAS AN ADVANTAGE OF DETECTING OCCULT HERNIA DEFECTS

Hitoshi Idani MD, Hiroshi Sasaki MD, Takashi Yoshioka MD, Shinya Asami MD, Shinichiro Kubo MD, Yohei Kurose MD, Hiroki Nojima MD, Masahiko Muro MD, Tetsumasa Yamashita MD, Masataka Hirata MD, Kenjiro Kumano MD, Hitoshi Kin MD, Department of Surgery Fukuyam City Hospital, Department of Surgery Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences

**Objectives:** It has been reported that laparoscopic exploration shows multiple hernia defects that were not detected on physical examination. The objective of this study was to describe the superiority of laparoscopic approach in detecting occult hernia defects and the precise size of hernia defects.

**Methods:** A total of 35 consecutive patients who underwent laparoscopic ventral hernia repair in our hospital between April 2002 and August 2008 were enrolled in this study. The numbers and the size of ventral hernia found on preoperative physical examination and computed tomography were compared to those detected after adhesiolysis during laparoscopic procedures.

Data were collected prospectively.

**Surgical technique:** The initial port was inserted at the left upper abdomen by minilaparotomy followed by the insertion of two trocars at the left lateral abdomen. After the anesthesia was induced, the size of the hernia defect was measured laparoscopically after the adhesiolysis. Composit E/X or Dual mesh was fashioned so that the defect was overlapped in all dimensions by 3-5 cm. The mesh was fixed intracorporeally on the anterior abdomen by O nonabsorbable monofilament suture materials and tucks. **Results:** The patients consisted of 7 men and 28 women with a mean age of 71.4 years. There were 30 midline incisional, 3 right lower quadrant and 2 umbilical hernias. There were no intraoperative complications and no mortality. Conversion to an open repair was required in one patient because of massive adhesion into the hernia sac. Mean operation time and the length of hospital stay was 124 min and 7.1 days, respectively. Out of 35 laparoscopic ventral hernia repairs, 8 patients (22.8%) were found to have occult defects. The numbers of occult defects were 2 in 5, 3 in 2 and 4 in 1 patient. Out of 31 patients who were performed preoperative CT, hernia defects were detected precisely in 20 patients (64.5%), overestimated in 4 (12.9%) and underestimated in 7 (22.6%). Consequently, the size of mesh used was larger than that had been estimated before surgery in patients with occult hernia defects. During a median follow up period of 32 months, there has been no recurrence.

**Conclusion:** In laparoscopic ventral hernia repair, occult hernia defects were found to be common findings. The inspection during laparoscopy takes advantage of detecting occult hernia defects precisely, which result in an excellent outcome of laparoscopic ventral hernia repair.

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### A NOVEL TECHNIQUE FOR BIOMATERIAL REPAIR OF HIATAL HERNIAS

Brian Binetti MD, Tejinder P Singh MD, Ward Dunnican MD, Albany Medical Center, Albany, NY

**Objective:** Established recurrence rates after primary hiatal hernia repair are between 9 and 27%. Lightweight prosthetic mesh reinforcement is effective in reducing recurrence but carries the risk of esophageal erosion. Bioprosthesis may reduce recurrence rates but can be cumbersome to secure into position. We describe a technique to place GORE® BIO-A® tissue reinforcement that is simple, fast and provides wide coverage of the hernia defect.

**Methods:** We recruited 17 patients with a hiatal hernia defect greater than 5 cm to undergo laparoscopic repair. After primary non-pledgeted repair we placed a piece of GORE® BIO-A® material posterior to the esophagus with 5 cm overlap. Using an AbsorbaTack® fixation device, we fixed the material to the under surface of the diaphragm in a circumferential fashion.

**Results:** Seventeen patients, 4 male and 13 female, underwent laparoscopic hiatal hernia repair. Mean age was 58.1 years. Placement of BIO-A® material took less than 5 minutes in all cases. Follow-up time ranged from 30 to 240 days. There were no recurrences in the follow-up period. There were a total of 4 minor complications within 30 days unrelated to the material placement. Four patients had radiographic evaluation showing no recurrence.

**Conclusions:** This technique of biomaterial reinforcement of laparoscopic hiatal hernia repair has the advantage of being both easy to perform and easy to reproduce. It obviates the need for suture fixation which can be time consuming and difficult. Furthermore, the short-term results show no recurrence or mesh related complication. Hopefully, there will be improved outcomes versus primary repair in our long-term follow-up data. Biomaterial reinforcement of the hiatus in all cases may one day become routine as technical improvements occur.

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### TRANSABDOMINAL PRE-PERITONEAL LAPAROSCOPIC HERNIA REPAIR ALLOWS DIAGNOSIS AND APPROPRIATE TREATMENT OF OCCULT BILATERAL HERNIAS

D van Dellen MD, H Jones MD, M S Wadley MD, Department of Surgery, Worcestershire Royal Hospital, Worcester UK

**Introduction:** Transabdominal pre-peritoneal (TAPP) laparoscopic repair has become established as a suitable primary treatment modality for inguinal hernias. The diagnosis and subsequent repair of occult bilateral hernias has been described by a number of authors. In this situation TAPP is thought to be superior to both open and extra-peritoneal laparoscopic repair because it avoids unnecessary dissection.

**Methods:** A prospective review of patients undergoing TAPP hernia repairs by a single surgeon was carried out between October 2002 and September 2008. Intra-operative findings, with particular reference to occult bilateral hernias, were noted. Length of surgery, inpatient stay, body mass index (BMI) and post-operative follow up (satisfaction, complications and neuralgia) was also recorded.

**Results:** 203 patients (199 male; 4 female; median age 55; range 17-90) underwent 267 TAPP laparoscopic repairs (143 unilateral; 62 bilateral; 34 recurrent). In 31 (15%) cases occult bilateral hernias were diagnosed at the time of laparoscopy. There was a median BMI of 25 kg/m<sup>2</sup> in the series (range 19-33). Median hospital stay was 7 hours (range 3-48) with a median operating time of 38 minutes (range 18-67) for unilateral and 55 minutes (range 32-90) for bilateral hernias. All patients were satisfied with their repair at follow up (6 weeks). 20 (7%) patients developed complications (2 recurrences, 9 seromas, 3 haematomas, 3 superficial wound infections, 1 chest infection, 2 episodes of urinary retention.) 15 (5%) patients developed mild self-limiting neuralgia. There were no conversions to open procedure.

**Conclusions:** Laparoscopic TAPP inguinal hernia repair offers acceptably low complication rates, inpatient stay and operating time. With the added advantage of diagnosing occult bilateral hernias, we recommend it as the operation of choice for repair of inguinal hernias in suitable patients.

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**TEP REPAIR OF A BILATERAL OBTURATOR HERNIA**

Marco Maricevich MD, James Butterworth MD, Renata Maricevich MD, David Farley MD, Mayo Clinic - Rochester, MN

**Introduction:** Obturator hernias (OH) are rare and difficult to diagnose. While they account for as few as 0.073% of all hernias, their mortality can be as high as 70%. OH affects women more commonly than men (ratio ~ 8:1). Other risk factors are emaciation, multiparity, and chronic conditions that increase the intra-abdominal pressure such as COPD and constipation. Typically more frequent on the right side, obturator herniae carry a bilaterality incidence of 6%. The typical clinical presentation for OH is one of partial or complete small bowel obstruction. Computed tomography (CT) is the diagnostic tool of choice. Although obturator hernias have been treated with a variety of surgical techniques, few report using a laparoscopic approach.

**Methods:** We describe a case of a 90 year-old female who presented with signs of small bowel obstruction and a CT scan demonstrating an incarcerated left obturator hernia. We performed an exploratory laparoscopy to assess bowel viability followed by a totally extraperitoneal (TEP) hernia repair with mesh.

**Results:** After initial fluid resuscitation, the patient was taken to the operative room. Initial exploratory laparoscopy identified spontaneously reduced small bowel that was dilated, but viable. Obturator herniae were evident with puckering of peritoneum bilaterally. A pre-peritoneal space was generated and two 5 mm ports were placed in the midline. Further dissection revealed bilateral obturator, left femoral, and right indirect inguinal herniae. Two separate Prolene mesh (6 x 4 inches) were fashioned and inserted to cover all defects in a standard totally extraperitoneal repair (TEP). The patient recovered well from the procedure and met criteria for dismissal in the postoperative day 2. She remains well in follow-up.

**Conclusion:** A 90 year old female with a small bowel obstruction related to an incarcerated obturator hernia was treated effectively with a laparoscopic approach. Her TEP repair highlights the advantage of this technique for bilateral defects, finding additional herniae, evaluating bowel viability, and generating another long lasting option to treat these unusual defects.

23134

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**IS UNILATERAL LAPAROSCOPIC TEP INGUINAL HERNIA REPAIR A JOB HALF DONE? A CASE IN FAVOR OF BILATERAL REPAIRS**

Pawanindra Lal MD, Prejesh Philips MD, Jagdish Chander MD, V K Ramteke MD, Department of Surgery, Maulana Azad Medical College, New Delhi, India.

**Introduction:** Laparoscopic bilateral totally extraperitoneal (TEP) repair in unilateral hernias is conspicuous in published literature in its absence. There are no studies or data on the feasibility, advantages or disadvantages of bilateral repairs in all cases or in any subset of patients of unilateral primary inguinal hernia. The objective of our study is to study the feasibility of performing bilateral laparoscopic exploration of all unilateral cases followed by laparoscopic TEP in all cases and to compare the complications, recurrence rates, post operative pain, patient satisfaction, return to work when compared retrospectively with a similar number of age matched retrospective controls

**Method:** 150 Laparoscopic TEP operations were performed in 75 patients (Group A) prospectively and were compared with 75 unilateral TEP operations (Group B) in age-matched controls done previously by the same surgeon. All cases were performed under general anaesthesia and the TEP repair was performed using 3 midline ports. All uncomplicated patients were discharged at 24 hours in keeping with department policy.

**Results:** Of 75 patients (Group A), 25 (33.3%) were clinically diagnosed with bilateral hernias and the rest 50 (66.66%) were unilateral hernias. The distribution of the 25 bilateral cases was 11 bilateral direct and 14 bilateral indirect inguinal hernias. The distribution of the 75 age-matched controls (Group B) was of all unilateral hernias of which 47 were right sided and 28 were left sided. There were 23 direct hernia and 52 indirect hernias among the control group. The mean operative time for all 150 cases was 76.66 ± 15.92 mins. The operative time in the control group (unilateral hernias) was 66.16 ± 12.44 minutes whereas the operative time in the test group (bilateral repair) was 87.2 ± 11.32 minutes. The operative time in comparison was significantly higher in the bilateral group by 21.04 minutes or 31.88% (p value = 0.000, significant). The operative time in the true unilateral group was 82.45 ± 9.38 mins while the operative time in the former group (OCH + Bilateral hernias) was 91.35 ± 11.95 mins, which was a significant difference statistically (p value = 0.0015). Occult hernia was seen in a total of 15 cases of which 13 were occult contralateral hernias (OCH) (26%) and 2 were ipsilateral occult hernias. The mean operative times in the OCH cases were 81.46 ± 7.9 minutes whereas in those without OCH was 82.45 ± 9.38 minutes which is not a significant statistical difference (p value = 0.46).

**Complications -** There were 14 cases of peritoneal rent in the bilateral repairs group whereas in the unilateral group 10 were noted to have a peritoneal rent intraoperatively. There were 12 cases of subcutaneous emphysema in the bilateral TEP group whereas only 4 such cases were seen in the control group. This difference in the incidence of subcutaneous emphysema was statistically significant (p value = 0.026). There were no cases of seroma, hematoma, wound infection, visceral injury or post-operative neuralgia in either Group A or Group B. Pain: On statistical analysis, the VAS depicted pain scores at 12 hours only was significantly higher in the Unilateral repair group as compared to the bilateral TEP group. The VAS scores at all other times were not significantly different, statistically, between the 2 groups. Return to work: The average time of return to light routine or activities of daily living was 1 day in Group A whereas in group B it was 1.91 days (range 1-3 days). This was a statistically significant difference (p value = 0.000). Recurrence: There was 1 cases of recurrence in this study on the right side in a clinically left sided hernia in Group A, over a mean follow-up period of 4872 months and all patients reported to follow up by office visit or correspondence till 2 years and 2 patients were lost to follow up after 2 years. Among Group B, there was no recurrence over a follow-up period of 40-54 months with 3 patients lost to follow up after 3 years.

**Conclusion:** In the present study bilateral TEP was performed in 3 types of patients, those with clinically bilateral hernias, those with clinically unilateral but with an OCH, and finally in truly unilateral hernias. All of them were compared to unilateral TEPs in clinically unilateral hernias, and we found no significant increase in morbidity, pain, recurrence or complications in bilateral repairs. Convalescence, from the surgery, as gauged by the return to activities of daily living and return to work parameters, is also comparable. Surgeons experienced in laparoscopic TEP, in high volume centers can, and should, provide bilateral repairs in all patients of inguinal hernias keeping in mind the potential benefits versus the comparable morbidity. Bilateral repairs do take more time than unilateral TEP. Bilateral repair does not add to the risk of surgery in experienced hands and we strongly feel that a well done unilateral TEP is actually a job half done!

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**IS IT NECESSARY TO DO EXPLORATION OF THE RIGHT SIDE DURING TEP REPAIR FOR THE LEFT INGUINAL HERNIA?**

Choon Sik Chung MD, Jeong Eun Lee MD, Yong Geul Joh MD, Dong Keun Lee MD, Department of Surgery, Hansol Hospital

**INTRODUCTION:** Laparoscopic herniorrhaphy (LH) LH has ability to examine an asymptomatic contralateral side and repair occult contralateral hernia coincidentally with less morbidity. In this prospective study, we aimed to examine the result of diagnostic exploration of the right side during laparoscopic totally extraperitoneal (TEP) repair for the left side inguinal hernia.

**Methods:** A prospective study of 100 consecutive male patients who performed TEP repair by a single surgeon (C.S) between January and May 2008 was conducted. Two transabdominal preperitoneal prosthetic (TAPP) repair and one intraperitoneal onlay mesh (IPOM) cases were excluded. We routinely explored contralateral side in patients with the left side hernia on physical examination to reveal the incidence of the right side occult hernia.

**Results:** Mean age was 52 years old (range 18-82). Among the 100 patients, 17 had bilateral hernia, 52 right hernia and 31 left hernia on physical examination prior to surgery. In 31 left hernia of them, three was revealed to have contralateral occult hernia (9.7%). Of three patients, two patients with direct type hernia had the same type contralateral hernia (28.6%). Another one with indirect type hernia had direct type contralateral hernia (4.8%).

**Conclusion:** Given the low incidence of the contralateral occult hernia in indirect type hernia, routine exploration may not be needed during TEP repair. It may be, however, reasonable to do exploration contralateral side in direct type hernia because of the high rate of contralateral occult hernia.

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**COMPARATIVE ANALYSIS OF FREESTANDING AMBULATORY SURGERY CENTER UTILIZATION FOR INGUINAL HERNIA REPAIR**

Rachel C Forbes MD, Michael D Holzman MD, Kenneth W Sharp MD, Willie V Melvin MD, Jeffrey M Marks MD, Michael J Rosen MD, Benjamin K Poulouse MD, Vanderbilt University Medical Center; University Hospitals Case Medical Center

**Introduction:** Freestanding ambulatory surgery centers (ASCs) use has greatly increased. No study has evaluated the utilization of ASCs for inguinal hernia repair (IHR). This study compares patient factors, hernia types, and approaches (laparoscopic vs. open) for IHR performed at ASC and non-ASC facilities. **Methods:** Patients 18 years or older undergoing elective outpatient IHR were identified in the 2005 State Ambulatory Surgery Database. Patients were selected from four states representing each national census region: Colorado, Maryland, Vermont, and Wisconsin. Patient factors including demographics, comorbidities, hernia type (unilateral, bilateral or recurrent), approach, and location of procedure were compared between ASCs and non-ASCs. Proportions were compared using chi square analysis and means compared using t-test with an alpha level of 0.05 as significant.

**Results:** There were 14,777 patients identified who underwent inguinal hernia repair in 2005. Of those, 719 (5%) had their procedures performed at an ASC. Four percent of all Caucasian patients underwent IHR at an ASC compared to 1.8% of non-Caucasians. No gender difference was noted. Patients who had their procedures performed at non-ASCs had significantly more comorbidities than those at ASCs (p < 0.05) including hypertension, coronary artery disease, hyperlipidemia, copd/asthma, dysrhythmias, and mental illness. Patients were more likely to have a laparoscopic hernia repair at an ASC than at a non-ASC (30% v. 19%, p < 0.05). Conversely, recurrent hernia repairs were more likely to occur at non-ASCs than at ASCs (11.2 v. 8.2%, p < 0.05). Bilateral repairs occurred with equal frequency in ASCs (15%) and non-ASCs (16%). Patients in urban areas were more likely to have had their procedures done at an ASC than those in rural towns (p < 0.05).

**Conclusion:** Although IHR is increasingly performed in ASCs, only a small proportion of patients had repairs at ASCs in this study. These patients tended to be urban, have less comorbidity, and underwent more laparoscopic repairs than non-ASC patients. Further exploration of ASC utilization for IHR is warranted.

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### LAPAROSCOPIC TOTALLY EXTRAPERITONEAL HERNIA REPAIR VERSUS OPEN HERNIA REPAIR: COMPARISON OF PERIOPERATIVE OUTCOMES

Hang Joo Cho MD, Kee Hwan Kim MD, Ji Il Kim MD, Chang Hyeok An MD, Jeong Soo Kim, Seung Jin Yoo, Keun Woo Lim, Department of surgery, Uijongbu St. Mary's Hospital, The Catholic University of Korea.

**Introduction:** Lichtenstein repair is generally accepted as a safe and widely practiced. Laparoscopic TEP herniorrhaphy is a recent technique and now increasing in number, but not generally accepted because of technical difficulties and not established peri-operative outcomes. This study compares perioperative outcomes and complications between open Lichtenstein repair and laparoscopic TEP repair.

**Methods:** This study is retrospective study and from January to August, 2008, total 43 cases (22 cases of TEP method, 21 cases of Lichtenstein repair) were enrolled in this study. All cases were operated by same surgeon. Operative time, hospital stay, analgesic uses, post-operative hematoma, recurrence, groin pain, were compared.

**Results:** The mean operative time was 78  $\pm$  20 minutes (min) in the TEP group and 72  $\pm$  13 min in the Lichtenstein group and there was no statistical difference ( $p = 0.223$ ). The mean hospital stay was significantly shorter in the TEP group (4.5  $\pm$  0.7 days) than in the Lichtenstein group (5.2  $\pm$  0.8 days) ( $p = 0.015$ ). Total analgesic uses is comparative in both groups (1.2  $\pm$  1.1 times in the TEP group and 1.8  $\pm$  1.7 times in the Lichtenstein group). But, if result was stratified into two groups (within 24 hours and after 24 hours), analgesic uses is significantly frequent in the Lichtenstein group (0.3  $\pm$  0.5 times) than in the TEP group (0.7  $\pm$  0.8 times) after 24 hours ( $p = 0.038$ ). There was no recurrence in the both groups. Hematoma was more frequent in the TEP group (36%) than in the Lichtenstein group (9.5%) ( $p = 0.037$ ). But except for 2 cases of sono-guided aspiration in the TEP group, all hematoma patients were self-regressed about after 2 months. Groin pain was comparative in the both group.

#### Conclusion

In the TEP group, hospital stay is significantly shorter than in the Lichtenstein group and this is maybe because less post-operative pain after 24 hours from the operation. There was no difference in the operative time in the both groups and hematoma was more frequent in the TEP group than in the Lichtenstein group. Laparoscopic TEP herniorrhaphy may be performed efficiently with an acceptable operating time and shorter hospital stay.

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### FEASIBILITY AND POTENTIAL ADVANTAGES OF TRANSPOROUS MESH FIXATION BY A LAPAROSCOPIC SPRAY SYSTEM (LSS) IN INGUINAL HERNIA REPAIR

René H Fortelny MD, Alexander H Petter Puchner MD, Karl S Glaser MD, Heinz Redl PhD, II. Department of General Surgery, Wilhelminenspital, Vienna, Austria, Ludwig Boltzmann Institute for Experimental and Clinical Traumatology

**Background:** Chronic pain after inguinal hernia repair is often due to nerve injury by penetrating mesh fixation devices, such as staples, tacks or sutures. The cumulative incidence of pain, numbness and discomfort after surgery for inguinal hernia is reported to be as high as 30%. Tissue sealants have been proposed to provide atraumatic mesh fixation until fibrous incorporation of the implant into the abdominal wall occurs. In several studies on hernioplasty, punctual mesh fixation with fibrin sealant (FS) proved to be efficient in terms of fixation strength and elasticity, but seroma formation was reported in certain cases as a relevant potential side effect. Bearing these critical aspects in mind, a new laparoscopic spray system (LSS) was used, which produces a thin uniform layer of FS providing broad area coverage of the mesh achieving a transporous fixation with a high tensile strength. Aims of the study were to examine the reliability, safety and handling of LSS. The possible reduction of the amount of FS by the use of the LSS was another objective of this study.

**Methods:** After informed written consent was obtained, transabdominal preperitoneal hernioplasty (TAPP) was performed in 33 primary inguinal hernias in 27 non-selected consecutive patients by a single surgeon. A macroporous mesh (TI-Mesh®, GfE, Germany) was fixed with 1 ml of fibrin sealant (Tisseel® = Tissucol®, Baxter Bioscience, Austria). The FS was applied using a dedicated spray catheter with special safety features insertable through a 5 millimeter trocar and attached to a carbon dioxide regulating device.

**Results:** The intra operative handling was satisfactory. The mean operation time of 60.3 minutes ( $\pm 15.4$ ) was comparable to staple fixation and punctual FS application in TAPP. The formation of a thin layer of FS led to a 50% reduction in the amount used FS compared to punctual application.

**Conclusions:** This LSS provides an atraumatic broad elastic fixation of mesh in the TAPP-hernioplasty, allowing an easy and excellent fixation accompanied by a reduction of the amount of FS required. It could therefore help to simplify application and to reduce costs also compared to mechanical fixation and avoid potential seroma formation as described for punctual FS application.

**Key words:** Laparoscopic inguinal hernia repair; Fibrin Sealant; Laparoscopic Spray System; Mesh Fixation; Seroma formation

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### LAPAROSCOPIC REPAIR OF INCISIONAL HERNIAS FOLLOWING RENAL TRANSPLANTATION

Rafik A El-Sabroun MD, Kerri E Buch MS, Khalid M Butt MD, New York Medical College, Mount Sinai Medical Center, New York

**Introduction:** While laparoscopic mesh repair is gaining popularity as the standard technique for incisional hernia repairs, it has not so far been reported in renal transplant recipients. Technical challenges, including proximity to the allograft and the absence of a fascial margin make laparoscopic repair difficult. However, the lower recurrence rates, fewer complications, and shorter hospital stays that a laparoscopic approach offers compared to an open repair is ideal in this immunosuppressed population. We describe the technique of laparoscopic mesh repair of incisional hernias in renal transplant recipients.

**Patients and methods:** From May 2005 to September 2008, 14 patients (12 males, 2 females, average age = 51 years) in one institution underwent laparoscopic hernia repair by a single surgeon (primary hernias  $n = 12$ ; recurrent hernias  $n = 2$ ) after retroperitoneal right and left lower quadrant renal transplantation. Operative notes, hospital records and office charts were retrospectively reviewed for operative technique, early or late complications, and recurrence data.

**Results:** Laparoscopic repair was completed successfully in all patients using (Dualmesh®  $n = 9$ ; Parietex®  $n = 3$ ; Premacor®  $n = 1$ , and Proceed®  $n = 1$ ) mesh. No perioperative complications occurred. At mean time of follow-up of 26 months (1–41 months), there were no mortalities. One patient formed a postoperative seroma that was percutaneously aspirated. The same patient subsequently developed mesh stretch without migration, requiring replacement of a Dualmesh® with a Parietex® mesh 14 months after initial repair. No other hernia recurrences occurred.

**Conclusion:** Laparoscopic mesh repair of incisional hernias following lower quadrant renal transplantation is safe and feasible. Recognition of the anatomical relations of the renal allograft is of paramount importance. Laparoscopic repair should be the preferred procedure in transplant recipients, as it can provide similar outcomes to the non-transplant population.

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### THE IMPACT OF DIFFERENT COMMERCIALLY AVAILABLE ANTIADHESIVE BARRIERS IN EXPERIMENTAL IPOM HERNIA REPAIR USING A POLYPROPYLENE MESH

Alexander H Petter-Puchner MD, Simone Gruber-Blum MD, Julian Brand, René H Fortelny MD, Heinz Redl PhD, Ludwig Boltzmann Institute for Experimental and Clinical Traumatology, Vienna

**Background:** Intraperitoneal onlay mesh plastic technique (IPOM) is a common technique for ventral hernia repair. Adhesion formation, seroma formation, impaired functionality of the abdominal wall, and chronic pain are frequently observed complications. Adhesions are probably the most important side effect and can be evoked by meshes as well as fixation devices. Different mesh concepts for adhesion prevention or reduction have been developed including coated meshes and single antiadhesive barriers (sAB) for individual coating of meshes.

Combining one type of mesh with different sAB (providing a barrier between implant and viscera until the mesh is covered by neomesothelium) formed the rationale to conduct this study and ruled out a possible impact of different mesh materials. sAB were fixed to the mesh in a new atraumatic way by the use of fibrin sealant (FS).

**Methods:** 32 rats were operated in open IPOM technique ( $n = 8$  per group). One mesh per animal ( $2 \times 2$  cm) was fixed with 4 non-resorbable sutures. An antiadhesive barrier of  $2.5 \times 2.5$  cm was fixed with fibrin sealant (4 I.U.) to the visceral side of the implant. A macroporous polypropylene mesh was used. The antiadhesive layers tested were SurgiWrap®, PrevaDhã and Seprafilmã. All sAB are fully degradable in 2 to 8 weeks. Observation period was 30 days, mesh with sutures only served as control group.

Adhesion formation, tissue integration, seroma formation, inflammation and vascularisation were evaluated. Adhesions were scored qualitatively using the Vandendael score and quantitatively by evaluating the percental adhesion-coverage of mesh surface. Histology was performed.

**Results:** When compared to the control group PrevaDhã group showed a significant reduction of adhesion formation verified by the Vandendael score as well as by the percentage of mesh surface covered by adhesions. Adhesion formation was significantly reduced in the Seprafilm group compared to the control group. No difference concerning adhesion formation was found between SurgiWrap and control group. No seroma formation or inflammation was detected in any group. Tissue integration of the mesh was reduced in PrevaDhã and Seprafilm group, SurgiWrap and control group showed full mesh integration. There is a highly positive correlation between Vandendael score and percental adhesion area of mesh surface ( $r = 0.7$ ).

**Conclusions:** In our opinion FS is an excellent agent for sAB fixation. The new method of atraumatic fixation is simple and effective. Sealed PrevaDhã and Seprafilmã are potent agents for the reduction of adhesion formation. A potential relationship between effective adhesion prevention and impaired tissue integration of the implant was observed demanding further research. A poor integration of the mesh into the abdominal wall may influence mesh function.

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### COULD TOTAL EXTRAPERITONEAL HERNIA REPAIR DONE UNDER SPINAL ANESTHESIA WITHOUT FIXATION OF MESH BE RECOMMENDED AS THE FIRST LINE PROCEDURE FOR UNILATERAL INGUINAL HERNIAS?

Pankaj Garg MS, Shanmeet Singh MD, Mohamed Ismail MS. 1. MM Institute of Medical Sciences and Research, Mullāna, Haryana, India. 2. Fortis Super Speciality Hospital, Mohali, Punjab, India. 3. Moulanā Hospital, Perianthalmanna, Kerala, India

**Background-**Though laparoscopic total extra peritoneal repair (TEP) of inguinal hernia has been recommended as the method of choice for bilateral and recurrent inguinal hernias, yet for unilateral inguinal hernias, both the open and TEP are considered at par.

While doing unilateral inguinal hernia repair, TEP has several advantages over the open repair. The pain in the early post operative period is less, the patient recovery is faster leading to early resumption of work, the symptomatic ipsilateral femoral and obturator hernia and contralateral direct bubunocoele can be detected and managed at the same time. However, it is associated with distinct disadvantages. These are requirement of general anesthesia(GA), need to fix the mesh, seroma formation, high cost and difficult learning curve. GA, when compared to spinal anesthesia (SA), can lead to significant hemodynamic changes, post operative nausea and vomiting, increased cost and inability to operate in high cardio-pulmonary risk patients. Fixation of mesh with metal staples also increases cost and may lead to new post operative groin pain which even becomes chronic in small percentage of patients. So need for GA and mesh fixation are considered as the major disadvantages of laparoscopic hernia repair. Several studies have compared TEP done under GA to SA and with fixation of mesh to non-fixation of mesh. The results showed that TEP could be successfully done under SA or without fixation of mesh with no increase in recurrence rate or any other complication.

**Methods -**We, perhaps for the first time, demonstrated that TEP could be done under SA without fixation of mesh with comparable results in term of recurrence and complications. In a study(1) done in 675 patients involving 1289 TEP hernia repair, TEP was done under SA without fixing the mesh (SA-NF) in 1220 hernias.

	SA-NF, n = 636	GA-NF, n = 16	SA-F, n = 23
Recurrence	2 (0.2 %)	0	0 (p = NS)
Conversion-open	0	0	1(4%) (p = NS)
Urine retention	19 (3 %)	0	7(30 %)(p = Sig)
Seroma	/1220 (1.5 %)	0	3/42(7%)(p = Sig)
Hospital stay	1.06 ± 0.2 days	1.01 ± 0.1 days	1.4 ± 0.5(p = Sig)

It was compared to the groups with TEP done under SA with fixation of mesh (SA-F) and TEP done under GA with non-fixation of mesh (GANF),(Table-1) The recurrence rates, conversion rate and complications were comparable in all the three groups and similar to the rates reported for TEP and open hernia repair in the literature. The mean hospital stay, the days to resume normal activities and pain scores were significantly higher in mesh fixation (SA-F) group(1).

**Discussion-** The procedure-TEP done under SA with non-fixation of the mesh- had all the advantages of TEP without its major disadvantages viz GA administration and need to fix the mesh. TEP under SA is a bit technically demanding. However several studies have shown that doing TEP under SA or epidural anesthesia is feasible, safe and had complications rate similar to cases done under GA. Since preperitoneal space collapses after the TEP procedure is completed, the mesh is 'sandwiched and stabilized' in the preperitoneal space even when the mesh is not fixed with any method. Several studies in the past have confirmed the safety, low recurrence rates and better results in terms of pain of the TEP procedure done with non-fixation of mesh.

**Conclusions-** TEP done under SA with non-fixation of mesh, perhaps can be recommended as the procedure of choice for unilateral inguinal hernia repair. More prospective randomized studies comparing this procedure to the open hernia repair are needed to substantiate this.

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### FLEXIBLE ENDOSCOPIC SUB-RECTAL SHEATH TUNNELING ALLOWING INTRAPERITONEAL VISUALIZATION DURING SINGLE INCISION VENTRAL HERNIA MESH REPAIR

Nikalesh Ippagunta MD, Jawad M Latif MD, Kevin McGill MD, James J McGinty MD, Avinash Burra MS, Constantinos Rizas MD, Faiz Y Bhora MD, George J Todd MD, Scott J Belsley MD, St Luke's Roosevelt Hospital Centre

**Objective:** Dual-layer mesh products are optimal for a subset of ventral hernia repair. While small umbilical defects are easily accessed through a single incision, intraperitoneal visualization is limited and only possible prior to mesh placement. The purpose of our study was to evaluate the feasibility of a single-incision flexible endoscopic sub-rectal sheath tunneling technique to allow intraperitoneal visualization of mesh placement.

**Methods and Procedures:** Three 25-kg female swine were anesthetized with general anesthesia and intubated. A 2 cm umbilical incision was created to mimic a standard approach for umbilical hernia repair. A dual-channel gastroscope (Storz) was introduced through this skin incision and an extraperitoneal tunnel below the rectus fascia was developed in two different locations. Needle knife cautery and endoscopic grasping forceps (Olympus) were used for dissection and to enter the peritoneal cavity. The scope was retroflexed allowing intraperitoneal visualization of the hernia site. Mesh repair was performed in usual fashion using 2-0 prolene sutures and intraperitoneal visualization confirmed mesh deployment without incident. The scope was removed and single incision closed in usual fashion.

**Results:** The total duration of the procedure was approximately 30minutes ± 10minutes. The average length of the tunnel was 15 cm. A lateral approach was abandoned after the first procedure because of fear of bowel injury during peritoneal entry. The two following techniques employed a tunnel that entered the abdomen over the liver. Intraperitoneal visualization was performed without associated bowel injury by three surgeons of varying endoscopic experience.

**Conclusions:** We demonstrated the feasibility of a technique that does not require further skin incisions or fascial disruption yet allows intraperitoneal visualization of mesh placed during a single incision hernia repair. Further studies will employ semi-rigid over-tubes to facilitate angulation and larger pieces of mesh employing more complicated peritoneal fixation.

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### ABDOMINAL HERNIAS: CAN WE DETERMINE DEFECT SIZE?

Dennis Eschete MD, Karl LeBlanc MD, Surgeons Group of Baton Rouge, Baton Rouge, La 70808

**Introduction:** To analyze ability to accurately determine abdominal wall hernia defect size by pre-operative versus intra-operative examinations. With the continuous growing number of abdominal hernias, more practicing surgeons are beginning to practice laparoscopic repair. The hernia defect is an important aspect of the surgery including mesh sizing for repair and operative planning that is needed during these advanced techniques.

**Methods:** A prospective study of all patients who underwent laparoscopic ventral hernia repair (LVHR) by a single practitioner in a group practice within a community setting. 63 patients were included in the study between June 2000 through October 2002. Patient demographics, location of hernia defect, and measurements of hernia defects were obtained. Hernia evaluations were obtained pre-operatively (office evaluation, OE), intra-operatively (post anesthesia induction, IO), with insufflation post abdominal markings (IF), and direct measurement (DM).

**Results:** Sixty three patients were included in the study with an average age of 53 years old. The average BMI was 33 with 44 primary hernia defects. Average defect sizes for OE, IO, IF and DM measurements averaged 51.05 cm<sup>2</sup>, 34.28 cm<sup>2</sup>, 143.87 cm<sup>2</sup> and 83.95 cm<sup>2</sup> respectively. Of the 63 patients, 8 defects were unable to be appreciated in office (12.7%) with an average of 51.05 cm<sup>2</sup> in dimension. When compared against the direct measurement, the OE, IO and IF did not reach statistical significance with p-values of 0.32, 0.093, and 0.31 respectively. There also was no significance found in relation to normal, obese or morbidly obese patients in relation to clinical examination with p-values of 0.213, 0.231 and 0.265 respectively.

**Conclusion:** LVHR measurements on patient populations vary with technique and the most accurate and reliable way to determine defect is by direct measurement.

23821

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### NATIONWIDE TRENDS IN INCISIONAL HERNIAS IN THE ERA OF LAPAROSCOPIC SURGERY

Usama Qumsieh MD, Marek Rudnicki MD, Wendy Weller PhD, Advocate Illinois Masonic Medical Center, Albany School of public health

**Objective:** Incisional hernias (IH) are observed in 10–15% of patients after open abdominal procedures and in less than 1% of patients after laparoscopic procedures. Given that the number of laparoscopic surgeries relative to open surgeries has increased over time, one would expect that the prevalence of IH among hospital discharges would decrease over time.

**METHODOLOGY:** The Nationwide Inpatient Sample from the Healthcare Cost and Utilization Project was analyzed using HCUPnet. Hospital discharges with a principal or secondary IH diagnosis (ICD-9 codes 551.21, 552.21 and 553.21) were included in the study. Similarly, all discharges with any procedure code identifying IH surgery (ICD-9 codes 53.51 and 53.61) were also included. The crude prevalence of IH diagnoses and IH surgeries were calculated based on the number of diagnoses and surgeries and the total discharges in a given year, according to values obtained from the NIS database. In addition, the total number of laparoscopic vs open abdominal procedures was queried as well. Annual changes in the number of IH diagnoses and procedures were calculated using the z-score. All analyses were performed on data that were weighted to provide national estimates.

**Results:** The laparoscopic component of abdominal surgery increased from 7.39% in 1993 to 12.66% in 2006 for the US hospitals. During the same period, there was an increase in the number of patients discharged with a diagnosis of IH (from 73,896 in 1993 to 117,879 in 2006). The prevalence of the IH diagnoses rose from 215.4/100,000 discharges to 298.8. 62,278 surgeries were performed for IH in 1993 vs. 100,948 in 2006 with steady annual increase and the prevalence rising from 184.4/100,000 discharges in 1993 to 255.9 in 2006.

**Conclusions:** Despite increasing trends in laparoscopic surgeries, the prevalence of IH does not seem to be in decline. Furthermore, the total number of surgeries done for IH is in rise as well.

23900

P469

### TECHNIQUE AND OUTCOMES FOR PATIENTS REQUIRING LAPAROSCOPIC SURGERY AFTER LARGE VENTRAL HERNIA REPAIRS

Atif Iqbal MD, Archana Ramaswamy MD, Bruce Ramshaw MD, Department of General Surgery, University of Missouri Columbia, Columbia, MO

**Objective:** Patients with ventral hernia repairs risk mesh infection with subsequent surgeries, which can lead to serious morbidity. Such patients need an unorthodox approach to prevent serious complications such as mesh infection or recurrent hernias. **Methods:** Patients who had large ventral hernia repairs and subsequently underwent laparoscopic procedures for various purposes were retrospectively reviewed. The aim of the study was to report our experience, technique and short term outcomes for this group of patients.

**Results:** A total of 7 laparoscopic procedures were performed in 6 patients. Mean age was 36 with a mean BMI of 48. The cause of the original hernia ranged from splenectomy, small bowel resection to colectomy. Four patients had a laparoscopic ventral hernia repair with a mesh while two patients had a component separation with myo-fascial advancement done. The average size of the mesh used was 30 x 20 cm. Mean time between the 2 surgeries was 25 months. The 2nd procedures were all laparoscopic and included 2 Roux-en-Y gastric bypasses, 2 cholecystectomies, 1 splenectomy, subtotal colectomy and bilateral inguinal hernia repair with mesh. Abdominal access was attained in all except 2 patients via a RUQ or LUQ incision with blunt dissection using a gloved finger. An average of 1-2 extra trocars had to be placed for adhesiolysis. All trocar sites through the mesh were sutured using a suture passer at the end of the procedure. Mean OR time was 182 minutes while the mean time spent on adhesiolysis was 44 minutes. Mean EBL was 118 cc. One patient had a port site infection followed by an abdominal abscess which needed IR drainage while another patient had a recurrent hernia requiring surgery. None of the patients required conversion to an open procedure. No mesh infections and bowel injuries were seen. Mean hospital stay was 4 days while patients started PO diet at a mean of 1 day postop. No mortality was seen. Mean follow up was 9 months.

**Conclusions:** Laparoscopic procedures after large ventral hernia repairs are safe and have a low complication rate. The repair of large ventral hernias does not preclude from further laparoscopic procedures. Larger studies are required to further delineate these findings.

23928

P470

### LAPAROSCOPIC INCISIONAL HERNIA REPAIR IN ORTHOTOPIC LIVER TRANSPLANT PATIENTS

Janine N Pettiford MD, John Sweeney MD, Behnoud Beroukhim BS, Vadim Sherman MD, Baylor College of Medicine

Laparoscopic incisional hernia repair in orthotopic liver transplant patients

Janine N. Pettiford, MD, John Sweeney, MD, Behnoud Beroukhim, and Vadim Sherman, MD.

**Background:** The incidence of incisional hernias in orthotopic liver transplant (OLT) patients is approximately 5-17%. Treatment options are often complicated by the patients' co-morbidities and immunosuppression. The purpose of this study was to assess surgical outcomes of laparoscopic incisional hernia repair in OLT patients.

**Methods:** OLT patients undergoing incisional hernia repair between 1999-2008 were retrospectively reviewed. A total of 19 OLT patients underwent 22 incisional hernia repairs. Outcomes were assessed for recurrence, complications, and length of hospital stay. Patients were evaluated for surgery at least 6 months post-OLT and after being off Prednisone for 6 months.

**Results:** Presenting factors for primary incisional hernia were pain 15/19 (78.9%), incarceration 2/19 (10.5%), and cosmesis 2/19 (10.5%). Two of these patients (10.5%) were complicated by recurrence and one patient (5.2%) presented with infected mesh at one month. All primary operations were attempted laparoscopically with 17/19 (89.5%) being completed laparoscopically and 2/19 (10.5%) converted to open. 2/19 (10.5%) presented emergently with intestinal incarceration and underwent laparoscopic repair without any complications. The two recurrences and one infected mesh underwent a second operation. 2/3 (66.6%) of these were completed laparoscopically. All 22 herniorrhaphies used ePTFE (Gore-Tex dual mesh); mesh was fixed laparoscopically using a combination of spiral tack and transfascial fixation sutures. Nonabsorbable sutures were used for mesh fixation in open repairs. Additional complications include wound infection in 2/22 (9.1%) and seroma in 3/22 (13.6%). Average length of hospital stay was 5.4 days.

**Conclusion:** Laparoscopic incisional hernia repair in OLT patients is safe and effective. Despite immunosuppression, infection rates and recurrences are low, however, length of stay is prolonged in this challenging group of patients.

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### PRESENTATION, DEMOGRAPHICS, AND SURGICAL MANAGEMENT OF BOCHDALEK HERNIAS IN ADULTS

John D Horton MD, John C Coleman MD, Jason M Johnson DO, William Beaumont Army Medical Center

**Background:** Bochdalek hernias are congenital diaphragmatic defects that have been well described in the pediatric literature. The first congenital diaphragmatic hernia was described in the 17th century by Lzarus Riverius and first described clinically by Vincent Alexander Bochdalek in 1848. Although treatment has progressed through the use of thoracoscopic repair in 1995 and laparoscopic repair in adults in 1998, reports of Bochdalek hernias in adults remain limited to single patients or small series. In order to better understand this disease process and its management in the adult population, we conducted an extensive review of the literature.

**Methods:** A literature search was performed using PubMed, Embase, and Google Scholar. All English language articles after 1950 were included. The following data points were queried: age, sex, presentation, studies utilized during work-up, laterality, surgical approach, hernia sac management, specific laparoscopic techniques, outcomes, and follow-up.

**Results:** Based on these criteria 166 articles were identified and analyzed. Particular attention was paid to modern surgical techniques used to repair these unusual defects. The average age of patients was 41 (n = 163) and 45% of patients were female. Left-sided hernias 78%, right-sided Bochdalek hernias accounted for 20%, and 2% were bilateral (n = 162). Congenital Abnormalities (n = 154) were present in 12% of patients. Presentation of symptoms of less than one month duration occurred in 49% of right-sided Bochdalek hernias and 33% of left-sided. Presenting symptoms included strangulation 31% right-sided, 27% left-sided; Obstruction 41% left-sided, 31% right-sided; and pulmonary symptoms 38% left-sided hernias, 34% right-sided. Surgical approach (n = 133) utilized included Laparotomy (38%), Thoracotomy (33%), Laparoscopy (11%), and Thoracoscopy (3%). Complications rates were found to be 20% for Laparotomy, 14% for Thoracotomy, and 7% for Laparoscopy. Thirty day mortality was found to be 5% for Thoracotomy, 2% for Laparotomy, and 0% for Laparoscopy.

**Conclusion:** Modern minimally invasive techniques for repair of Bochdalek hernia can be performed safely with minimal mortality.

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### VENTRAL HERNIA REPAIR IN PATIENTS WITH CIRRHOSIS

Carlos G Martinez MD, Afshin Eslami MD, Huseyin Kadikoy BS, Vadim Sherman MD, Baylor College of Medicine, Michael E. DeBakey Department of Surgery, Houston, TX

**Introduction:** Ventral hernias occur in up to 30% of patients with cirrhosis, however, elective repair is usually delayed until the onset of symptoms and is reserved for low risk patients. Hernia complications such as incarceration are usually treated with an open approach. Refinement of laparoscopic techniques has resulted in decreased morbidity in ventral hernia repairs and as a tool in emergent cases. The purpose of this study was to assess surgical outcomes of emergent and elective laparoscopic and open ventral hernia repairs in cirrhotic patients.

**Methods:** We retrospectively reviewed 14 cirrhotic patients who underwent 15 consecutive laparoscopic and open ventral hernia repairs by a single surgeon over a two year period (2006 to 2008) with a follow-up in the range of 2 months to 2 years at a large tertiary care center.

**Results:** 8/14 (57%) of patients were in class A, 2/14 (14%) were in class B, and 4/14 (29%) were in class C of the Child-Pugh classification. 9/15 (60%) of all the hernia procedures were attempted or completed laparoscopically and 6/15 (40%) were primary open repairs. 11/15 (73%) of cases were emergent (bowel incarceration, strangulation, or leaking ascites) and 4/15 (27%) were elective. 8/15 (53%) patients had incarcerated hernias. Of those, 1/8 (13%) had strangulated bowel which required a small bowel resection. Of the emergent cases, 8/11 (73%) were attempted laparoscopically, 6/11 (55%) were completed laparoscopically, and 2/11 (18%) were converted to an open procedure. 3/11 (27%) of the emergent cases were primary open cases. Of elective cases, 1/4 (25%) were completed laparoscopically and 3/4 (75%) were completed as open cases. 8/15 (53%) of the cases were umbilical hernias and 7/15 (47%) incisional hernias. 9/15 (60%) of the hernias were repaired with ePTFE mesh and 6/15 (40%) were repaired primarily. Of those repaired primarily, 2/5 (40%) of the hernias recurred and required a second repair with mesh. The mean size of the defects were 77 cm<sup>2</sup> (range 4 to 150). Operative time averaged 109 min (range 75 to 195) and estimated blood loss averaged 125 cc (range 50 to 200). Length of hospital stay (LOS) averaged 5 days (range 1 to 16). 6/14 (42%) patients were inpatients and 8/14 (58%) were outpatients at the time of hernia repair. The LOS averaged 7 days for the inpatient hernia repairs and 4 days for the outpatient hernia repairs (range 1 to 16 days). The complications of surgery included seroma 3/15 (20%), postoperative ileus 2/14 (13%), and wound infection 1/15 (7%).

**Conclusions:** Despite the increased risk of surgery in cirrhotic patients, laparoscopic surgery for elective and emergent ventral hernia repairs is a safe and effective option. Open ventral hernia repair has a high rate of recurrence, especially when performed emergently. Laparoscopic ventral hernia repair in cirrhotics should be considered early in the management algorithm.

24003

P473

### HISTOLOGIC AND IMMUNOHISTOCHEMICAL EVALUATION OF HUMAN ACELLULAR DERMAL MATRICES

David J Dexter MD, D L Hamlin, J S Roth, University of Maryland Medical Center

Background: Abdominal wall hernias are a common complication following abdominal wall surgery. Biologic matrices are used to repair these hernias due to their biocompatibility as well as their ability to serve as a matrix for tissue regeneration and remodeling. While freeze-dried human acellular dermal matrices (F-HADM) are proven effective in abdominal wall hernia repair, hydrated human acellular dermal matrices (H-HADM) have not been previously evaluated. This study evaluates the histologic pattern of inflammation and revascularization of H-HADM and F-HADM used in the repair of abdominal wall hernias in the rabbit model. Methods: Thirty-six 3-4 kg New Zealand white rabbits underwent laparotomy with creation of an abdominal wall hernia. After a period of defect re-peritonealization, the animals underwent hernia repair with H-HADM (Flex HD), F-HADM (Alloderm), or primary repair. Within each group, 4 animals were survived for 4, 8, and 20 weeks. Outcomes evaluated included white blood cells (WBC), eosinophils, vascular endothelium per high powered field (HPF).

Results: Thirty-five animals underwent abdominal wall hernia repair. Histologic evaluation demonstrated 144 WBC/HPF in H-HADM and 534 WBC/HPF in F-HADM at 4 weeks ( $p < 0.05$ ), 104 WBC/HPF in H-HADM and 314 WBC/HPF in F-HADM at 8 weeks ( $p < 0.05$ ) and 134 WBC/HPF in H-HADM and 144 WBC/HPF in F-HADM at 20 weeks (NS). There was a preponderance of eosinophils in all tissue/HPF in H-HADM and 302/HPF in F-HADM at 4 weeks ( $p < 0.05$ ), 41/HPF in H-HADM and 149/HPF in F-HADM at 8 weeks ( $p < 0.05$ ), and 86/HPF in H-HADM and 104/HPF in F-HADM at 20 weeks (NS). CD31 immunohistochemical analysis was performed to evaluate the pattern of vascular ingrowth. Vascular endothelium was seen throughout both grafts with no significant differences identified. Conclusions: H-HADM appears to have a reduced inflammatory response at 4 and 8 weeks compared to F-HADM. This difference is no longer apparent at 20 weeks. The significance of this finding is unclear and will need further study. H-HADM and F-HADM both appear to have similar patterns of vascular ingrowth at all time points.

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### LAPAROSCOPIC PARAESOPHAGEAL HERNIA REPAIR: AN EIGHT YEAR EXPERIENCE

Jennifer E Keller MD, Suman Medda, Michael H Raymond, Dimitrios Stefanidis MD, Kent W Kercher MD, B. Todd Heniford MD, Division of GI and Minimally Invasive Surgery, Carolinas Medical Center, Charlotte, NC

Introduction: Mandatory repair of paraesophageal hernias is no longer standard of care with a reported risk of strangulation of 1% per year. Methods of repair vary with regard to surgical approach and technique. We report our experience with laparoscopic paraesophageal hernia repair, using a variety of techniques for repair based on patient comorbidities, age, crural durability, and length of intraabdominal esophagus.

Methods: All patients undergoing paraesophageal hernia repair were enrolled in a surgical outcomes database. Demographics, operative procedures, and clinical outcomes were reviewed retrospectively. Techniques included crural reapproximation alone, CR with fundoplication CR with gastropexy, and gastropexy utilizing percutaneous endoscopic gastrostomy (PEG) fixation.

Results: From August 1999 - September 2008, 113 paraesophageal hernia repairs were performed at a single institution; laparoscopic ( $n = 108$ ) versus open ( $n = 5$ ). Conversion rate to open was 3.7% ( $n = 4$ ). Regarding laparoscopic repairs, primary CR alone or with gastropexy was used in patients with shortened intraabdominal esophageal length. Fundoplication, Nissen ( $n = 27$ ) or Toupet ( $n = 36$ ), was added when adequate length was present. CR with sutured gastropexy and paraesophageal hernia reduction with PEG gastropexy was used in older patients with multiple comorbidities and in patients unable to tolerate pneumoperitoneum for extended periods. Biologic mesh was applied to the diaphragmatic hiatus after reapproximation ( $n = 33$ ) when crural durability was questionable. Overall complication rate was 10.2% ( $n = 11$ ) and included dysrhythmia, venous thrombosis, pneumonia, pulmonary embolus, respiratory failure, and urinary tract infection. Mean follow-up was 22 weeks (range, 1-349). Two patients experienced a recurrence (1.8%) following laparoscopic repair; both developed severe post-operative vomiting within five days of repair. No complications or recurrences were associated with application of biologic mesh to the hiatus.

	Age(yrs)	BMI	ASA	LOS(days)
CR Alone ( $n = 9$ )	57.6(42-81)	31.2(22-53)	2.4(2-3)	9.3(2-55)
CR + fundoplication ( $n = 63$ )	62.2(27-89)	29(18-40)	2.3(2-4)	3.7(1-8)
CR + gastropexy( $n = 24$ )	66.8(47-86)	29.9(18-53)	2.4(2-3)	4(4-4)
PEG( $n = 12$ )	79.5(65-86)	22.2(18-40)	2.8(1-4)	11.3(3-50)

Conclusions: Laparoscopic paraesophageal hernia repair is safe and effective for the repair of paraesophageal hernias. Technique should be tailored to the individual patient based on age, comorbidities, intraabdominal esophageal length, and strength of the crura. Application of biologic mesh to the esophageal hiatus with crural reapproximation results in minimal morbidity and no recurrence to date.

24039

P475

### PREOPERATIVE PAIN DOES NOT PREDICT POSTOPERATIVE PAIN IN INGUINAL AND VENTRAL HERNIA REPAIR

Ajita S Prabhu MD, S Bringman MD, B J Ramshaw MD, T Divilio MD, D Simpkins MD, C Romanowski MD, AE Lincourt PhD, BT Heniford MD, Carolinas Medical Center

Introduction: Chronic pain is the most common complication following hernia repair. Thus far, the presence of preoperative pain has been of unclear significance as a predictor of postoperative pain.

Methods: A query of the International Hernia Mesh Registry was performed to include all inguinal and ventral hernia repairs within the registry. Patients with preoperative pain were compared with patients with no preoperative pain at 1 and 6 months postoperatively to determine if preoperative pain is an independent predictor of postoperative pain. Pain was assessed using the Carolinas Comfort Scale (CCS), a survey specific for quality of life following hernia repair. The CCS allows patients to rate sensation of mesh, pain, and movement limitations on an ordinal scale of 0-5, where higher scores correlate with increased pain. The pain scores from the CCS were used for the purposes of this study. The CCS was administered preoperatively and at 1 and 6 months postoperatively. Scores were compared using the Wilcoxon rank sum test. Results were considered significant if  $p < 0.05$ .

Results: The International Hernia Mesh Registry included 430 patients with inguinal and ventral hernia repairs. Of patients returning a CCS survey at 1 month postoperatively, 345 had preoperative pain, and 58 did not. Of patients returning a CCS survey at 6 months postoperatively, 114 had preoperative pain, and 21 did not. At 1 month postoperatively, patients with preoperative pain did not have significantly greater CCS pain scores (0.636, 0.125-4.857) than their counterparts without preoperative pain (0.517, 0-4.000)  $p = 0.64$ . Also, at 6 months postoperatively, patients with preoperative pain had a similar degree of discomfort as reflected by CCS pain scores (0.274, 0-4.000)  $p = 0.25$ .

Conclusion: Preoperative pain does not appear to be an independent predictor of postoperative pain in inguinal and ventral hernia repairs.

Minimally Invasive Other

22146

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**THE ROLE OF MINI-INVASIVE SURGERY IN MANAGEMENT OF ACUTE CHOLANGITIS AND OTHER COMPLICATIONS OF GALLSTONE DISEASE**

Viktor N Chernov PhD, Abdulkadir Yakubu MD, Rinat S Tinchurin PhD, Rostov State Medical University

**Aims and objectives:** The role of mini-invasive surgery in management of acute cholangitis and other complications of gallstone disease

**Background:** To demonstrate the capability of laparoscopic and small-incision in management of acute cholangitis and other complications of cholelithiasis.

**Material and methods:** Records of 2973 patients who underwent cholecystectomy at Department of General Surgery, Rostov State Medical University between the year 2004 and 2007 were reviewed.

Three hundred ninety two cases of gallstone-related complications were evaluated retrospectively and divided into three groups. Group1; LC included 258(65.8%) patients with laparoscopy cholecystectomy. Group 2; MC included 84(21.4%) patients with minilaparotomy cholecystectomy, while Group 3; OC included 50(12.8%) patients with conventional open cholecystectomy.

Demographic information, clinical characteristics, types of surgery, operation time, postoperative hospital stay, complications, conversion rate and postoperative mortality were evaluated.

**Results:** The age range of all subjects was 15 to 86 years; the mean age incidence was 57.12 ± 1.60 years, and the male: female ratio was 1:3.4. The age of 81.5% of all patients was 51 to 80 years. There were 27 (6.8%) patients out of the 392 cases presented with a combination of acute pyogenic cholangitis with other complications of cholelithiasis; mechanical jaundice in 26(88.9%), choledocholithiasis in 22(81.5%), biliary pancreatitis in 7(25.9%), common bile duct strictures in 5(18.5%), pericholecystic fibrotic mass in 4(14.8%) and emphyema in 3 (11.1%). Twenty three (85.2%) subjects had three and more of such combinations. Seventeen patients (63.0%) were associated with concomitant diseases.

The average duration of surgery in LC was 72 ± 9 minutes and 55 ± 2 minutes in MC group. Hospital days were comparatively less in the LC group, 11.4 ± 0.6 days as against 16.3 ± 2.3 for MC group. The median length of hospital stay following LC and MC was 7 and 10 days respectively.

**Conclusion:** Both mini-incision and laparoscopic prompt cholecystectomy during the index admission can be practiced with low and similar rate of complications in cholangitis and gallstones related complications.

22154

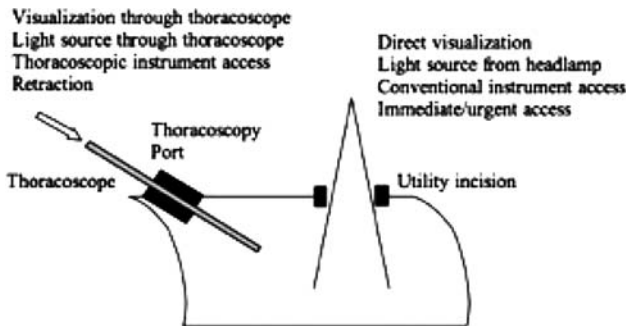
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**OUTCOMES OF A HYBRID TECHNIQUE FOR VIDEO-ASSISTED THORACOSCOPIC SURGERY (VATS) PULMONARY RESECTION IN A COMMUNITY-BASED PRACTICE**

Roger H Kim MD, Kazuaki Takabe MD, Charles G Lockhart MD, Virginia Commonwealth University, Richmond, VA, VCU Massey Cancer Center, Richmond, VA, Chippenham and Johnston-Willis Medical Center, Richmond, VA

**Background:** Despite more than 15 years passing since the first description of video-assisted thoracoscopic surgery (VATS) for pulmonary resection, the technique has yet to gain widespread acceptance, especially in community hospitals. The majority of surgeons who routinely perform VATS resections work in academic or government institutions. The perceived complexity of the technique, inadequate instrumentation and resources, and concern regarding the potential compromise of surgical and oncologic principles may present a greater barrier to adoption of the conventional VATS technique by community-based surgeons. The objective of this study was to determine the outcomes of a hybrid technique for VATS pulmonary resection utilized by a single surgeon in a community-based practice.

**Methods:** A series of 492 VATS pulmonary resections performed between January 2005 and March 2008 was retrospectively reviewed. All procedures were performed by a community-based, solo-practice surgeon using a hybrid VATS technique, with the routine utilization of a thoracoscopy port and a utility incision. The advantages of this dual access are ease in instrumentation, visualization, lighting, and retraction. In addition, this technique allows immediate access under direct vision for urgent control of bleeding, which can be difficult using a conventional thoracoscopic approach.



**Results:** There were 264 women (54%) and 225 men (46%), with a mean age of 62.8 years (range, 14–88). 166 patients (34%) had benign lesions, and 326 (66%) had malignant lesions. Lobectomy was performed in 242 patients (49%), segmentectomy in 127 (26%), wedge resection in 58 (12%), bleb resection in 45 (9%). Pneumonectomy was performed in 14 patients (3%) and bilobectomy in 3 patients (1%). The mean operative time was 52 minutes with a median of 48 minutes. There were no conversions to conventional thoracotomy. The mean length of stay was 7 days (median 4 days). The mean length of ICU stay was 1.7 days, with 85% of patients having no days spent in the ICU. Mean duration of time with a chest tube was 4 days. There were no intraoperative deaths, however, 17 patients (3.5%) died in the perioperative period (within 30 days of surgery). Overall survival was 91.2% over a mean follow-up of 239 days. These results compare favorably with outcomes reported for the conventional VATS approach. **Conclusions:** This series shows that a hybrid VATS approach to pulmonary resection can achieve outcomes comparable to those of conventional VATS. To our knowledge, this is the largest reported series of VATS pulmonary resection from a community-based surgical practice. This hybrid VATS approach is safe and feasible and may promote an increased utilization of thoracoscopic surgery among smaller, community-based practices.

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**APPENDECTOMY TRENDS LEAD TO ONE MAIN ROAD: LAPAROSCOPY**

Luke J Hofmann DO, Sukhyung Lee MD, James N Elder MD, John P Schriver MD, William Beaumont Army Medical Center

**INTRODUCTION:** The use of laparoscopic appendectomy has steadily grown since its inception. Various reports demonstrated its advantage over open approach in reducing postoperative pain, incidence of wound infection, shorter duration of hospital stay. Currently, the choice of operative approach is mostly at the surgeons' discretion. A retrospective study was performed to evaluate the trend for one procedure over another in an equal access federal health care system.

**METHODS AND PROCEDURES:** The computerized Surgery Scheduling System from July 1, 2000 through June 30, 2008, was queried for all appendectomies performed at our institution. Cases with additional procedures in addition to appendectomies were excluded. The usage of laparoscopic appendectomy over years was analyzed using Pearson's chi-square.

**RESULT:** During the study periods 623 appendectomies were performed with 212 (34%) open appendectomies and 411 (66%) laparoscopic appendectomies. Laparoscopic appendectomy became the procedure of choice over time (38% [117/310] from 2000 through 2004 vs. 94% [294/313] from 2005 to 2008, chi-square, p < 0.001). Open and laparoscopic appendectomies had similar procedure time over the length of the study (open: 71.5 ± 58.2 min vs. laparoscopic 74.86 ± 36.7 min, p = 0.451). However, mean procedure time for laparoscopic appendectomy has decreased from 86.3 ± 45.3 minutes (2000–2002, n = 39) to 71.24 ± 36.9 minutes (2006–2008, n = 202, p = 0.026). Average ages were similar between two groups (open: 29.7 ± 17.8 years old vs. laparoscopic 30.7 ± 15.7 years old, p = 0.468). Conversion rates for laparoscopic appendectomy were similar (2000–2002; 5.0% [2/37] vs. 2006–2008, 3.9% [8/211], chi-square, p = 0.658).

**CONCLUSION(s):** In an equal access federal health care system, the current rate of laparoscopic appendectomy is nearly 94% which is substantially higher than many previous reports.

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**SINGLE INCISION LAPAROSCOPIC CHOLECYSTECTOMY (SILC) STEP BY STEP: REFINING THE TECHNIQUE**

A Kandel MD, A Meguid MD, A Hawasli MD, St John Hospital & Medical Center, Detroit, Michigan SAGE Sponsor: Vic Velanovich, MD

**Background:** The traditional four incision laparoscopic cholecystectomy is being challenged by new innovative single incision approach. We present our refined technique of the single incision laparoscopic cholecystectomy (SILC), step by step, in an attempt to standardize this new technique and bring it as close as possible to the traditional four incision laparoscopic cholecystectomy.

**Method:** 12 consecutive patients underwent elective single incision laparoscopic cholecystectomy at a major laparoscopic center by the same surgeon (AH). The technique was divided into 5 stages. Each stage is made of several steps for a total of 15 steps. These steps will be illustrated and explained in the presentation. The stages are:

- A) Incision and trocar placement (4 steps). B) Exposure (4 steps).
- C) Dissection & clipping (3 steps) D) Hemostasis & clean up (2 steps).
- E) Extraction and wound closer (2 steps).

**Results:** We started the technique using single incision and three trocars with retractable curved dissectors & rigid 45 degree angle scope. After refining the technique the operative times were decreased from an average of 73 minutes in the first 4 cases to an average of 39 minutes in the last 4 cases, a 47% decrease (Fig. 1).

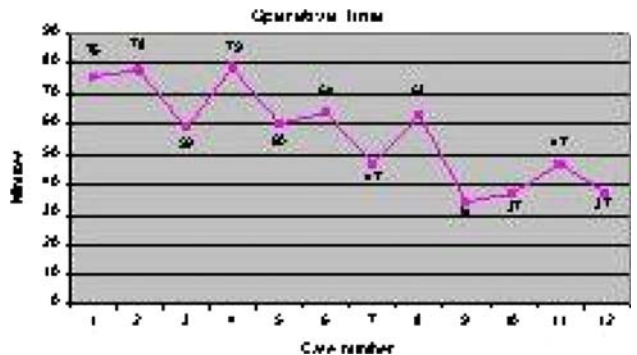


Fig. 1

Only complication was entry into the gallbladder during dissection from the liver bed in three patients. Nine patients were discharged the same day and three the following day. **Conclusion:** Single incision laparoscopic cholecystectomy can be used effectively for elective removal of the gallbladder with the same length of stay, operative time, and patient's safety as the traditional four-incision method. The technique can be taught to surgical residents maintaining reasonable operative time and low intra-operative complications.

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### TIME FOR A SERIOUS LOOK AT SAFE AND EFFECTIVE MANEUVERS OF OPEN SURGERY. HARMONIZATION WITH OPEN SURGERY

Shahram Nazari MD, Semira Mousavi Khosroshahi MD, H.Reza Sarie MD, Afshin Amini, Erfan Hospital

**Background:** Since its advent in the late 1980's, "Laparoscopic Cholecystectomy" has become the standard procedure for gall bladder surgery. Isolation of the cystic duct is the first dangerous technique in laparoscopic cholecystectomy. Nearly all of the laparoscopic surgeons are now popular with standard laparoscopic cholecystectomy, in which dissection begins at Calot's triangle. Despite increasing experience with laparoscopic cholecystectomy (LC), authors are continuing to report bile duct injuries which are greater than open surgery. Over the last decade, many surgeons prefer to do LCs in patients with high levels of difficulties. Now, patients with acute cholecystitis, gangrenous gallbladders, Mirizzi syndrome, gallstone pancreatitis or fibrotic, contracted gallbladders are not absolute contraindications for LC. So, it seems that the incidence of bile duct injury in LC rose again, today, in the hands of expert laparoscopic surgeons. In conventional open cholecystectomy, the fundus-down approach (FDA) and partial cholecystectomy (PC) are well recognized safe procedures during difficult cholecystectomies (DC) because it minimizes the risks of damage to the structures in or around Calot's triangle. In spite of this, fundus-first dissection and partial cholecystectomy are not widely practiced in LCs.

**Methods:** The purpose of this study was to evaluate the feasibility of PC and FDA in DCs. The study included 540 patients treated over 36 months who underwent LC by one surgeon. The inclusion criterion was the presence of ultrasound proven gallstones. The great majority were difficult cases, so we also reviewed the safety aspects of these approaches and evaluated whether they can prevent conversion in difficult cases. FDA was started in 45 patients; 40 procedures were completed laparoscopically. Five of the cases were further converted to open surgery. PC was done in 24 patients; all PCs were completed laparoscopically. The mean operative time was 95–130 minutes (mean 112.5), which is significantly greater than conventional standard LC (range 20–40 minutes, mean 30). PC and FDA were performed without immediate or late complications. **CONCLUSION:** FDA and PC appear to be safe procedures, and have the potentials to reduce the conversion rate in DC and may decrease the risk of injury to bile ducts.

**RECOMMENDATION:** FDA and PC could be started in DCs. The surgeon should have adequate laparoscopic experience and the surgeon must be familiar with intraoperative cholangiography and intracorporeal suturing. If in spite of these techniques, the anatomy is still obscure and the surgeon is not certain, he must convert to open surgery to prevent bile duct injuries.

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### TRANSUMBILICAL LAPAROSCOPIC UROLOGIC SURGERY – ARE SPECIAL DEVICES STRICTLY NECESSARY?

Anibal W Branco MD, Alcides J Branco Filho MD, William Kondo MD, Luciano C Stunitz MD, Cruz Vermelha Hospital, Curitiba, Paraná, Brazil

**Introduction:** Laparoscopic urologic surgery is generally performed using three to six ports by transperitoneal or retroperitoneal access. Recent developments regarding laparoscopic surgery have been directed toward reducing the size or number of ports to achieve the goal of minimal invasive surgery, by mini-laparoscopy, natural orifices access and transumbilical approach. In this paper we evaluated the safety and feasibility of transumbilical laparoscopic surgery using conventional laparoscopic instruments and ports.

**Methods and Procedures:** The Veress needle was placed through the umbilicus which allowed the carbon dioxide inflow. A 10 mm trocar was placed in the periumbilical site for the 30-degree scope followed by the placement of two additional 5 mm periumbilical trocars. The entire procedure was performed using conventional laparoscopic instruments. In the end of the surgery, trocars were removed and all three periumbilical skin incisions were united for the specimen retrieval.

**Results:** Six procedures were performed following this technique: three nephrectomies, one adrenalectomy, one ureterolithotomy and one retroperitoneal mass resection. The mean operative time and blood loss were 70.5 minutes and 108.3 cc, respectively. No intraoperative complications occurred and no patients needed blood transfusion. Analgesia was performed using dypirone (1 g IV q6 h) and ketoprofen (100 mg IV q12 h). Time to first oral intake was 8 hours. Mean hospital stay was 28 hours.

**Conclusions:** Laparoscopic transumbilical surgery seems to be feasible and safe even using conventional laparoscopic instruments, and can be considered a potential alternative for traditional laparoscopic surgery.

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### MDCT NAVIGATION FOR LAPAROSCOPIC APPENDECTOMY VIA A SINGLE UMBILICAL INCISION

Keiichi Fujino MD, Minoru Kakihara MD, Atsuki Noji, Tamio Yamasaki MD, Hidekazu Yano MD, Tonami Sato MD, Hiroyuki Kobayashi MD, Seiji Kado MD, Nobuo Kugai MD, Department of General Medicine, National Defense Medical College, Japan

**Introduction:** Although three ports laparoscopic appendectomy is traditional procedure, it needs the application of much expensive endoscopic instrumentation for resection and removal of the appendix. We studied the cases of three-dimensional (3D) imaging using Multi-detector CT (MDCT) to demonstrate the anatomical location of appendix clearly and of laparoscopic appendectomy via a single umbilical incision.

**Materials and Methods:** We performed MDCT in 42 patients of acute appendicitis between August 2006 and August 2008. The locations of the base of the appendix and McBurney's point were marked on a coronal image. The distances from umbilicus to the base of the appendix (UB), and the distances from the base of the appendix to McBurney's point (BM) were measured. In some cases, 3D-CT image were reformed for the laparoscopic appendectomy.

**Laparoscopic procedures:** A 1.5 cm skin incision was made in the base of the umbilicus and the abdominal wall was lifted by retractor. A scope and a grasper were introduced into the abdominal cavity through this incision. The operator imaged the location of the appendix by 3D-CT information, grasped, dissected the appendix from the surrounding tissues, and delivered through the same incision. The appendectomy was performed using conventional ligation method outside the abdominal cavity.

**Result:** The UB was 9.5±1.6 cm and BM was 2.7±1.6 cm. The base of appendix was located exactly at McBurney's point in only 3% among patients. When the laparoscopic view is directed to the target on McBurney's point, 92% cases of the base of appendix is located within the range 30°right to 30°left. Laparoscopic appendectomy were attempted in 12 patients, the mean operation time was 61 minutes. The mean postoperative stay was 5 days. All patients have no clinical problem and no visible umbilical scar.

**Conclusion:** 3D-CT image can provide useful information for the location of the appendix and helpful for surgical navigation as viewpoint of a surgeon or pre-operative surgical planning. This single umbilical incision procedure minimizes the skin incision and shows a better cosmetic and lower cost result compared to three ports laparoscopic appendectomy.

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### "INVISIBLE CHOLECYSTECTOMY" INITIAL EXPERIENCE OF HYBRID CHOLECYSTECTOMY

Carlos Alexandre G Fonseca MD, Josemberg Marins PhD, Manoel Galvão MD, Instituto de Endoscopia de Natal, UFPE, Gastro Obeso Center-

The operative technique and the results of the first 50 patients of hybrid cholecystectomy are fully described.

**Methods:** 50 Patients underwent to 'invisible cholecystectomy'. The surgical technique was a Transumbilical laparoscopic cholecystectomy with a 3 mm additional port in the epigastric area. Two trocar of 5 mm were introduced through the umbilical scar, the first one in midline with vertical incision and the second one with oblique incision, in lower right quadrant, both inside the umbilical scar. The third trocar, in epigastric area, keeping the usual triangulation observed in laparoscopic surgery. The gallbladder was pulled up with a wire introduced by a practical device created by us. The infundibulum was pulled down and right and makes easier the dissection of the triangle of Callot.

**Results:** 42 female patients and 8 male, All with ultrasonographic diagnose of cholelithiasis. Two patients one male and one female were previous submit to laparoscopic gastric bypass. The mean operative time was 58 minutes (range 36 to 142 min) with no conversions and no complications. Mean hospital stay was 28hs (range 18hs to 74hs).

**Conclusion:** The Knowledge obtained with the study of NOTES, TUFES, and LESS can be, and must be used in laparoscopic cholecystectomy to reduce operative trauma and improve cosmetic results. The use of conventional laparoscopic instruments, and keeping triangulation makes easier to introduce the advances in current surgical practice. The hybrid procedures are a important bridge in the way of NOTES and LESS in current surgical practice. The wire traction is a practical and easily reproductive device that can be used also in NOTES, TUFES and LESS.



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**A RIGID ACCESS PORT FOR TRANSUBILICAL SURGERY**

Stuart I Brown PhD, Timothy G Frank PhD, James L Gove, James D Martin, Ian Rutherford, Leslie Kelly, Alfred Cuschieri MD, IMSaT University of Dundee

**Introduction:** Several authors have reported laparoscopic procedures conducted through an umbilical incision, with the intention of further reducing trauma, hospitalization and recovery time compared to conventional laparoscopy. At least two access ports for such surgery are now available commercially, but developmental questions regarding the optimal design for this approach remain unanswered.

**Methods and Procedures:** The authors' institution, a collaboration of physicists, engineers and surgeons, targeted three design issues for transumbilical access: effecting a secure seal between the abdominal wall and the device, ensuring retention against the expelling forces of the pneumoperitoneum and optimizing instrument ergonomics within the limited space. The result is a rigid, conical device, secured with a simple screw form in the peritoneum and containing an array of sealed orifices for endoscopes (5 or 10 mm) instruments (2 to 5 mm) and clip applicators (5 mm). Instruments featuring a 20° proximal curve to left or right are deployed through the device and a dedicated device liver retractor was also invented. Initial evaluation was performed in dead porcine abdomens (n = 5) and thereafter in acute trials on White Landrace pigs (n = 4).

**Results:** Abdominal exploration and laparoscopic cholecystectomy was easily performed on all animals. The screw form provided secure fixation and no CO<sub>2</sub> leaks were noted under normal use. Deployment and retrieval of the port was easily accomplished by rotation in the appropriate direction. 'Clashing' of the surgeons hands was resolved by curving the instruments proximally, but the absence of curved laparoscopes and clip applicators impeded freedom-of-motion slightly.

**Conclusions:** The animal studies provide firm evidence of efficacy and human trials may now commence with confidence. It is important to curve the instruments at the point where they emerge from the device to prevent obstruction of hand movements. Further progress will be greatly enhanced by the production of suitably curved endoscopes and clip applicators. The designs are the subject of patent application and licensing agreements.

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**HALS NEPHRECTOMY AND DISTAL PANCREATECTOMY: APPROACH FOR DONOR BENEFITS IN SIMULTANEOUS PANCREAS AND KIDNEY TRANSPLANT**

Naotake Akutsu MD, Michihiro Maruyama MD, Chikara Iwashita MD, Kazunori Otsuki MD, Taihei Ito MD, Kenichi Saigo MD, Takashi Kenmochi MD, Department of Surgery, Chiba-East National Hospital, National Hospital Organization (NHO)

**[INTRODUCTION]** It is seriously important for living donations to make safer and to reduce operating stress. Laparoscopic surgery is thought to be a useful operating procedure for solving these problems. We performed first case of living donor (LD) simultaneous pancreas and kidney transplantation (SPKTx) in Japan in 2004, and until now, we have done 10 cases of LD-SPKTx. With donor operation, open approach had been performed for first 8 cases. However, in the last two cases, we started hand-assisted laparoscopic (HALS) living donor nephrectomy and distal pancreatectomy for donor benefits. In this presentation, we report successfully completed HALS living donor nephrectomy and distal pancreatectomy.

**[METHOD AND PROCEDURES]** In SPKTx donor operation with HALS approach, the patient was placed in the supine position rotated 30 degrees to the right. Placements of working ports were as follows (one hand port (7 cm); above umbilicus, three 12 mm ports; (left lateral abdomen, left subcostal abdomen and left lower abdomen)). First, we performed left nephrectomy after dividing ureter with double clipping and finally dividing renal artery and vein by ENDO GIA (Covidien). Next, we performed distal pancreatectomy. Resection position was above the left side edge of portal vein.

**[RESULTS]** Donors were a 58-year old woman and a 28-year old man. Their height, weight and body mass index were as follows (160 cm and 165 cm, 55 kg and 65 kg, 21.6% and 23.8%). Total operation time was 468}28 minutes. An estimated blood loss was 201}223 ml. A warm ischemia time of kidney was 149}40 seconds and that of pancreas was 300}85 seconds. As compared with open approach, HALS approach took more operation time and almost same ischemic time, but less blood loss. Graft functions in recipients were so good that urine from transplant kidney and normalizing of blood sugar were recognized immediately after transplantation. They discharged the hospital without remarkable complications.

**[CONCLUSIONS]** We demonstrated that HALS nephrectomy and distal pancreatectomy would have advantages of safeness for donor and of transplant organ function in SPKTx.

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**LAPAROSCOPIC SURGERY FOR SPLENIC ARTERY ANEURYSM -REPORT OF A CASE-**

Atsushi Iida MD, Kei Honda MD, Akio Yamaguchi MD, First Department of Surgery, University of Fukui

**[Introduction]** Splenic artery aneurysm is not common disease, but has a risk of rupture as the other visceral aneurysms. There are some reports to embolize it by interventional approach, however many of the cases resulted in splenic infarction and consequent splenectomy. Open surgical treatment is the current standard for those cases. We report a case of successful laparoscopic surgery for splenic artery aneurysm.

**[Patient]** 59-year-old man who has hypertension admitted a hospital complained slight back pain. Multi-slice CT scan and MR-angiography showed winding splenic artery and an aneurysm at the pancreas body. The patient consulted us to operate it by laparoscopic procedure.

**[Procedures]** We set the same settings as our laparoscopic splenectomy. We put one of each 11 mm and 12 mm trocar and two of 5 mm trocars. After the dissection and mobilization of spleen and pancreas body from left side, the splenic artery aneurysm was identified. The splenic arteries were isolated, and then the aneurysm was clipped and resected. Splenectomy was performed after confirmed insufficient blood flow in spite of the other branch of splenic artery. All procedures were performed at a time under laparoscopic.

**[Results]** The operating time was 259 min and the bleeding was 100 g. Post operative course was uneventful and the patient was discharged at the five post operative days with minimum wound.

**[Conclusions]** Laparoscopic surgery for splenic artery aneurysm was feasible treatment. The patient does not need to operate emergently for splenic infarction with symptoms. Multi-slice CT scan and MR-angiography were useful to describe the details of aneurysm for diagnosis.

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**CONSECUTIVE CASE SERIES OF SINGLE INCISION LAPAROSCOPIC CHOLECYSTECTOMY**

Katie Love MD, Curtis E Bower MD, ECU Department of Surgery, Brody School of Medicine

**Introduction:** After training for SILS cholecystectomy, the technique was introduced in clinical practice to any consenting patients who were candidates for standard four-port laparoscopic cholecystectomy. The feasibility of this technique and frequency of conversions were assessed.

**Methods and Procedures:** Over a one month period, 15 patients underwent laparoscopic cholecystectomy by an academic surgeon. The initial approach was via a single trans-umbilical skin incision using two 5 mm ports through different fascial sites. Standard laparoscopic instrumentation was used.

**Results (mean):** BMI: 23-45(34), Age: 30-77(50), Duration: 29-80(51) mins. Diagnoses included symptomatic cholelithiasis, acute and chronic cholecystitis, and biliary dyskinesia. There were two conversions to a four-port cholecystectomy when inflammatory tissue hindered retraction. There was one major complication of post-operative bleeding due to coagulopathy secondary to chronic medical conditions. There was one minor complication of persistent drainage from the umbilical incision.

**Conclusion:** With effective placement of retraction sutures, visualization and retraction are comparable to that of a multi-port approach. The technique is easy to master, and safe for any patient who is a candidate for laparoscopic cholecystectomy as ports can always be added in the event of a difficult dissection. Further data collection with long term follow-up will be needed to ensure equivalent outcomes. There will be demand for this approach by patients for cosmetic reasons, and it may serve as a bridge to natural orifice techniques.

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### INCIDENTAL GALLBLADDER CANCER AFTER LAPAROSCOPIC CHOLECYSTECTOMY AND THE NEED OF A COMPLETE STAGING

Thorsten O Goetze PhD, Vittorio Paolucci, Ketteler- Clinic Department of Surgery

**Introduction:** Incidental gallbladder carcinoma (IGBC) is a carcinoma first detected by the pathologist. The indication for the cholecystectomy was a benign disease. It is often supposed that the laparoscopic technique could deteriorate the prognosis of gallbladder cancer, often based on anterior data of only small groups and very often case reports. According to new data of the literature on the registry these can no longer be maintained. In the literature there is a big variety of different 5 year survival curves for the different T- stages, and often different staging methods are used (Nevin/JSBS/ 5th edition AJCC) so it seems to be very difficult for the surgeons to compare the different results. In 2010 the 6th edition of the AJCC- classification is going to be replaced by 7th edition, the question is if this is going to simplify the situation.

**Material and method:** To obtain data we are using the German- Registry of IGBC, which is an institution of the German Society of Surgery. We have calculated the data for the T- stages and AJCC- stages 6th edition.

**Results:** 606 cases of incidental gallbladder cancer have been recorded so far. There are 335 patients treated by the laparoscopic procedure, 158 by the open one, 111 with an intraoperative conversion from the laparoscopic to the open technique. After analyzing the T- stages the Kaplan- Meier graphs show a significant advantage for the laparoscopic procedure compared with the open surgery for the entire patients (n = 606) (p < 0,05). After analyzing the diff. T- stages separated acc. to the operation method, the laparoscopy seems not to worsen the prognosis. In 323 cases it was possible to make a complete staging, regarding the N and M- status. After analyzing the AJCC- stages for 323 there also seems to be no disadvantage for the laparoscopic treated patients.

**Discussion:** The access technique open or laparoscopic does not seem to influence the prognosis of incidental gallbladder carcinoma. The problem in the literature is, that often many authors only classify the tumors according to the T- stages without regarding the 'n' and 'm' status, so a variety of different 5 year survival curves exists. A possible explanation could be that nodal status is not known, or that the 6th edition UICC/ AJCC- system is very complex and difficult. In comparison the maybe 7th edition of AJCC- cancer staging system of Fong really seems to be a very good kind of classification the question is if it is going to simplify the problematic.

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### THE PERFORATION OF THE GALLBLADDER IN CASES OF INCIDENTAL GALLBLADDER CANCER- INDICATION FOR THE USE OF RETRIEVAL BAGS?

Thorsten O Goetze PhD, Vittorio Paolucci PhD, Ketteler- Clinic Department of Surgery

**Introduction:** The accidental intraoperative perforation of the gallbladder is a problem of the laparoscopic surgery, if an incidental gallbladder carcinoma exists at the time of operation.

According to the literature this complication comes up to 30% of the laparoscopic operations.

In order to prevent the dissemination of tumourcells the use of an isolation bag is proclaimed.

The question is if the intraoperative perforation of gallbladder carcinoma really leads to a prognostic deterioration and if the patients which have been treated with an isolation bag have an prognostic advantage.

**Material and method:** To obtain data we are using the data of the German- registry of incidental gallbladder carcinoma, which is supported by the German Society of Surgery. We are collecting our data with a standardized questionnaire, which has been sent to all german and now to all austrian surgical clinics as well.

In a period of 3 months we are actualizing the data.

**Results:** 606 cases of incidental gallbladder carcinomas are registered.

335 were operated laparoscopically, 105(31.3%) of them get a relapse of the tumour. 180 patients were treated with the support of an isolation bag, the rate of a relapse was 35% (n = 63).

155 of the laparoscopic group have treated without a isolation bag, the rate of an relapse was 27% (n = 42).

In 73 of 335 laparoscopic treated patients there was an intraoperative accidental opening of the organ, the rate of a relapse was 39.7% (n = 29).

In 51 of 73 cases an isolation bag was used, the rate of a relapse was 41.2% (n = 21). The other 22 of 73 patients who were operated without an isolation bag have a rate of relapse of 36.4%(n = 8).

The group without an intraoperative perforation (n = 262) have 29.0% (n = 76) of tumour recurrence.

129 of this 262 were treated with the use of an isolation bag, 42 (32.6%) of them had a tumour recurrence, the other 133 of the 262 patients treated without a bag had a recurrence rate of 25.6% (n = 34).

**Discussion:** In our registry, the intraoperative perforation leads to a significant prognostic disadvantage(p = 0.046 Fisher's exact test).

The patients treated with an isolation bag have a tendency of a higher rate of tumour recurrences (p = 0,055 Fisher's exact test), but the isolation bag was used significantly more often in cases of gallbladder perforation, nevertheless the recurrence rate is higher in patients without a intraoperativ perforation treated with the use of an isolation bag compared with those treated without a bag. The reasons therefore have to be discussed.

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### LAPAROSCOPIC SINGLE-ACCESS APPENDECTOMY

Dimitrios Tsakayannis MD, Andreas Kiriakopoulos MD, Dimitrios Linos MD, Department of Surgery, Hygeia Hospital, Athens, Greece

**Background:** Natural orifice transluminal endoscopic surgery (NOTES) has been proven to be technically feasible in animal models but still has significant limitations for human application. Single-access transabdominal surgery is a competing alternative which obviates the need for multiple incisions. Looking to minimize the operative trauma and following NOTES principles, we used the umbilicus, an existing natural scar, as the sole abdominal entry site to perform laparoscopic appendectomy. **Methods and Surgical Technique:** We performed laparoscopic transumbilical appendectomy in seven (7) patients with uncomplicated appendicitis. Patients with appendicular mass or abscess were excluded. Three 5 mm laparoscopic trocars were placed within the umbilicus with a bridge of fascia between them. A 5 mm 30 degree angle laparoscopic camera was placed for visualization through one port. A rigid grasper was placed from the other port to manipulate the appendix. The appendiceal mesentery was ligated with ultrasonic scissors. The base of the appendix was ligated with endo-loops. Once the dissection was completed, the appendix was removed from the umbilicus and the umbilicus reconstructed. **Results:** Seven patients (2 male, 5 female) with a mean age of 38 years (range 28–50) were included in this preliminary study. Mean operative time was 45 min (range 35–55). There were no conversions or postoperative complications. Mean hospital stay was 1.2 days. **Conclusion:** Laparoscopic single-access appendectomy was safe and feasible in our group of patients and maintains the principle of 'scarless' surgery. The advent of new instruments and access platforms will facilitate the wider application of this technique in the future. Prospective studies will be necessary to compare this technique with conventional laparoscopic appendectomy.

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### ENDOSCOPIC AXILLARY SURGERY

Jiri Vokurka PhD, Jitka Vokurkova PhD, Michal Kaspar MD, Tomas Paseka MD, Stanislav Krejsta MD, Surgical Dept.Hospital Boskovice, St.Anna's Faculty Hospital, Masaryk University Brno

**Introduction:** Biopsy of lymph node tissue helps in the staging of breast cancer, providing reliable prognostic information and identifying patients who will benefit from systemic therapy. Endoscopic techniques combined with liposuction have been developed to provide a minimally invasive technique.

**Methods and procedures:** In endoscopic axillary lymph node removal, very small incisions are made in the axillary skin and removes the lymph nodes using an endoscope. Liposuction is used to remove excess axillary fat.

**Results:** The operative time for endoscopic axillary lymph node removal found no significant difference in operation time between axilloscopy (162 minutes) and open surgery (148 minutes). We found good shoulder-arm mobility at 7 days postoperatively. Only 16% of axilloscopy patiens reported pain on the first postoperative day compared to 38% of open surgery patiens. The incidence of seroma following endoscopic axillary retrieval was 6%, wound infection in 5% of patiens.

**Conclusion:** The axilloscopic approach with liposuction to axillary region presents a safe procedure whose results are more favourable than those of open procedures.

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### NEEDLESCOPIC LUNG BIOPSY IN INTERSTITIAL LUNG DISEASE USING TWO-LUNG VENTILATION ANESTHESIA WITH LOW TIDAL VOLUME

Hyun Koo Kim MD, Doo Young Kang MD, Heezoo Kim MD, Young Ho Choi MD, Sang Ho Lim MD, College of Medicine, Korea University Guro Hospital

**Introduction:** One-lung ventilation plays a pivotal role in thoracoscopic lung biopsy. However, it has the disadvantages of causing hypoxemia, tracheobronchial trauma and oxidative stress caused by the pulmonary reexpansion, which could be harmful to the postoperative course of interstitial lung disease. We performed needlescopic surgery for interstitial lung disease using two-lung ventilation with low tidal volume and evaluated the feasibility and safety of this procedure.

**Methods and Procedures:** Eighteen patients (male, 8; mean age 58.6  $\pm$  0.96 years) with interstitial lung disease were included in this study. The patients were intubated with a single-lumen endotracheal tube and ventilated with a tidal volume of 10 ml/kg and a respiratory rate of 12 cycles/min at a FiO<sub>2</sub> of 0.5. Prior to entering the thoracic cavity, the tidal volume was reduced to 4 ml/kg, and the respiratory rate was increased to 24 cycles/min to maintain the same amount of minute volume as was present initially. A 2-mm needlescope and a 2-mm minisite endograsp were inserted at the sixth intercostal space along the mid and the posterior axillary line, respectively. A biopsy specimen was obtained using 1 or 2 endostaplers via an 11.5-mm port at the fifth intercostal space along the anterior axillary line. Airway pressure, end-tidal CO<sub>2</sub>, and the results of blood gas analysis were obtained right after endotracheal intubation and during the operation, and were compared. And, anesthesia and operation time were measured.

**Results:** Mean FEV1 and DLCO of the patients was 2.2  $\pm$  1.03L (range, 0.84 ~ 3.58) and 64.4  $\pm$  24.05% (range, 35 ~ 100). The tidal volume was 565.6  $\pm$  81.22 mL at anesthesia induction, which decreased to 289.4  $\pm$  59.74 mL during the two-lung ventilation. In one patient (5.6%), the tidal volume was additionally decreased by 75 mL to obtain an optimal working field. The differences between the airway pressure were significant between the two measurement time points (22.9  $\pm$  10.62 mmHg at anesthesia induction vs. 17.3  $\pm$  9.22 during operation,  $p < 0.5$ ). However, pH, PCO<sub>2</sub>, and PO<sub>2</sub> were not significant different. The oxygen saturation (99.1  $\pm$  0.83% vs. 99.5  $\pm$  0.53%,  $p = \text{NS}$ ) and end-tidal CO<sub>2</sub> (33.1  $\pm$  4.29 mmHg vs. 33.3  $\pm$  2.66,  $p = \text{NS}$ ) were not significantly different. The mean number of biopsy was 1.17  $\pm$  0.39 and pathology was confirmed at all cases. The time from intubation before the incision was 17.2  $\pm$  2.56 minutes, the operation time was 21.5  $\pm$  5.62 minutes and the total anesthesia time was 50.0  $\pm$  9.24 minutes. There was no case where needlescopic surgery was converted to an open thoracotomy or the two-lung ventilation was converted to one-lung ventilation. The chest tube was removed at postoperative day 1.8  $\pm$  0.96 (range, 1 ~ 4) with an exception of a patient who had air leakage until the postoperative 9th day. **Conclusions:** Needlescopic lung biopsy for interstitial lung disease using two-lung ventilation anesthesia with low tidal volume was much less invasive, safe and technically feasible.

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### ROLE OF VIDEO-ASSISTED THORACOSCOPIC ANATOMICAL LUNG RESECTIONS

Masahide Murasugi PhD, Masato Kanzaki PhD, Naoko Wachi MD, Tamami Isaka PhD, Toshio Shimizu PhD, Toyohide Ikeda PhD, Kunihiko Oyama PhD, Takamasa Onuki PhD, Sumio Nitta PhD, Tokyo Women's Medical University, Department of Surgery, Chest Institute, Tokyo, JAPAN

**INTRODUCTION:** Although video-assisted thoracoscopic surgery (VATS) is now widely accepted. However, VATS procedure is seldom used for pulmonary segmental resection. Various patterns of branching are seen for pulmonary arteries and veins in the lung hilum. Because a surgeon appreciates individual anatomy before an operation, an operative risk is reduced and indication is increased.

**SUBJECTS and METHODS:** Between 1993 and 2007, 857 patients underwent video-assisted thoracoscopic surgery (VATS) for primary lung cancers or metastatic lung tumors at the Tokyo Women's Medical University. Among them, 369 patients of anatomical lung resections were attempted using the VATS approach. We produced application software, and anatomical lung resection was simulated with personal computer.

**Results:** VATS was carried out with three surgical ports and small thoracotomy. Furthermore, a pulmonary three-dimension construction was performed using a personal computer, and an operation was simulated. About 1 hour was needed to make a three-dimensional image from 60 DICOM images of 2 mm thin slice CT. With Metasquid LE (free software) we can simulate cut the vessels and change the figure of them 3-dimensionally. The operative method performed 321 lobectomies, 9 bilobectomies and 39 segmentectomies. Median operation time was 278 minutes and average blood loss was 198 g. There population consisted of 235 males and 144 females with a mean ages of 66.7 (range, 28 to 87). Resected segment was S6 (n = 13), left upper seg. (n = 8), left4 + 5 (n = 7), S7 + 8 (n = 5), S1 + 2 (n = 3), S3 (n = 1), S7-10 (n = 1), S10 (n = 1). There was no surgical mortality.

**Conclusions:** Video assisted thoracoscopic anatomical lung resection is safe and may be an acceptable for lung tumors. In conclusion, surgeons appreciate individual anatomy and the simulation is thought to contribute to safety and increase of operative indication.

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### THE TREATMENT OF URACHAL REMNANTS BY LAPAROSCOPIC ASSISTANT OPERATION

Li GuiBin MD, Chen YuFeng MS, Qiu Yun MD, The 5th Central Hospital of TianJin China

**Objective:** To explore the application of laparoscopic technology in the operation of urachal remnants. **Methods:** Eight children with urachal remnants had been cured through urachal excision operation by Laparoscope in our hospital from July 2003 to January 2008. **Result:** All of cases recovered uneventfully. The mean operating time was from 30 minutes to 45 minutes. The mean postoperative hospital stay was 5 days. The curative effect is satisfied. **Conclusions:** To compare with traditional abdominal operation, the treatment of urachal remnants by Laparoscopic operation has the benefits of less invasiveness, giving satisfactory cosmetic results, early resumption of normal activities and assured curative effect.

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### 3D VISION ENHANCES TASK PERFORMANCE INDEPENDENT OF THE SURGICAL METHOD

Oliver J Wagner MD, Monika E Hagen MD, A Kurmann MD, Philipp Morel PhD, Daniel Candinas PhD, Stephan A Vorburger MSc, Division of Digestive Surgery, University Hospital Geneva and Department of Visceral and Transplantation Surgery, Inselspital, University Hospital Bern, Switzerland

**Background:** Despite well-established advantages of minimally invasive surgery, laparoscopy lacks of natural stereoscopic depth perception and spatial orientation. Therefore, these 2 parameters appear to represent major downsides of minimal-invasive surgery. Still, the importance and overall negative effect of this lack of natural stereoscopic depth perception and spatial orientation has not been clearly demonstrated. The aim of this study was to evaluate if three-dimensional (3D) visualization improves surgical skills and task performance when compared to two-dimensional (2D) vision.

**Material and Methods:** Difference between 3D and 2D vision was tested in 34 individuals of different surgical levels (n = 4: more than 10 years surgical experience, n = 8: 5-10y.; n = 9: 1-5y.; n = 13: no hands-on professional experience).

Each individual performed three different tasks (T1-3) in an open, laparoscopic and robotic surgical technique T1 intended to test three dimensional imaging and spatial relationships by using small rubber rings which had to be placed over soft cones for training simple grasping and positioning. T2 tested dexterity and precision using a suture that had to be passed from instrument hand to hand through 10 flexible small eyelets arranged in an S curve. T3 tested dexterity in suturing and knot tying of a simulated gaping skin incision. Each task was performed in a 3D mode using binocular vision for open performance, the Viking 3Di Vision System for 3D laparoscopic performance and the daVinci system in a 3D mode for robotic performance. Subsequently same tasks were repeated in a 2D mode respectively (open monocular by means of a blindfold, conventional laparoscopy, daVinci 2D mode). Times of each performance was taken and statistically evaluated.

**Results:** Loss of 3D vision increased difficulty and time to perform a task independent of the approach. To solve simple tasks in 2D vision it took about 25% longer than in 3D vision. For more complex tasks 2D vision prolonged the procedure by about 75%. For easy tasks laparoscopic and robotic assisted performance were similar with a trend towards shorter time for performance with the robotic system. For harder tasks performed under 3D vision, robotic-assisted performance was faster than laparoscopic performance. 3D robotic-assisted performance was superior to 2D laparoscopic performance, independent of the difficulty of the task. **Conclusion:** The percentage of time reduction by 3D to perform a task was dependent on the difficulty of the task and independent of the modality. The more complex a task, the more 3D vision increased performance compared to 2D vision.

Open approach was superior to laparoscopic or robotic-assisted procedures, independent of the task or vision. For harder than easy tasks performed under 3D vision, robotic-assisted performance is faster than laparoscopic performance. Performance under 2D vision is not significantly different between laparoscopy and robotic-assisted procedures, independent of the difficulty of the task. The importance of vision does not rectify to directly compare laparoscopic surgery with robotic-assisted surgery. The main difference between task performance in laparoscopy and robotic-assisted surgery seems to be the vision!

23303

P496

### LAPAROSCOPIC INTRAOPERATIVE HYPERTHERMIC CHEMOPERFUSION FOLLOWING RADICAL TOTAL GASTRECTOMY: A NOVEL TECHNIQUE

Naresh K Ahuja MD, Swati Patel MD, Ramesh Ramanathan MD, Department of Surgery, University of Pittsburgh, Pittsburgh, PA

**Objective of technique:** Several neo-adjuvant and adjuvant techniques has been described for advanced gastric cancer, including intraoperative hyperthermic chemoperfusion (IOHC). Laparoscopic radical gastrectomy (LRG) for gastric cancer has also been described, however, concurrent laparoscopic radical gastrectomy followed by IOHC remains unreported. We are reporting laparoscopic IOHC technique for advanced gastric cancer following a LRG.

**Technique:** A 45 years old female, diagnosed with advanced gastric cancer, was found to have absence of disease progression following four cycles of neo-adjuvant therapy, was operated for LRG and IOHC. Peritoneal cavity was accessed through five ports: three 5 mm ports were entered at right, left subcostal regions and right flank. Two twelve mm ports were entered at right and left paramedian lines approximately two finger breaths above umbilicus. Following LRG, GI continuity was restored and the crura were re-approximated. Subsequently, the specimen was extracted through extension of left paramedian trocar incision. Under laparoscopic guidance, two-20F inflow and two 30F outflow cannulae were positioned in upper and lower abdomen, through existing trocar site incisions. Peri-cannulae skin incisions were tightened with cannulae anchoring stitches to prevent extravasation of chemo. An intraperitoneal temperature sensor was placed through the abdominal wall. Connections of cannulae to the perfusion machine were established and primed with 3 liters of lactate ringer (LR); thirty mg of Mitomycin C was then added to perfusate. Fluid temperature was maintained to 42–43°C and intraperitoneal perfusate temperature was maintained at 41–42°C. A flow rate of 1300 ml/min was achieved. After 40 minutes, ten mg of additional Mitomycin C was added. Intraperitoneal chemoperfusion was maintained for a total of 110 minutes. After completion, perfusate was drained and peritoneal cavity was lavaged with 3 liters of LR. The cannulae were removed, ports were reinserted, and pneumoperitoneum re-established. Following feeding jejunostomy insertion, a JP drain was placed near anastomosis and duodenal stump. Finally, the ports were removed and wounds closed. Patient tolerated the procedure and discharged expectantly. **Conclusion:** Laparoscopic intraoperative hyperthermic chemoperfusion can be performed following laparoscopic radical gastrectomy for advanced gastric cancer.

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### FINANCIAL IMPACT OF LAPAROSCOPIC SURGERY AT A HIGH-VOLUME ACADEMIC CENTER

Guillaume Martel MD, Husein Moloo MD, Gino Picciano MS, Robin P Boushey MD, Eric C Poulin MD, Joseph Mamazza MD, The Ottawa Hospital, University of Ottawa, Ottawa, ON, Canada

**INTRODUCTION:** The objective of this study was to compare the hospital costs of laparoscopic and open foregut and colorectal surgery at our institution. **Methods:** Consecutive patients undergoing elective foregut surgery (fundoplication, paraesophageal hernia repair), segmental colectomy, and rectal resection between 2005 and 2007 were identified from a hospital administrative database. The Eclipsys Case Costing System, used for hospital budgeting, produced data for each patient. Descriptive comparisons of matching laparoscopic and open operations were generated. To standardize comparisons, emergencies, day surgeries, perioperative deaths, transfers to and from our institution, and outliers were excluded.

**Results:** In total, 73% of foregut procedures (138/190), and 30% of colorectal resections (314/1,050) were performed laparoscopically. The mean length of stay in hospital was 4.9 days shorter for laparoscopic foregut procedures (2.6 vs. 7.4 days), and 2.2 days shorter for laparoscopic colorectal resections (5.7 vs. 7.8 days). Laparoscopic foregut surgery was associated with a mean \$7,961 total saving per case, over open surgery. Laparoscopic foregut procedures were associated with mean savings per case in nursing (\$876), operating and recovery rooms (\$1,009), and special care unit (\$2,178) costs. Laparoscopic segmental colectomies were associated with a mean \$1,287 total saving per case, while laparoscopic rectal resections yielded a mean \$2,009 total saving per case. Although mean operating and recovery room costs per case were marginally greater for laparoscopic colorectal surgery (segmental \$504, rectal \$957), significant savings were achieved with nursing (\$870) and special care unit (\$1,818) expenditures. At current case volumes, laparoscopic procedures have yielded over five hundred thousand dollars per fiscal year in cost savings at our institution.

**Conclusions:** For both foregut and colorectal procedures, laparoscopy appears to be consistently cheaper than open surgery. While operating room costs are marginally higher with laparoscopic colorectal surgery, significant savings are achieved in other areas of patient care due to shorter hospital stays.

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### LAPAROSCOPIC REPAIR OF BLUNT DIAPHRAGM INJURY

DUSTIN W SMITH MD, TODD NICKLOES DO, ROB WILMOTH MD, Department of Surgery, University of Tennessee Graduate School of Medicine  
**Background:** Rupture of the diaphragm secondary to blunt trauma is not uncommon. It is primarily seen in high speed motor vehicle collisions. Repair of blunt diaphragm injury carries significant morbidity and mortality, especially if diagnosis is delayed. Laparoscopy has been investigated and validated as a diagnostic tool in penetrating trauma. However, its role in blunt diaphragm injury has not been well defined. Protocols defining selection criteria have not been standardized.

**Methods:** Retrospective data review from the Trauma Registry at our institution over a three year period. Detailed clinical data was collected including demographic information, mechanism of injury, method of diagnosis, delay in diagnosis, size and location of the defect, method of repair, operative time, estimated blood loss, and post-operative length of stay.

**Results:** Twenty-four patients were identified with diaphragm injury secondary to blunt trauma. Twenty-one of these were repaired via traditional laparotomy or thoracotomy, two were repaired in a laparoscopic fashion, and one died before any operative intervention. The laparoscopic repairs were performed without significant difficulty, blood loss, or increase in operative time when compared to the open cases. Post-operatively, the laparoscopic patients did not suffer any complications related to their repair. The length of stay for this group of patients was shorter than for those repaired in an open fashion.

**Conclusions:** The overall growth of minimally invasive surgery has led to the application of this technology for both diagnostic and therapeutic purposes in trauma patients. The results of this review support laparoscopy as an acceptable diagnostic and therapeutic alternative to conventional surgery in the carefully selected patient with blunt diaphragm injury. There may be an advantage of shorter post-operative length of stay in patients repaired with minimally invasive techniques.

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P499

### LAPAROSCOPIC REPOSITIONING OF VENTRICULOPERITONEAL SHUNT DUE TO CEREBROSPINAL FLUID PSEUDOCYST: A CASE SERIES IN ADOLESCENTS

T P Mayfield MD, B A Hiser MD, I Igbaseimokumo MD, S L Bachman MD, University of Missouri-Columbia, Columbia, MO, USA

Ventriculoperitoneal shunt remains one of the most common surgical forms of treatment for hydrocephalus. Many patients will eventually require a shunt revision for malfunction and recurrent hydrocephalus. For abdominal complications of ventriculoperitoneal shunts, laparoscopic techniques have been reported to be successful for shunt repositioning. We describe our recent experience at one institution in a series of adolescent patients.

Two patients aged 14 and 17 presented with mental status changes secondary to hydrocephalus and radiologic evidence of a malfunctioning ventriculoperitoneal shunt. Accessing the reservoir determined there was no proximal obstruction and a shunt series of plain x-rays confirmed there was no distal kinking. Abdominal ultrasound confirmed large cystic fluid collections surrounding the intra-abdominal catheter. In conjunction with general surgery and the neurosurgery team, an exploratory laparoscopy was planned. A 10 mm balloon tipped trocar was placed in the LUQ and conventional 15 mmHg insufflation was initiated. Two additional 5 mm ports were placed in each case for instrumentation, followed by a brief lysis of adhesions. The intra-abdominal portion of the ventriculoperitoneal shunt in both cases was identified within a fibrous capsule in the right upper quadrant, which was lysed with blunt and sharp dissection. The shunt tip was gently extracted from the pseudocyst, and examined for proper function and CSF flow. The catheter was then repositioned in the pelvis well away from the RUQ pseudocyst. There was no evidence of infection and the cyst was left undisturbed to resorb. In the second case an old, orphan catheter was also removed from the abdomen. Average operating time was 39 minutes. Both patients showed hydrocephalus resolution on post-operative CT scan and were discharged on post-operative day one.

Laparoscopic techniques are safe and highly effective means of managing intra-abdominal complications from ventriculoperitoneal shunts. A standardized multi-disciplinary approach may combine efficient service and excellent patient care.

23397

P500

### FEASIBILITY AND EFFICACY OF OPTIMAL PERITONEAL DIALYSIS CATHETER PLACEMENT USING A LAPAROSCOPIC TECHNIQUE

Adrian G Dan MD, Brian Lenczewski MD, Sean Rines, Steven Schultz BS, John Zografakis MD, Akron City Hospital - Summa Health System - NorthEastern Ohio Universities College of Medicine

**INTRODUCTION:** Peritoneal dialysis (PD) is an effective and accepted method for renal replacement therapy in patients with chronic renal failure. Various laparoscopic techniques have been described separately to optimize placement and reduce the potential of catheter related complications and failure. A study was undertaken to determine the feasibility and efficacy of combining these laparoscopic techniques for optimal placement of PD catheters.

**Methods:** A total of 20 laparoscopic PD catheter placements were attempted over 1 year. Highlights of the technique included placement of an adhesive betadine impregnated drape and betadine catheter site irrigation to avoid infection, use of fascia and muscle separating trocars to avoid hernia formation, omentopexy to the right upper quadrant using trans-abdominal suture passers to avoid omental wrapping, pre-peritoneal catheter tunneling under laparoscopic guidance, suture anchoring to the anterior abdominal wall to avoid catheter migration and flushing with heparinized saline at the end of the procedure to avoid fibrin clotting. Data regarding patient demographics and characteristics as well as feasibility of placement and any short term complications and catheter failures were recorded. **Results:** Laparoscopic PD catheter placement was attempted in 20 patients, all with an ASA of 3 or 4 and with a mean age of 55.4 years (M: F = 15:5). Catheter placement was successful in 95% (19/20) of patients and was aborted in one patient with extensive intra-abdominal ascites and adhesions (mean time of surgery = 37 min.). The procedure was performed as an outpatient in 95% (19/20) of patients and 5% (1/20) stayed for 23-hour observation. The mortality rate was 0% and the 30-day morbidity rate was 16% (3/19) and included 1 intra-abdominal hemorrhage, 1 urinary retention and 1 catheter site cellulitis. The catheter failure rate was 16% (3/19) and included 2 fibrin clots and 1 failure due to extensive adhesions. A total of 5 catheters were removed including 2 for catheter failure, 1 for intra-abdominal hemorrhage, 1 for patient wish to switch to hemodialysis and 1 due to no need after successful renal transplantation. One catheter required laparoscopic revision of the catheter for fibrin clotting.

**Conclusion:** Optimal placement of PD catheters using a combination of laparoscopic techniques is highly feasible (95%) and efficacious with acceptably low short term catheter complication and failure rates, comparing favorably with reported rates for the standard open technique.

23432

P501

### NEEDLE INGESTION: LAPAROSCOPIC AND ENDOSCOPIC TAILORED APPROACH

Hang Joo Cho MD, Kee Hwan Kim MD, Ji Il Kim MD, Chang Hyeok An MD, Jeong Soo Kim MD, Seung Jin Yoo MD, Keun Woo Lim MD, Department of Surgery, Uijongbu St. Mary Hospital, The Catholic University of Korea.

**Introduction:** Needle ingestion is extremely rare among the ingested foreign bodies. The longer, slender, sharp-ended foreign bodies such as needles, the chances of perforation are considerably greater. In most, foreign body ingestion cases are excreted per vias naturals, but in some cases, especially needles, the object does not pass naturally, and lead to perforation of the bowel. The authors experienced 3 cases of needle ingestion . two cases were treated by laparoscopic approach and one case was treated by colonoscopic approach.

Case 1

A 34-year-old man who ingested a needle about 10 days ago was referred to our clinic with left lower quadrant(LLQ) pain for 2 days. On Physical examination, the showed tenderness on LLQ area, but no rebound tenderness and muscle guarding. Abdominal plain X-ray and CT scan showed a needle in the descending colon and perforation into retroperitoneum. We performed laparoscopic approach and dissected white line, then removed the needle from descending colon. The regular diet started at POD#4, and patients discharged at POD #6.

Case 2

A 55-year-old man, who ingested two needles about 5 days ago, was referred to our clinic with RUQ and periumbilical pain for 2 days. Plain abdominal X-ray and CT scan showed needles located in 2nd portion of duodenum and proximal jejunum and the penetrated bowel wall. By laparoscopic approach, we removed the two needles from duodenum and jejunum and performed irrigation.

Case 3

A 30-year-old man who ingested a needle and coil spring of ballpoint pen about a week ago, visited clinic with RLQ pain. On physical examination he showed no tenderness or rebound tenderness. Plain abdominal X-ray and CT scan revealed a needle to be located and stucked in cecum and the coil spring portion located in sigmoid colon. There was no penetration finding. The coil spring was eliminated with defecation 1 day after admission. We performed colonoscopy and removed the needle with snare.

Result

Laparoscopic approach is treatment of choice that patients who have tenderness or rebound tenderness because needle can penetrate and perforate bowel. It is difficult to perform endoscopic or colonoscopic approach.

There was no need of additional suture, and we only performed irrigation and placed JP drain. If there was no perforation sign, the location of needle is adequate for endoscopic or colonoscopic removal, and endoscopic approach is a choice.

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### OPERATIVE RISK FACTORS INFLUENCING EARLY MORTALITY IN LAPAROSCOPIC REPAIR FOR PERFORATED PEPTIC ULCERS

Dennis Wong MD, Simon Wong MD, Wing Tai Siu MD, Michael Li MD, Department of Surgery, Pamela Youde Nethersole Eastern Hospital

**Aim:** To review a single institution's experience on routine use of laparoscopic repair for perforated peptic ulcers and to determine risk factors that may be associated with increase mortality.

**Methods:** From February 1997 to December 2007, all cases of non-iatrogenic perforated peptic ulcers (PPU) from our institution were retrospectively reviewed. Data collection included patient demographics, ulcer characteristics, operative morbidity and mortality.

**Results:** During the 10-year study period, there were a total of 338 cases of PPU. 28 cases were excluded due to atypical presentation or iatrogenic causes. Of the 310 cases included, 217 underwent laparoscopic patch repair. There were 93 cases of open conversion (30%) due to failure to identify perforation site, large ulcer, severe peritoneal contamination and/or additional procedure required. Overall morbidity rate was 24.8% that included leakage and collection requiring intervention, chest and wound infection, and reoperation. There were 29 cases of mortality (9.4%). Multivariate statistical analysis showed that preoperative risk factors (age > 70, ASA > 3, delayed presentation > 24 h) and intraoperative risk factors (severe peritoneal contamination and operation time) were independently associated with increased mortality.

**Conclusions:** Outcome in laparoscopic repair for PPU can be further improved by careful patient selection. Early open conversion to shorten operation time, as determined by the presence of risk factors, may reduce mortality.

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### LAPAROSCOPIC ASSISTED EXCISION OF RETROPERITONEAL FILARIAL LYMPHANGECTASIA PRESENTED WITH BILATERAL GROIN SWELLING

HIJRAN MAHDI MD, AL-KHOR HOSPITAL, HMC, QATAR

This is a rare presentation of Filariasis affecting Retroperitoneal region presented with Bilateral Groin Swelling treated by Laparoscopic and bilateral groin excision. Wuchereria bancrofti: the major parasite causing lymphatic filariasis. Hydrocele is the most common manifestation of chronic W. bancrofti infection in males, in endemic areas.

**CASE REPORT:** A 21-year old Nepali male admitted to our hospital in QATAR complaining of bilateral painless groin swelling. By examination, the patient looked healthy, afebrile, not pale, not jaundiced, no lymphadenopathies. Local examination revealed 10 x 8 cm soft swelling on the left groin (femoral triangle) and 6 x 4 cm same consistency swelling on the right side. The overlying skin where intact with no erythema, pigmentations, or dilated veins. The swellings were more prominent on standing while reduced on lying down. Non tender, partially compressible, no thrill or bruit over them, no lower limbs swelling.

The patient investigated by Ultrasound which revealed large lobulated soft swelling. CAT scan and MRI showed Retroperitoneal infiltrative lesion, extending from the level of the renal hilum down to inguinal regions along the course of iliac vessels. Contrast study from the left groin swelling suggested the diagnosis of lymphangectasia while cytopathology of the aspirate which was bloody chyle showed microfilariae (Wuchereria bancrofti).

The patient underwent laparoscopic exploration using 3 trocars same as TAPP technique for hernia repair. Methylene blue injected in the groin swelling externally and showed clear boundaries of the stained lymphangectatic lesion by laparoscopy which facilitated preperitoneal dissection and excision of the lesion down to femoral canal, then followed by external incision in the groin to excise the external component of the lymphangectatic lesion. Histopathology of the excised specimen confirmed the diagnosis of filariasis and the patient was given anti-filarial medications.

**In Conclusion,** this is a rare case of retroperitoneal filariasis extending through the femoral canal to the groin treated by laparoscopic assisted excision and medications.

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P504

### LAPAROSCOPIC TREATMENT OF CHRONIC SMALL BOWEL INTUSSUSCEPTION DUE TO MECKEL'S DIVERTICULUM IN AN ADULT MALE

Daniel M Alterman MD, Matthew L Mancini MD, The University of Tennessee Graduate School of Medicine

**Objective:** The role of laparoscopy in small bowel obstruction remains controversial and it has been rarely reported in the treatment of acute obstruction secondary to Meckel's diverticulum. Chronic intussusception can have variable symptoms and diagnosis is challenging. We present a case of chronic small bowel intussusception in an adult man secondary to Meckel's diverticulum that was treated laparoscopically.

**Methods:** A case report and review of the literature is presented concerning laparoscopic treatment of chronic intussusception and of Meckel's diverticulum in the adult.

**Results:** A 53 year old man complained of intermittent abdominal pain and after endoscopic evaluation was found on CT scan to have small bowel intussusception without acute obstruction. A repeat CT scan indicated similar findings. Diagnostic laparoscopy revealed the intussusception and small bowel resection with anastomosis was performed. Pathologic review confirmed chronic intussusception due to Meckel's diverticulum.

**Conclusions:** Previous case series and reports have indicated that laparoscopy is safe and effective for the evaluation and treatment of symptomatic Meckel's diverticulum. To our knowledge this is the first report of successful laparoscopic treatment of chronic small bowel intussusception due to Meckel's diverticulum in the adult. Laparoscopy appears to be safe and effective for the evaluation and treatment of the symptomatic Meckel's diverticulum.

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### CHOLANGIOSCOPIC LASER LITHOTRIPSY FOR COMPLETE ENCRUSTATION OF THE EXTRA-HEPATIC BILIARY TREE BY 15-YEAR RETAINED BILIARY STENT

Steven P Bowers MD, David Thiel MD, Susanne Preissler BS, Steven Lange MD, Anthony Adelson MD, Mayo Clinic, Florida

The authors report on a case of stone-stent complex encrusting the entire extra-hepatic biliary tree after biliary stent placed in 1993 for gallstone-associated pancreatitis. The patient presented with cholangitis 14 years after initial treatment, and underwent multiple serial ERCP procedures for biliary decompression and papillotomy, but failed removal of the stent-stone complex. Figure 1 shows MRCP image with complete encrustation of the extra-hepatic biliary tree. Initial treatment consisted of percutaneous biliary decompression with an internalized trans-hepatic drain. After 6-week maturation of the trans-hepatic drain tract, the patient was taken to the operating room for percutaneous cholangioscopic laser lithotripsy. A sheath was placed in the drain tract, enabling passage of a 7.5 French choledochoscope, and the Holmium laser was used with a 200 micron fiber at 1.0 Joules and 10 Hz. The encrusted stone was progressively fractured off the stent in two operative stages separated by two weeks, allowing endoscopic retrieval of the stent at the second stage. Two weeks following the stent retrieval, follow-up cholangiogram revealed complete clearance of the biliary tree (Figure 2)

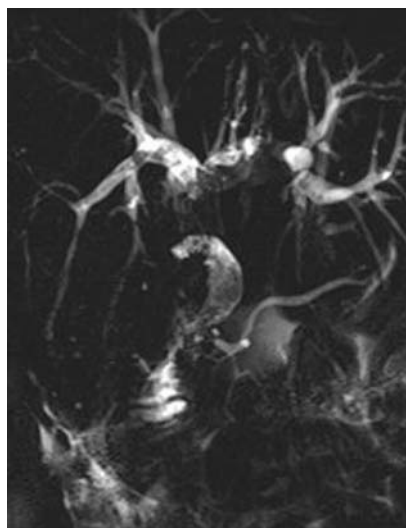


Fig. 1 MRCP showing dilated cystic duct and large stone-stent complex

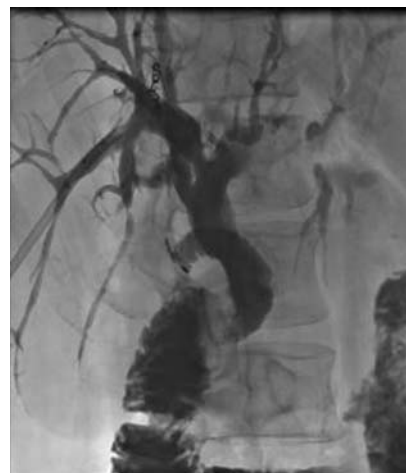


Fig. 2 Completion cholangiogram prior to removal of PTC drain

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**LAPAROSCOPIC SURGERY IN A RURAL COMMUNITY IN GUATEMALA**

J Pfluke MD, J Love DO,S Nicholson MD, R Stewart MD, M Corneille MD, Department of Surgery, University of Texas Health Sciences Center, San Antonio, TX

Introduction: Advantages of laparoscopic surgery have been well demonstrated, though primarily through experiences in industrialized nations. However, there are few reports of laparoscopy performed in developing countries. Economic, logistic and technical factors have been cited as obstacles to performing laparoscopic surgery in underdeveloped nations.

Methods: A surgical team consisting of general surgeons, gynecologic surgeons, anesthesiologists, senior surgical residents, and operating room support personnel was assembled. Surgical equipment and supplies were acquired through corporate donations and private purchases. Patients were evaluated by local physicians prior to our arrival, and those with surgical diagnoses were evaluated by our team. Operations were performed at a government sponsored hospital in Uspantán, a rural community in the highlands of Guatemala in July 2008.

Results: 65 patients underwent 70 operations. 11/70 (15.7%) were performed laparoscopically, including 8 laparoscopic cholecystectomies, 2 laparoscopic tubal ligations, and 1 diagnostic laparoscopy. 2/8 (25%) cholecystectomies were converted to the open approach: 1 due to severe adhesions from a previously aborted open cholecystectomy, and 1 due to bleeding and equipment malfunction. No post-operative complications were identified prior to discharge from the hospital. Local physicians were contacted 3 months post-operatively, and no other complications were reported. Aging optical systems and insufflation devices represented the greatest challenges intra-operatively.

Conclusions: Basic laparoscopic surgery can safely and successfully be performed in developing, resource-poor countries. Technical and economic obstacles exist, but can be overcome with careful patient selection and minor changes in operative technique.

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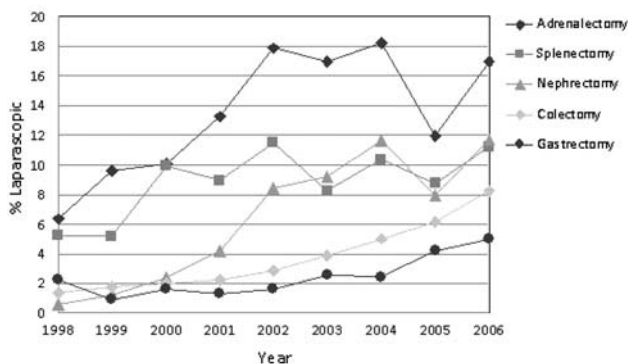
**NOT FOLLOWING THE TREND: SLOW GROWTH OF COMPLEX LAPAROSCOPIC PROCEDURES IN THE UNITED STATES**

Anand Singla BA, Sing Chau Ng MS, Nicholas G Csikesz, James Hart BA, Richard A Perugini MD, Demetrius E Litwin MD, Jennifer F Tseng MD, Shimul A Shah MD, Department of Surgery, Surgical Outcomes Analysis & Research, University of Massachusetts Medical School, Worcester, MA

Laparoscopic (LAP) surgery has experienced significant growth since the early 1990s and is now considered the standard of care for many procedures like cholecystectomy. Increased expertise, training and technological advancements have allowed the development of more complex LAP procedures including removal of solid organs. Unlike LAP cholecystectomy, it is unclear whether complex LAP procedures are being performed with the same growth today. Methods: Using the Nationwide Inpatient Sample (NIS) from 1998–2006, patients undergoing elective LAP or open colectomy (n = 209,769), gastrectomy (n = 17,289), splenectomy (n = 9,174), nephrectomy (n = 64,171) or adrenalectomy (n = 5,556) were identified. The Elixhauser index was used to adjust for patient comorbidities. Main endpoints were adjusted in-hospital mortality, adjusted length of stay (LOS) and total hospital charges.

Results: Complex LAP procedures account for a small percentage of total elective procedures (colectomy: 4.0%; splenectomy: 8.8%; gastrectomy: 2.4%; nephrectomy 7.0%; adrenalectomy 14.2%). These procedures were performed primarily at urban (94%) and teaching (63%) centers. Although all LAP procedures trended up, the growth was greatest in LAP colectomy and nephrectomy (p < 0.001). All LAP procedures except for gastrectomy had a significantly reduced chance of prolonged length of stay when compared to their respective open procedures and adjusted for patient and hospital factors (p < 0.002). Only LAP splenectomy resulted in a significant hospital cost benefit compared to open splenectomy (p = 0.0002). After adjusting for patient and hospital factors, there was a mortality benefit only for LAP colectomy (OR 0.55; 95% CI 0.39 – 0.78) and splenectomy (OR 0.27; 95% CI 0.09 – 0.85) when compared to their respective open procedures.

Conclusions: Despite the significant benefits of complex LAP procedures as measured by LOS, hospital charges and in-hospital mortality, the growth of these surgeries has been slow unlike the rapid acceptance of LAP cholecystectomy. Future studies to identify the possible causes of this slow growth should consider current training paradigms, technical capabilities, economic disincentive and surgical specialization.



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**DIRECT ACCESS TO THE ABDOMINAL CAVITY AND AVOIDANCE OF FACIAL CLOSURE WITH BLADELESS OPTICAL TROCAR SYSTEM**

Ismail H Ozerhan MD, Onur C Kutlu MD, Yusuf Peker MD, Sadettin Cetiner MD, Turgut Tufan MD, Gulhane Medical Academy Department of General Surgery Ankara Turkey, Etimesgut 600 Bed Army Hospital Ankara Turkey

Background: Direct access under visualization to the abdominal cavity is becoming more popular and new systems are being introduced. The authors summarize their experience on the safety of the ethicon endopath bladeless trocar system.

Materials and Methods: 528 procedures (481 Laparoscopic Cholecystectomy, 28 Laparoscopic Gastric Bypass, 19 Laparoscopic Nissen Fundoplication) were performed with the Endopath optical bladeless trocar system between 2005 and June 2008. Total of 1678 ports were placed. No facial closures were performed.

Results: Mean followup was 11 months, 82% of the patients were available for followup. No abdominal organ or vascular injuries have been encountered during the procedures. No internal herniation or symptom resembling intrabdominal adhesion formation was seen. Only 1 port side herniation was encountered. 0.05%, only 1 port site bleeding was encountered 0.05%. No other access site related complications were encountered.

Conclusion: Peritoneal access with the Endopath Optical Bladeless trocar system yielded excellent results in our series for the prevention of access site related complications. Although these results are yet to be confirmed by other researchers, we believe that bladeless access systems are safe and effective for the prevention of complications.

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**ENDOSCOPIC VERSUS OPEN HARVESTING TECHNIQUES IN PIG FLAP MODELS**

Alexandru Blidisel PhD, Lucian Jiga PhD, Alexandru Nistor MD, Vlad Dornean MD, Mihai Ionac PhD, University Of Medicine and Pharmacy from Timisoara

Introduction: In an era of minimal invasive surgery, endoscopic flap harvesting has not been widely accepted as the gold standard for harvesting muscles flaps, despite numerous benefits over the open technique. This is due to a lack of experience for most consultants with this new method. Aim of this study was to determine if the endoscopic technique can deliver better results than the classical one when applied by surgical residents without classical flap harvesting experience.

Materials and Methods: This study analyses three experimental flap models in pigs (gracilis, rectus abdominis, latissimus dorsi) comparing the endoscopic assisted technique with the open one in 23 trainees without extensive endoscopic experience, harvesting a total of 68 flaps. A brief presentation of the techniques used in the endoscopic models is given in contrast to the open models. Evaluation was based on the following criteria: total procedure time, complications, post-op recovery time, Difficulty and learning curve.

Results: Endoscopic flap harvesting performed by trainees without extensive experience, still yields better results over the open technique and has major advantages such as minimal donor site morbidity and pain, less scarring and early recovery. The disadvantages include a longer procedure time, 2D vision and a longer learning curve. Mean operating time was significantly higher for the endoscopic procedure (120–210 min) compared to the open models (90–150 min). The recovery period ranged from 4 h to 12 h for the endoscopic assisted procedure versus 36 h to 72 h in the open procedure. The overall difficulty was not significantly higher for the endoscopic assisted model (3.26 out of 5) compared to the open one (2.42 out of 5).

Conclusions: Given the low complication rate and relative ease of harvest, 24 out of 26 trainees would apply the endoscopic technique in the clinic. We conclude that the endoscopic technique is currently the best way to harvest these types of flaps, despite being underrated by senior consultants.

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### OPTIONS AND TECHNICAL SOLUTIONS IN SINGLE INCISION LAPAROSCOPIC CHOLECYSTECTOMY

Alberto R Iglesias MD, Atul K Madan MD, Jose M Martinez MD, Emanuele Lo Menzo MD, Diya I Alaedeen MD, Division of Laparoscopic Surgery, Department of Surgery, University of Miami

**Introduction:** Single incision laparoscopic cholecystectomy (SILC) may offer advantages over traditional laparoscopic cholecystectomy. However, surgeons must be able to offer this procedure with equal safety and results. Thus, various technical options should be in the repertoire of any surgeon planning on performing SILC. The objective of this study was to describe various technical nuances and options for SILC.

**Methods:** Technical variations and options were reviewed from patients who underwent SILC. Advantages and disadvantages were ascertained from the operating surgeon on all cases. Any other involved laparoscopic surgeons were asked to give input about the various options.

**Results:** For incision the options noted were: vertical through the umbilicus, transverse through the umbilicus and below the umbilicus. For access to peritoneal cavity: Veress needle, optical viewing trocar without insufflation, modified Hasson, and blind insertion. For trocars: low profile 5 mm trocars, two 5 mm trocars of varying length, and a larger trocar with separate openings. For optics, options were: angled 5 mm rigid laparoscope, angled 45 cm 5 mm scope and a flexible tip 5 mm laparoscope. For retraction: third instrument and transabdominal sutures. For securing of traction sutures: figure of 8 and clips. For dissecting instruments: standard 5 mm laparoscopic Maryland dissector, standard 5 mm laparoscopic right angle dissector, reticulating and articulating 5 mm laparoscopic Maryland dissector, and 5 mm ultrasonic dissector. For removing the gallbladder: laparoscopic 10 mm retrieval bag versus no bag. The preferred options were a vertical incision through the umbilicus, an optical view trocar, larger trocar with separate openings, flexible tip 5 mm laparoscope, transabdominal sutures, figure of 8, ultrasonic dissector and laparoscopic retrieval bag.

**Conclusions:** While various technical options are available, a preferred and reproducible technique has been developed. Surgeons should understand the various alternatives to their preferred technique in SILC. These various options should enable easier adoption of SILC for most surgeons.

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### A NOVEL APPROACH TO LAPAROSCOPIC-ASSISTED TRANSGASTRIC ERCP AFTER ROUX EN Y GASTRIC BYPASS

Larissa E Coleman MD, Lily Chang MD, Virginia Mason Medical Center, Seattle, WA, USA

**Background:** Since the advent of the Roux-en-Y Gastric Bypass (RYGBP), an increasing number of patients with altered upper gastrointestinal tract anatomy require endoscope retrograde cholangiopancreatography (ERCP). Endoscopic access to the remnant stomach with laparoscopic assistance is a technique well-described in the literature. However, manipulation of the flexible gastroscope within the peritoneal cavity and gastric remnant can be difficult. The purpose of this study was to describe a new variation on the laparoscopic-assisted transgastric ERCP approach. The new approach decreases operative time, eases access into the remnant stomach, and does not add significant cost to the operation.

**Methods:** Five patients with prior history of RYGBP who underwent laparoscopic-assisted transgastric ERCP for post-cholecystectomy common bile duct stones over a one year period were reviewed. The first four patients underwent standard laparoscopic access into the abdominal cavity with lysis of adhesions and identification of the remnant stomach. The ERCP scope was introduced into the peritoneal cavity through a left upper quadrant incision, then inserted into the remnant stomach through a gastrotomy. After completion of the ERCP, the scope was removed, and the gastrotomy was closed using a laparoscopic stapler. A new approach was used for the fifth patient. Access to the gastric remnant was identical to the prior patients. In contrast, a sterile rigid sigmoidoscope was placed through the abdominal wall in the left anterior axillary line, then through the gastrotomy, and directed into the antrum directly facing the pylorus. The ERCP endoscope was placed through the sigmoidoscope and easily advanced through the pylorus into the duodenum. Operative times and additional costs were evaluated.

**Results:** The operative times ranged from 137 to 188 minutes in the prior method (137, 141, 169, 188), with the new method taking only 98 minutes. All of the ERCP's were accomplished but in much less time and with greater subjective ease to the endoscopist. The operating room cost is about \$30.00 per minute. The additional cost of the rigid sigmoidoscope is only \$2.73. All of the patients did well and there were no complications.

**Conclusion:** Altered upper gastrointestinal anatomy will continue to become more prominent with the popularity of RYGBP. Access to the hepatobiliary tree via the gastric remnant using laparoscopic-assisted endoscopy is a safe and direct approach. With our novel technique using a rigid transabdominal-transgastric sigmoidoscope as an over-tube, this procedure is now faster and easier for the endoscopist, without adding significant cost.



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### LAPAROSCOPIC RESECTION FOR DUODENAL CARCINOID

Jan Dostalík MD, Petra Gunkova, Lubomir Martinek, Igor Gunka, Libor Machytka, Miloslav Mazur, Teaching Hospital Ostrava

Laparoscopic resection for duodenal carcinoid

Carcinoids are heterogeneous group of neuroendocrinal tumours. Relatively benign characteristics, slow progression, low metastatic potential and absence of endocrinal activity are typical for localization in duodenum. Type and extent of surgery depends on size and staging of tumour. 27 years old female patient with well differentiated carcinoid in the second part of duodenum is presented. The tumour of size 5 x 3x2 mm manifested with abdominal symptomatology did not invaded muscularis propria. Scintigraphy did not demonstrated others pathologic deposits of somatostatin receptors. The wedge resection of duodenal wall was performed laparoscopically with preoperative endoscopic localization and marking of the tumour. Uneventful operation and postoperative course presents contribution of the miniminvasive surgery for specific duodenal lesions.

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### INITIAL CLINICAL ASSESSMENT OF UROLOGICAL LAPAROSCOPIC SINGLE-SITE (LESS) SURGERY

Fernando J Kim MD, Wilson R Molina MD, Mario Chammas MD, Ernest E Moore MD, Division of Urology, Denver Health Medical Center and University of Colorado Health Sciences Center

We examined the initial clinical experience of Urological LESS surgery in our institution.

**Methods:** Since June of 2008, a total of 10 patients underwent LESS surgery (simple Nephrectomy and renal cryoablation).

**Surgical Technique:** Laparoscopic entry technique is performed using the Veress needle for initial CO2 insufflation. Umbilical site incision is used for the placement of a 12 mm bladeless trocar that is exchanged for the R-Port immediately after successful entry into the intraperitoneal cavity, allowing placement of instruments i.e., laparoscopic ultrasound probe, staplers, clip applicators as traditional laparoscopic procedure but through a 1.2 cm incision. The use of 'linear' optics i.e., Olympus endoeyeTM, and laparoscopic instruments that can offer multiple functions (grasping/cutting/hemostasis); i.e., GYRUS bipolar cutting forceps, and instruments with high degree of freedom i.e., Cambridge Endo AutonomyTM Lapro-AngleTM, are pivotal to facilitate this surgical technique.

**Results:** A total of 10 patients underwent LESS (2 Simple Nephrectomy and 8 Renal cryoablation).

Table 1 represents demographic data

Table 2 represents operative data (mean + SEM)

OR time minutes	Side of surgery	EBL (cc)	Hosp stay (hr)
88.7 + 13	2L/8R	85.5 + 23	48 + 9.5

Previous abd. surgery-none. FU (mo) 1.57 + 0.57

**Conclusions:** There is a learning curve for the proficient laparoscopic surgeon due to the technical challenge to triangulate and grasp tissues firmly enough to allow traction and counter-traction for exposure and dissection since the optics and working instruments are confined to a single axis or channel. Moreover, LESS surgery appears to be a feasible surgical technique for Urological laparoscopic procedures, i.e., simple Nephrectomy and Renal cryoablation. Future development of instruments and trocars designed for LESS procedures may allow more complex Urological surgeries to be performed routinely.



23841

P514

### A NOVEL TECHNIQUE FOR LAPAROSCOPIC PLACEMENT OF LUMBOPERITONEAL SHUNTS

Vikram Attaluri MD, Christopher Lebeis BS, Christopher Iannotti MD, Mark Luciano MD, Steve Rosenblatt MD, Cleveland Clinic

**Background:** Lumboperitoneal (LP) shunts are effective in the treatment of intracranial hypertension but have traditionally been placed utilizing an open technique. This technique has been associated with migration of distal LP shunt catheters and can be especially difficult in the high proportion of obese patients, requiring a larger incision with greater associated morbidity and postoperative pain. A laparoscopic approach would also prevent an incision over the catheter path allowing a lower infection rate. We present our technique for the laparoscopic placement of LP shunts.

**Methods:** Between June 2003 and July 2008, 27 patients underwent laparoscopic LP shunt placement. Patients' ages ranged from 12yo to 80yo with a mean of 37yo. 11 of 27 pts had previous LP shunts that were nonfunctioning. Most patients required the shunt due to complications of pseudotumor cerebri but one patient was treated for a recurrent spinal cyst. The follow-up period was current through August 2008.

With the patient secured in the lateral decubitus position, the abdomen was entered using a 5 mm Endopath trocar (Ethicon, Cincinnati Ohio) and a 0 degree 5 mm scope. After switching to a 30 degree scope, a limited diagnostic laparoscopy was performed. If adhesiolysis was necessary, then further 5 mm trocars were placed as needed.

Under direct visualization, the tunneling rod was placed into the abdomen. Following which, the distal LP shunt was threaded through the tunneling rod into the peritoneum. The proximal shunt was then secured to the valve proximally by Neurosurgery. Through a 2 mm stab incision, the suture passer was used to grasp the shunt and it was then placed into the pelvis.

**Results:** All shunts were placed successfully. There was no associated operative morbidity or mortality. Similarly, there was no postoperative morbidity. Specifically, no patients developed wound complications or preperitoneal distal shunt placement, and the patients experienced decreased pain and morbidity associated with the smaller laparoscopic incisions.

**Conclusion:** Laparoscopic placement of LP shunts offers a safe alternative to the open procedure. Our technique combines the proven efficacy of the open approach, with the proven advantages of laparoscopy, which include decreased postoperative pain, shorter hospital stay, quicker return to normal activity and improved cosmetic results. Indeed, it may also be the preferred technique in select patient populations such as the obese due to ease of intraperitoneal placement and decreased wound morbidity due to the smaller incisions.

23858

P515

### SINGLE INCISION LAPAROSCOPIC CHOLECYSTECTOMY USING CONVENTIONAL INSTRUMENTS: A COMPARISON WITH THE GOLD STANDARD

Scott R Philipp MD, Brent Miedema MD, Klaus Thaler MD, Department of Surgery, University of Missouri - Columbia, Columbia, MO, USA

**Objective:** The aim of this pilot study was to analyze our initial experience using single umbilical incision cholecystectomy (SILC) with conventional laparoscopic equipment in comparison with standard laparoscopic cholecystectomy (LC). **METHODS:** Between June 1, 2008 and September 30, 2008, data from all consecutive patients undergoing LC by two surgeons were prospectively collected and retrospectively analyzed on an intention to treat basis. SILC cases were selected based on assessment of feasibility by the surgeon. The procedure for SILC varied by retraction techniques and port placement with the goal of obtaining the critical view of safety. Outcome measures were completion rate of LC using a single incision, operative time and assessment of complications. **RESULTS:** From 27 cholecystectomies performed during the study period, SILC was attempted in 16 patients and successfully completed in eight (50%). The other eight patients required 1-3 additional incisions. The critical view was achieved in all cases. Placement of transabdominal sutures allowed for adequate anterior retraction of the fundus and lateral retraction of the infundibulum in some cases. Visualization was improved when using a flexible tip laparoscope (Olympus LTF-VH 5 mm Deflectable Tip Video Laparoscope). The close proximity of ports at the umbilical incision decreased range of motion and limited triangulation making the operation technically challenging, although average operating time for attempted SILC was not different compared to standard LC (86 vs 70 minutes). Intra-operative complications in the SILC group included a cystic artery injury and two cases of bile leak after placement of retraction sutures. The only complication in the LC group was a grade I hepatic duct injury. There were three post-operative wound complications in the SILC group and none in the LC group. **CONCLUSION:** SILC using conventional laparoscopic instrumentation is safe but has limitations. Development of new medical devices, instruments, and techniques will be required for more consistent success. Further studies should define selection criteria and determine any benefits compared with standard LC.

23902

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### SINGLE INCISION LAPAROSCOPIC CHOLECYSTECTOMY (SILC): INITIAL EXPERIENCE WITH CRITICAL VIEW TECHNIQUE AND ROUTINE INTRAOPERATIVE CHOLANGIOGRAPHY

Steven E Hodgett MD, Brent D Matthews MD, Steven M Strasberg MD, L Michael Brunt MD, Department of Surgery and Institute for Minimally Invasive Surgery, Washington University School of Medicine, St. Louis, MO.

**Introduction:** Single Incision Laparoscopic Cholecystectomy (SILC) is emerging as a potentially less invasive alternative to both standard laparoscopic cholecystectomy (LC) and NOTES cholecystectomy. However, as this technique becomes more widely employed, it is important to maintain the ability to perform the critical view (CV) dissection and intraoperative cholangiography (IOC). We present our initial experience with SILC using the CV dissection and routine IOC.

**Methods:** Fourteen patients with biliary colic were offered SILC. Exclusions were acute cholecystitis, morbid obesity, and prior upper midline abdominal surgery. The SILC approach was performed via the umbilicus and critical view dissection (with photo documentation) was attained prior to clipping or transection of any ductal structures. IOC was done using various needle puncture techniques. Assessment of CV was carried out retrospectively by independent surgeon (SMS) review of operative still photos in 15 of 16 cases using a three point grading scale under IRB approval. One point was given for each of the following: visualization of only two ductal structures entering the gallbladder, a clear hepatocystic triangle, and separation of the base of gallbladder from the liver.

**Results:** SILC was performed in 16 patients (6 M, 10F). Average BMI was  $28 \pm 4.6$ . Mean OR time was  $125 \pm 31.4$  min. Fourteen of 16 cases were performed as single incision and two cases required one supplementary 3 or 5 mm subcostal port. Complete IOC was successful in 14/16 cases (87.5%). One attempted IOC was unsuccessful and a 2nd IOC showed incomplete filling of the proximal ductal system due to contrast extravasation at the cystic duct. Critical view was achieved at the time of operation in all 16 cases. Photo documentation review confirmed CV by all 3 criteria in 10 cases, 2 of 3 in 2 cases, and 1 of 3 in two. In only one case was photo documentation inadequate to verify any of the three CV criteria.

**Conclusions:** As laparoscopic cholecystectomy becomes less invasive, proven safe dissection techniques must be maintained. Dissection to obtain the critical view should be the goal of every single incision case and routine IOC can be done in a high percentage of cases. These measures should help ensure that patient safety considerations are foremost in the evolution of minimally invasive approaches to cholecystectomy.

23907

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### A TERTIARY CENTRE EXPERIENCE IN LAPAROSCOPIC REPAIR OF PRIMAY AND RECURRENT HIATUS HERNIA IN 1125 CASES

Mr. Ali A Warsi MD, Christopher P Armstrong MD, Frenchay Hospital, Bristol, U.K.

Laparoscopic anti-reflux surgery for primary and recurrent hiatus hernia in a tertiary referral centre in 1125 cases

**Method:** Retrospective analysis of laparoscopic antireflux surgery performed under one consultant in an Upper GI tertiary referral centre. Referral pattern, learning curve, specialist training and late outcomes were analysed for all anti-reflux surgery from January 1996 to December 2007. Data were analysed for Laparoscopic Nissen fundoplication (LNF), repair of Para-oesophageal hiatus hernia and recurrent laparoscopic anti-reflux surgery.

**Results:** During the study period, a total of 1125 procedures were performed for 1115 patients- 1006 LNF, 98 laparoscopic para-oesophageal hiatal hernia (LPH) repairs and 21 laparoscopic redo hiatal hernia (RDH) repairs where the initial operation was performed in another centre. In 1996 only 12 LNF were performed whereas in 2007, 145 LNF were performed, representing a 12-fold increase. The median operating time in 1996 and 2007 were 145 mins and 70 mins respectively. There were 156 patients with Barrett's oesophagus, 52 had strictures due to gastro-oesophageal reflux disease (GORD) requiring dilation. Majority of the referrals were from the gastroenterologists and general practitioners (GP). Respiratory physicians and ear, nose and throat (ENT) referrals accounted for 60 cases, 49 of these had asthma, with symptoms refractory to conventional medical treatment. All the asthma patients' symptoms improved and remarkably 41(83%) patients were off all medications. The consultant performed 746 LNF whereas trainees (senior residents) performed 264 cases under supervision. There were 4 conversions to open in LNF due to bleeding, splenectomy and dense adhesions, and 4 in LPH because they were very large hernias. 4 (RDH) were completed laparoscopically. Eight patients (0.7%) developed post-operative dysphagia but were treated conservatively. Good number of patients (39%) went home within 24 hours and 53% within 48 hours. 99% of the patients followed up in the outpatients were happy with the surgical results. The learning curve seems to plateau after nearly 5 years of antireflux operations or after 200 cases. The average time taken to return to normal daily activities was 2 weeks.

**Conclusion:** Laparoscopic antireflux surgery is safe, effective and durable in the treatment of GORD. Tertiary referral centre offers invaluable training opportunities for senior surgical trainees.

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### A NOVEL MINIMAL ACCESS SURGERY PROTOTYPE FOR RAPID DIAGNOSIS OF APPENDICITIS IN THE EMERGENCY ROOM

Juan D Hernandez MD, Agudelo Natalia MS, De Francisco Santiago, Espinosa Andres, Gonzalez Jaime MS, Arango Rafael MS, Cardenas Marcela MS, Universidad de los Andes

1. Introduction: Abdominal pain diagnosis when appendicitis is suspected is based on clinical findings. However, near half of these patients have atypical or equivocal presentation signs and symptoms. When the result of evaluation is unclear, diagnostic imaging alternatives are used; if unavailable, patients may be discharged undiagnosed. Every year in the U.S., near 100,000 patients develop perforated appendicitis due to delayed or incorrect diagnosis, and nearly 98,000 unnecessary appendectomies are performed. These errors cost over \$2.4 billion a year in hospital charges, lost wages, and medical malpractice lawsuits.
2. Objectives: Development of a device and procedure to rapidly assess abdominal pain in the emergency room for patients with suspected appendicitis and unclear symptoms. The procedure is based on direct visualization of abdominal structures under local anesthesia and sedation.
3. Methods: The patented device Trocamera has been developed comprised by three systems: space creation, visualization and navigation control. First tests were carried out on corpses to assess basic functionality; and in a living swine to assess usability in real conditions. Prototype was improved based on these findings and evaluated by three surgeons in recently deceased human bodies, who assessed usability in terms of: usage understanding, comfort, ease of control, and structure recognition.
4. Preliminary results: The usability evaluation of Trocamera showed that it is possible to generate a space large enough to identify structures with minimum fatigue and satisfactory navigation control and orientation. Visualization quality is enough to recognize structures, but does not match laparoscopic standards.
5. Conclusions: The main innovative features of Trocamera are the means to generate a working space that enables efficient visualization of intrabdominal structures, and a navigation arrangement to control image capture. Visualization quality, although paramount for an accurate diagnosis, is not the focus of the research since this has already been solved. Preliminary results demonstrate that the main features of Trocamera achieve surgeon approval for rapid recognition of normal structures in the abdominal cavity.

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### SINGLE INCISION TRANSUMBILICAL LAPAROSCOPIC APPENDECTOMY

Alan A Saber MD, Mohamed H Elgamel MD, Department of Surgery, Michigan State University, Kalamazoo, Michigan

Introduction: Laparoscopic appendectomy requires 3–4 skin incisions to place 3–4 trocars. We describe a technique for single incision transumbilical appendectomy that utilizes the same equipment required to perform standard laparoscopic appendectomy.

Methods: Sixteen patients underwent single incision laparoscopic appendectomy using the new technique, operative time, and complications were recorded.

Results: Sixteen patients underwent single incision laparoscopic appendectomy with this technique. Twelve females and four males were included in the study, with a mean age of 24.6 years. Mean OR time was 68 minutes. All patients were discharged the next day. Two cases required addition of one additional port, and one patient required three ports in the standard fashion. None of these patients required conversion to open approach.

Conclusion: Single Incision Transumbilical Laparoscopic appendectomy is a safe, feasible and reproducible.

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### EMERGENT LAPAROSCOPIC SURGERY FOR PERFORATED ULCERS AND PERITONITIS: A CASE REVIEW

Andrew C Eppstein MD, Prakash Gatta MD, Lisa R Martin Hawver MD, Timothy J Broderick MD, University of Cincinnati

Introduction: Acute care surgery for peritonitis and perforated ulcer has traditionally been performed open, but in select circumstances may be safely performed laparoscopically with good outcomes.

Methods: A retrospective chart review of emergent cases in an academic medical center involving acute abdomen from 2007 to 2008 included three perforated duodenal ulcers and one marginal ulcer following Roux-en-Y gastric bypass which were repaired laparoscopically. Patient records were reviewed for complications and follow-up was established through clinic records.

Results: Four patients who presented with acute abdomen and imaging consistent with pneumoperitoneum were emergently explored laparoscopically and found to have perforated ulcers (three duodenal ulcers and one at a previous gastrojejunostomy for gastric bypass). The perforations were repaired with Graham patches and purulent contamination was irrigated laparoscopically. There were no operative complications. Patients were treated for *Helicobacter pylori* postoperatively and were discharged on regular diet and oral antibiotics. Mean hospitalization was 5 days. No complications were noted on follow-up.

Conclusion: Despite conventional teaching at academic medical centers that emergent laparotomy should be performed for pneumoperitoneum, emergent laparoscopic surgery for perforated ulcers with peritonitis is an acceptable and safe alternative to traditional open surgery.

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**COMPARING THE LEARNING CURVES OF MINIMALLY INVASIVE BILIARY-ENTERIC ANASTOMOSIS USING LAPAROSCOPY OR ROBOT ASSISTANCE**

Shiva Jayaraman MD, Ibrahim Al-Ghamdi MD, Firas Z El-Deen MD, Douglas Quan MD, Christopher M Schlachta MD, CSTAR (Canadian Surgical Technologies & Advanced Robotics), Lawson Research Institute, University of Western Ontario, London, Ontario, Canada

Objective: To test whether assistance with the da Vinci surgical system improves the learning curve for a complex minimally invasive (MIS) operation over laparoscopy alone using an ex-vivo model of biliary enteric anastomosis. METHODS: An ex-vivo model for choledocho-jejunostomy (CDJ) was created using specimens of porcine liver that included an intact extrahepatic biliary system and a contiguous loop of proximal intestine. Minimally invasive CDJs were performed by three surgeons with graduated experience in minimally invasive surgery: Surgeon A (MIS and robotic focus); Surgeon B (experienced MIS); Surgeon C (basic MIS). All three surgeons had extensive open surgical experience in CDJ. Each surgeon performed 10 da Vinci robot-assisted and 10 laparoscopy alone CDJs. The primary objective was the learning curve as measured by comparing mean time to completion of the first three versus the last three anastomoses using each technique. The secondary outcome was a comparison of time to complete CDJ between techniques. RESULTS: Surgeon A did not demonstrate a significant learning curve with either the laparoscopic (22.4 vs. 22.4 minutes, p = NS) or robotic (24.7 vs 19.8 minutes, p = NS) approach. Surgeon B demonstrated improvement with laparoscopy but it was not significant (46.6 vs. 39.5 minutes, p = NS). However, with robotic assistance, a significant learning curve was demonstrated (36.8, vs. 24.7 minutes, p = 0.02) with a plateau in performance - similar to Surgeon A's - reached after three cases. Surgeon C demonstrated a significant learning curve with laparoscopy (58.3 vs. 33.2 minutes, p = 0.004). No improvement was noted with robot assistance (32.2 vs. 34.7 minutes, p = NS). Surgeon A's mean operative times were equivalent with laparoscopy and robotic techniques (24.5 vs. 22.3 minutes, p = NS). Both Surgeon B and Surgeon C experienced faster mean operative times with robot assistance over laparoscopy alone (39.4 vs. 28.6 minutes, p = 0.01; and 43.8 vs. 33.0 minutes, p = 0.008 respectively). CONCLUSIONS: In this ex-vivo model, the advantage of robotic assistance was less apparent for expert MIS surgeons. Conversely, robotics may allow less experienced surgeons to perform more complex operations without first developing advanced laparoscopic skills; however, there may be benefit to first obtaining fundamental skills.

**FUNDAMENTAL SURGICAL SKILLS WERE RETAINED THREE MONTHS AFTER COMPLETION OF OUR ROBOTIC SURGERY TRAINING PROGRAM**

Irene H Suh MS, Ka-Chun Siu PhD, Mukul Mukherjee PhD, Eric Monk BA, Bhavin C Shah MD, Dmitry Oleynikov MD, Nick Stergiou PhD, Nebraska Biomechanics Core Facility, University of Nebraska at Omaha, Omaha, NE, USA, Department of Surgery, University of Nebraska Medical Center, Omaha, NE, USA, College of Public Health, University of Nebraska Medical Center, Omaha, NE, USA

Introduction: Evaluation of the learning curve of robotic surgery has shown reduced errors and decreased task completion and training times, as compared with regular laparoscopic surgery. However, most training evaluations of robotic surgery have only addressed retention in less than a month after completion of training. Aim: Our goal was to investigate the amount of surgical skill retained after 3 months of training with the da Vinci Robotic Surgical System. Methods: After completing an initial training program, the participating medical students were tested for retention after one day, one week, one month, and 3 months. To quantify retention both objective and subjective parameters were tested. A repeated measure ANOVA was used to determine statistical significance. Results: Time of task completion was decreased from pre- to post-training (p = 0.007) and was retained from pre-training to all the corresponding retention periods: 1 day (p = 0.003), 1 week (p = 0.005), 1 month (p = 0.005), and 3 months (p = 0.007; Figure 1). The total distance traveled did not show significant difference between pre-testing and any retention tests. The modified objective structured assessment of technical skills (OSATS) for robot assisted surgery showed improved performance from pre-test to post-test (p = 0.002) and all the retention tests maintained this improvement (Figure 2). Participants reported familiarity, increased self-confidence and mastery to perform robotic surgical tasks after training. Conclusions: All medical students retained their fundamental surgical skills 3 months after receiving the robotic surgical training program emphasizing the quality of our training protocol.

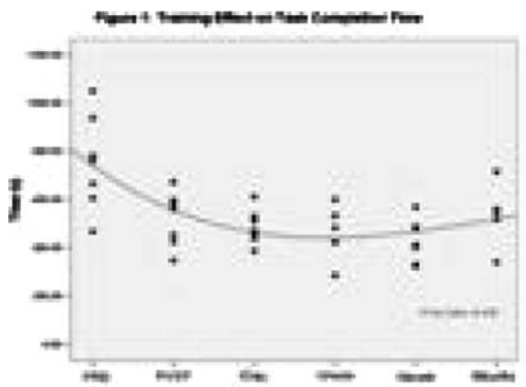


Fig. 1

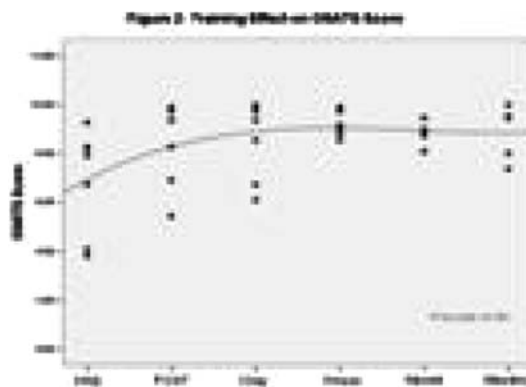


Fig. 2

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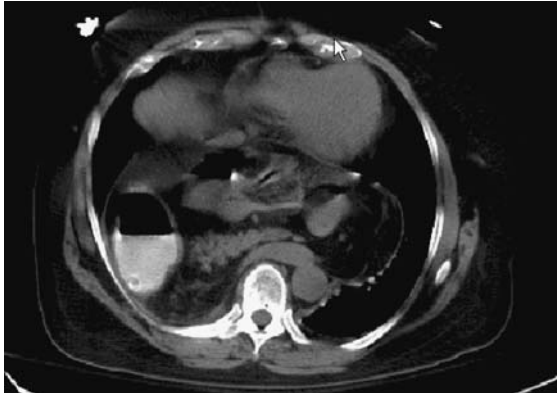
### THE HUGE HIATAL HERNIAS. CAN THE ROBOT HELP?

NIAZY SELIM MD, UNIVERSITY OF KANSAS

**Introduction:** Over the past decade, laparoscopic surgery became the standard approach for the repair of hiatal hernias. Large hiatal hernias remain challenging to the laparoscopic surgeon. The difficulties originate from the depth of the hernia in the mediastinum as well as the narrow orifice (hiatus) to dissect beyond. We present a novell study for the robotic repair of 4 large hiatal hernia involving the stomach and other organs in the mediastinum.

**Materials and Methods:** Four consecutive patients presented to the University of Kansas with huge hiatal hernias. Two patients were males and 2 were females. The mean age was  $64.5 \pm 12.2$ . The main symptom was bloating in all patients. Gastroesophageal reflux was a symptom in 2 (50%) patients. Recurrent pneumonia and difficulty of extubation from previous surgery were the main reason for diagnosis in one (25%) patient. The Da Vinci robot was used to perform the entire steps of the procedures in all patients. Dissection was performed using either the ultrasonic shears or the electric hook.

The hiatal repair was performed using the Crura Soft Bard mesh® in all patients. Primary repair was not feasible due to the large size of the defect. Intraoperative endoscopy was performed in 2 patients to evaluate the integrity of the esophagus. Three patients had Rosetti-Nissen (360°) fundoplication and one patient had Toupet fundoplication (270°). One patient required Leigh-Collis gastroplasty to overcome a short esophagus.



**Results:** All patients tolerated the procedures well. Robotic assisted laparoscopic repair was successful in all patients. The mean operative time was  $192.5 \pm 26.6$  minutes. Mean Blood loss was  $43.75 \pm 41.5$  ml. No postoperative mortality. Three patients were extubated immediately postoperatively. One patient developed postoperative pneumonia. Mean stay in the hospital was  $9.5 \pm 9.46$  days. One patient developed postoperative dysphagia (4 months later) which required esophageal dilation. **Conclusion:** These technically challenging hiatal hernias can be repaired successfully with the Da Vinci telesurgical system. It provides the surgeon with the necessary degrees of freedom and the instrument's length to facilitate a deeper access in the chest through the hiatus.

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### MULTIPURPOSE SURGICAL ROBOT AS A LAPAROSCOPE ASSISTANT

Carl A Nelson PhD, Xiaoli Zhang MS, Bhavin C Shah MD, Matthew R Goede MD, Dmitry Oleynikov MD, University of Nebraska-Lincoln, University of Nebraska Medical Center

**Introduction:** This study demonstrates the effectiveness of a new, compact surgical robot at improving laparoscope guidance. Currently, the assistant guiding the laparoscope camera tends to be less experienced and requires physical and verbal direction from the surgeon. Human guidance has disadvantages of fatigue and shakiness leading to inconsistency in the field of view. This study investigates whether replacing the assistant with a compact robot can improve the stability of the surgeon's field of view and also reduce crowding at the operating table. **Methods:** A compact robot based on a bevel-gear 'spherical mechanism' with 4 degrees of freedom and capable of full dexterity through a 15 mm port, was designed and built. The robot was mounted on the standard railing of the operating table and used to manipulate a laparoscope through a supraumbilical port in a porcine model with a joystick controlled externally by a surgeon. The process was videotaped externally via digital video recorder and internally via laparoscope. Robot position data were also recorded within the robot's motion control software. **Results:** The robot effectively manipulated the laparoscope in all directions to provide a clear and consistent view of liver, small intestine and spleen. Its range of motion was commensurate with typical motions executed by a human assistant and was well controlled with the joystick. **Conclusions:** Qualitative analysis of the video suggested that this method of laparoscope guidance provides highly stable imaging during laparoscopic surgery, which was confirmed by robot position data. Because the robot was table mounted and compact in design, it increased standing room around the operation table and did not interfere with the workspace of other surgical instruments. The study results also suggest that this robotic method may be combined with flexible endoscopes for highly dexterous visualization with more degrees of freedom.



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### SIMULTANEOUS ROBOTIC-ASSISTED PREPERITONEAL INGUINAL HERNIOPLASTY AND PROSTATECTOMY

S S Vijan MD, J C Barreto MD, I Frank MD, M T Gettman MD, M L Kendrick MD, Mayo Clinic

**Objective:** Robotic-assisted prostatectomy for prostate cancer is increasingly performed. A subset of these patients presenting for prostatectomy also have inguinal herniae. Simultaneous surgical intervention of these conditions could provide several advantages. Our aim was to describe the feasibility, technique and outcome of robotic-assisted preperitoneal inguinal hernia repair performed simultaneously with robotic-assisted prostatectomy.

**Methods:** Retrospective review of all patients between June 2005 and August 2008 that underwent a simultaneous robot-assisted inguinal hernioplasty and prostatectomy. **RESULTS:** A total of 19 inguinal herniae were repaired in 15 male patients with a mean age of 61 years. These herniae were symptomatic in 11 or noticeable by patient in 4. After prostatectomy, robotic-assisted dissection identified indirect (n = 12), direct (n = 6), or pantaloon (n = 1) herniae. All hernioplasties were constructed in a preperitoneal fashion using Prolene mesh secured with intracorporeal suturing. Closure of the peritoneum was performed to isolate the mesh from abdominal viscera. Postoperative complications occurred in 3 patients consisting of seroma (n = 2) and bowel obstruction (n = 1). Over a median follow-up of 5.8 months, no hernia recurrences were observed.

**Conclusions:** Simultaneous robotic-assisted preperitoneal inguinal hernioplasty at the time of prostatectomy is technically feasible, avoids separate procedures and recovery, utilizes available technology, and is a suggested approach for patients with resectable prostate cancer who present with inguinal herniae.

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### LAPAROSCOPIC ROBOT-ASSISTED PANCREATIC CYSTGASTROSTOMY: SURGICAL TECHNIQUE AND SHORT-TERM OUTCOMES

Mark S Choh MD, Fabio Sbrana MD, Francesco M Bianco MD, Enrique F Elli MD, Pier C Giulianotti MD, University of Illinois-Chicago

**Background:** Pancreatic pseudocysts are a relatively common complication of acute pancreatitis. While there a number of approaches to the management of pseudocysts, internal surgical drainage is generally the most effective in preventing recurrence. The use of minimally invasive techniques for pseudocyst drainage is rising. The use of the da Vinci surgical system allows for a stable, magnified, high-definition view of the surgical field. Use of the fourth robotic arm can provide secure retraction, and the improved articulation of the robotic instruments can facilitate suturing the cystgastrostomy anastomosis and the anterior gastrotomy. We describe our technique and short-term results of laparoscopic robot-assisted pancreatic cystgastrostomy.

**Methods:** A minimally invasive approach to surgical drainage of pancreatic pseudocysts was attempted in 7 patients (5 males, 2 females) from July, 2007 to April, 2008. All cases were attempted with the aid of the da Vinci Surgical System. Data regarding patient characteristics, indications, operative data, and perioperative outcomes were analyzed retrospectively. Average age was 44 (24 to 72) with a mean BMI of 28 (24 to 35). Mean preoperative size of the cyst by CT scan was 12.4 cm by maximum diameter. An anterior transgastric cystgastrostomy was performed in 5 patients; one patient underwent a posterior cystgastrostomy with necrosectomy for an infected pseudocyst, and one patient was converted to an open procedure due to significant adhesions. Ultrasound was used as an adjunct in all transgastric cases to confirm position of the pseudocyst and to identify major vascular structures.

**Results:** Of those undergoing robotic cystgastrostomy, mean operative time was 146 minutes (65 to 215) and estimated blood loss averaged 28 ml (5-100 ml). Nasogastric drainage was continued for a median of 3 days. Mean length of hospital stay was 6.6 days. No postoperative mortality was noted. No postoperative bleeding complications were noted. There were two postoperative complications; one patient who underwent necrosectomy and cystgastrostomy for an infected pseudocyst developed septicemia postoperatively and recovered with conservative management; one patient developed acalculous cholecystitis requiring cholecystectomy on POD 3. At a mean follow-up of 12.5 weeks, all patients were pain-free without recurrence of their pseudocyst.

**Conclusion:** Robot-assisted laparoscopic pancreatic cystgastrostomy is safe and feasible. The improved visualization and dexterity offered by the da Vinci surgical system can facilitate more complex cases requiring adhesiolysis and necrosectomy, and can improve precision during suturing of the cystgastrostomy or closure of the anterior gastrotomy, potentially decreasing the risk of complications such as bleeding. Further experience with this technique will likely improve short-term outcomes. Long-term follow-up is needed to assess the durability of this technique.

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**LAPAROSCOPIC ROBOT ASSISTED DISTAL PANCREATECTOMY IN AN HIV + PATIENT FOR MUCINOUS CYSTIC NEOPLASM WITH OVARIAN STRUMA: A CASE REPORT**

Alexandra B Roginsky MD, Mark S Choh MD, Francesco M Bianco MD, Enrique F Elli MD, Fabio Sbrana MD, Piero C Giulianotti MD, University of Illinois at Chicago

Background: Mucinous cystic neoplasms of the pancreas are distinct entities with malignant potential, the vast majority occurring in middle aged women. The presence of ovarian struma and lack of communication with the main pancreatic duct is required for the diagnosis of mucinous cystic neoplasm.

Case history: We report on a twenty six year old female, with a past medical history significant for HIV infection, well controlled with HAART, who presented with post prandial abdominal pain and underwent routine evaluation, including a CT scan. The CT scan demonstrated gallstones, as well as a cystic lesion in the tail of the pancreas. The patient underwent a robotic distal pancreatectomy and cholecystectomy. The patient had a successful resection with negative margins and was discharged home on post operative day nine.

Conclusion: To our knowledge, this is the first report of an HIV + patient with a mucinous cystic neoplasm and robotic resection. As patients with HIV disease live longer and more patients obtain abdominal imaging, this patient population will likely increase, but there is no known association at this time.

P527

23853

**ANTERIOR MINITHORACOTOMY AS A SAFETY MEASURE IN ROBOTIC LUNG RESECTION**

Francesco M Bianco MD, Kendra Grubb MD, Enrique F Elli MD, Mark S Choh MD, Sunil Prasad MD, Pier C Giulianotti MD, University of Illinois-Chicago

Objective: After introduction in the 1990 s, the minimally invasive approach for lung resection is performed in specialized institutions. Various minimally invasive techniques have been proposed, with and without minithoracotomy. Variations in the technique include an anterior versus a posterior approach, either with or without rib spreading. This study discusses a technique using anterior minithoracotomy for access in robot-assisted VATS.

Methods: The introduction of the da Vinci Surgical System (Intuitive) in our clinical practice has allowed us to overcome some of the limitations of standard thoracoscopic instruments but presents other technical challenges. The robotic system is more rigid and requires additional space as compared to the standard VATS approach. Moreover, because of the anatomy of the chest, there is potentially increased risk of acute bleeding requiring rapid conversion to the open technique. The minithoracotomy, placed in the infra-mammary fold, is performed once the feasibility of the procedure is addressed, and serves as the access point for one of the robotic instruments, the port for the assistant at the patient's side, as well the specimen retrieval site.

Results: After 36 robotic pulmonary resections, we standardized a technique that allows the completion of a safe pulmonary resection using two trocars and one 4 cm anterior minithoracotomy at the inframammary fold without rib spreading. Out of 36 robotic assisted lung resections we performed the last 26 using the anterior thoracotomy technique: 21 lobectomies, 4 bilobectomies, 1 pneumonectomy (14 female, 12 male) with a mean age of 68 years, no intraoperative morbidity or mortality was reported.

Conclusion: Using an anterior minithoracotomy potentially increases the safety of the procedure without adding an additional incision for extraction of the specimen and further provides a satisfactory aesthetic result since the incision is hidden in the infra-mammary fold. We consider this approach safe and reproducible and present our technique and experience for discussion.

P528

**Solid Organ Removal**

**22192**

**P529**

**22401**

**P531**

**MINIMALLY-INVASIVE ADRENALECTOMY: A COMPARISON OF SURGICAL APPROACHES AND PATIENT OUTCOMES**

Stacey Woodruff MD, Shelby Holt MD, William Snyder MD, Fiemu Nwariaku MD, UT Southwestern Medical Center

Background: Laparoscopic transabdominal adrenalectomy (LTA) is the most common procedure for the surgical treatment of adrenal tumors. Although the retroperitoneoscopic adrenalectomy (RPA) is becoming more common, few studies have examined the safety and outcomes of both procedures.

Objective: To compare the safety and surgical outcomes between LTA and RPA. Methods: Retrospective review of 142 patients undergoing laparoscopic transabdominal or retroperitoneoscopic adrenalectomy at an academic medical center over seven years. Patient demographics, tumor size and type, operative time, length of hospital stay and surgical outcomes (conversion, complications) were compared between two groups. Statistical analysis was performed using the Student's t-test and statistical significance set at a level of 0.05.

Results: 142 patients underwent 153 adrenalectomies from 2000 through 2007. LTA was performed in 129 patients and RPA in 13. Indications for adrenalectomy were hyperaldosteronism (64), hypercortisolism (30), pheochromocytoma (22), nonfunctioning adenoma (1), and others (9). Outcomes are summarized in the table. Morbidity for LTA was 11% and included splenic injury (5), postoperative ileus (2), wound infection (2), pneumonia (1), arrhythmia (1), narcotics overdose (1), and diaphragm injury (1); for RPA 23%, including subcostal neuropathy (2), bleeding requiring conversion (1). Mortality was zero. Conclusion: Both LTA and RPA are safe and associated with excellent outcomes.

	LTA	RPA (2007 only)	p value
Mean age (yrs)	51 ± 13	49 ± 12	0.61
Mean size (cm)	3.0 ± 2.0	3.8 ± 2.1	0.16
Mean LOS (days)	2.0 (0.75–28)	1.7 (1–5)	0.53
Mean op time	133 ± 28	172 ± 61	0.07
Conversion	4 (3%)	1 (8%)	

**22250**

**P530**

**EFFICACY OF HAND-ASSISTED LAPAROSCOPIC SPLENECTOMY FOR PORTAL HYPERTENSION PATIENTS WITH THROMBOCYTOPENIA**

Michiya Kobayashi MD, Hiroyuki Kitagawa MD, Tsutomu Namikawa MD, Ken Okamoto MD, Ken Dabanaka MD, Hiromichi Maeda MD, Takehiro Okabayashi MD, Kazuhiro Hanazaki MD, Koji Oba MS, Department of Human Health and Medical Sciences, Hospital Administration Section, Kochi Medical School

Peg-interferon and ribavirin therapy is promising for hepatitis C virus positive patients; however thrombocytopenia as its adverse event limits the treatment. We perform hand-assisted laparoscopic (HALS) splenectomy to increase the thrombocyte before interferon treatment for patients with thrombocytopenia.

From March, 2006 to August 2008, we performed HALS splenectomy in 26 patients. 5 cases underwent Hassab operation. An 8 cm median skin incision was made in the upper abdomen and GelPort <sup></sup> TM </sup> was placed. 3 trocars were placed at the left side of umbilicus. Spleen was mobilized with spatula type electric cautery and LCS. Surgeon's left hand made a good operation field. The splenic vessels were ligated with intracorporeal one hand ligation technique, and the splenic hilus was sealed and cut with LigaSure <sup></sup> TM </sup>. The spleen was taken out in a plastic bag through the median incision.

3 cases were converted to open, 2 of which had history of interventional therapies for esophageal varices or hepatocellular carcinoma. Mean splenic weight, operating time, and blood loss of all cases were 506.0 g, 181.7 min and 390.2 ml, respectively. Those with histories of preoperative interventions such as EIS, PSE, TAE, and RF showed heavier spleen (p = 0.001), longer operation time (p < 0.0001), and much more bleeding (p = 0.001) compared to those without them. No serious post-operative complications were encountered. HALS splenectomy is efficient even for patients with portal hypertension.

**OUTPATIENT LAPAROSCOPIC HYSTERECTOMY WITH SAME DAY DISCHARGE, A CASE SERIES**

R B Rosenfield MD, The Pearl Women's Center

Study Objective: To Assess the feasibility of performing Laparoscopic Hysterectomy in an Ambulatory Surgery Center with Same Day Discharge to Home.

Design: Case Series (Canadian Task Force Classification II–3)

Setting: The Pearl Women's Center, Portland, OR, USA

Private, Physician Owned, Freestanding Ambulatory Surgery Facility

Patients: 250 Consecutive Patients 2005–2008

Results: 250 consecutive hysterectomy patients are presented undergoing laparoscopic hysterectomy; age 19–58, BMI 18–48.6, uterine mass 30–1800 grams, operative time 36–269 minutes, time until discharge 39–360 minutes.

Interventions: Operative Technique consistently utilized five access ports and radiofrequency energy for the dissection. In the Laparoscopic Supracervical Hysterectomy (LSH), morcellation and removal of the uterus was performed through the umbilical access point. In the Total Laparoscopic Hysterectomy (TLH), the specimen was removed vaginally and colpotomy closure was performed laparoscopically.

Consistent anesthesia protocols with aggressive and preemptive management of postoperative pain and nausea facilitate a predictable and reproducible recovery pattern in patient. Concomitant operations including lysis of adhesions, enterolysis, resection of endometriosis, pelvic support surgery, and urinary incontinence slings do not alter the ability to achieve rapid discharge to home. No complications resulted in conversion to laparotomy or transfer to hospital. Overall complication rate was 3.8%.

Conclusion: The Laparoscopic Supracervical (LSH) and Total Laparoscopic Hysterectomy (TLH) can be safely and efficiently performed in a completely outpatient setting with rapid same day discharge to home within 6 hours of surgical completion. Properly selected patients and adequately trained surgeons facilitate a successful transition to the outpatient environment.

**22449**

**P532**

**LAPAROSCOPIC MANAGEMENT OF LARGE ADRENAL TUMORS**

Vered Avidan-Noy MD, Petachia Reissman MD, Department of surgery, Shaare-Zedek medical center, Jerusalem.

Background: Laparoscopic Adrenalectomy (LA) is the gold standard approach for small sized adrenal tumors.

Tumors larger than 6 cm harbor an increased risk of malignancy, and the oncological adequacy of the LA in these cases was not proven.

In addition, the technical challenge, and hence the safety of the LA in large adrenal masses is questionable.

Hypothesis: LA is technically safe and oncologically adequate for adrenal tumors larger than 6 cm.

Methods: Retrospective review of patients who underwent LA for large adrenal tumors, defined as 6 cm or more per preoperative imaging or per intraoperative assessment, between 1997–2008.

Results: Out of 200 LA performed during the study period, 40 patients met inclusion criteria. Right: left = 22:18. Mean age: 52.9 years, range 11–81.

Indications:

Non functioning large / enlarging tumor 12 (30%)

Pheochromocytoma 12 (30%), in 2 suspected to be malignant

Cushing's syndrome 9 (22.5%)

Metastasis 3 (7.5%)

Virilizing tumor, cystic mass, Adrenocortical Carcinoma (ACC), and Adrenocorticotropic Independent Macronodular Adrenocortical Hyperplasia - 1 (2.5%) patient each.

Pathological diagnoses:

Adenoma 17 (42.5%)

Pheochromocytoma 11 (27.5%), one of them suspected to be malignant

Myelolipoma 5 (12.5%)

Metastasis 3 (7.5%)

ACC 3 (7.5%)

Cortical hyperplasia 1 (2.5%).

Mean tumor size: 7.5 ± 1.8, range 4.5–11 cm. There were three (7.5%) conversions. Mean operative length: 156 ± 61 minutes, excluding converted procedures. Mean length of stay: 4 ± 1.5 days.

Intraoperative complications: major and minor bleeding occurred in 2 (5%) and 4 (10%) patients, respectively. Postoperative complications (all minor) occurred in 8 (20%) patients. One patient with ACC died of CVA 7 days after surgery.

Of the 3 patients with primary adrenal malignancies, no patient developed local recurrence, but one developed distant metastasis (follow up: 9–36 months).

Conclusions: LA for large adrenal tumors is technically safe, with acceptable rates of intra- and postoperative complication and low mortality rate in high volume centers.

The incidence of primary malignancy in large adrenal tumors is lower than was traditionally taught. Due to small number of malignancies, it is impossible to discuss the oncological safety.

22605

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### IMMEDIATE OUTCOME AFTE 350 LAPAROSCOPIC SPLENECTOMIES (LS). A SINGLE TEAM 15 YEARS EXPERIENCE

EM Targarona PhD,C Balague PhD,MC Martinez MD, L Pallares MD, MP Hernandez MD, M Trias PhD, Serv. Surgery, Hospital Santpau, UAB

Laparoscopy has become the gold standard approach for LS. It relative infrequency impairs the obtention of definitive or evidence based data. LS outcome would differ according the hematological diagnosis, and the size of the spleen is considered a critical factor related to the outcome. Aim: To asses the impact of primary diagnosis (benign/malignant) or spleen size on outcome after LS in a large single team series. Material and Method: From Feb 97 to Sept 08 we performed 350 LS and prospectively recorded. All patients were considered for LS. LS was classified according diagnosis (benign/malignant) or spleen weight (< 400, 400-1000, > 1000). We recorded age, op time, conversion, stay, spleen weight, conversion, morbidity, mortality, reoperation and hand assisted (HALS) use. Results: This series included 250 benign and 100 malignant cases. LS was feasible in 93,5% of cases. When we compared malignant vs benign, there was significant differences ( $p < 0.001$ ) in relation to age (40(3-85) vs 64(22-84), Conversion (5% vs 13%), morbidity (15 vs 29%), spleen weight (179 g vs 1139), and HALS need (3,5 vs 38%). Results according weight were:

Results according spleen weight

	< 400	400-1000	> 1000
Age(yr.)	39(3-84)	53 (13-84)	60 (18-21)*
Conversion	4%	5%	18%*
Op time (min)	107	120	150+
Weight	170	670	1793*
HALS	2%	7%	50%*

\*:  $p < 0.1$

There were no differences according stay & morbi-mortality. Conclusion: LS may offered to al patients requiring elective splenectomy. However malignancy and splenomegaly increase significantly the difficulty. HALS is routinely used in large spleens.

22665

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### HAND-ASSISTED LAPAROSCOPIC SPLENECTOMY COMPARED TO CONVENTIONAL LAPAROSCOPIC SPLENECTOMY

Abdulmalik Altaf MD, James Ellsmere MD, Jaap Bonjer MD, Dennis Klassen MD, Department of Surgery, Dalhousie University

Objective: Laparoscopic splenectomy (LS) has several advantages compared to the open technique. Splenomegaly poses several technical hurdles for the performance of splenectomy laparoscopically. With the introduction of hand-assisted laparoscopic splenectomy (HALS), the application of laparoscopic splenectomy has broadened to include cases of massive splenomegaly. We hypothesize patients who undergo HALS may enjoy the benefits of laparoscopic surgery while having their enlarged spleens safely removed. Methods: A retrospective review of patients who underwent HALS or LS at a tertiary care center between January 2003 and June 2008. The main outcomes evaluated were the intra- and early postoperative morbidity and mortality rates, conversion rate to open, need for blood transfusion and length of postoperative hospital stay. Patients' demographics, diagnosis leading to splenectomy, splenic weight and postoperative days to resuming full diet were also measured. Differences between HALS and LS groups were analyzed and compared. Differences between groups were also evaluated controlling for splenic weight and malignant diagnosis using multiple linear and logistic regression analysis. Results: 103 patients underwent splenectomy during the study period (23 HALS and 80 LS). The HALS group had significantly larger spleens (mean weight 2165 vs. 209 g,  $p < 0.0001$ ), older patients (mean age 63.6 vs. 53.2 y,  $p = 0.0136$ ) and more patients with malignant diagnosis leading to splenectomy (20 vs. 16 patients,  $p < 0.0001$ ). There was no statistically significant difference in the intra- or early postoperative morbidity (8 vs. 21,  $p = 0.4226$ ), conversion rate to open (1 vs. 0,  $p = 0.2233$ ), or the need for blood transfusion (4 vs. 8,  $p = 0.4590$ ). The mean length of postoperative stay (6.96 vs. 3.46 day,  $p = 0.0329$ ), operative time (171.9 vs. 125.1 min,  $p < 0.0002$ ) and days to resuming full diet (3.5 vs. 1.8,  $p = 0.013$ ) were significantly longer in the HALS group. There was no mortality observed. Group differences in all variables were non-statistically significant when controlling for splenic weight and malignant diagnosis. Conclusions: Compared to LS, HALS showed similar postoperative morbidity and mortality rates, conversion rate to open, and need for blood transfusion. Although the operative time and the length of postoperative stay were longer in the HALS group, this could be explained by the higher splenic weight, the larger proportion of patients with malignant diagnosis, and older patient population. In patients with splenomegaly, HALS is feasible and is associated with low morbidity and mortality.

22667

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### HOSPITAL EXPERIENCE, BODY IMAGE, AND COSMESIS AFTER LAPAROSCOPIC OR OPEN SPLENECTOMY

AE Canda MD, I Sucullu MD, Y Ozsoy MD, AI Filiz MD, Y Kurt MD, S Demirbas MD, I Inan MD, Department of Surgery, Manisa State Hospital and Gulhane Military Medical Academy, Haydarpasa Training Hospital, TURKEY; University of Geneva, SWITZERLAND.

Introduction: We aimed to assess the hospital experience and body image - cosmesis after laparoscopic or open conventional splenectomy.

Methods and procedures: Patients who underwent splenectomy were invited to fill out the questionnaires evaluating hospital experience, body image and cosmetic results. Student's t-test, paired samples t-test and ki-square test were used for statistical analysis.

Results: A total of 72 patients (34 laparoscopic splenectomy [LS], 38 open splenectomy [OS]) participated to the study. Favorable scores from modified hospital experience questionnaire were seen in the LS group, compared to the OS group ( $P < 0.001$ ). The importance of duration of hospital admission, size of scar, presence of complications, pain after surgery, delay in normal daily activities and normal diet were similar in both groups. Scores from body image questionnaire (both body image scale and cosmetic scale) were higher in the LS group, compared to the OS group ( $P < 0.01$  and  $P < 0.001$ , respectively). Higher self confidence after surgery was observed in the LS group ( $P < 0.001$ ). Scores for incision scars were significantly higher in the LS group (8.7 vs. 6.3;  $P < 0.001$ ). When patients asked if they need to have splenectomy would they accept to pay an extra charge for laparoscopy; 66% of patients who underwent LS and 81% of patients who underwent OS were willing to pay an acceptable extra charge.

Conclusion: Although there is no randomized controlled study comparing the LS and OS; currently, the LS is the procedure of choice for most indications for splenectomy. Our results presenting improved outcomes with LS will contribute the widespread application of laparoscopy for splenectomy.

22884

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### BILATERAL LAPAROSCOPIC TRANSPERITONEAL ADRENALECTOMY

Nobumi Tagaya PhD,Takayuki Kosuge MD, Akihito Abe PhD,Masatsugu Tachibana PhD,Keiichi Kubota PhD, Second Department of Surgery, Dokkyo Medical University

Objectives: We report our experience with bilateral laparoscopic transperitoneal adrenalectomy, and evaluate the safety and efficacy of laparoscopic approach for bilateral adrenal disorders.

Patients and methods: Between March 1998 and January 2008, we performed laparoscopic adrenalectomies in 41 patients. Of these, 4 consecutive patients (9.8%) with bilateral adrenal diseases (pheochromocytoma in 3 and Cushing syndrome in 1) underwent bilateral laparoscopic adrenalectomy via transperitoneal route. Their mean age was 36 years (range: 17-73 years) and three males and one female. Chief complaints were hypertension in 3 patients, health check, central obesity, abdominal pain, and dyspnea in one, respectively. Bilateral adrenalectomy was performed either synchronously (3 patients) or metachronously (1 patient). All patients were placed in semi-lateral position. One patient used an abdominal wall lift method and other patients were created pneumoperitoneum by 4 or 5 ports.

Results: All procedures were performed successfully. For the bilateral synchronous cases and metachronous case, the mean operation time was 407 min (range: 337-460 min) and 333 min, estimated blood loss was 673 ml (range: 90-1200 ml) and 172 ml, resumption of oral intake and ambulation required less than 2 days for both cases, and postoperative hospital stay was 13.7 days (range: 7-15 days) and 11.5 days, respectively. Pathologically, the number and size of tumor ranged from 1 to 5, with a mean of 2.1, and 8 to 48 mm, with a mean of 28.2 mm. Intraoperative complications consisted of adrenal vein bleeding without requiring open conversion in one case and transient hypertension due to pheochromocytoma in three cases. No postoperative complications and rehospitalization occurred during the mean follow-up of 88 months (range: 10-125 months).

Conclusions: Bilateral laparoscopic transperitoneal adrenalectomy is feasible and safe with minimal postoperative morbidity.

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### FROM START TO FINISH: 117 CONSECUTIVE LAPAROSCOPIC ADRENALECTOMIES

Sebastian V Demyttenaere MD, Peter N Nau MD, Jason C Roland MD, P Bittenbender MD, Peter Muscarella MD, W. Scott Melvin MD, E. Christopher Ellison MD, The Ohio State University Medical Centre

**Introduction:** Laparoscopic adrenalectomy has quickly replaced open adrenalectomy as the procedure of choice. The purpose of this study is to describe a single institution experience with laparoscopic adrenalectomy over a 12 year period.

**Methods:** Retrospective chart review was done for all patients who underwent laparoscopic adrenalectomy between 1996 and 2008. Patient preoperative, intraoperative and postoperative data were recorded. Data are displayed as mean (SD),  $p < 0.05$  sig.

**Results:** 117 adrenalectomies were performed in 110 patients. Mean age was 52 (12) years, 41% were male. Mean BMI was 30 (7) and Charlson comorbidity was 2 (2). 58 adrenalectomies were performed on the left side, 45 on the right and 7 were bilateral. There were 12 conversions to open, 50% occurred in patients with pheochromocytomas. Complications included blood transfusion (8), splenic laceration (1), severe hypokalemia (1) and one mortality from congestive heart failure. Operative time was 139 mins (47) for unilateral and 274mins (120) for bilateral adrenalectomy. Mean blood loss was 244 mL and length of stay was 3 days. Mean tumor size was 3.9 (2.2) cm. Pathologic diagnoses were adenoma (48), pheochromocytoma (26), cortical hyperplasia (6), metastasis (6), ganglioneuroma (4), pseudocyst (4), carcinoma (3), normal (3) and other (17). Comparing the first 55 patients with the second 55, there was similar length of stay (3 vs 3 days,  $p=0.2$ ) and estimated blood loss (233 vs 259 mL,  $p=0.44$ ) but shorter operative time (162 vs 131 min,  $p=0.02$ ). 9/12 (75%) of conversions occurred in the second half of our experience.

**Conclusion:** Laparoscopic adrenalectomy is safe with relatively minor complications. More conversions occurred in the second half of our learning curve, most likely because of wider patient selection.

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### SHORT-STAY LAPAROSCOPIC RADICAL NEPHRECTOMY IN A COMMUNITY HOSPITAL SETTING

Benny Liliav MD, Frederick L Sabido MD, Michael V Eisenbraun, PA-C, Michael A Savino MD, Gene F Coppa MD, Department of Surgery, Staten Island University Hospital, 475 Seaview Avenue, Staten Island, NY 10305

**Introduction and Objective:** Laparoscopic nephrectomy has become the standard of care in the academic and community setting alike. Few studies address the length-of-stay in the community setting. We describe the initial experience of a board certified general surgeon performing laparoscopic nephrectomy on a short-stay (24-hour) basis with a board certified urologist.

**Materials and Methods:** A retrospective review and analysis of 40 consecutive laparoscopic nephrectomies for both malignant and benign conditions was performed from 2002 to 2008. Neither the general surgeon, nor the urologist had formal fellowship training in laparoscopic nephrectomies.

**Results:** Forty patients underwent a laparoscopic radical nephrectomy from 2002 to 2008, mean age 65 years, (range 30 to 87 years). Thirty two cases were for malignancy. Average estimated blood loss was 155 cc. The median length of stay was 1 day. Twenty eight patients (70%) were discharged in less than twenty-four hours.

Nine patients were discharged on the second postoperative day and two patients were discharged on the third postoperative day. One patient developed a retroperitoneal hematoma secondary to anticoagulation therapy. The patient was discharged on postoperative day four and recovered without sequela. As the surgeons' experience increased the length-of-stay decreased, with 11 of the last 14 patients discharged home within twenty-four hours. No patients required readmission.

**Conclusions:** It is possible to safely perform laparoscopic nephrectomies on a short-stay (24-hour) basis in the community hospital setting by a non-fellowship trained general surgeon.

23398

P539

### A CASE OF ANOMALOUS SYSTEMIC ARTERIAL SUPPLY TO NORMAL BASAL SEGMENT OF THE LEFT LOWER LOBE

Kenji Minami MD, Ken Hirohata MD, Takuya Iwasaki MD, Satoshi Hara MD, Department of Surgery, Kinki University School of Medicine

A 45-years-old male was referred to another hospital because of hemoptysis. Chest 3D-CT showed an aberrant artery arising from the thoracic aorta and supplying the left basal segment and return to normal left lung vein, the bronchial tree was normal. Based on these findings, we diagnosed this case as having an anomalous systemic arterial supply to the normal based segment of the left lower lobe. We performed a left lower lobectomy and closure of the anomalous systemic artery by video-assisted thoracic surgery (VATS). The aberrant artery coursed along the left pulmonary ligament into the left lower lung from descending aorta. The patient had uneventful postoperative course and was discharged on postoperative day 7.

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### MINIMALLY INVASIVE ADRENALECTOMY: OUR EXPERIENCE IN 40 PATIENTS

Jesus Vasquez MD, Sergio Diaz MD, Juan P Toro MD, University of Antioquia in Medellin, Colombia.

**Introduction:** Due to its retroperitoneal anatomy, minimally invasive adrenal surgery is considered the procedure of choice for benign adrenal tumors. Because of potential hemorrhage, surgeons performing these operations should be experts in the field but, being an infrequent procedure, it is difficult to gain expertise and to master the procedure.

**Methods and Procedures:** We included all patients operated by the authors (JV and SD) from January 2000 to May 2008. Surgical approach was transperitoneal with the patient in a lateral decubitus position and using 4 trocar ports. Surgical strategy was based on identification of the vena cava on the right side and of the renal vein on the left side. Patients' records were reviewed for demographics, surgical variables, hospital stay and morbidity.

**Results:** 42 adrenalectomies were done in 40 patients (Bilateral Simultaneous in 2 cases). 35 were female and 5 were male. Mean age was 42 years. There were 21 (50%) left sided procedures, 19(45%) right sided and 2 bilateral(5%). Indications, in order of frequency were: pheochromocytoma (62%), incidentaloma, Cushing's syndrome, carcinoid tumors and Conn's. Tumor size was on average 6 cmt, the largest having 15 cmt. Mean operative time was 49 minutes. There were no conversions to open surgery. Minor complications occurred in 4 cases (9.5%) with no mortality. Mean hospital stay was 2 days.

**Conclusions:** Laparoscopic adrenalectomy is safe and effective for benign disease, even for large tumors. Lateral transperitoneal approach is the preferred option having very low conversion rate and morbidity.



23615

### LAPAROSCOPIC SPLENECTOMY IN HEMATOLOGIC MALIGNANCIES

Roberta Gelmini MD, Fabrizio Romano MD, Chiara Franzoni MD, Gaia Piacentini MD, Anna Gambini MD, Cristina Penati MD, Massimo Saviano MD, Franco Uggieri MD, Department of Surgery, Policlinico of Modena, University of Modena and Reggio Emilia, Department of Surgery, San Gerardo Hospital II University of Milan - Bicocca

**Aims:** Although laparoscopic splenectomy (LS) for benign hematologic disease is well accepted, its role in the treatment of haematological malignancies is still controversial. The aim of this study is to compare efficacy and feasibility of LS for hematologic malignancies and patients outcome with benign disease patients who underwent the same procedure.

**Methods:** Between January 2001 and December 2007 in two affiliated university hospital 141 patients underwent to LS for hematologic disease. 104 for benign hematologic disorders (HB) and 37 (26.2%) for malignancies (HM).

**Results:** Median splenic weight was greater in the HM group (mean 787 gr range 205–2500 gr) than in the HB group (mean 350 gr range 150–110 gr) with a statistically significant difference ( $p < 0.005$ ). The conversion rate is significantly greater in the HM group (22.2% versus 2.9%  $p < 0.001$ ) instead the mean operation time (150 minutes in HM group vs 125 in HB) and the mean blood loss are similar in the two groups of patients.

Considering the postoperative course, morbidity (13.8% in HM vs 11.5% in HB group) and mean hospital stay (5.5 days in HM vs 4.4 in HB) were not different among the two groups. No mortality occurred.

**Conclusions:** The analysis of our data highlights that LS for hematologic malignancies is effective and feasible even if associated to a higher conversion rate compared with LS for benign disorders. Besides, no differences in the outcome of patients (blood loss, morbidity, mortality and hospital stay) was noted among the two groups.

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### OPEN OR LAPAROSCOPIC RESECTION OF PARAGANGLIOMA? A COMPARISON TO ADRENAL PHEOCHROMOCYTOMA IN THE LAPAROSCOPIC ERA

Trudie A Goers MD, Michael Abdo, Jeffrey F Moley MD, Brent D Matthews MD, L Michael Brunt MD, Department of Surgery and Institute for Minimally Invasive Surgery Washington University in Saint Louis

**Introduction:** Laparoscopic adrenalectomy (LA) has become the standard for removal of most adrenal pheochromocytomas (pheos). However, laparoscopic (LAP) resection of extra-adrenal pheos or paragangliomas has been reported only anecdotally. This study investigates the results of resection of paragangliomas in the laparoscopic era.

**Methods:** A retrospective record review of all patients who underwent resection of intra-abdominal paragangliomas over a 10-year interval from 1998–2008 was performed. Pre- and post-operative clinical, radiologic, biochemical and pathologic data were collected and compared to patients who underwent LA for adrenal pheo [LA Pheo] (N=62). Statistical analysis was performed using GraphPad Instat. Data are mean  $\pm$  SD.

**Results:** Eleven patients had resection of paragangliomas (5 OPEN, 6 LAP). Most common locations were peri-renal or renal hilum (N=6) and para-aortic (N=3). Data for the 3 groups are included in the table below. One LAP was converted to open due to inflammation from a prior biopsy. Mean age of paragangliomas (PARA) was  $49.3 \pm 16.7$  years and mean tumor size was  $4.6 \pm 2.1$  cm. OPEN paragangliomas were larger, had shorter operative times, and longer hospitalization and ICU stays compared to LAP ( $p < .05$ ). Compared to LA for adrenal pheo, operative times for LAP were significantly longer ( $p = 0.001$ ) but other outcomes were similar. There were no complications for the LA or LAP cases, but one ventral hernia resulted from an OPEN case.

	OPEN PARA (N=5)	LAP PARA (N=6)	LA Pheo (N=62)
Age (years)	54.2 $\pm$ 16.8	45.17 $\pm$ 16.95	50.11 $\pm$ 18.89
Tumor size (cm)	5.78 $\pm$ 2.4	3.65 $\pm$ 1.22	4.22 $\pm$ 2.22
OR time (min)	176.6 $\pm$ 69.3	263.33 $\pm$ 80.25	174.65 $\pm$ 53.42
LOS (days)	6.6 $\pm$ 3.1	3.2 $\pm$ 2.1	3.35 $\pm$ 1.58
ICU stay (days)	1.1 $\pm$ 0.7	0.33 $\pm$ 0.5	0.17 $\pm$ 0.4

**Conclusion:** Patients with paragangliomas can safely benefit from laparoscopic resection with outcomes similar to adrenal pheos. Compared to open resection, these patients have shorter intensive care and overall hospital stays.

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### SHOULD HAND ASSISTANCE BE USED FOR MID-SIZED SPLEENS?

Matthew R Goede MD, Bhavin C Shah MD, Irene H Suh MS, Stacy J Putney, Corrigan McBride MD, Aaron R Sasson MD, Dmitry Oleynikov MD, University of Nebraska Medical Center, Omaha, NE

**Introduction:** Laparoscopic splenectomy has been shown to offer several advantages over open splenectomy, and has become a standard for splenectomy. Hand-assisted laparoscopic splenectomy has been studied in splenomegaly greater than 17 cm and has been found to be safe and efficacious.

**Aim:** To evaluate the use of hand-assistance in laparoscopic splenectomies from 12 to 17 cm.

**Methods:** After IRB approval, a retrospective review of all laparoscopic (LS) and hand-assisted laparoscopic (HLS) splenectomies between December 2001 and August 2008 in our institution was performed.

**Results:** Of the 46 laparoscopic assisted splenectomies, 24 HLS and 22 LS were performed for both oncologic and hematologic indications. Both groups were similar in age, gender, BMI, operative time, blood loss, and post-operative stay. There was a statistically significant difference in spleen size between LS and HLS. It is our institutions' practice to perform HLS on spleens greater than 17 cm. In the HLS group, there was more post-operative ileus and bleeding requiring re-exploration. Further analysis was performed on spleens between 12 and 17 cm. 20 splenectomies were performed in this size group, 10 of which were HLS, and 10 of which were LS. Spleen size (mean 15.2 cm vs. 14.4 cm) was not significant between the HLS and LS groups. Operative time (140.5 min vs. 142.7 min) was not significantly different between the techniques. Post-operative stay was significantly longer in those patients who underwent HLS (4 vs 1.8 days,  $p = 0.002$ ).

**Conclusion:** Patients that require hand-assisted laparoscopic splenectomy for spleens between 12 cm and 17 cm have longer post-operative stays and no improvement in operative time. Further prospective studies are required to evaluate if the use of HLS negatively impacts patients with mid-sized spleens.

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### LAPAROSCOPIC VERSUS OPEN SPLENECTOMY FOR HEMATOLOGIC DISEASES - A 10-YEAR, SINGLE-CENTER EXPERIENCE

Gordon G Wisbach MD, Heidi L Fitzgerald MD, Roger Lis, David C Brooks MD, Ali Tavakkoli-zadeh MD, Brigham & Women's Hospital

**Introduction:** Although laparoscopic splenectomy (LS) has become widely accepted as the approach of choice for the surgical treatment of hematologic diseases, some areas still remain controversial. We present a 10-year, single institution experience with splenectomy for non-traumatic diseases to evaluate the safety and feasibility of laparoscopic versus open (OS) technique.

**Methods:** A retrospective review of 286 consecutive patients that underwent splenectomy for hematologic disease from January, 1997 to January, 2007 was performed. Patient demographics, indication, operative technique and time, spleen weight, length of hospital stay (LOS), peri-operative morbidity and mortality were recorded. The two operative approaches were categorized based on an intention-to-treat basis.

**Results:** Two hundred and five patients underwent open splenectomy and 81 patients underwent a laparoscopic approach. The two groups were comparable for sex and BMI. The LS group was younger (48 vs. 54 years  $P < 0.0028$ ). The most common underlying disease was malignancy (45%) in the OS patients and ITP (48%) in the LS patients. Of the 65 total ITP patients, 2 had accessory spleens removed during LS, and there were no cases of recurrent disease requiring re-operation. Eleven conversions from LS to OS occurred, mostly due to hemorrhage, and 3 of these patients had massive splenomegaly. Overall there were 90 spleens weighing greater than 1000 gms with 29% in OS group ( $P < 0.001$ ). Although LS was associated with significantly longer operative time (149 vs. 108 min  $P < 0.0001$ ), it carried a lower peri-operative morbidity and mortality (17.6% vs. 4.9%,  $P = 0.0098$  and 2.4% vs. 0%, respectively) and shorter LOS (4 days vs. 3 days,  $P < 0.001$ ).

**Conclusion:** Laparoscopic splenectomy is the preferred surgical approach for treatment of benign as well as malignant hematologic disorders. Massive splenomegaly is a relative contraindication that requires an experienced surgeon, otherwise a hand-assisted laparoscopic or open approach should be considered.

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### TWO FOR ONE: A CRH AND ACTH SECRETING PHEOCHROMOCYTOMA

Ekai K Hsu MD, Colin Parsons MD, Jonathan Pierce MD, Department of Surgery, UC Davis Medical Center, Sacramento, CA.

**Introduction:** This is a unique case of a pheochromocytoma secreting both ACTH and CRH. Pheochromocytomas secreting either CRH or ACTH have been reported in the literature and are a rare cause of Cushing's syndrome. To date, there are no reports of a pheochromocytoma producing both hormones. **Background:** A 38-yr-old previously healthy female presented with a 2 week history of anasarca, headache and severe hypertension (SBP 200–250 mmHg). Evaluation revealed evidence of pheochromocytoma and Cushing's syndrome (Table 1); an abdominal MRI showed a 4-cm left adrenal mass and right adrenal hyperplasia. After excluding other sources of ectopic ACTH and CRH production, the diagnosis of combined CRH / ACTH secreting pheochromocytoma was made. **Outcome:** After pre-operative alpha blockade, an attempt at steroid synthesis blockade with ketoconazole was unsuccessful in reducing cortisol

levels. After blood pressure stabilization, laparoscopic left adrenalectomy was performed and resulted in rapid normalization of all biochemical abnormalities (Table 1). Histology and immunohistochemistry demonstrated a 3.5-cm pheochromocytoma with strong staining for ACTH. **Summary:** Although rare, ectopic production of ACTH, CRH or both by pheochromocytomas, should be considered when evaluating patients with severe hypertension and evidence of hypercortisolism.

Table 1

	Pre-op Values	Post-op Values	Normal Values
ACTH	903	11	6–58 pg/ml
CRH	80	31	<34 pg/ml
Cortisol	117.6	16.9	4.3–22.4 mcg/dl
24hUr Cortisol	4941	N/A	< 45 ug/d
24hUr Metaneph	4805	433	30–350 ug/d