

Laparoscopic Gastrectomy

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Laparoscopic resection of the stomach should mimic an open operation as closely as possible. This is applicable to the technique, as well as to the indications for the operation. Palliative resection for gastric malignancy can be indicated to prevent hemorrhage or obstruction.

Indications and Contraindications

Indications

- Malignant tumors (carcinoma, gastrointestinal stromal tumor [GIST])
- Benign tumors (e. g., Leiomyoma)
- Arteriovenous malformations
- Recurrent peptic ulcer disease

Contraindications

- Severe cardiac failure (unable to withstand pneumoperitoneum)
- Sepsis
- Severe coagulopathy
- Previous upper abdominal surgery (relative)
- T4 or bulky tumors (relative)

Preoperative Investigation/Preparation for the Procedure

See ► Chap. 21 “Total Gastrectomy with Conventional Lymphadenectomy.”

Instrumentation

- Two monitors
- Three 10- to 12-mm trocars, two 5-mm trocars
- One 15-mm trocar (optional) to pass the 60-mm stapler and retrieval bag
- 30° laparoscope
- Unipolar or bipolar coagulation
- Hemostatic device (LigaSure, Ultracision)
- Standard laparoscopic instruments for advanced laparoscopic surgery, including fenestrated clamps and endo-Babcock clamp
- Vascular clip applier
- Endostapler (45–60 mm, with white, blue, and green cartridges)
- Liver retractor
- Vessel loops
- Gastroscope (optional, to identify small lesions)
- Retrieval bag or wound protector

Step 1**Procedure****Positioning and installations****Positioning**

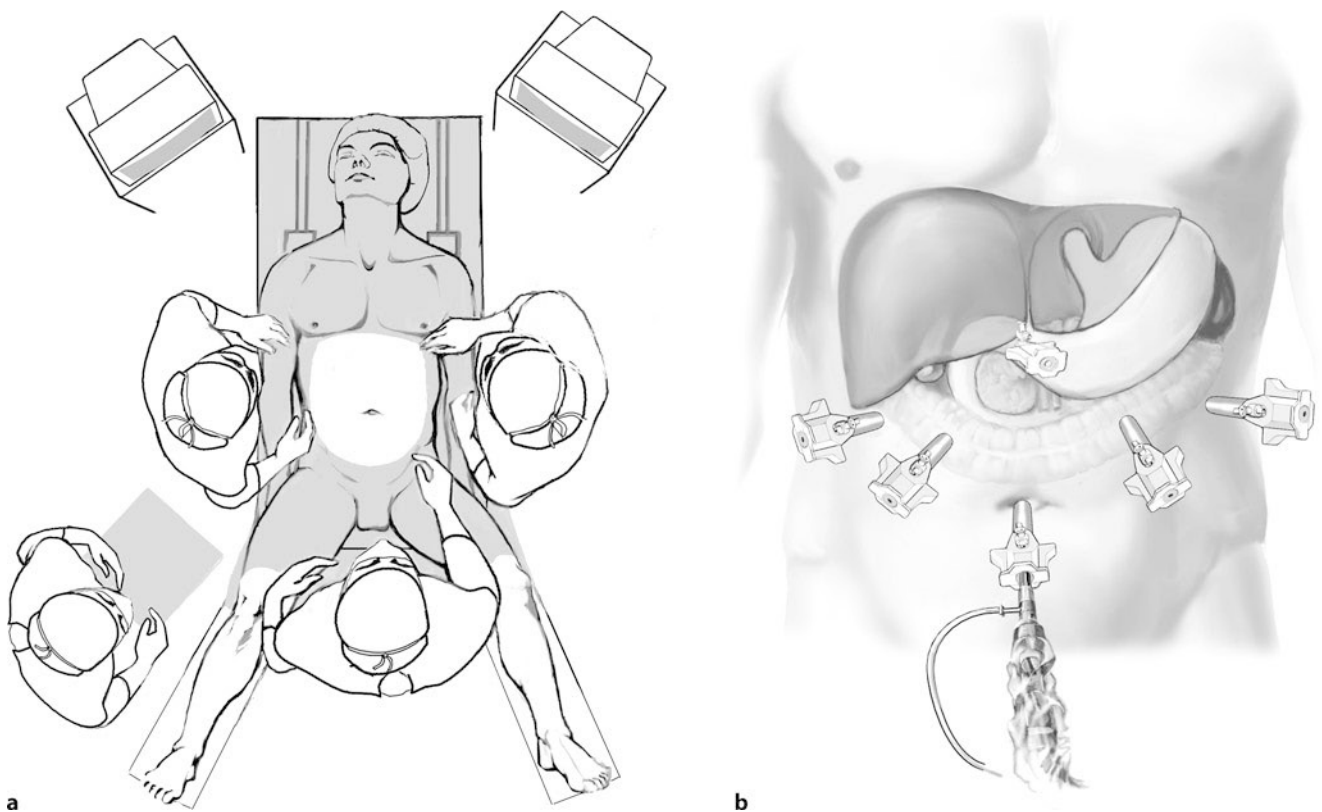
The patient is placed in the supine position. The surgeon stands between the legs of the patient, the first assistant on the left, the second assistant on the right side of the patient. The scrub nurse is positioned on the right or left hand side of the surgeon (■ Fig. 27.1a).

Installation of pneumoperitoneum and inspection of abdominal cavity

Pneumoperitoneum is established cranial to the umbilicus, in the midline. In obese patients the umbilicus is located more caudally; in these patients the first trocar may be just caudal to the left costal margin in the muscle ocular line – a safe area in obese individuals. In case of malignancy the abdominal cavity is inspected for signs of dissemination to the peritoneum or other organs. To allow for optimal inspection and to create the opportunity to take biopsies, one or more additional trocars are inserted. Inspection of the caudal side of the mesentery of the transverse colon and the region of Treitz ligament can be facilitated by bringing the patient into a Trendelenburg position.

Introduction of trocars (■ Fig. 27.1b)

The total number and position of trocars is dependent on the level of resection. The subxiphoidal trocar is only necessary for high resections of the stomach. Introduction of this trocar should be on the left side of the falciform ligament, especially when exploration of the cardia and gastroesophageal junction is necessary.

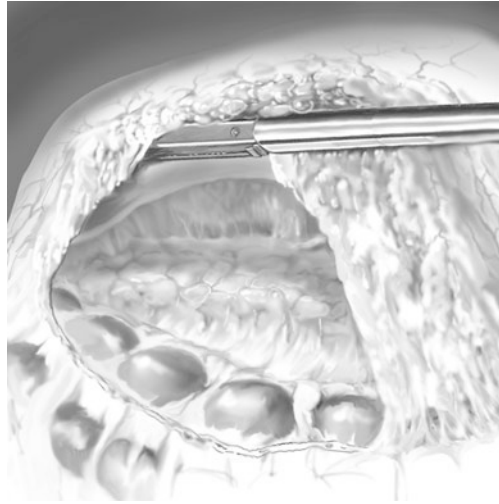


■ Fig. 27.1

Step 2

Opening of the lesser sac

To determine (laparoscopic) resectability of the tumor, opening of the lesser sac is achieved by detaching the greater omentum from the transverse colon by sharp dissection. In case of a benign indication, opening of the lesser sac can be performed more easily by creating a window in the greater omentum, for instance by using Ultracision. Involvement of the pancreas in malignant tumors requires conversion to open resection in most cases. In case of malignancy, once resectability has been established, the lesser sac is opened until the gastrocolic ligament is completely dissected from the hepatic to the splenic flexure (■ Fig. 27.2).

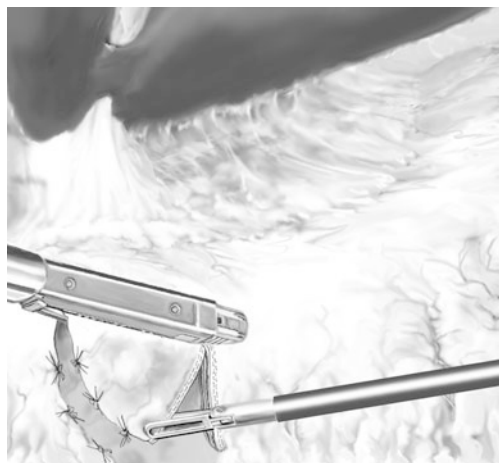


■ Fig. 27.2

Step 3

Resection of benign lesions

In benign lesions a stapled wedge resection is performed. Resection is performed under gastroscopic surveillance in case the lesion is not visible on the serosal side of the stomach especially if the lesion is located near either the gastroesophageal junction or in the antrum to assure that there is no stenosis of the gastric lumen. The gastrohepatic ligament must be opened if the tumor is located on the lesser curvature of the stomach (■ Fig. 27.3).

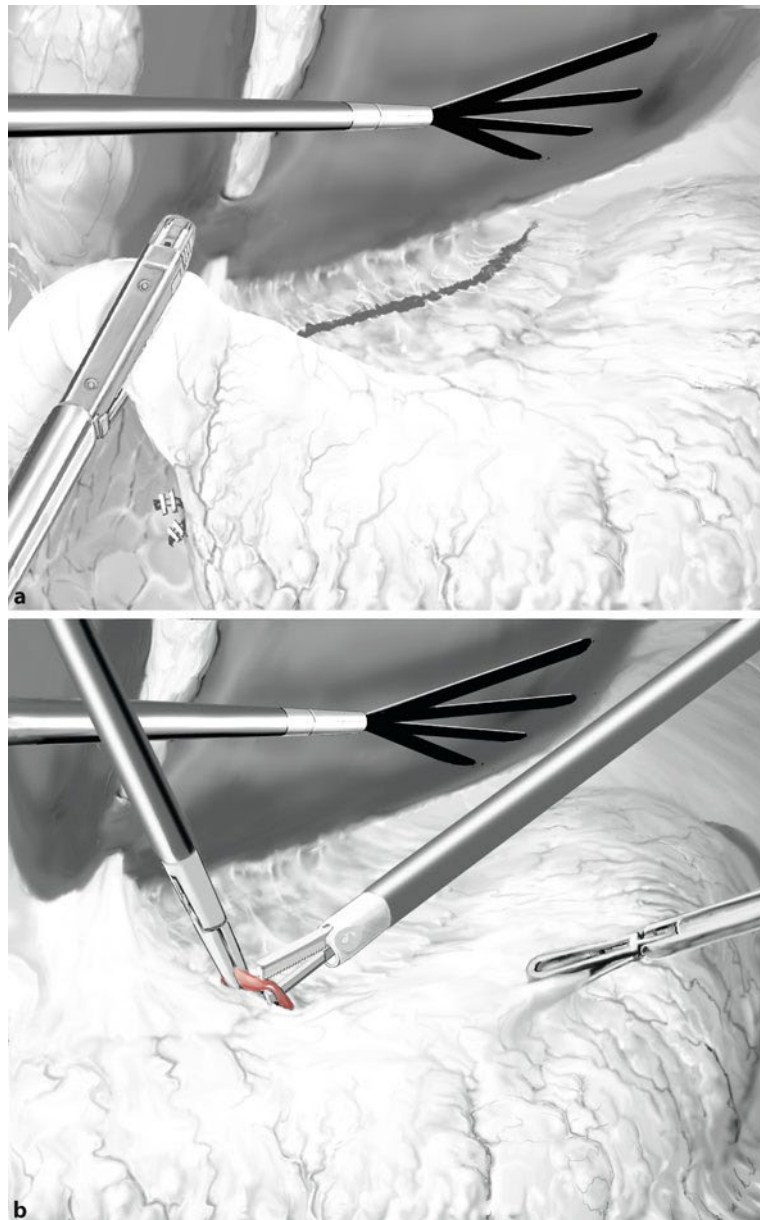


■ Fig. 27.3

Step 4**Transection of duodenum and resection of gastrohepatic ligament**

After detachment of the greater omentum, the right gastroepiploic vessels are identified and secured with clips at the level of the duodenum. Mayo's vein will locate the exact position of the pylorus. Identification of the pylorus can be facilitated by gentle palpation with a clamp in the postpyloric area. Care should be taken not to damage the pancreatic parenchyma as this may result in a pancreatic fistula. Sharp dissection at the posterior side of the postpyloric part of the duodenum creates space to introduce a 45-mm stapling device. A vessel loop can be used to facilitate safe insertion of the stapler. Prior to the closure of the stapler, care should be taken that the vessel loop and vascular clips are not included in the line of stapling (■ Fig. 27.4a).

The assistant retracts the liver to allow exposure of the lesser omentum. The gastrohepatic ligament is opened at the level of the hepatoduodenal ligament. The right gastric artery is transected using Ultracision (■ Fig. 27.4b). The assistant retracts the liver to allow exposure of the liver hilum. Following the common, proper, and left hepatic artery, the lesser omentum is freed, securing lymph nodes of the pyloric group up to the right pericardial group. This en bloc lymphadenectomy is part of a level D2 resection and is optional. A replaced or aberrant left hepatic artery, originating from the left gastric artery, can be safely dealt with, using clips if necessary. Alternatively this lymphadenectomy can be done after transection of the stomach.



■ Fig. 27.4

Step 5**Securing of left gastric vessels**

The posterior aspect of the stomach is freed from the anterior surface of the pancreas by sharp dissection of adhesions. At this stage a vessel loop can be used to allow easier manipulation of the stomach. In most patients, the splenic artery is identified cranial to the pancreas. More cranially, the left gastric vessels are identified and transected with clips or a vascular stapler. Optional D2 lymphadenectomy of the stomach implies formal lymphadenectomy at this stage (■ Fig. 27.5).



■ Fig. 27.5

Step 6**Transection of the stomach**

The transection line of the stomach is performed 5 cm orally to the tumor (■ Fig. 27.6a). If the tumor cannot be identified adequately on the serosal side of the stomach, intraoperative gastroscopy is mandatory to determine the exact line of transection. Location of the tumor high in the body of the stomach may require opening of the gastrosplenic ligament and securing of short gastric vessels with Ultracision (■ Fig. 27.6b).

D2 lymphadenectomy requires resection of lymph nodes of the gastrohepatic ligament and along the hepatic artery. If the nodal clearance has not been performed en bloc, it is feasible to do it at this stage (■ Fig. 27.6c).

After transection of the stomach, the specimen is placed in a retrieval bag for safe extraction. Extraction is done through a mini-laparotomy. This laparotomy can be conducted at a cosmetically preferred site (e.g., Pfannenstiehl). Alternatively a midline mini-laparotomy is performed in the upper abdominal region. In the latter option the anastomosis can be done in an open fashion.

Step 6 (continued)

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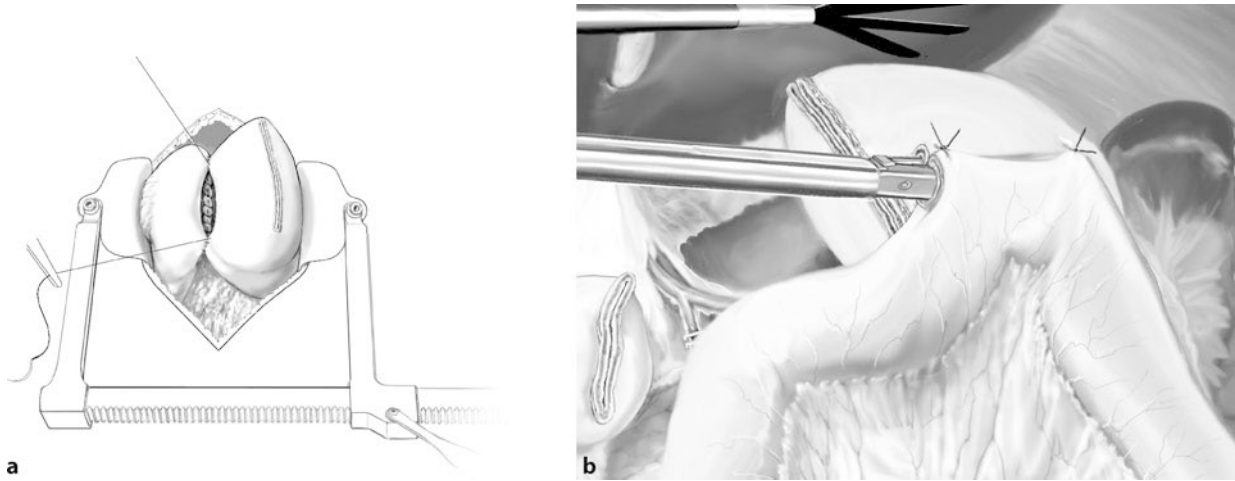
Fig. 27.6

Step 7**Anastomosis****Open anastomosis**

Through a small midline laparotomy a standard Billroth II or Roux-en-Y reconstruction can be performed (■ Fig. 27.7a).

Laparoscopic anastomosis (Billroth II)

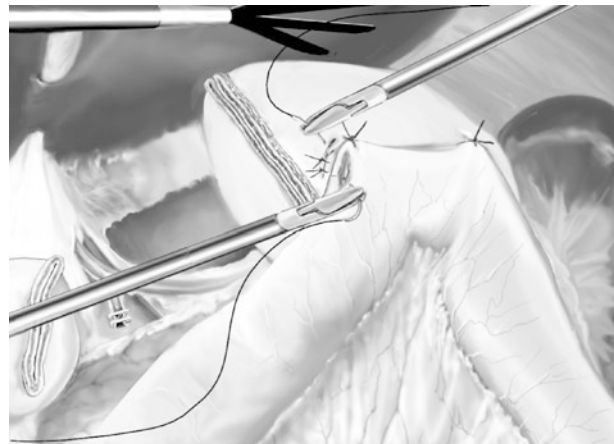
To perform a laparoscopic side-to-side gastrojejunostomy, the ligament of Treitz and the proximal jejunum are identified by lifting the transverse colon and tilting the table into a Trendelenburg position (head down). A loop of proximal jejunum is brought up in an antecolic or retrocolic fashion. This loop of jejunum is sutured to the anterior aspect of the stomach remnant with two resorbable, seromuscular stay sutures, approximately 2 cm apart. A stab incision in both the stomach and the jejunum is made with diathermia. Care should be taken that the incision in the stomach is made through all gastric wall layers. The stab incisions are enlarged, and the endostapler is introduced with one blade in the stomach and the other in the jejunum. Subsequently the stapler is fired one or two times, dependent on the size of the cartridges (60 or 45 mm). In case a 60-mm stapler is used, a 15-mm trocar should be introduced (■ Fig. 27.7b).



■ Fig. 27.7

Step 8**Closure of stab incisions in stomach and jejunum**

The incision that remains in the stomach and the jejunum after firing the endostapler is closed using a single-layer resorbable, polyfilament suture. Closure with an endostapler should not be attempted as the anastomosis is easily compromised because it is difficult to ensure inclusion of all tissue of the stomach and jejunum on both sides of the stab incisions in the staple line without narrowing the anastomosis (■ Fig. 27.8).



■ Fig. 27.8

Postoperative Investigations

See ► Chap. 21 “Total Gastrectomy with Conventional Lymphadenectomy.”

Postoperative Complications

■ Short term

- Anastomotic leakage (including duodenal stump leakage)
- Pancreatic fistula
- Chylous ascites (particularly after R2 resection)

■ Long term (all indications)

- Bile gastritis (particularly after Billroth II reconstruction)
- Anastomotic ulcer disease

■ Long term (in case of malignancy)

- Local recurrence (duodenal stump or resection line of stomach)
- Distant metastases

Tricks of the Senior Surgeon

- Instead of a vessel loop, a heavy resorbable suture can be used to pull the stomach or duodenum into the endostapler. Even if this suture is included in the staple line, this will not compromise the anastomosis.
- In lean patients it is often possible to remove one of the 10- to 12-mm trocars and directly introduce the 60-mm stapler or the retrieval bag, instead of using a 15-mm trocar.
- Suturing is best done with the laparoscope in the middle and two needle holders on either side of the scope with a 60° to 90° angle between the two needle holders.