

Laparoscopic Roux EN y Gastric Bypass (LRYGB)

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Introduction

Edward Mason introduced a different approach to bariatric surgery (BS) in 1966, inspired by the observation that subtotal gastrectomies often cause weight loss (WL) [1]. The first gastric bypass procedure was performed by horizontal section of 10% volume of the upper stomach and anastomosis into the jejunal loop, excluding 90% of the gastric reservoir. Wittgrove and Clark established a standard technique for laparoscopic gastric bypass in 1991 [2]. Similar progressive improvement in the results of Laparoscopic Roux-en-Y Gastric Bypass (LRYGB) is reported in most large series around the world [3, 4].

BS or Metabolic Surgery (MS) has given morbidly obese patients sustainable WL and better or complete control of weight-related comorbidities like Type 2 Diabetes Mellitus (T2DM), hypertension (HT), hyperlipidemia (HL), obstructive sleep apnea, joint pain, and others. Laparoscopic Roux-en-Y (LRYGB) is considered the gold

standard BS procedure giving the above benefits for a longer period of time. LRYGB is also associated with lifelong follow-up like other bariatric surgeries and requires stringent intake of multivitamins, calcium tablets, vitamin d supplements, and Iron for long periods of time to prevent nutrition-related side effects a few years down the line.

With LRYGB method, up to 25% total body WL (68.2% excess WL) can be achieved in the long term [5, 6]. After LRYGB, WL was attributed to consuming a smaller volume and bypassing the jejunum. However, it is likely that there is a complex interplay of physiological mechanisms including food intake, food preferences, calorie restriction, and energy expenditure.

Early complications occur in approximately 4% of patients after LRYGB. The most common complications are bleeding, perforation, or leakage requiring immediate surgical intervention [7]. In 15–20% of patients, late complications such as abdominal pain, obstruction, anastomotic stricture, and marginal ulcers may occur up to 10 years after surgery [8, 9].

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Patient Selection and Indications

Medical treatment can be tried in morbid obesity, but failure rates are still very high, patients can be evaluated for surgery after medical treatment fails. NIH has determined some conditions for patients who want to have BS in 1991 [10]. The

Society of American Gastrointestinal Endoscopic Surgeons (SAGES) has similar recommendations [11].

- Patients who are unlikely to respond to medical treatment.
- Patients who are motivated and informed about surgical risks.
- Patients with a body mass index (BMI) > 40 kg/m².
- Patients with BMI between 35 and 40 kg/m², with one high-risk comorbid condition.

In Asian setup, the following guidelines are followed

- BMI >37 kg/m² irrespective of comorbidity.
- BMI >32 kg/m² in the presence of T2DM or two or more obesity-related comorbidities.

These guidelines ensure that patients can be properly classified for surgery, and patients can be prepared for surgery.

Contraindications

- Contraindications of General Anesthesia.
- Intractable Coagulopathy.
- Metastatic or Inoperable Malignancy.
- Cirrhosis with Portal Hypertension (Type B and C Budd Chiari Classification).
- Inflammatory Bowel Disease.
- Previous Surgery involving small bowel resection.
- Relative contraindications include large ventral hernia, multiple previous abdominal surgeries, extremes of age (<18 and >65), alcohol/drug abuse.

Note: Surgery should be deferred if the patient plans for pregnancy within 12–18 months.

Preoperative Assessment

The most important aspect for long-term success of LRYGB is proper counseling regarding life-

style and dietary changes, regular follow-ups, and need for prolonged supplement usage.

Preoperative Investigation

Blood Investigation

Complete blood count, Blood Group, Renal Function Test, Liver Function test, PT/INR, PTTK, Lipid Profile, Thyroid Profile, Blood sugar random (Blood sugar Fasting and Postprandial, HbA1C, C peptide level if Diabetic), Vitamin B12, and Vitamin D3.

1. X-ray Chest.
2. ECG and 2D ECHO or 2D Stress Echo (if hypertensive).
3. Upper Gastrointestinal Endoscopy (to rule out H. Pylori Infection).
4. Ultrasound Examination of whole abdomen (to rule out gall stones) and if present Cholecystectomy should be planned with bariatric even if asymptomatic.
5. Urine Routine and Microscopy.
6. Ultrasound Doppler Bilateral Lower Limb Venous System (to rule out DVT).

OT Setup and Port Positioning

Patient's Position

All long instruments, Nathanson's Liver Retractor, and 45° long scope should be ready. Patient should be in Supine position or split leg according to surgeon preference with secure strapping and padding of bony points and table should be checked for reverse Trendelenburg position. We catheterize all patients routinely. (Fig. 1).

Port Positioning

Our preferred entry is by 0 telescope mounted on 12 mm 15 cm long Optiview trocar in the left midclavicular line 15–18 cm from Epigastrium.

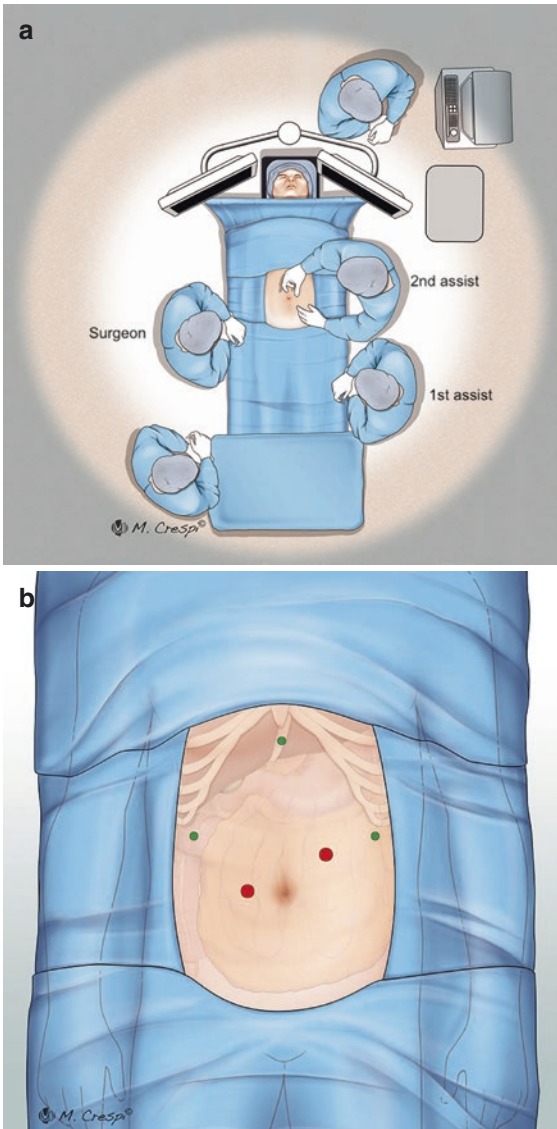


Fig. 1 (a) Patient's position. (b) Port placement

1. Second Trocar is inserted 5 or 12 mm 15–18 cm from epigastrium in right midclavicular line (Surgeon port).
2. Third 12 mm trocar is inserted a palm breadth from second trocar in right upper abdomen (Surgeon port).
3. Fourth 5 mm port through epigastrium for liver retractor.
4. Fifth 5 mm port palm breadth from first on left upper abdomen (Assistant Port) (Fig. 1b).

Surgical Technique

Step 1: Creation of gastric pouch: Patient is placed in steep reverse Trendelenburg position. Dissection is done along lesser curvature starting between first and second vessel from gastroesophageal junction. A retrogastric tunnel is created by blunt dissection and energy source. A 60 mm linear blue or purple stapler applied transversely from port 3 and followed by Vertical 60 mm Blue or Purple firings [2–3]

from port 2 to create 25–30 ml pouch is created over 36 french bougies. Gastrotomy is created at distal most part of the pouch for Gastrojejunostomy (Fig. 2).

Step 2: Fashioning of Gastrojejunostomy:

Patient is made supine. Transverse Mesocolon mesentery is lifted to identify DJ Flexure (Ligament of Treitz) and small bowel is counted 70–100 cm (Depending on BMI kg/m²) and 45 cm blue or purple stapler is used and Gastrojejunostomy is fashioned and enterotomy closed by vicryl 2/0 after performing Jejunio-jejunostomy. Now Patient is again made reverse Trendelenburg. The patency of Gastrojejunostomy is checked by smooth passage of Orogastric Tube. Leakage is checked by methylene blue dye test (Fig. 3).

Step 3: Side to Side Jejunio-Jejunostomy: 60 mm white stapler is used to form BilioPancreatic limb just distal to Gastrojejunostomy. Now 100 cm Alimentary Limb is counted and Side to side Jejunio-Jejunostomy is fashioned by 60 mm white stapler and enterotomy closed by vicryl 2/0 (Fig. 4).

Step 4: Closure of Mesenteric defects: Both Jejuniojejunostomy and Petersen defects are closed by nonabsorbable 2/0 Ethibond sutures.

Step 5: Drain Insertion and closure of defects: One Jackson Pratt drain is put close to Gastrojejunostomy anastomosis and all ports are closed (12 mm ports are closed in layers and 5 mm only skin is closed).

Post-op Course

Patient is kept NPO on the day of surgery and put on pantoprazole infusion (80 mg in 50 ml normal saline at 5 ml/h). Patient is started on oral sips on post-op day 1 and mobilized with chest physiotherapy and Incentive spirometry. On postoperative day 2 30–50 ml clear liquid is started and the patient is discharged with one dose of protein solution. Gradually Clear liquid fluid is escalated to 80–100 ml per hour followed by blend diet and full small meals over a period of 1–2 months. Note patient should not drink water 30 min before and 30 min after every meal. Patient should not use any straw. Most important is complete absti-

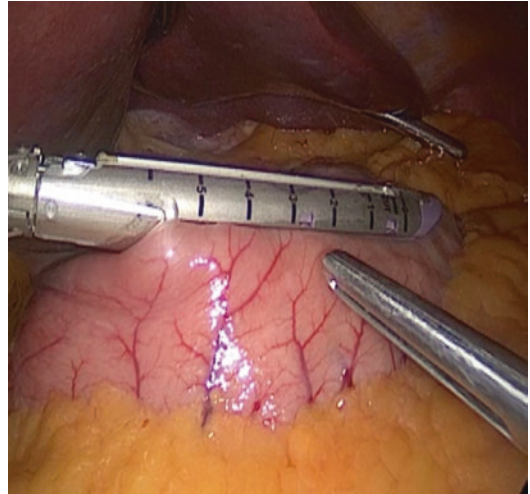


Fig. 2 Creation of Gastric pouch

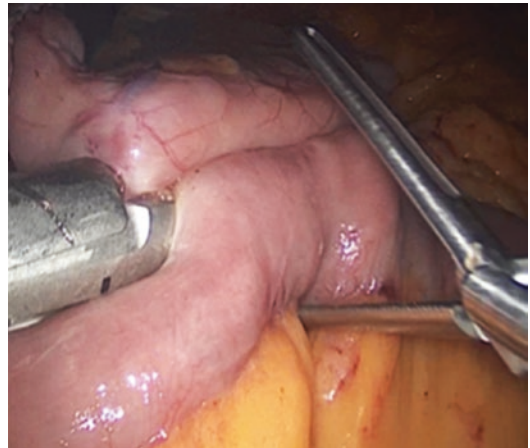


Fig. 3 Fashioning of Gastrojejunostomy

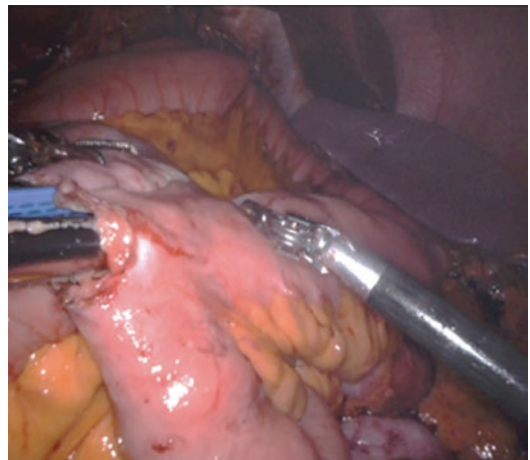


Fig. 4 Side to side Jejunio-jejunostomy

nence from Alcohol and Smoking to prevent any complications. Another important point is the continuous intake of multivitamins, Calcium, VitaminD3, and Iron throughout life. Patient is also advised for complete laboratory checks once a year and monthly meetings with the physician and should be encouraged to attend support group meetings.

Common Complications

- *Bleeding*: Any evidence of bleeding like disproportionate rise in pulse rate and drop in hemoglobin should warn for diagnostic laparoscopy even in absence of any abdominal signs. CECT abdomen may be used as an adjunct for relaparoscopy but should not be mandatory and clinical suspicion should alert the clinician to have a diagnostic check. Any bleeder should be sutured (over hemostat) and if no bleeding is seen, check endoscopy intra-operative should be done and bleeder taken care of. If still no bleeder is seen and jejeuno-jejunosotomy is suspected oversewing the anastomosis and if required refashioning the anastomosis should be considered.
- *Leakage*: Another very important complication is leakage from anastomotic site. Re Laparoscopy with resuturing/refashioning anastomosis/Gastrostomy drainage with feeding jejeunosotomy should be attempted depending on the time of redo surgery and patient general condition. Leakage from Jejeuno-jejunosotomy should be dealt with suturing/refashioning with distal feeding jejeunosotomy should be done.
- *Stenosis*: Gastrojejunostomy stricture should be dealt with the removal of triggering factor (Smoking) and serial dilatations or refashioning. Jejeuno-jejunosotomy stricture will present with obstruction or abdominal distension and will require refashioning.
- *Others*: Deep Venous Thrombosis and Pulmonary embolism should be dealt with

standard treatment protocols. Weight regain treatment will vary from diet counseling, redosurgery (Limb lengthening/fundectomy). Internal hernias are rare if both mesenteries are closed but if any doubt exists immediate Diagnostic laparoscopy or Exploratory Laparotomy should be done. Nutritional deficiencies have to be dealt with on case to case basis and may even require reversal of procedure in extreme cases.

Late Complications

- Vitamin deficiencies and hair loss.
- Dental problems.
- Abdominal pain and discomfort.
- Dumping syndrome.
- Postprandial hypoglycemia.
- Loss of bone density.
- Kidney stones.
- Gallstones.
- Gastric remnant distension.
- Marginal ulcers.
- Stomal Stenosis [12].

Conclusion

LRYGB offers both benefits and complications, the mechanisms of which are still not fully understood. Most clinicians agree that beneficial effects outweigh harm [13, 14]. The suggestions that the LRYGB relies solely on mechanical restriction and malabsorption are no longer valid. In order to achieve positive results after LRYGB, the harmony of intestinal hormones, bile acids, nerve mechanisms, intestinal microbiota, food preferences and changes in energy expenditure is essential [15]. Complications can be seen in all bariatric surgical methods. However, many studies have been conducted in order to diagnose complications early and manage them correctly after LRYGB.

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