Chapter 5
Laparoscopic Gastrectomy: Partial and Total

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5.1 Introduction

5.1.1 Clinical Presentation

Symptoms: Early gastric cancer often presents with few if any clinical symptoms or signs and is most commonly identified incidentally during gastroscopy for other symptoms, such as reflux. In contrast, locally-advanced disease is associated with a number of symptoms, many of which are non-specific. These can include: abdominal pain, bloating, reflux, vomiting, weight loss, fatigue and melena.

Physical Examination: Unless the cancer is very advanced or the patient very thin, a palpable abdominal mass is not commonly felt on abdominal palpation. Anemia due to chronic low-volume tumour blood shedding is common in patients with advanced lesions and may manifest as scleral pallor, weakness, tachycardia, postural hypotension and melena on physical examination. Palpation of lymph node basins (supraclavicular, cervical and inguinal) rarely reveals positive findings until the disease is at a very advanced stage. Abdominal distension due to ascites is also a late finding consistent with peritoneal carcinomatosis. Occasionally, abdominal distension and tympany confined to the left upper quadrant can be appreciated in patients with partial or complete gastric outlet obstruction.

Laboratory investigations: Bloodwork may demonstrate iron-deficiency anemia, acute renal failure (particularly in obstructing lesions associated with gastric outlet obstruction and vomiting), hypoalbuminemia, and elevation of tumour markers, particularly CA19-9. Occasionally, massive upper gastrointestinal bleeding can occur due to erosion of the tumour into peri-gastric vessels leading to hematemesis

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and passage of bright red blood per rectum, often in conjunction with abrupt hemodynamic instability and shock.

5.1.2 Pre-Operative Evaluation

Patients with malignancies should have investigations specific to their particular cancer type to determine tumour stage and resectability prior to surgery. Common pre-operative tests for gastric cancer patients include:

1. Upper endoscopy with biopsies to confirm histology and tumour location
2. Computed tomography (CT) scan of the chest, abdomen and pelvis to identify local/regional extent of disease as well as indications of distant organ or peritoneal metastases
3. Whole body positron emission tomography (PET) scan to further clarify tumour stage
4. Endoscopic ultrasound to determine tumour depth, regional lymph node involvement and signs of peritoneal disease
5. Diagnostic laparoscopy to identify peritoneal disease and assess tumour resectability

All patients undergoing planned partial or total laparoscopic gastrectomy should undergo routine pre-operative investigations to determine their fitness for surgery. These frequently include:

6. Medical history including exercise tolerance, cardiorespiratory diseases, surgical history, medications (e.g. anticoagulants), and use of cigarettes, alcohol and illicit substances
7. Physical examination including vital signs, cardiorespiratory auscultation and abdominal palpation and cervical/supraclavicular lymph node examination
8. Baseline blood work (CBC, electrolytes and renal function, coagulation profile, blood grouping and cross match, tumour markers)
9. Electrocardiogram
10. Chest x-ray
11. Selective fitness testing as required (e.g. cardiac stress testing, 6-minute walk test)

5.1.3 Indications for Surgery

Laparoscopic anatomical (partial or total) gastrectomy is most commonly performed for resection of gastric adenocarcinoma (Fig. 5.1). Other gastric diseases that may warrant anatomical resection by the laparoscopic approach also include:

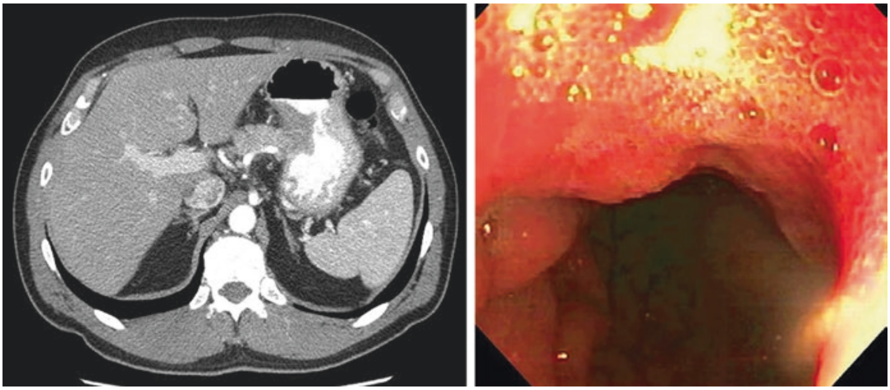

Fig. 5.1 Computed tomography scan (left) and endoscopic image (right) of gastric adenocarcinoma

1. Prophylactic gastrectomy for gene mutation carriers prone to later cancer development (e.g. CDH1 gene mutations)
2. Refractory gastric ulcer disease and benign peptic strictures
3. Refractory bleeding due to gastric antral vascular ectasia (GAVE) or other gastropathies
4. Rare tumours or pre-malignant conditions, either for curative intent or symptom control (e.g. multifocal neuroendocrine tumour, lymphoma, diffuse adenomatous polyposis)
5. Gastro-intestinal Stromal Tumors (GISTs) arising in the stomach, although the vast majority can be managed by non-anatomic wedge gastrectomies [1]

5.2 Technique

5.2.1 Laparoscopic versus Open Approach

The laparoscopic approach can be offered in many cases where gastrectomy is warranted, and utilization of laparoscopy for gastric resection has continued to increase globally since Kitano reported the first laparoscopic-assisted distal gastrectomy in 1994 [2]. Randomized control trials have since demonstrated equivalent short-term operative and oncologic outcomes between laparoscopic and open gastrectomy for cancer when performed by experienced surgeons [3]. However, circumstances in which laparoscopy may be challenging due to difficulties in gastric mobilization/handling with laparoscopic instruments or poor visualization of critical structures continue to exist. The following factors make laparoscopic resection challenging and may warrant consideration of an open approach:

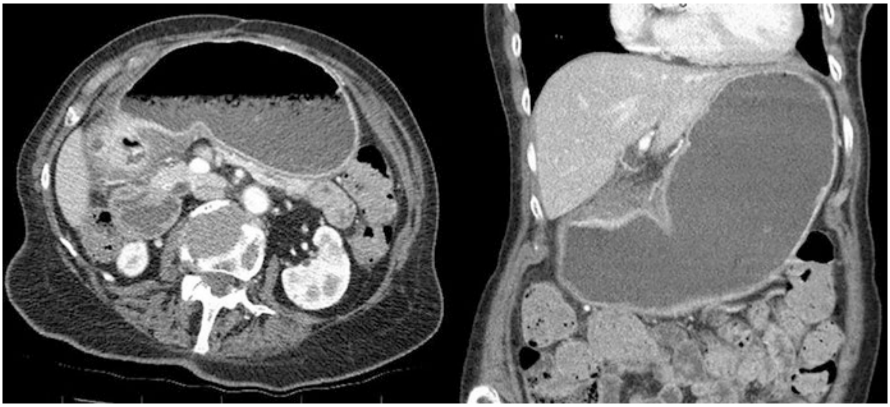

Fig. 5.2 Distal tumour causing gastric outlet obstruction and massive gastric distention

Tumour/Disease Factors:

1. Tumour bulk
2. Presence of gastric outlet obstruction (causing significant gastric distention—Fig. 5.2)
3. Linitis plastica causing diffuse gastric stiffness and rigidity
4. Bulky tumour infiltration of regional lymph nodes
5. Tumour invasion of neighboring organs necessitating multivisceral resection

Patient Factors:

1. Complex prior surgical history
2. Body habitus
3. General condition (e.g. significant hemodynamic instability, poor cardiac output causing intolerance to pneumoperitoneum)

Surgeon Factors:

4. Personal skills and experience in complex laparoscopy and GI tract reconstruction

5.2.2 Patient Positioning

The patient is positioned supine with legs split, allowing the operator and assistants to stand on either side of the patient and between the legs, facing the epigastrum (Fig. 5.3). Arms may be extended or tucked in. The patient should be securely fastened to the operating table to ensure no movement or sliding during intraoperative changes in table angle. Laparoscopic gastrectomy requires the patient be tilted into acute reverse Trendelenburg position for prolonged periods and care must be taken to ensure the patient does not slide down the table during the case. Supportive

Fig. 5.3 Patient positioning for laparoscopic gastrectomy. This positioning allows ready access to the epigastrum, left upper quadrant and hiatus necessary to complete gastric mobilization and gastroenteric tract reconstruction

devices such as bean bags and anti-slip cushions placed under the patient, as well as foot braces and safety straps should be used.

5.2.3 Trocar Placement and Operator Positioning

Two main approaches to laparoscopic gastrectomy predominate with slight variations in trocar placement and location of the operators during the case:

1. One surgeon, one assistant/camera operator approach
2. Two surgeons, one camera operator approach

5.2.3.1 One Surgeon, One Assistant Approach

In this configuration, the primary surgeon stands between the patient's legs facing the epigastrum and the assistant stands on the patient's left side. The principal advantage of this approach is the need for fewer skilled personnel in comparison to the two-surgeon configuration. One less trocar is used also. Retraction is provided by only one hand of the assistant (who is operating the camera with the other hand), which can limit exposure and flexibility of access. Dissection of the distal gastric greater curvature and right gastroepiploic vessels is relatively more awkward from this approach for the primary surgeon than in the two- surgeon approach.

5.2.3.2 Two-Surgeon, One Camera Operator Approach

In this configuration, an operator stands on either side of the patient and each have two trocars through which they alternately provide retraction and perform dissection (Fig. 5.4). The camera operator stands between the patient's legs facing the epigastrum. In this configuration, each operator performs part of the dissection (e.g. the right gastroepiploic dissection is more easily performed from the patient's left side, while the proximal greater curvature mobilization and division of short gastric vessels is more easily performed by the operator standing on the patient's right). Retraction and exposure are enhanced in comparison to the one-surgeon approach because each assistant has two instruments with which to assist rather than just one. This configuration may be particularly advantageous in obese patients or those with extensive intra-abdominal adhesions from prior surgery. Training is also facilitated by this approach as the primary surgeon can more easily expose and guide a learner when using two hands rather than just one.

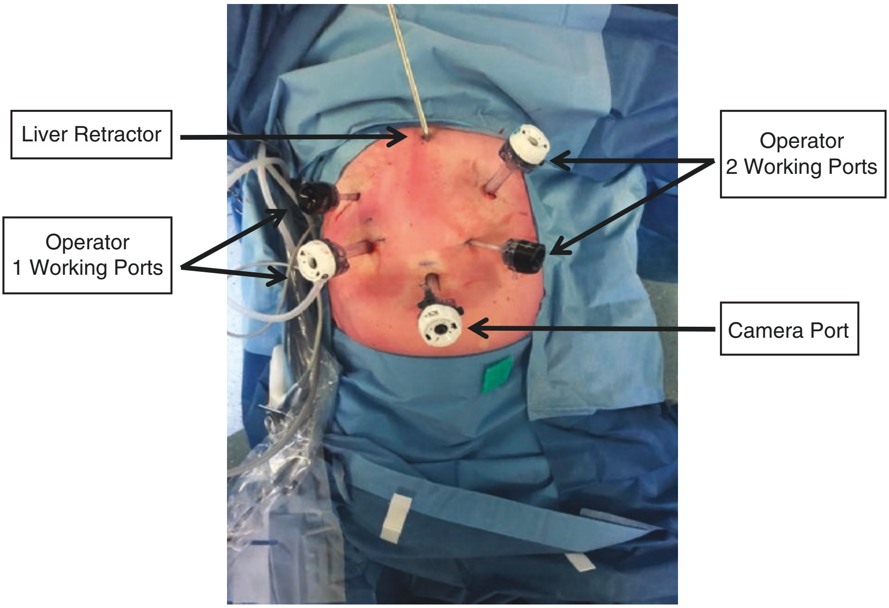

Fig. 5.4 Port set up for two surgeon, one camera operator configuration. The 12 mm trocars are placed for the operators' dominant hands (right-hand dominant configuration shown). The authors prefer using a 10 mm camera to ensure a clear image during aspects of the case requiring high image clarity (e.g. lymph node dissection and reconstruction)

5.2.4 Lymphadenectomy

Laparoscopic gastrectomy for cancer involves en bloc resection of the tumour with regional lymphadenectomy. For locally advanced gastric adenocarcinoma, extensive (D2) regional lymphadenectomy is the preferred standard internationally [4–6]. D2 dissection for subtotal gastrectomy involves removal of all perigastric lymph nodes as well as skeletonization of the hepatic and splenic arteries with retrieval of celiac and peri-portal lymph nodes. For total gastrectomy, removal of gastric fundus, short gastric and splenic hilar nodes is added. The Japanese lymph node station numbering system is summarized below [6]. For perigastric nodes, even numbers indicate greater curvature while odd numbers indicate lesser curvature lymph node locations (Table 5.1).

5.2.5 Gastric Mobilization and D1 Lymphadenectomy

The case is begun by dividing the pars flacida towards the right pillar of the diaphragm (Fig. 5.5).

At this point, with the lesser sac exposed, the D2 lymphadenectomy can be performed directly. Alternatively, this step can be left until the stomach is fully mobilized and duodenum divided. In bulky tumours or obese patients, waiting until the

Table 5.1 Lymph node station numbers and corresponding locations for D1 (perigastric) and D2 (retroperitoneal) dissections for gastric adenocarcinoma [7]

Station #	Anatomical location	Extent of lymphadenectomy
1	Cardia	D1
2	Fundus	D1
3	Incisura	D1
4d	Distal greater curvature	D1
4sb	Greater curvature, mid-body	D1
4sa	Short gastric vessels	D1
5	Right gastric artery	D1
6	Right gastroepiploic artery	D1
7	Left gastric artery	D1
8a	Hepatic artery (anterior)	D2
8p	Hepatic artery (posterior)	D2
9	Celiac artery	D2
10	Splenic hilum	D2
11p	Splenic artery (proximal)	D2
11d	Splenic artery (distal)	D2
12a	Peri-portal (left side of portal vein)	D2

Note that station 1 and 3 nodes (incisura and cardia) are included in the standard lymphadenectomy for all gastric cancer resections, including distal tumours

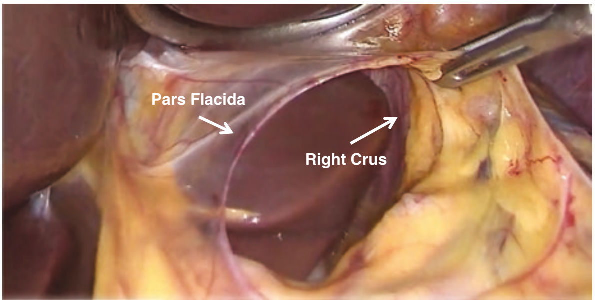

Fig. 5.5 Division of pars flacida towards right diaphragmatic crus

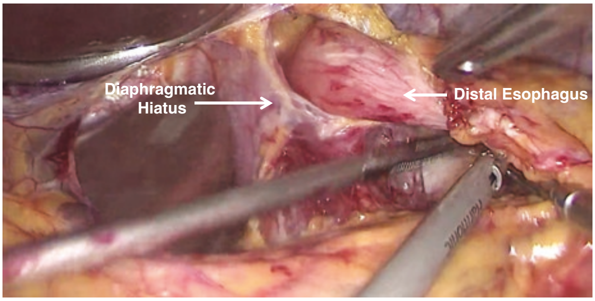

Fig. 5.6 Mobilization of the distal esophagus at the hiatus

duodenum is divided allows the operator to flip the stomach cephalad, providing better exposure to the celiac vessels for D2 dissection (described in detail below).

For a total gastrectomy, the esophagus is mobilized at the hiatus and the vagus nerves divided (Fig. 5.6).

For a subtotal gastrectomy, only the right crural attachments are opened inferiorly towards the median arcuate ligament. Later, during the D2 dissection, this will serve as a target for the end of the celiac lymph node dissection.

Next, the gastrocolic omentum is divided along the gastric greater curvature (Fig. 5.7).

This is continued towards the inferior pole of the spleen for a subtotal gastrectomy. For a total gastrectomy, the entire gastric body and fundus are mobilized by dividing the short gastric vessels. For an oncologic procedure, it is important to resect all potential lymphatic tissue with the specimen, and thus the surgeon should divide the short gastric vessels at the splenic hilum, taking the station 4sa lymph nodes with the specimen.

Once the proximal greater curvature is mobilized, the distal dissection is performed. The transverse colon is retracted inferiorly by the assistant and the posterior wall of the stomach elevated to expose the interface between the right gastroepiploic vessels and the transverse mesocolon. The mesocolon is gently separated from the right gastroepiploic pedicle with blunt dissection and divided until the duodenum is exposed in the first stage. The remaining gastrocolic omentum is then divided,

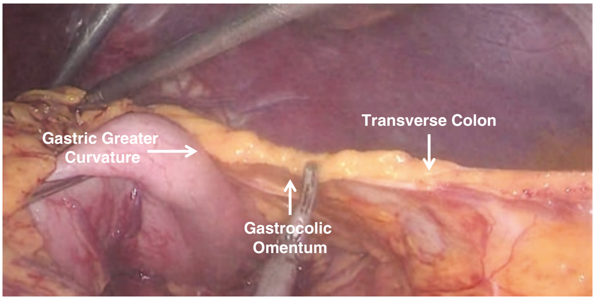

Fig. 5.7 Division of the gastrocolic omentum to mobilize the gastric greater curvature

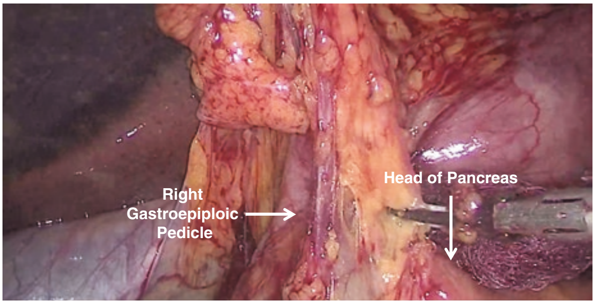

Fig. 5.8 Identification of the right gastroepiploic vessels over the head of the pancreas

completely separating the stomach from the transverse colon. The right gastroepiploic vessels are then skeletonized and ligated as proximally as possible on the head of the pancreas (Fig. 5.8).

During this portion of the dissection, it is crucial to identify the head of the pancreas and ensure the dissection does not progress underneath it, as this can risk injuring major vessels such as the middle colic vein or superior mesenteric vein and artery. In exposing the posterior wall of the duodenum on the head of the pancreas, the gastroduodenal artery is seen and used as a landmark to identify the take-off of the right gastroepiploic artery. The station 6 lymph nodes are swept up with the specimen and taken *en bloc* by dividing the gastroepiploic vessels.

Next, the right gastric artery is isolated at its origin on the proper hepatic artery in the porta hepatis (Fig. 5.9). It is ligated and divided, and the station 5 lymph nodes mobilized out of the porta towards the duodenum.

The duodenum should now be fully cleared off on both sides and ready to be divided. For distal tumours, care should be taken to ensure sufficient mobilization of the duodenum to achieve a negative pathological margin. If necessary, the duodenum can be mobilized off the head of the pancreas for several additional centimeters to achieve greater distance from the tumour. This should be done carefully as perforating vessels between the head of the pancreas and the duodenum often bleed, and it is easy to make a hole in the posterior wall of the duodenum during this mobilization, especially if using an uninsulated thermal energy device.

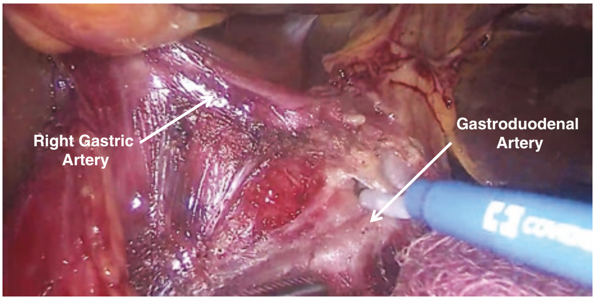

Fig. 5.9 Dissection along the gastroduodenal artery with right gastric artery retracted to provide tension

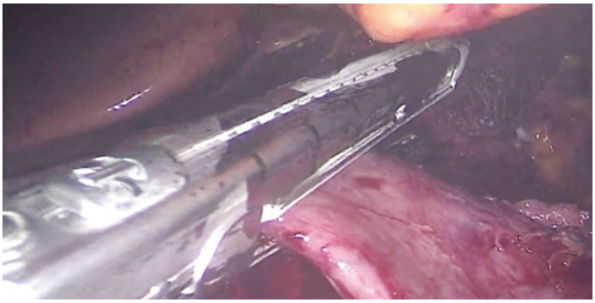

Fig. 5.10 Stapled division of the duodenum

5.2.6 Distal Specimen Division

The duodenum is divided in the first stage using an endoscopic stapler, usually passed from the surgeon's left hand (one surgeon approach) or by the right hand of the surgeon on the patient's right side (two surgeon approach). The duodenum should be stapled straight across with no bunching of tissues to avoid duodenal stump leaks (Fig. 5.10). Oozing from the staple line can be controlled with application of clips.

The stomach is then rotated cephalad and towards the spleen to expose the celiac axis and allow ready access to the retroperitoneum for the D2 lymph node dissection (see below).

5.2.7 D2 Dissection

While perigastric nodes are easily taken with standard gastric mobilization (see Table 5.1 above), D2 dissection requires additional maneuvers to complete. The assistant retracts the left gastric vessels such that they are placed under tension at a 90-degree angle to the celiac axis (Fig. 5.11).

The operator then opens the peritoneum along the superior border of the pancreas and follows this plane proximally and distally (Fig. 5.12).

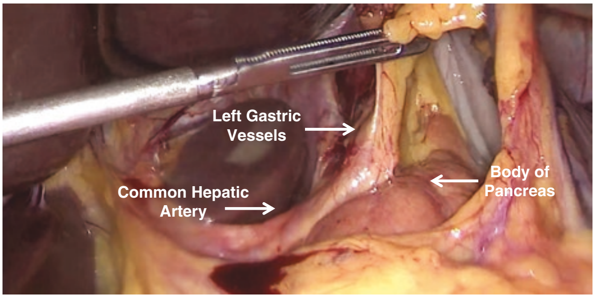

Fig. 5.11 Retraction of left gastric vessels to expose the retroperitoneum for D2 dissection

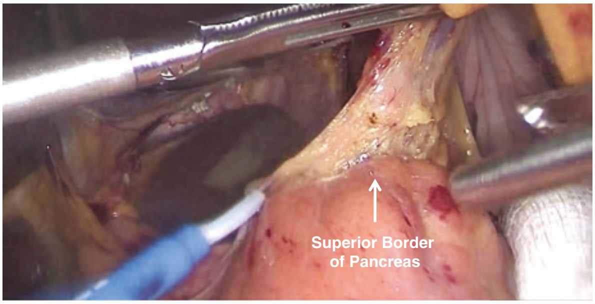

Fig. 5.12 D2 dissection begun along the superior border of pancreas

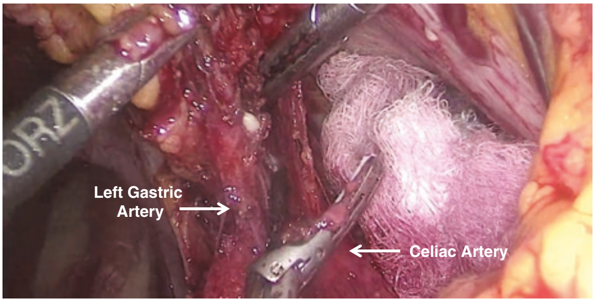

Fig. 5.13 Completion of left side of celiac dissection

While the goal is to skeletonize the splenic artery, variations in its location and path may make this vessel hard to identify and the pancreatic border should instead be used as a landmark to begin the dissection. This is particularly true in obese patients where visceral fat can quickly obscure key landmarks. Once the peritoneum is opened, lymphatic tissue is swept up towards the stomach off the retroperitoneum. This will eventually expose the left adrenal gland. The splenic artery should then be visible and skeletonized with lymphatic tissue mobilized towards the left side of the celiac artery (Fig. 5.13).

On the right of the celiac axis, the 8a lymph node overlying the hepatic artery is mobilized, exposing the vessel beneath (Fig. 5.14).

Dissection is carried towards the porta hepatis and the 12a node overlying the left side of the portal vein is carefully mobilized (Fig. 5.15).

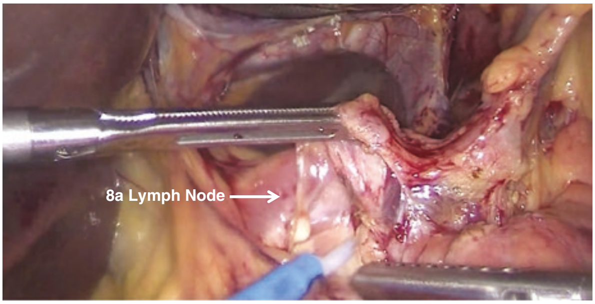

Fig. 5.14 Dissection of 8a lymph node off the common hepatic artery beneath

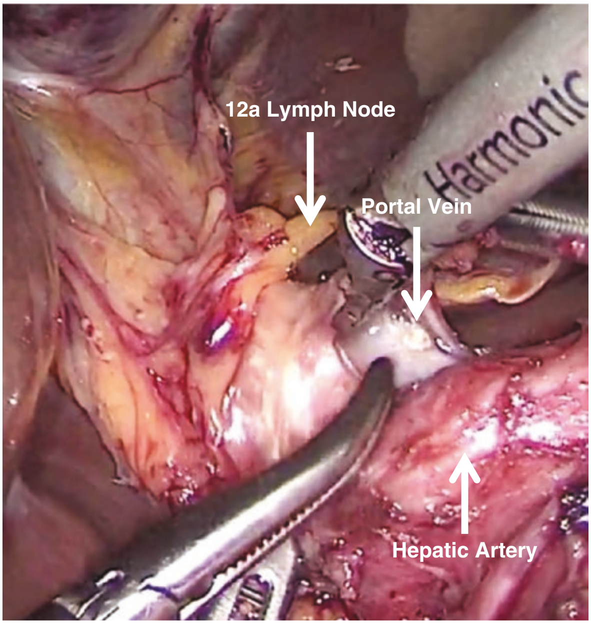

Fig. 5.15 Dissection of the 12a lymph node off the portal vein behind the hepatic artery

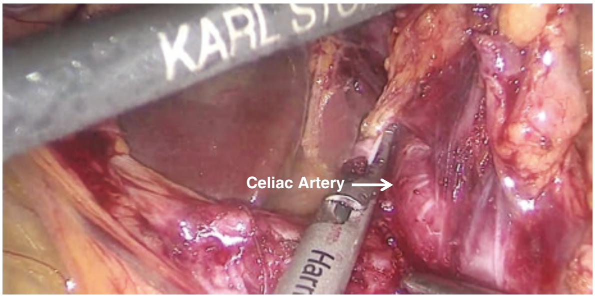

Fig. 5.16 Completion of the right side of the celiac dissection

The 8p lymph node behind the hepatic artery and station 9 nodes along the right side of the celiac artery are then swept off the retroperitoneum towards the base of the left gastric artery such that only the left gastric vessels remain (Fig. 5.16).

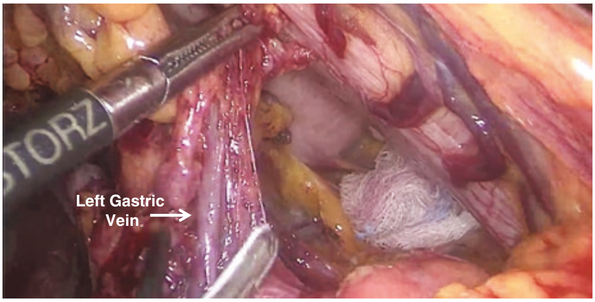

Fig. 5.17 Exposure of left gastric vein

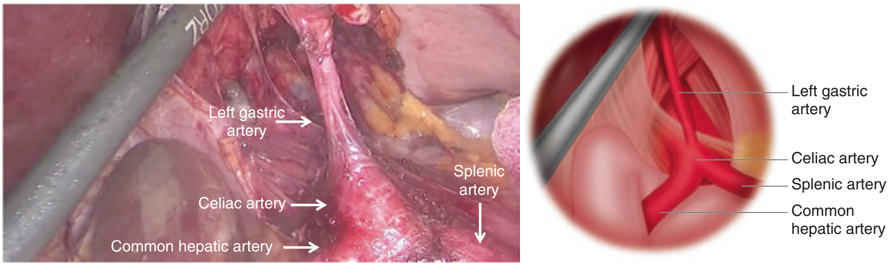

Fig. 5.18 Celiac axis and left gastric artery skeletonized

Typically, the left gastric vein is found between the origins of the hepatic and splenic arteries (Fig. 5.17), however its insertion is highly variable, and care should be taken during the D2 dissection to identify and carefully ligate this vein as it can be easily avulsed.

With all lymphatic tissue mobilized towards the origin of the left gastric artery, this vessel is skeletonized, ligated and divided at its base, completing the D2 dissection (Fig. 5.18).

5.2.8 Proximal Specimen Division

Once the D2 dissection is complete and the left gastric vessels divided, the remaining stomach is ready to be divided proximally. For a subtotal gastrectomy, the cardia and lesser curve lymph nodes (stations 1 and 3) are mobilized inferiorly to the level chosen for division of the stomach to be excised with the rest of the specimen (Fig. 5.19). For total gastrectomy, this step is unnecessary, as the esophagus is divided and the cardia nodes naturally removed with the specimen.

An endoscopic stapler is used to divide the proximal stomach, and this is most easily achieved from the patient's left side. Several stapler firings are usually

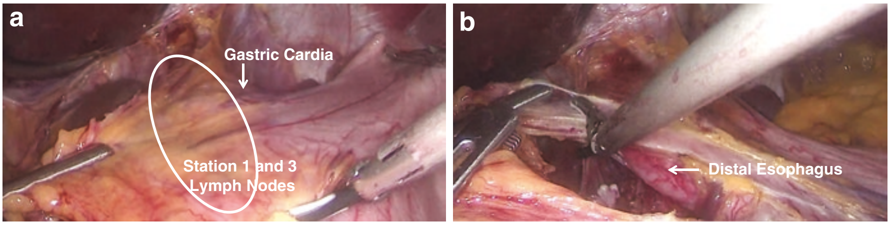

Fig. 5.19 (**a**) Retraction of stomach to allow dissection of station 1 and 3 lymph nodes off the gastric lesser curvature for subtotal gastrectomy. (**b**) Station 1 lymph nodes are mobilized off the gastric cardia towards the distal esophagus to allow for complete lymphadenectomy with gastric pouch preservation in subtotal gastrectomy

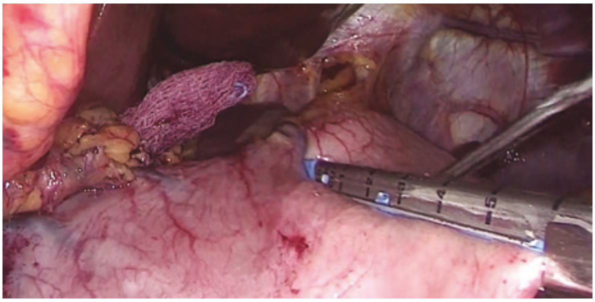

Fig. 5.20 Proximal gastric division with laparoscopic stapler for subtotal gastrectomy. Note that the station 1 lymph nodes have been mobilized off of the high lesser curvature and included with the specimen

required to completely transect the stomach for a subtotal gastrectomy. The authors prefer stapling on an angle from the tip of the spleen towards the high lesser curvature, such that the remaining gastric pouch is shaped like a funnel, which might improve drainage (Fig. 5.20).

For total gastrectomy, it is helpful to place stay sutures on either side of the esophagus before division to enable retraction of the esophagus after the stomach is removed (otherwise it will naturally retract several centimeters into the thorax).

5.2.9 Specimen Retrieval

Once the specimen is completely divided, it is placed in the patient's right upper quadrant for later retrieval. If margins are a concern, immediate extraction through a small accessory incision is done to allow pathological frozen section analysis before reconstruction is completed.

Choices abound for where to retrieve the specimen. Some practitioners prefer a small Pfannensteil incision for its cosmesis, low hernia rate and minimal associated pain. However, due to the distance of this incision from the surgical site, this extraction site can only be used for specimen retrieval (no reconstruction can be performed from here). Alternatives include a small upper midline incision or small left subcostal incision. These can then subsequently be used to reconstitute bowel continuity if the reconstruction is to be done extracorporeally (see below).

5.2.10 *Reconstruction*

Several options exist for reconstruction after partial or total gastrectomy (intra- vs extra-corporeal, Billroth II vs Roux-en-Y). Regardless of the method selected, the first step is proper identification of the Ligament of Treitz and proximal jejunum. This is done by elevating the transverse mesocolon to expose the jejunum as it exits the retroperitoneam (Fig. 5.21).

Approximately 20 cm distal to this, in a portion of the bowel that easily reaches the gastric remnant or distal esophagus, the assistant securely grasps the bowel, so the location is not lost, and the bowel orientation is not rotated.

5.2.10.1 Extracorporeal Reconstruction

This is most easily performed for subtotal gastrectomy in a thin patient. A subcostal incision is made, and the specimen retrieved through a wound protector. The clamped proximal jejunum is exteriorized. The distal stomach can also be exteriorized through this incision and either a roux-en-y or Billroth II reconstruction made as per the operator's preference. These can be either hand-sewn or performed with staplers (Fig. 5.22).

Extracorporeal esophagojejunostomy can also be done in the case of a total gastrectomy, however this can be quite technically challenging, especially in large or obese patients. If this reconstruction approach is selected, the specimen should be extracted through an upper midline accessory incision which then allows visualization of the distal esophagus for reconstruction. Again, the anastomosis can be established either in a hand-sewn manner or using staplers.

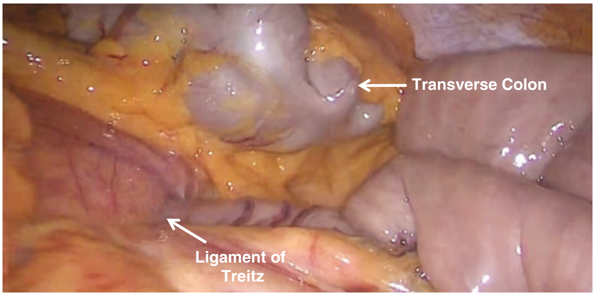

Fig. 5.21 Exposure of the Ligament of Treitz at the root of the transverse colon mesentery

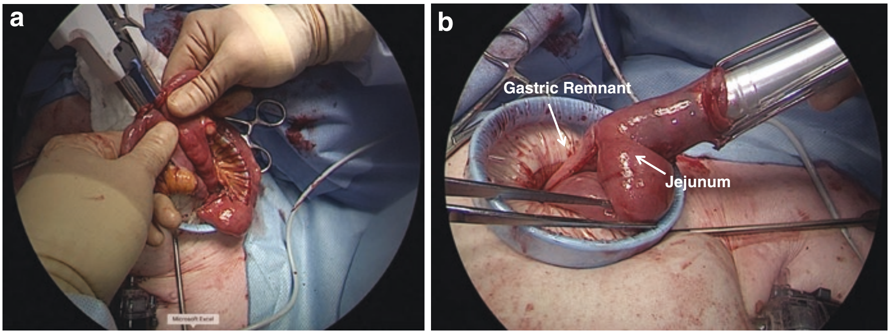

Fig. 5.22 (**a**) Creation of stapled jejunojejunostomy through left upper quadrant accessory incision for roux-en-y reconstruction. (**b**) Creation of circular stapled gastrojejunostomy through left upper quadrant accessory incision for roux-en-y reconstruction in subtotal gastrectomy

Some practitioners prefer performing the jejunojejunostomy through an accessory incision, which is usually quite easy and efficient, and the esophagojejunostomy intracorporeally due to improved visualization (hybrid approach).

5.2.10.2 Intracorporeal Reconstruction

Intracorporeal reestablishment of bowel continuity allows improved visualization in comparison to the extracorporeal method but is more technically challenging. Furthermore, in a thin or small patient, limited space can make this approach more difficult than the extracorporeal options described above. Reconstruction is performed with the surgeon standing either between the legs or on the patient's right-hand side.

5.2.11 Billroth II

For intracorporeal Billroth II, an anticolic, retrogastric orientation is easiest to perform. There is also no risk of bowel herniation or obstruction where the jejunum traverses the colonic mesentery as would be the case for a retrocolic reconstruction. The loop of proximal jejunum is brought up to the posterior wall of the stomach and secured in place using a stay suture. Enterotomies are made in the stomach and jejunum, and one arm of the endoscopic stapler passed in each to create a common channel. The enterotomy defect can then be closed either by hand sewing (less likely to narrow the outflow tract lumen) or stapling (technically easier and faster).

Obstruction or narrowing of either the efferent or afferent limb must be avoided in a Billroth II reconstruction as either will cause problems with biliary limb drainage and can lead to duodenal stump blow out. Intra-operative upper endoscopy can be used to confirm patency of both limbs.

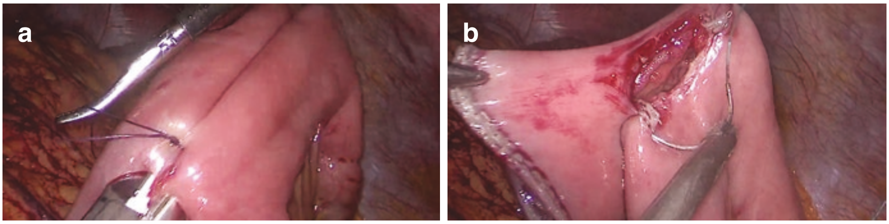

Fig. 5.23 (**a**) Intracorporeal stapled jejunojejunostomy creation for Roux-en-Y reconstruction. (**b**) Set up for hand-sewn intracorporeal enterostomy closure after creation of jejunojejunostomy by linear stapler. The assistant suspends the bowel by stay suture to facilitate exposure (off screen)

5.2.12 Roux-en-Y: Jejunojejunostomy

An intracorporeal jejunojejunostomy is created in a similar manner to that described above. The proximal jejunum is divided approximately 20 cm distal to the ligament of Treitz in a place where the roux limb mesentery allows it to reach easily to the distal gastric pouch or esophagus. The small bowel mesentery can be divided further with either a vascular stapler or vessel sealing energy device to achieve greater length. The assistant holds the end of the biliary limb to avoid later confusion while the surgeon runs the roux limb, counting off sufficient length to avoid bile reflux (minimum 40 cm for subtotal gastrectomy and 60 cm for total gastrectomy). The biliary and roux limbs are then aligned and enterotomies made in each. A stay suture can be used to facilitate proper orientation and is then later used to close the enterostomy. One limb of the endoscopic stapler is passed through each enterotomy and fired to create the common channel. The enterostomy defect is then closed. If this is done hand sewing, it is easier to start at the inferior corner and sew up (away from the surgeon) towards the stay suture which is used to tie the final knot. If stapling, stay sutures might be used to suspend the edges of the enterostomy while passing the stapler. In either case, great care should be taken to avoid narrowing the anastomosis as this will lead to roux limb obstruction (Fig. 5.23).

5.2.13 Roux-en-Y: Proximal Anastomosis

To create either a gastrojejunostomy or esophagojejunostomy intracorporeally, similar steps are taken as above. The anastomosis can be made using any of the following:

1. Fully hand-sewn technique
2. Linear stapler to create the back wall and hand sewing the anterior defect
3. Circular stapling

For hand sewn anastomoses, the roux limb is brought up to the gastric remnant or distal esophagus and secured in place with stay sutures. Enterotomies are made

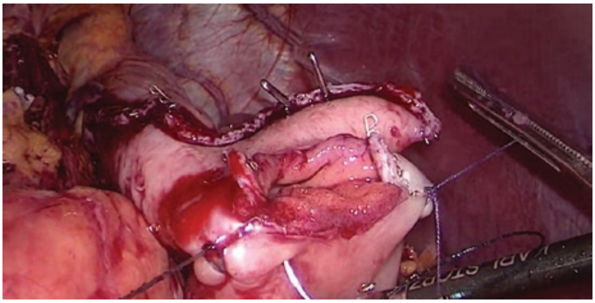

Fig. 5.24 Intracorporeal, transverse hand-sewn closure of enterotomy defect after linear stapled gastrojejunostomy creation

in both limbs. A single layer anastomsosis using two sutures (3-0 vicryl or 3-0 PDS are common choices) is then performed. One suture completes the back wall and the other the front wall and they are tied to each other. The sutures can be run from either the patient's left or right side, depending on the comfort of the operator.

For linear stapling, the limbs are similarly oriented with stay sutures as above and enterotomies made in each. One arm of the endo-stapler is passed into each limb. A 30 mm anastomosis is sufficient—using a longer stapler can lead to tension when closing the enterostomy defect as it will be unnecessarily large. The stapler is used to create the back wall of the anastomosis, leaving the enterotomy defect anterior. This is then closed in a transverse manner by hand sewing. Closing this defect vertically should be avoided as this can lead to narrowing of the anastomosis [8] (Fig. 5.24).

A circular stapled anastomosis is created by either seating a 25 mm anvil in the distal esophagus or gastric remnant by passing it on an oral-gastric tube via the mouth, or by sewing the anvil into the lumen by hand from the abdomen. The staple line on the end of the roux limb is then opened and the circular stapler passed directly through the abdominal wall and positioned in the roux limb. The stilette is deployed, and the anvil and stapler ends are mated, tightened together and the stapler fired. The open end of the roux limb is then closed with a single firing of a straight endostapler.

5.2.14 Closure of Mesenteric Defects

Whichever reconstruction method is chosen, mesenteric defects are traditionally closed to prevent formation of internal hernias. This can be achieved with running or interrupted sutures according to the operator's preference (Fig. 5.25).

5.3 Post-Operative Management

After laparoscopic gastrectomy, most patients can be managed according to the recommendations of the Enhanced Recovery After Surgery (ERAS) society consensus guidelines for anatomical gastrectomy [9]. This approach minimizes the use of tubes and drains, emphasizes multimodal analgesia and early ambulation, and early

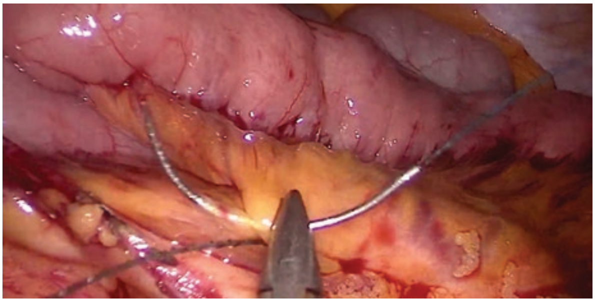

Fig. 5.25 Intracorporeal sutured closure of mesenteric defect after Roux-en-Y reconstruction

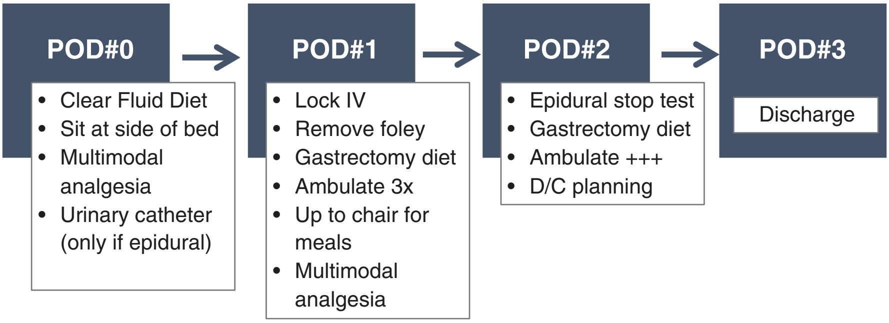

Fig. 5.26 Typical patient trajectory after laparoscopic or open gastrectomy at the Montreal General Hospital, Montreal, Canada. Patients are managed according to Enhanced Recovery After Surgery (ERAS) principals and according to consensus guidelines from the ERAS society [9]

resumption of *ad lib* oral intake. Use of nasogastric suction, abdominal drains and indwelling urinary catheters are of no benefit in most patients and should not be routinely used. Offering patients oral post-gastrectomy diet as early as day 1 has not been shown to result in increased adverse events, and as such percutaneous or naso-jejunal feeding tubes are generally unrequired. Dietician consultation before discharge is recommended to help patients transition to post-gastrectomy anatomy and dietary constraints. Sample dietary recommendations for post-gastrectomy patients can be found at: http://www.muhcpatienteducation.ca/DATA/GUIDE/822_en~v~stomach-cancer-nutrition.pdf. A typical patient trajectory after gastrectomy at the Montreal General Hospital is depicted in Fig. 5.26. It is important to remember that any deviation from normal post-operative course mandates immediate investigation and may require deviation from the standard care trajectory.

5.4 Conclusion

Laparoscopic gastrectomy can be safely performed for many indications. Recent data from randomized control trials reveals experienced operators can achieve similar short term surgical and oncologic results to open surgery for even locally advanced cancers [3]. Nevertheless, laparoscopic gastrectomy is an advanced procedure and thus familiarity with the operative steps, variety of reconstruction techniques and potential pitfalls are necessary to ensure good outcomes.

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