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Preface

General and Visceral Surgery Review was originally published in German in 1996 as a revision aid for surgery in general. Since then, as the individual surgical subspecialties continue to develop, and today's medical training is built around the "Common Trunk" (as it is called in Germany), with subsequent specialist training, it has been necessary to continually update and adapt the higher-training content according to the various surgical specialties. *General and Visceral Surgery Review* was published in its sixth German-language edition in 2009.

Karl-Heinz Reutter, MD, created *General and Visceral Surgery Review* and continued it through five successful editions in the German language. I am not only happy to take over the task of editor from him for further German language editions, I am also highly delighted to be able to present the first English-language edition.

The purpose of this textbook is higher training and examination preparation in general and visceral surgery. We have made every effort to include up-to-date information and to present this information in a concise and succinct format, thus enabling colleagues to acquire the necessary theoretical knowledge in the shortest possible time.

This book is designed to place emphasis on core statements, and includes suggestions for further reading to help consolidate what has been learned. Contributions were provided by surgeons actively working in this field. By calling on their own practical experiences they have produced an ideal learning tool suited to the current requirements of higher training and examination preparation.

Nicolas T. Schwarz *Neumünster, Germany*

Acknowledgements

I thank my colleague K.-H. Reutter, MD, for giving me the opportunity to take over the editorship of this book. My special thanks also go to my medical colleagues in the Departments of Surgery and Trauma Surgery in Neumünster. We owe the production of this new edition to their enthusiasm for general and visceral surgery and to their constant thirst for knowledge, coupled with the desire to pass on this interest and their love of the specialty to their many colleagues.

Contents

Indication

Indications for Surgery

- Ulcerative esophagitis, strictures, Barrett esophagus
- Failure or intolerance of drug therapy
- Patient's wish as an alternative to long-term drug therapy
- Volume reflux with chronic bronchitis
- Volume reflux with treatment-resistant regurgitation of food
- An interdisciplinary decision with gastroenterologists should be made.

- Interdisciplinary indication for surgery

Conservative Treatment

- Weight reduction
- Sleep with upper body elevated
- Proton pump inhibitors, in ca. 80% freedom from symptoms, healing of the reflux esophagitis almost without exception; often requires lifelong treatment

- Weight reduction, sleeping with upper body elevated, proton pump inhibitors

Surgical Treatment

- Laparoscopic Nissen–Rosetti **fundoplication**
- Alternatively, hemifundoplication
- **Hiatoplasty:** posterior narrowing of the esophageal hiatus that has been stretched by the sliding hernia; additionally counteracts reflux by increasing the angle at which the esophagus opens into the stomach
- Additional **fundophrenicopexy** indicated only for upside-down stomach
- With very large sliding hiatal hernias or paraesophageal herniation, use of a **plastic mesh** to close the hernia may be necessary.
- Numerous other procedures are not established for use outside of clinical studies. These include, for instance, heating by radiofrequency therapy, intraluminal mucosal plication, and injection of plastic polymers.

- Standard treatment: laparoscopic fundoplication and hiatoplasty

Laparoscopic Fundoplication

Operative Technique

- Position the patient with legs on stirrups and with the buttocks supported.
- Create a pneumoperitoneum and carry out diagnostic laparoscopy (**Fig. 8.2**).
- Then place the patient in semi-seated position with feet lowered and turned slightly to the right side. The surgeon stands between the patient's legs.
- The left lobe of the liver is retracted with a triangle over the trocar from the right costal arch (T5).
- Exposure of the gastroesophageal junction is by incision of the lesser omentum proximal to the accessory left hepatic artery, which is often present.
- Incision of the peritoneal fold over the esophagus
- Dissection of the fundus along the greater curvature of the stomach from adhesions to the spleen (**caution:** short gastric arteries) and in a retroperitoneal direction. Dissection with ultrasonic scissors has proven useful.
- Dissect the esophagus free at the junction with the gastric fundus, protecting the vagal trunks.
- If appropriate, perform dissection of a hiatal hernia in the lower mediastinum.
- Tighten the hiatus, usually by two or three sutures posteriorly using nonabsorbable suture material (hiatus repair; **Fig. 8.3**).
- If appropriate, additional implantation of a plastic mesh after reduction of a large hiatal hernia, paraesophageal hernia or upside-down stomach

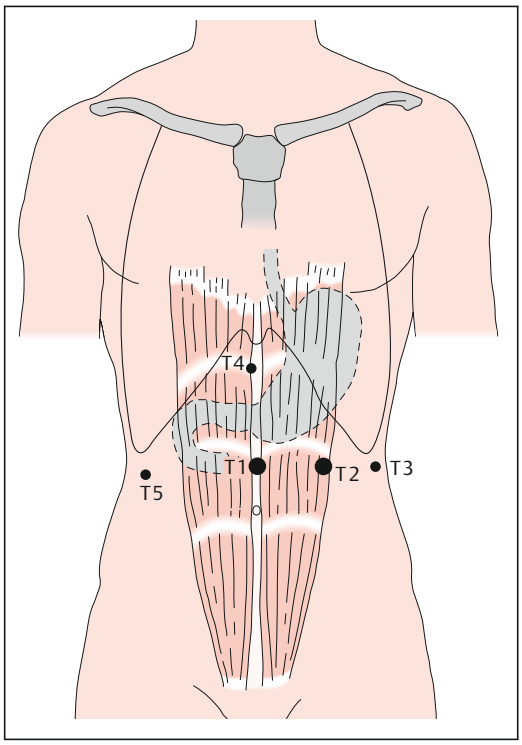

Fig. 8.2 Access routes for laparoscopic fundoplication.
T1: optic trocar
T2: working trocar, surgeon
T3: working trocar, assistant
T4: working trocar, surgeon
T5: working trocar, assistant, for holding the left lobe of the liver (triangle)

- Create a loose fundal cuff around the distal esophagus, drawing the mobilized fundus behind the esophagus.
- Introduction of a large gastric tube to prevent narrowing of the lumen by the fundoplication (this is done only at this time as it would interfere with dissection beforehand)
- Fixation of the cuff by picking up the esophagus with the first suture to prevent the stomach from sliding proximally. Two further sutures are used to form a loose cuff (floppy Nissen; **Fig. 8.4**); all sutures are nonabsorbable.
- Remove the gastric tube and check that the cuff is loose.
- Check for hemostasis, particularly on the spleen and liver.

Postoperative Management

- Removal of the gastric tube while still in the operating room
- Light diet the following day, ensuring that it is well masticated
- Check blood count on postoperative days 1 and 3.
- Discharge on postoperative day 3. Reflux symptoms should be eliminated on the day of surgery.

Complications

- Dysphagia
- Gas bloat syndrome
- Stenosis
- Recurrence

- Dysphagia and gas bloat syndrome (result of an excessively tight cuff)
- Telescope phenomenon if cuff is not fixed to the esophagus
- Denervation syndrome as a result of injury to vagal branches or vagus trunk
- Reflux recurrence if the cuff loosens
- Cicatricial stenosis at the esophageal hiatus with symptoms of narrowing

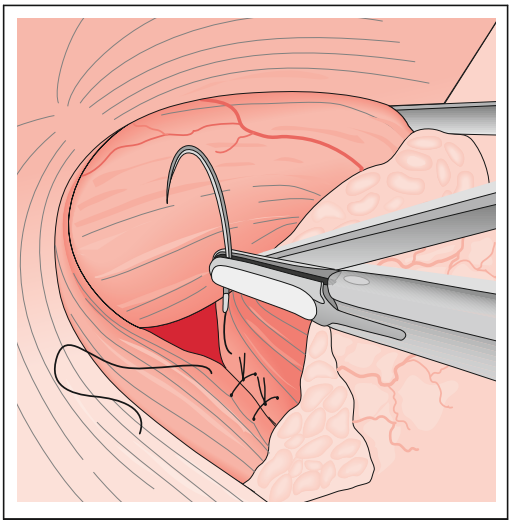

Fig. 8.3 Hiatal repair

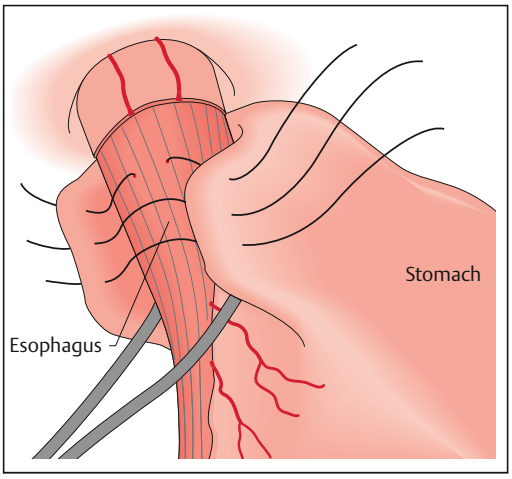

Fig. 8.4 Nissen fundoplication

Esophageal Carcinoma

Epidemiology

- Incidence about 10 per 100 000 population/year
- Predominantly **squamous epithelial carcinomas,** followed by **adenocarcinomas;** incidence of adenocarcinomas of the distal esophagus and gastroesophageal junction has been increasing in recent years.
- Ratio of men to women is 5 : 1.

Etiology

- Rapid metastasis to the local lymph nodes and extensive intramural growth (mucosal margin of the tumor often does not correspond to the tumor margin in the esophageal wall)

- Intramural growth
- Early lymphatogenous metastasis
- Lung and liver metastases
- Peritoneal carcinomatosis

- Distant metastases from proximal tumors especially to the lung and from distal tumors to the liver; skeletal metastases only occur later; with locally advanced distal tumors there is often peritoneal carcinomatosis
- Tumor localization is very important because of the different treatment approaches

Risk Factors

- Smoking
- Alcohol
- Thermal injury (hot foods)
- Cicatricial strictures, for example after acid or alkali corrosive injury, radiation
- Barrett esophagus: precancerous condition for adenocarcinoma of the esophagus

Classification

- Assessment of lymph nodes crucial for staging, prognosis and treatment

- **Squamous epithelial carcinoma:** distinction between cervical, supra- and infrabifurcation
- **Adenocarcinoma** of the distal esophagus is classified with proximal gastric carcinoma as adenocarcinoma of the esophagogastric junction (AEG):
  - ► Type I: distal esophagus (Barrett carcinoma)
  - ► Type II: cardia carcinoma, at the gastroesophageal junction
  - ► Type III: subcardiac gastric carcinoma, infiltrating the cardia from below
- AEG type I tumors are classified as esophageal carcinomas in the TNM classification, and AEG type II and III tumors are classified as gastric carcinomas (**Tables 8.2** and **8.3**).

Table 8.2 TNM classification

Tx		Primary tumor not assessable
T0		No evidence of primary tumor
Tis		Carcinoma in situ
T1		Infiltration of the lamina propria, muscularis mucosae, or submucosa
T2		Infiltration of the muscularis propria
T3		Infiltration of the adventitia
T4		Infiltration of neighboring structures
Nx		Regional lymph nodes not assessable
N0		No regional lymph node metastases
N1		Regional lymph node metastases
M0		No distant metastases
M1		Distant metastases and **nonregional lymph node metastases**
	Tumor in the upper thoracic esophagus	
	M1a	Metastases in cervical lymph nodes
	M1b	Nonregional lymph nodes and/or other distant metastases
	Tumor in the middle thoracic esophagus	
	M1a	not possible
	M1b	Nonregional lymph nodes and/or other distant metastases
	Tumor in the lower thoracic esophagus	
	M1a	Celiac lymph nodes
	M1b	Nonregional lymph nodes and/or other distant metastases

13 Rectum

J.M. Mayer

Anatomy

- Between the dentate line and 16 cm from the anus, measured with a rigid proctoscope

- The rectum extends from the upper border of the anal canal (dentate line) to 16 cm from the anus, measured with a rigid proctoscope.
- It is divided into three levels:
  - Upper third: 12–16 cm from the anus (intraperitoneal)
  - Middle third: 6–12 cm from the anus (extraperitoneal)
  - Lower third: < 6 cm from the anus (extraperitoneal)
- Rectal ampulla: lies against the concavity of the sacrum
- Anal canal: at the level of the pelvic diaphragm, passes in a posterior direction

Fasciae in the Lesser Pelvis

- Anterior and posterior investing fascia
- Lateral: paraproctium forming ligamentous connection with the pelvis

- **Posterior:** The parietal pelvic fascia lines the pelvis posteriorly. It extends from the pelvic ring almost to the tip of the sacrum, meets the pelvic floor, and covers the mesorectum posteriorly as visceral pelvic fascia (investing fascia). Between them is the avascular Waldeyer space.
- **Lateral:** The paraproctium forms a ligamentous connection with the pelvis.
- The Denonvillier fascia is **anterior.** In men, it clothes the posterior wall of the bladder, the seminal vesicles and the posterior wall of the prostate. It is reflected at the urogenital diaphragm and covers the rectum anteriorly as the visceral pelvic fascia (investing fascia).

Arteries (Fig. 13.1)

- Main blood supply: superior rectal artery; no marginal artery
- Middle and inferior rectal arteries: inconstant, supply the distal anterior wall
- After resection, usually adequate blood supply from distally

- Superior rectal artery (unpaired) from the inferior mesenteric artery provides the blood supply to the major part of the rectum. It divides into three terminal branches on the posterior wall of the rectum, which empty into the hemorrhoidal plexus at 3, 7, and 11 o'clock positions.
- Middle rectal arteries (paired, inconstant) from the internal iliac artery run above the levators into the paraproctium and supply a small section of the distal anterior rectal wall together with the inferior rectal arteries (paired, inconstant) from the pudendal arteries, which are branches of the internal iliac artery, running below the levators.
- Blood supply after low anterior rectal resection:
  - With ligature close to the trunk of the inferior mesenteric artery, the proximal colon stump is supplied only through the anastomosis of the Riolan and Drummond arcade. It is therefore important to spare the marginal arcade.
  - The rectal stump can be supplied only by the inferior rectal arteries and possibly the middle rectal arteries. The longer the rectal stump, the more endangered is its blood supply. Intramural vascular anastomoses usually ensure an adequate blood supply from distally.

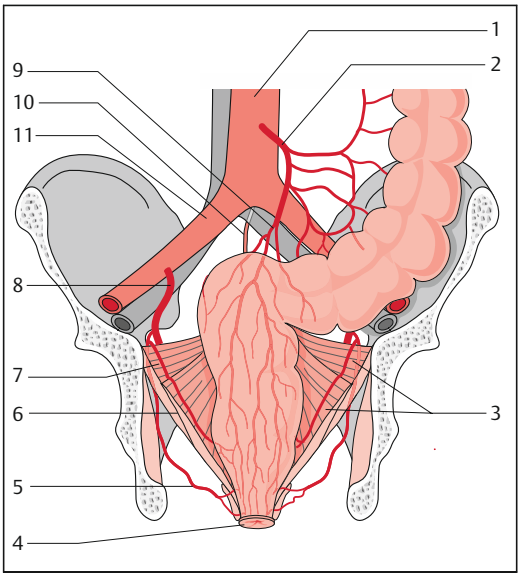

Fig. 13.1 Blood supply of the rectum.
1: Aorta
2: Inferior mesenteric artery
3: Levator ani with puborectalis sling
4: Anal canal
5. Inferior rectal artery
6: Levator ani
7: Middle rectal artery
8: Internal iliac artery
9: Superior rectal artery
10: Middle sacral artery
11: Common iliac artery

Veins

- The main venous drainage is to the liver through the unpaired superior rectal vein and portal vein system.
- In the lower quarter of the rectum, there may be venous drainage to the lungs via the middle and inferior rectal veins and inferior vena cava (inconstant).

- Main drainage is to the liver through the superior rectal vein.
- Middle and inferior rectal veins usually absent.

Lymphatic Drainage

- The main lymphatic drainage follows the branching of the superior rectal artery to the locoregional lymph nodes in the mesorectum, and from there along the main trunk of the superior rectal artery to the para-aortic lymph nodes.
- Because of the absence of a vascular arcade close to the bowel wall, there are no lymphatic pathways running proximally and distally along the bowel. Malignant cells are usually not found more than 4 cm from the primary tumor. Thus, smaller safety margins are sufficient in rectal surgery.
- The inferior quarter of the rectum has no lymph nodes because of the absence of mesorectum. Lymphatic drainage is intramural in the cranial direction.
- Lymphatic channels along the middle and inferior rectal arteries are present only rarely. Iliac lymph node metastases (lateral pelvic wall) therefore occur rarely, even with supraanal rectal cancer.
- The anal canal also drains to the inguinal lymph nodes.

- Main drainage along the superior rectal artery
- Only slight spread along the bowel because of the absence of a marginal artery
- Drainage to iliac and inguinal lymph nodes usually absent

Innervation

- The distal quarter of the rectum has particularly pronounced innervation.
- This is the site of the procontinence reaction for maintaining the anorectal reflex.
- The epicritic sensibility for distinguishing solid matter, liquid, and gas is located in the anoderm.

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Note: 'vs' indicates differential diagnosis.

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