Laparoscopic transhiatal esophagectomy: outcomes

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Abstract

Background: Laparoscopic transhiatal esophagectomy, indicated for benign and malignant esophageal diseases, is a complex operation, often associated with a high rate of morbidity and mortality. During the past decade this technique has became well accepted among specialized surgeons for the treatment of esophageal cancer, avoiding thoracotomy and reducing open access complications. The aim of the present study was to retrospectively analyze patients with esophageal cancer who underwent laparoscopic transhiatal esophagectomy.
Methods: From November 1993 to August 2006, 78 patients underwent laparoscopic transhiatal esophagectomy. There were 68 cases of esophageal cancer (57 males and 21 females, age range = 28–73 years) with a predominant rate of squamous cell carcinoma (60.2%).
Results: The conversion rate was 6.4%. The mean operative time was 153 min with a 12.8% rate of cervical leak and a postoperative (30-day) mortality rate of 5.1%. The four-year survival rate was 19% as determined within a subgroup of 21 patients whose followup during the period was possible.
Conclusions: Laparoscopic transhiatal esophagectomy is a safe alternative for experienced professionals. This access can improve mortality, hospital stay, and other outcomes when compared with open methods.

Key words: Esophageal cancer — Esophagectomy — Laparoscopic esophagectomy

Esophageal cancer is the sixth most frequent cause of death worldwide. In 2003 some 13,900 new cases, resulting in 13,000 deaths, were reported in the United States. The high mortality rate may be explained by the fact that 50% of patients have inoperable lesions at the time of diagnosis. According to their histologic charac-teristics, the main types of cancer are classified as epidermoid carcinoma and adenocarcinoma [3]. The incidence of the former is higher than the latter; although in the United States the frequencies of the two types of tumor are similar. The main risk factors for cancer of the esophagus are smoking and alcoholism, and men are more at risk than women [4, 5].

The procedure most commonly used in the treatment of benign lesions and esophageal cancers is transhiatal esophagectomy. The series by Orringer et al. [22] that included 1085 patients is one of the largest reported and serves as a standard for comparison. In their series the overall anastomotic leak rate was 13% and perioperative mortality was 4%. Fifty-three percent of patients were discharged by the postoperative day 10. Transhiatal esophagectomy has become popular in the last few decades but is often associated with high rates of morbidity and mortality. In Brazil, esophagectomy without thoracotomy was published for the first time by Ferreira [2, 8, 10] and has been performed at São José do Avaí Hospital (SJAH) since 1982 by Tinoco et al. [6, 20, 23, 29, 30].

The goal of reducing complications during and after surgical procedures has stimulated the development of less invasive techniques, including laparoscopic transhiatal esophagectomy as described by De Paula et al. [4] and Swanstrom et al. [26, 27]. Laparoscopic surgery is considered the best strategy for cases in which cholecystectomy and esophageal fundoplication are recommended because it has reduced pain and morbidity and a shorter hospital stay [20, 29, 30, 33].

The aim of this study was to report on the intra- and postoperative complications of laparoscopic transhiatal esophagectomy at the Department of Surgery of SJAH. The survival rate and a four-year followup are also presented and discussed.

Patients and methods

Between November 1993 and August 2006, 78 patients underwent laparoscopic transhiatal esophagectomy and 68 were subsequently identified as having esophageal cancer. The group with malignant tu-

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Table 1. Past history and pathologic staging of a group of 68 cancer patients who underwent laparoscopic transhiatal esophagectomy in the General Surgery and Laparoscopy Service of the Hospital São José do Avaí (Itaperuna, RJ, Brazil)

Characteristic	n	%
Symptoms		
Dysphagia	60	93.7
Loss of weight	39	60.9
Odynophagia	8	12.5
Pyrosis	1	1.56
Husky voice	1	1.56
Social habits		
Smoking and alcoholism	22	32.3
Smoking	5	7.35
Alcoholism	2	2.9
Denied engaging in either smoking or alcoholism	39	57.3
Pathologic staging[a]		
Stage I	3	4.41
Stage II	21	30.8
Stage III	30	44.1
Stage IV	14	21.87

[a] According to the TNM classification of esophageal cancer

mors was predominantly male (73%). Age ranged from 28 to 73 years (mean = 55.5 years). The past histories (clinical symptoms and social habits) and the pathologic staging of these patients are shown in Table 1. Histopathologic analysis revealed that 41 patients had epidermoid carcinoma (60.2%) and 27 had adenocarcinoma (39.8%). The primary locations were upper portion, 2 cases (3.0%); midportion, 32 cases (47%); and lower portion, 34 cases (50%).

Preoperative evaluation was performed using upper digestive endoscopy and biopsy, thorax X-ray and contrast study of the upper gastrointestinal tract, computerized tomography of the thorax and abdomen, and, in cases of upper- or midesophagus lesions, bronchoscopy. Preliminary therapy before the laparoscopic procedure included radiotherapy and neoadjuvant chemotherapy.

The surgical procedure was conducted with the anesthetized patient positioned in 30° reverse Trendelenburg position to allow for cervical hyperextension. The surgeon and camera were positioned on the right and the assistant on the left. Video monitors were placed bilaterally at the head of the patient.

Pneumoperitoneum was obtained by direct abdominal puncture at the umbilical scar using the Veress needle technique through a 1-cm incision located on the umbilical scar. A 30° angled laparoscope probe (flexible 7.5-MHz probe, Aloka UST-5536-7.5) was introduced through a 10-mm trocar placed in the umbilical scar. Under direct vision, four secondary trocars were positioned as follows: two 10-mm trocars, one in the left hemiclavicular line 4 cm from the costal border and one in the left anterior axillar line 5 cm from the costal border; one 5-mm trocar in the epigastric region below the xiphoid appendix (to retract the liver); and a 5-mm trocar in the right hemiclavicular line 5 cm from the costal border.

Laparoscopic exploration with ultrasound was used to search for liver metastasis that had not been previously diagnosed. Following confirmation that resection was indicated, an umbilical tape was placed and fixed by two clips around the esophagus to facilitate traction and exposure. Transhiatal dissection of the esophagus was as proximal as possible. The pitfall for dissection of the middle part of the esophagus is to open the diaphragm on its anterior portion with the ultrasonic shears and isolate the esophagus up to the carina as cranial as possible. The liver retractor goes inside the mediastinum, elevating the pericardic sac with care to avoid arrhythmias. Long instruments must be used.

The left gastric artery and vein were clipped. Ultrasonic scissors were used to release the lesser curve, seal the short gastric and the left gastroepiploic vessels, and release the greater curve and allow visualization of the right gastroepiploic vessels. Adherences of the gastric wall were released, facilitating gastric mobilization. Gastric blood supply was maintained by the right gastroepiploic and right gastric vessels. Next, a 4–6-cm horizontal neck incision was made and the cervical esophagus exposed. Careful dissection was performed down until the ascending laparoscopic dissection was found. Once the cer-vical esophagus was sectioned, its distal end was attached to the umbilical tape and laparoscopically pulled down into the abdominal cavity. The incision of the left hemiclavicular line was enlarged to 4 cm to allow the exteriorization of the esophagogastric junction through a plastic tube. A gastric tube was constructed outside of the abdominal cavity with the help of two loads of 60-mm linear staples by dividing the stomach, starting at the lesser curve from *angularis incisura* up to Hiss angle, preserving the right gastric vessels. The gastric tube was fixed using umbilical tape and reintroduced into the peritoneal cavity. A 10-mm trocar was introduced through the 4-cm incision and the pneumoperitoneum was restored. The gastric tube was then pulled up to the cervicotomy by means of the umbilical tape. An anastomosis was performed between the cervical esophagus and gastric tube using standard techniques and the nasoenteral tube was positioned. Ultrasonic shears were used to make an extramucosal pyloroplasty.

Results

Laparoscopic transhiatal esophagectomy was performed on 68 patients with esophageal cancer, but in five patients it was converted to open surgery. The mean time of the laparoscopic procedure was 153 min, the average hospital stay was 6.9 days, and the mortality rate was 5.1%.

Preoperative radiotherapy and chemotherapy greatly contributed to the efficiency of laparoscopic transhiatal esophagectomy by reducing the tumor size and thus facilitating resection. Intraoperative complications included pleural lesions (11 patients, with bilateral lesions in 2 cases), lesion of the laryngeal nerve (1 patient, 1.56%) and blood loss requiring transfusion (1 patient, 1.56%).

We used total parenteral nutrition postoperatively until five days after surgery, upon which the patient starts a liquid diet. The cervical drain is removed upon hospital discharge. The pleural cavity drain is removed when it shows no oscillation. We did not drain the abdominal cavity.

During the postoperative period, ten patients (12.8%) developed leaks in the cervical anastomosis. Ten patients (12.8%) developed stenosis of the anastomosis, and there were seven cases of infection at the site of esophageal extraction from the abdominal cavity (9%). Four patients died. One male patient developed postsurgical pneumothorax on the right side as a result of a pleural drainage procedure. During the process there was accidental perforation of the gastric tube. A gastrostomy was done but the perforation with mediastinitis led to sepsis and death. Another male patient developed bilateral pleural empyema and had to have a tracheostomy and subsequently maintained on ventilation support in the intensive care unit. The patient died as a consequence of respiratory infection. The other two patients died from leak-related sepsis.

The four-year survival rate was 19% as determined within a subgroup of 21 patients whose followup during the period was possible.

Discussion

Esophagectomy is a high-skill surgery with a great level of intra- and postsurgical complications and a mortality

rate that ranges between 5% and 19%. Moreover, there appears to be no consensus among surgeons regarding the best means of access the esophagus, and the most appropriate treatment for malignant diseases of the esophagus has yet to be established [4, 6, 7, 14–16, 18, 21, 24, 29, 30]. During the last decade the mortality rate following esophagectomy, undertaken because of cancer, has decreased with the lowest levels resulting from hiatal surgery. Furthermore, careful preparation of patients has contributed to the improved outcome of this type of surgery. Careful attention to the contributing factors to the development of a leak, particularly conduit ischemia and anastomotic technique, and the use of a cervical anastomosis can reduce the incidence of anastomotic complications and its severity postoperatively [17]. Moreover, to reduce complications and to improve patient recovery, the use of minimally invasive procedures has been used. The implementation of these techniques, however, involves higher costs from extensive laparoscopic training and greater skill levels by the surgeon [12, 15, 23, 30].

Conventional esophagectomy can be performed with either laparotomy and transhiatal dissection, or with laparotomy and thoracotomy, techniques that are associated with an increased risk of morbidity and mortality. The transhiatal laparoscopic approach, however, requires neither repositioning of the patient during surgery nor selective intubation. The fashioning of the gastric tube outside the patient is easier and less expensive because it can be performed either by a hand-sewn technique or by linear conventional staplers, and it is faster. Furthermore, the loss of blood and the length of hospital stay are minimized, and the involvement of the intensive care unit is reduced. Some authors, however, think that the period of hospital stay is still too long [7, 21, 30].

Esophagectomy with extended lymphadenectomy carries considerable morbidity due to parietal trauma. We believe that once there is one compromised node, it means systemic disease. During transhiatal esophagectomy we can perform lymphadenectomy of only the celiac axis. Our experience using laparoscopic transhiatal esophagectomy shows that the procedure involves less pain and reduces the frequency of cardiac and respiratory complications in the postoperative period, findings that are in agreement with published reports [26, 30]. Our patients had only ventilator- or leak-related pneumonias. The prone position has technical advantages and reduces postoperative respiratory complications. Although mostly transient, vocal cord paralysis is a frequent complication, mainly with an extended transthoracic resection with dissection of the aortopulmonary window where the left recurrent laryngeal nerve is at risk. The cervical anastomosis should be made on the left side to minimize the risk of bilateral vocal cord paralysis.

The mortality rate within five years of esophagectomy is higher in Western compared with Eastern countries. The survival rate of patients who underwent transhiatal esophagectomy at our hospital is similar to that reported in the literature for Western countries and is also comparable with that of transthoracic esophagectomy. The duration of the laparoscopic transhiatal esophagectomy procedure was shorter than that of corresponding surgeries and proportional to the level of expertise of the surgical team, as already mentioned in the literature [11, 15, 19, 25, 31, 32]. Regarding the occurrence of anastomosis leaks and respiratory complications, Nguyen and co-workers [20, 21] have reported that there are no significant differences between the transhiatal and the conventional transthoracic esophagectomy. It is important to note that the definition and precision of the mediastinal dissection was greatly improved by laparoscopic transhiatal esophagectomy and permitted the efficient lymphadenectomy of the celiac trunk [4, 30]. Until relatively recently, there was concern that the morbidity and mortality associated with primary resection of an esophageal carcinoma could outweigh the likelihood of a long-term benefit. A disadvantage of the conventional approach is the high morbidity rate, especially with pulmonary complications. Minimally invasive esophageal resections may reduce this morbidity and preserve the oncologic outcome. Laparoscopic esophagectomy was technically feasible and resulted in good initial results in our center, which is experienced in minimally invasive and open esophagectomies. This approach minimizes cardiopulmonary complications and almost eliminates recurrent laryngeal nerve injury and pharyngeal dysfunction. Optimal results require appropriate patient selection and a multidisciplinary team experienced in the management of esophageal cancer.

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