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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

1 Perioperative Medicine  
N.T. Schwarz  

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative Phase</td>
<td>1</td>
</tr>
<tr>
<td>Intraoperative Phase</td>
<td>5</td>
</tr>
<tr>
<td>Postoperative Period</td>
<td>6</td>
</tr>
<tr>
<td>Fast-Track Surgery</td>
<td>7</td>
</tr>
</tbody>
</table>

2 Thyroid  
B. Thiel  

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy</td>
<td>9</td>
</tr>
<tr>
<td>Physiology</td>
<td>12</td>
</tr>
<tr>
<td>General Epidemiology</td>
<td>12</td>
</tr>
<tr>
<td>General Diagnostic Approach</td>
<td>12</td>
</tr>
<tr>
<td>General Treatment Approach</td>
<td>17</td>
</tr>
<tr>
<td>Diseases of the Thyroid</td>
<td>26</td>
</tr>
<tr>
<td>Euthyroid Goiter</td>
<td>26</td>
</tr>
<tr>
<td>Hyperthyroidism</td>
<td>28</td>
</tr>
<tr>
<td>Graves Disease, Immunogenic Hyperthyroidism</td>
<td>30</td>
</tr>
<tr>
<td>Thyrotoxic Crisis</td>
<td>33</td>
</tr>
<tr>
<td>Thyroiditis</td>
<td>34</td>
</tr>
<tr>
<td>Thyroid Carcinoma</td>
<td>37</td>
</tr>
</tbody>
</table>

3 Parathyroid  
B. Thiel  

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy</td>
<td>44</td>
</tr>
<tr>
<td>Physiology</td>
<td>45</td>
</tr>
<tr>
<td>Primary Hyperparathyroidism</td>
<td>45</td>
</tr>
<tr>
<td>Secondary Hyperparathyroidism</td>
<td>51</td>
</tr>
<tr>
<td>Tertiary Hyperparathyroidism</td>
<td>54</td>
</tr>
<tr>
<td>Parathyroid Carcinoma</td>
<td>54</td>
</tr>
<tr>
<td>Hypoparathyroidism</td>
<td>55</td>
</tr>
</tbody>
</table>

4 Thorax (Pleura, Lung)  
R.J. Elfeldt  

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy</td>
<td>57</td>
</tr>
<tr>
<td>Pleural Effusion</td>
<td>57</td>
</tr>
<tr>
<td>Pleural Empyema</td>
<td>61</td>
</tr>
<tr>
<td>Chest Trauma: Blunt Chest Injuries</td>
<td>62</td>
</tr>
<tr>
<td>Chest Contusion</td>
<td>63</td>
</tr>
<tr>
<td>Chest Compression</td>
<td>63</td>
</tr>
<tr>
<td>Rib Fractures</td>
<td>64</td>
</tr>
<tr>
<td>Fracture of the Sternum</td>
<td>65</td>
</tr>
<tr>
<td>Lung Contusion</td>
<td>66</td>
</tr>
<tr>
<td>Chest Trauma: Penetrating Chest Injuries</td>
<td>67</td>
</tr>
<tr>
<td>Traumatic Pneumothorax</td>
<td>67</td>
</tr>
<tr>
<td>Hemothorax</td>
<td>69</td>
</tr>
<tr>
<td>Chylothorax</td>
<td>70</td>
</tr>
<tr>
<td>Tracheal and Bronchial Injuries</td>
<td>70</td>
</tr>
</tbody>
</table>

5 Mediastinum  
R.J. Elfeldt  

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy</td>
<td>72</td>
</tr>
<tr>
<td>Mediastinoscopy</td>
<td>73</td>
</tr>
<tr>
<td>Subcutaneous Emphysema</td>
<td>74</td>
</tr>
<tr>
<td>Mediastinal Emphysema</td>
<td>74</td>
</tr>
<tr>
<td>Mediastinitis</td>
<td>75</td>
</tr>
</tbody>
</table>
# Contents

## 6 Diaphragm

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy</td>
<td>77</td>
</tr>
<tr>
<td>Diaphragmatic Hernias</td>
<td>78</td>
</tr>
</tbody>
</table>

Rare Disorders of the Diaphragm | 81   |

## 7 Hernias

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inguinal Hernias</td>
<td>85</td>
</tr>
<tr>
<td>Femoral Hernias</td>
<td>95</td>
</tr>
<tr>
<td>Incisional Hernias</td>
<td>96</td>
</tr>
</tbody>
</table>

Umbilical Hernia | 103   |

Epigastric Hernia | 104   |

Internal Hernias | 104   |

## 8 Esophagus

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy</td>
<td>106</td>
</tr>
<tr>
<td>Histology</td>
<td>108</td>
</tr>
<tr>
<td>Physiology</td>
<td>108</td>
</tr>
</tbody>
</table>

Functional Disorders | 108   |

Achalasia | 108   |

Other Functional Disorders | 109   |

Esophageal Diverticulum | 110   |

Cervical Pulsion Diverticulum (Zenker Diverticulum) | 110   |

Epiphrenic Pulsion Diverticulum | 111   |

Traction Diverticulum | 111   |

Gastroesophageal Reflux Disease (GERD) | 111   |

Esophageal Carcinoma | 115   |

Injuries of the Esophagus | 123   |

Corrosive Injuries | 123   |

Traumatic Perforation of the Esophagus | 124   |

Spontaneous Esophageal Rupture (Boerhaave Syndrome) | 124   |

## 9 Stomach and Duodenum

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy</td>
<td>126</td>
</tr>
<tr>
<td>Ulcer</td>
<td>128</td>
</tr>
</tbody>
</table>

Bleeding from the Stomach and Duodenum | 150   |

Gastric Carcinoma | 155   |

MALT Lymphoma | 173   |

## 10 Small Intestine

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy</td>
<td>176</td>
</tr>
<tr>
<td>Crohn Disease</td>
<td>176</td>
</tr>
</tbody>
</table>

Meckel Diverticulum | 184   |

Jejunal Diverticulum | 184   |

## 11 Vermiform Appendix

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy</td>
<td>185</td>
</tr>
</tbody>
</table>

Diverticulitis of the Appendix | 193   |

Appendix Carcinoid | 193   |

Mucinous Cystadenoma / Pseudomyxoma | 193   |

Peritonei | 194   |

Appendix Carcinoma | 194   |

---

[Source: Schwarz u. a., General and Visceral Surgery Review (ISBN 9783131543110) © 2012 Georg Thieme Verlag KG]
Contents

12 Colon

Anatomy ........................................ 196
Anastomosis Techniques .................... 197
Minimally Invasive Colon Surgery ........ 199
Diverticulosis and Diverticulitis ......... 200

Ulcerative Colitis ............................. 205
Polyps of the Colon ......................... 212
Colon Cancer .................................. 214

13 Rectum

Anatomy ......................................... 230
Rectal Cancer .................................. 233
Pelvic Floor Insufficiency ................. 240

14 Anus

Anatomy ........................................ 245
Hemorrhoids .................................... 245
Perianal Vein Thrombosis ................. 250
Anal Fissure .................................. 250
Abscesses and Anal Fistulas ............. 251
Fecal Incontinence ......................... 255
Anal Carcinoma .............................. 258

15 Intestinal Obstruction

H. Brunn 263

Anatomy ........................................ 277
Hypersplenism Syndrome ................. 277

16 Spleen

H. Brunn 277

Anatomy ........................................ 277
Physiology ...................................... 277

17 Liver

M. Voelz 281

Anatomy ........................................ 281
Benign Liver Tumors ....................... 282
Focal Nodular Hyperplasia (FNH) ...... 282
Hepatocellular Adenoma ................. 283
Hepatic Hemangioma ....................... 283
Focal Cysts .................................... 284
Malignant Liver Tumors ................... 284
Primary Hepatic Carcinoma .............. 284
Liver Metastases ............................. 286
Hydatid Disease of the Liver (Echinococcosis) ... 297
Portal Hypertension ....................... 299
Liver Trauma ................................... 302

18 Gallbladder and Biliary Tract

M. Voelz 304

Anatomy ........................................ 304
Cholecystolithiasis ......................... 306
Acute Cholecystitis ......................... 315

Gallbladder Carcinoma ..................... 316
Extrahepatic Bile Duct Carcinoma ..... 319

aus: Schwarz u. a., General and Visceral Surgery Review (ISBN 9783131543110) © 2012 Georg Thieme Verlag KG
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Pancreas</td>
<td>321</td>
</tr>
<tr>
<td></td>
<td>Anatomy</td>
<td>321</td>
</tr>
<tr>
<td></td>
<td>Physiology</td>
<td>323</td>
</tr>
<tr>
<td></td>
<td>Acute Pancreatitis</td>
<td>323</td>
</tr>
<tr>
<td></td>
<td>Chronic Pancreatitis</td>
<td>327</td>
</tr>
<tr>
<td>20</td>
<td>Transplantation</td>
<td>339</td>
</tr>
<tr>
<td>21</td>
<td>Peritonitis</td>
<td>346</td>
</tr>
<tr>
<td>22</td>
<td>Neuroendocrine Tumors and Gastrointestinal Stromal Tumors</td>
<td>360</td>
</tr>
<tr>
<td></td>
<td>Neuroendocrine Tumors</td>
<td>360</td>
</tr>
<tr>
<td></td>
<td>Stomach</td>
<td>364</td>
</tr>
<tr>
<td></td>
<td>Duodenum and Pancreas—Insulinoma</td>
<td>364</td>
</tr>
<tr>
<td></td>
<td>Duodenum and Pancreas—Gastrinoma</td>
<td>366</td>
</tr>
<tr>
<td></td>
<td>Ileum</td>
<td>369</td>
</tr>
<tr>
<td>23</td>
<td>Soft-Tissue Tumors</td>
<td>377</td>
</tr>
<tr>
<td>24</td>
<td>Vascular Surgery</td>
<td>381</td>
</tr>
<tr>
<td></td>
<td>Arteries</td>
<td>381</td>
</tr>
<tr>
<td></td>
<td>Vascular Injuries</td>
<td>382</td>
</tr>
<tr>
<td></td>
<td>Aneurysms</td>
<td>383</td>
</tr>
<tr>
<td></td>
<td>Acute Limb Artery Occlusion</td>
<td>385</td>
</tr>
<tr>
<td></td>
<td>Acute Mesenteric Artery Occlusion</td>
<td>387</td>
</tr>
<tr>
<td></td>
<td>Chronic Arterial Disease of the Limbs</td>
<td>388</td>
</tr>
<tr>
<td>25</td>
<td>Emergency and Trauma Surgery</td>
<td>395</td>
</tr>
<tr>
<td></td>
<td>Polytrauma</td>
<td>395</td>
</tr>
<tr>
<td></td>
<td>Head Injury</td>
<td>397</td>
</tr>
<tr>
<td></td>
<td>Fractures</td>
<td>399</td>
</tr>
<tr>
<td></td>
<td>Dislocations</td>
<td>403</td>
</tr>
<tr>
<td></td>
<td>Illustration Credits</td>
<td>413</td>
</tr>
<tr>
<td></td>
<td>Index</td>
<td>415</td>
</tr>
</tbody>
</table>
### 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.

### 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

### 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 **fundoplicectomy** 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.

### 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
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
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**
• 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**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tx</td>
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</tr>
<tr>
<td>T0</td>
<td>No evidence of primary tumor</td>
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<tr>
<td>Tis</td>
<td>Carcinoma in situ</td>
</tr>
<tr>
<td>T1</td>
<td>Infiltration of the lamina propria, muscularis mucosae, or submucosa</td>
</tr>
<tr>
<td>T2</td>
<td>Infiltration of the muscularis propria</td>
</tr>
<tr>
<td>T3</td>
<td>Infiltration of the adventitia</td>
</tr>
<tr>
<td>T4</td>
<td>Infiltration of neighboring structures</td>
</tr>
<tr>
<td>Nx</td>
<td>Regional lymph nodes not assessable</td>
</tr>
<tr>
<td>N0</td>
<td>No regional lymph node metastases</td>
</tr>
<tr>
<td>N1</td>
<td>Regional lymph node metastases</td>
</tr>
<tr>
<td>M0</td>
<td>No distant metastases</td>
</tr>
<tr>
<td>M1</td>
<td>Distant metastases and nonregional lymph node metastases</td>
</tr>
</tbody>
</table>

**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

- 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

- **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)

- 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.
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).

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.

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.

Main drainage is to the liver through the superior rectal vein.
- Middle and inferior rectal veins usually absent.
- 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
Note: ‘vs’ indicates differential diagnosis.

A

abdomen (abdominal cavity)
acute see acute abdomen
approach to pelvic floor insufficiency surgery via 244
 cleansing 353, 354–357
sepsis see sepsis
wall
anatomy 96
distension with obstructed bowel 265, 269
hernia see hernia
abdominal guarding in peritonitis 349
abdominoperineal approach
anal carcinoma 260
rectal cancer
amputation of rectum 239
intersphincteric resection of rectum 238
abdominothoracic esophageal resection 119–120
abscesses
bowel
anus 251–254
colorectal carcinoma surgery and risk of 228
Crohn disease 178, 181, 183
hepatic 307
pleural (empyema) 61–62
pyogenic see empyema
accessory spleen 277
achalasia 108–109
ACPP/SCCM Consensus Conference, diagnostic criteria for sepsis and septic shock 359
acute abdomen 349
mesenteric artery occlusion vs other causes of 387
acute lung injury or acute respiratory distress syndrome, ventilation 358
adenocarcinoma
anal 258, 261
esophagus 117, 119
distal 115, 116
esophagogastric junction (AEG) 116, 155, 166
adenoma
colic 213, 214
progression to carcinoma 215
hepatocellular 283
parathyroid 45, 46, 47, 48, 49
removal 48
ultrasonography 15
thyroid 15, 16, 28, 29
adenomatous polyposis, familial (FAP) 213, 214
adhesions, bowel 266, 275
adhesive plastic drapes for temporary abdominal closure 356
adjunctive treatment in peritonitis 358
adjuvant (postoperative) therapy
colon carcinoma 218
gastric carcinoma 159–160
gastric MALToma 175
pancreatic carcinoma 334
rectal cancer 234
soft-tissue tumors 379
adventitia
arterial 381
esophagal 108
afferent loop syndrome 147
aftercare see postoperative care
airway injury 70–71
Aitken classification of epiphyseal fractures 401
AJCC see American Joint Committee on Cancer
alimentary tract see gastrointestinal tract
Altemeier operation in pelvic floor insufficiency 244
alveolar echinococcosis 298
American College of Chest Physicians/Society of Critical Care Medicine (ACPP/SCCM) Consensus Conference, diagnostic criteria for sepsis and septic shock 359
American Joint Committee on Cancer (AJCC) staging
esophageal carcinoma 117
gallbladder and bile duct carcinoma 317, 319
American Society of Anesthesiologists’ risk group classification 1, 2
amine precursor uptake and decarboxylation (APUD) system 360
aminosaliclylates
Crohn disease 180
diverticulitis 203
ulcerative colitis 207, 208
amputation, soft-tissue tumors 380
anal canal see anus
anal sphincters, internal and external 232
dysfunction causing fecal incontinence 255
artificial sphincter implanta-tion 258
reconstructive surgery 257
incision (sphincterotomy) 251
see also intersphincteric resec-tion
anaplastic (undifferentiated) thyroid carcinoma 38, 41, 43
anastomosis (surgical)
colorectal 197–199, 238
low anterior proctectomy 237
proctocolectomy 210, 211, 212
hepatic resections 292
in pancreatic carcinoma palliation 336
peptic ulcer surgery leakage 147
stenosis 147
techniques 134–136
in portal hypertension surgery 301
small bowel in Crohn disease 182
transplantation, kidney–pancreas 343
anastomosis of Riolan 197
anesthesia 6
liver resection 289
aneurysms 383–385
angiographic embolization in upper GI bleeding 153, 154
angiography acute limb artery occlusion 386
acute mesenteric artery occlusion 387
bowel obstruction 271
rib fractures 65
subclavian steal syndrome 390
see also computed tomography angiography
anoderm 232
extent of loss in hemorrhoidectomy 247–249
antecolic Billroth II gastrectomy 140
antibiotics cholecystitis (acute) 316
diverticulitis 203
H. pylori eradication 132
peritonitis 352–353
antibodies in autoimmune thyroid disease 14, 30, 31
anticoagulation 3–5
after deep vein thrombosis treatment 393
lifelong 394
antithyroid drugs 29, 32
anus (and anal canal) 245–262
abscesses 251–254
anatomy 232
carcinoma 258–262
fissure 250
fistulas in or in region of 251–254
Crohn disease 182
hemorrhoids 245–249
see also colo-anal pouch anastomosis; ileo-anal pouch; transanal procedures
AO classification fractures 399
soft-tissue injury 405
aortic hiatus 77
aortoiliac occlusion 389
APACHE-II score in peritonitis 350
appendectomy appendicitis conventional 192
laparoscopic 190–191
carcinoid 194
appendicitis, acute 183–193
treatment 189–192
appendix (vermiform) 185–195
rare conditions 186, 193–194
neuroendocrine tumors 193–194, 370–371
APUD (amine precursor uptake and decarboxylation) system 360
arteries 381–391
structure/anatomy 381
supply to tissues/organs colon 196–197
diaphragm 77 esophagus 106–107
gallbladder/biliary tract 305
liver 281–282
pancreas 321
peritoneum 346
rectum 230
spleen 277
stomach/duodenum 126
thyroid 9, 10
surgery 381–391
arteriosclerosis 388
arthroplasty prosthesis, infected 409
ASA’s risk group classification 1, 2 ascending colon 196
aspiration, pleural 58
aspiration biopsy/cytology (incl. fine needle)
pancreatic carcinoma 333
thyroid 16–17
carcinoma 39–41
de Quervain’s thyroiditis 34
goiter 27
hyperthyroidism 28
aspirin-related peptic ulcers 130
atherogenesis, steps in 388–389
atherosclerosis, risk factors 388
Atlanta classification of acute pancreatitis 324
auscultation
obstructed bowel 269
peritonitis 350
autoimmune thyroid disease 30–32
diagnosis 14
autonomic adenoma 15, 16, 28, 29
autotransplantation (grafts of autologous tissue)
interposition graft in post-gastrectomy reconstruction 165, 166, 167–168
parathyroid tissue 53
skin graft with incisional hernia 103
for vessel replacement 381
aneurysms 384
see also bypass grafts axonotmesis 409
azathioprine
Crohn disease 181
ulcerative colitis 208

B

B cell lymphoma, gastric 174
bacteria in peritonitis pathogenesis 347–348
bands, adhesive (bowel) 266, 275
barium swallow achalasia 109
esophageal diverticulum 110
Barrett esophagus 111, 112, 113, 116
Bassini herniotomy 88
Beger operation 329, 330
Best Crohn Disease Activity Index (CDAI) 177
bile, inspection for leaks with liver resection 292
bile ducts
anatomy 304
carcinoma (cholangiocarcinoma) 284, 285, 318–320
common 304
exploration 309, 314
stone impacted in 307
biliary (gallstone) ileus 267, 275, 307
biliary-enteric anastomosis (procedure)
hepatic metastases 292
pancreatic carcinoma 336
biliary-enteric fistula (pathological) 307
biliary tract 304–320
anatomy 304–305
Billroth I gastrectomy 133, 138–140
ulcer recurrence after 150
Billroth II gastrectomy 133
afferent loop syndrome following 147
ulcer recurrence after 150
biopsy
aspiration see aspiration biopsy
esophageal 112
liver, in portal hypertension 300
soft-tissue tumors 378
for radical removal 378, 379
bisegmental liver resection 294–295
Bismuth–Corlette classification of Klatskin tumors 319
bleeding see hemorrhage
blood vessels see entries under vascular and specific types of vessels
Blumberg sign 187
blunt chest trauma 62–67
Bochdalek hernia 77, 79
Boerhaave syndrome 124–125
bone fractures see fractures
in hyperparathyroidism 46
infection 407–409
bone scintigraphy, esophageal carcinoma 118
Borrman classification, advanced gastric carcinoma 157
bowel see intestine
brachytherapy
anal carcinoma 261
esophageal carcinoma 119
Braun anastomosis 140, 141, 171
breast, video-endoscopic goiter resection approach via 24
bridging mesh 101
bronchial injury 70–71
bronchoscop y, esophageal carcinoma 118
Brook terminal ileostomy, ulcerative colitis 209
Budd–Chiari syndrome 299
budesonide, Crohn disease 180
Buess transanal endoscopic microsurgery 235
bypass grafts 381
peripheral arterial occlusive disease 390
subclavian steal syndrome 391

C

C-cell carcinomas 38, 42
CA-19-9 and pancreatic carcinoma 333
calcitonin 12, 45
measurement 14
see also procalcitonin
calcium levels
abnormal see hypercalcemia
hypocalcemia
regulation 46
Calot triangle 305
cancer (malignant tumors)
appendiceal 193–194
bile duct (cholangiocarcinoma) 284, 285, 319–320
colorectal see colorectal cancer; rectum
esophageal 115–123
gallbladder 316–320
gallstones predisposing to 306
gastric 134, 155–173
lymph node metastases 127, 156, 157, 163
in stump following gastrectomy 149
hepatocellular 284, 285, 341
neuroendocrine 360, 361
pancreatic 332–336
parathyroid 54–55
thyroid 36, 37–46
carcinomatosis, peritoneal see peritoneal cavity
cardia, achalasia of 108–109
cardiac contusions 65, 66
cardiopulmonary symptoms, diaphragmatic hernia 79
caval filter 393
cecum 196
reservoir construction from 238
celiac trunk 126
central liver resection 294
central soft-tissue tumors 378
cervical esophageal, resection 121–122
cervical exploration, bilateral, in hyperparathyroidism 48
cervical lymph nodes see neck lymph nodes
cervical pulsion diverticulum 110, 110–111
chemical injury, esophagus 123–124
chemoradiotherapy
anal carcinoma 260, 261
prognosis 262
esophageal carcinoma 118, 119
gastric carcinoma 160
rectal cancer 234
chemotherapy
anal carcinoma 260, 261
bile duct carcinoma 320
colon carcinoma 218
gallbladder carcinoma 318
gastric carcinoma 158
adjuvant 159–160, 160
palliative 171
gastric MALToma 175
hepatic metastases 286, 287, 288
neuroendocrine tumors 363
gastrinoma 368
pancreatic carcinoma 334
pancreatic endocrine tumors
rectal cancer
adjuvant and neoadjuvant 234
palliative 240
soft-tissue tumors 379
thyroid carcinoma 43
chest (thorax) 57–71
anatomy 57
drainage see drains
trauma see trauma
chest X-ray/radiograph
achalasia 109
diaphragmatic hernia 80
mediastinitis 76
peritonitis 351
Perthes syndrome (traumatic asphyxia) 64
pleural effusions 58
in pleurodesis 59
sternal fractures 66
thyroid carcinoma 39
trauma 63
lung contusions 67
rib fractures 65
Child classification of liver cirrhosis 285, 286
children
fracture classification 401
inguinal hernia 85, 93
intussusception 267
large bowel obstruction 264
choanalgiocarcinoma 284, 285
choangiography
intraoperative 308
percutaneous transhepatic 308
choanalgiopancreatography
endoscopic retrograde see endoscopic retrograde cholangiopancreatography
magnetic resonance see magnetic resonance cholangiopancreatography
cholangitis, purulent, with stones 307
cholecystectomy
cholecystitis (acute) 316
choledocholithiasis 309, 309–315
aftercare 313–314
complications 314–315
laparoscopic see laparoscopy, interventional
open see open cholecystectomy
liver metastases 290
cholecystitis 315–316
acute 315–316
with choledocholithiasis 306, 307
chronic, with choledocholithiasis 307
choledocholithiasis 306, 309
choledochoscopy 313
choledochotomy 313
choleliths see gallstones
cholestasis, laboratory tests 308
cholinesterase levels and liver surgery 285
CHOP regimen, gastric MALToma 175
chromogranin A and neuroendocrine tumors 362
chyllothorax 70
ciclosporin, ulcerative colitis 208
cirrhosis, liver cancer risk 284
Child classification 285, 286
portal hypertension in 299
closed dislocation 404
closed fractures, soft-tissue
damage with, classification 400
closed pneumothorax 67–68
closed postoperative peritoneal lavage 355
cogulation therapy with liver metastases 291
cold thyroid nodule, scintigraphy 15
colecotomy (colon resection) 219–227, 274
carcinoma 219–227
diverticulitis 204, 205
liver metastases 290
cholecystitis 315–316
acute 315–316
with choledocholithiasis 306, 307
chronic, with choledocholithiasis 307
choledocholithiasis 306, 309
cholelithiasis 313
choledochotomy 313
choleliths see gallstones
cholestasis, laboratory tests 308
cholinesterase levels and liver surgery 285
CHOP regimen, gastric MALToma 175
chromogranin A and neuroendocrine tumors 362
chyllothorax 70
ciclosporin, ulcerative colitis 208
cirrhosis, liver cancer risk 284
Child classification 285, 286
portal hypertension in 299
closed dislocation 404
closed fractures, soft-tissue
damage with, classification 400
closed pneumothorax 67–68
closed postoperative peritoneal lavage 355
cogulation therapy with liver metastases 291
cold thyroid nodule, scintigraphy 15
colecotomy (colon resection) 219–227, 274
carcinoma 219–227
diverticulitis 204, 205
liver metastases 290
cholecystitis 315–316
acute 315–316
with choledocholithiasis 306, 307
chronic, with choledocholithiasis 307
choledocholithiasis 306, 309
cholelithiasis 313
choledochotomy 313
choleliths see gallstones
cholestasis, laboratory tests 308
cholinesterase levels and liver surgery 285
CHOP regimen, gastric MALToma 175
chromogranin A and neuroendocrine tumors 362
chyllothorax 70
ciclosporin, ulcerative colitis 208
cirrhosis, liver cancer risk 284
Child classification 285, 286
portal hypertension in 299
closed dislocation 404
closed fractures, soft-tissue
damage with, classification 400
closed pneumothorax 67–68
closed postoperative peritoneal lavage 355
cogulation therapy with liver metastases 291
cold thyroid nodule, scintigraphy 15
colecotomy (colon resection) 219–227, 274
carcinoma 219–227
diverticulitis 204, 205
liver metastases 290
cholecystitis 315–316
acute 315–316
with choledocholithiasis 306, 307
chronic, with choledocholithiasis 307
choledocholithiasis 306, 309
cholelithiasis 313
choledochotomy 313
choleliths see gallstones
cholestasis, laboratory tests 308
cholinesterase levels and liver surgery 285
CHOP regimen, gastric MALToma 175
chromogranin A and neuroendocrine tumors 362
chyllothorax 70
ciclosporin, ulcerative colitis 208
cirrhosis, liver cancer risk 284
Child classification 285, 286
portal hypertension in 299
closed dislocation 404
closed fractures, soft-tissue
damage with, classification 400
closed pneumothorax 67–68
closed postoperative peritoneal lavage 355
cogulation therapy with liver metastases 291
cold thyroid nodule, scintigraphy 15
colecotomy (colon resection) 219–227, 274
carcinoma 219–227
diverticulitis 204, 205
indications/contraindications
217, 234
palliative 217, 219, 227, 239–240
surgical see subheading above
see also rectum
colostomy
emergency, colorectal carcinoma 219
terminal descending 239
compartment resection, soft-tissue tumors 379–380
complications of procedures incl. surgery, perioperative (incl. iatrogenic damage) and their risks
for appendicitis 192–193
for bowel obstruction 276
cholecystectomy 314–315
for colon cancer 227–228
left hemicolecctomy 224
right hemicolecctomy 222
sigmoid colectomy 227
for esophageal carcinoma 123
gastric resection 146–149
for gastrointestinal reflux disease 114
ileostomy 210
ileus as 264, 267–268, 272–273
inguinal hernia repair 93
for liver metastases 297
for liver trauma 303
parathyroid surgery 51
peritonitis as 349
proctocolectomy 212
for rectal cancer 240
splenectomy 280
thyroid surgery 24–26
vascular investigations 382
for Zenker diverticulum 111
compound fractures, classification 400
compression, chest 63–64
computed tomography (CT)
appendicitis 188
bile duct carcinoma 319
bowel obstruction 271
cholecystolithiasis 308
diaphragmatic hernia 80
diverticulitis 202
esophagus
carcinoma 118
rupture 125
gallbladder carcinoma 318
hypersplenism 277
liver
focal nodular hyperplasia 282
hydatid cyst 298
liver cancer 285
operative planning 289
neuroendocrine tumors 362
pancreatitis (acute) 325
parathyroid 47
peritonitis 351
Perthes syndrome (traumatic asphyxia) 64
pleural effusions 58
portal hypertension 300
thyroid 16
computed tomography angiography (angio-CT) 382, 383
acute limb artery occlusion 386
acute mesenteric artery occlusion 387
pancreatic trauma 337
congenital hypoparathyroidism 55
consent, informed 3
continence-preserving proctocolectomy 210–212
contrast-enhanced CT
pancreatic carcinoma 333
pancreatitis
acute 325
chronic 327
contrast-enhanced radiography
bowel obstruction 271
Crohn disease 178
diaphragmatic hernia 80
mediastinitis 76
peritonitis 351
ulcerative colitis 207
see also barium swallow
contrast-enhanced ultrasound of liver in focal nodular hyperplasia 282
contusions
cardiac 65, 66
chest 63
lung 66–67
corpus cavernosum of rectum 232
corrosive injuries, esophagus 123–124
corticosteroids see steroids
cricomyotomy 111
criminal nerves 127
Crohn disease 176–184
appendix 193
Crohn Disease Activity Index (CDAI) 177
crural arterial occlusion 389
cryoaulation, hepatic metastases 288
cutaneo-enteric fistulas, Crohn disease 183
CVI regimen, gastric MALToma 175
cyst(s)
diaphragmatic 82
hepatic 284
hydatid 297, 298, 299
cystadenoma of appendix, mucinous 194
cystic artery 305, 306
in laparoscopic cholecystectomy 311
cystic duct 304, 305
in laparoscopic cholecystectomy 311
Czerny method, inguinal hernia 93
D
Dacron grafts for vessel replacement 381
de Quervain’s (subacute) thyroiditis 34
death see mortality
decompression surgery
bowel 273
endocrine orbitopathy 32–33
mediastinitis 76
pneumothorax 68, 69
deep venous thrombosis 392–394
defecation 232
deglutition (swallowing) 108
delayed primary surgery, polytrauma 397
Delorme operation in pelvic floor insufficiency 244
Denonvillier fascia 230
descending colon 196
devascularization operations in portal hypertension 301
development, thyroid 9
see also embryogenesis
diabetes, pancreatic transplantation 342
diaphragm 77–82
hernia 77, 78–81, 113
rare disorders 81–82
Dieulafoy ulcer 130, 153
differentiated thyroid carcinoma 37, 42, 43
digestive tract
see gastrointestinal tract
dilation procedures, gastric 143
dislocations 403–404
dissecting aneurysms 383
diverticulitis 200–205
appendiceal 193
diverticulum
colon 200, 201
esophageal 110–112
small bowel 184
dobutamine, peritonitis 358
dome sign 202
Doppler ultrasound
peripheral arterial disease 386
thyroid 14
see also duplex ultrasound
Dornia basket 313
double-barrelled ileostomy
incisural hernia 101
ulcerative colitis 209–210
double contrast enema, ulcerative colitis 207
drain(s) 6
anal fistulas and abscesses 254
chest 59
hemothorax 69
mediastinitis 76
pleural empyema 61, 62
pneumothorax 68–69
polytrauma 396
in hepatic resection 292
tube, wound dressings made of 357
drainage operations/procedures
gastric 143–146
resection procedures combined with 330
pancreatic 327
pseudocyst 331
peritonitis 353
drapes (adhesive plastic) for temporary abdominal closure 356
dressings for temporary abdominal closure 356–357
drug administration (pharmaceuticals)
choledocholithiasis 309
Crohn disease 180–182
gastroesophageal reflux disease 113
hyperparathyroidism (secondary) 52
hyperthyroidism 29
immunogenic 32
peptic ulcer 132–133
peritonitis 358
premedication 3
ulcerative colitis 207–208
drug-induced conditions
paralytic ileus 265
peptic ulcer 129, 130
thyroiditis 36
drug monitoring with immunosuppressive agents 345
ductal adenocarcinoma of pancreas 332
Dukes staging, colorectal cancer 216
dumping (gastric)
early 148–149
late 149
Dunhill operation 21–22
duodenopancreatectomy
partial 320, 329, 333, 344–355
total 329
duodenum 126–175
anatomy 126–128
bleeding from 150–153
Kocher mobilization see Kocher mobilization
neuroendocrine tumors 364–369
post-gastrectomy restoration of passage to 166
stenosis in Crohn disease 182
ulcer see ulcer
duplex ultrasound
subclavian steal syndrome 390
thyroid 14
duplications, diaphragmatic 81–82
dynamic gracilis repair 257
dystopic parathyroid glands 49
E
ECF regimen, gastric carcinoma 171
ECG, peritonitis 352
echinococcosis 297–299
echocardiography, cardiac contusions 66
edema (fluid collection), pancreatic necrosis 324, 325
efferent loop syndrome 147
effusions, pleural 57–60
elastic arteries 381
electrocardiography (ECG), peritonitis 352
electrolyte administration, acute pancreatitis 326
embolism, arterial
limbs 385
removal 386
mesenteric 387
removal 387
embolization in upper GI bleeding, angiographic 153, 154
embryogenesis, neuroendocrine tumor classification according to 361
see also development
emergency surgery 395–412
diverticulitis 202
malignant bowel occlusion 274
portal hypertension 300, 301
proctocolectomy 212
thyroidectomy 34
trauma 395–412
ulcerative colitis 207
emesis see vomiting
emphysema
mediastinal 74–75
subcutaneous 74
empyema
gallbladder 307
pleural 61–62
endocrine pancreatic tumors 336–337, 364–365
see also neuroendocrine tumors
Endo-GIA stapler, liver metastases 291
endometriosis, appendiceal 193
endoscopic investigation
Crohn disease 178
vs ulcerative colitis 180
gastrointestinal stromal tumors 374
large bowel obstruction 271
neuroendocrine tumors 363
ulcerative colitis 207
see also bronchoscopy; choleciodoscopy; colonoscopy; esophagoscopy; gastroscopy; laparoscopy; laryngoscopy; mediastinoscopy; thoracoscopy
endoscopic retrograde cholangiopancreatography (ERCP)
bile duct carcinoma 319
gallbladder carcinoma 318
gallstones 308, 309
pancreatic carcinoma 333
pancreatic trauma 337
pancreatitis acute 325
chronic 327
endoscopic sonography, esophageal carcinoma 118
endoscopic treatment/surgery gastrointestinal
gastric carcinoma 159, 161
rectal cancer 235
rectal polyps 239
upper GI bleeding 152, 153–154
parathyroid 49
thorax 22–23
see also laparoscopy, intervention/operative; minimally invasive surgery
endothelial damage in atherosclerosis 388
endotoxin (lipopolysaccharide)-binding protein levels in peritonitis 351
endovascular transluminal stent graft 385
enteral nutrition, peritonitis 358
entero-biliary anastomoses and fistulas see biliary-enteric anastomosis; biliary-enteric fistula
enterocele 242
enterocutaneous fistulas, Crohn disease 183
entero-enteric fistulas, Crohn disease 183
entero-genital fistulas, Crohn disease 183
enterovesical fistulas, Crohn disease 183
enzymes, pancreatic 323
epigastric hernia 104
epiphrenic diverticulum 110, 111
epiphysial (growth plate) fractures in children classification 401
reduction and internal fixation 402
erythrocyte concentrate, peritonitis 358
esophageal hiatus 77
hernia 78–79, 113
esophageal sphincter, lower 108
esophagitis, reflux 111, 112, 113
esophagogastroduodenal junction, adenocarcinoma (AEG) 116, 155, 166
esophagogastrostomy in gastric carcinoma palliation 171
esophagojejunostomy 168–169
cancer 165, 166, 168–169
peptic ulcer 143
esophagoscopy
achalasia 109
carcinoma 118
diverticulum 110
reflux esophagitis 112
esophagus 106–125
anatomy 106–107
carcinoma 115–123
diverticulum 110–112
function (physiology) 108
orders 108–109
histology 108
injuries 123–125
varices 150, 299, 300, 301
excision biopsy, soft-tissue tumors 378, 379
external fixation, bone infection following 409
extracorporeal shock wave lithotripsy 309
exudative pleural effusions 57
with empyema 61, 62
eye opening in Glasgow Coma Scale 398
intraoperative 6
pancreatitis (acute) 326
postperitonitis 358
fluid collection (edema), pancreatic necrosis 324, 325
focal nodular hyperplasia (liver) 282–283
Fogarty catheter, embolectomy 386
folicles, thyroid 9–10
follicular thyroid carcinoma 282–283
Fontaine classification of peripheral arterial occlusive disease 389
Forrest classification of upper GI bleeding 151, 152
fractures 399–403
rib 64–65
sternal 65–66
French triple therapy, H. pylori eradication 132
Frey operation 330
Frykmann and Goldberg operation in pelvic floor insufficiency 244
fundophrenicopexy 113
fundoplication 113–114
G
gallbladder 304–320
anatomy 304
removal see cholecystectomy stones 306–315
gallstones (biliary stones; choleliths) 306–315
carcinoma predisposition 306, 316
in common bile duct (cholecystolithiasis) 306
in gallbladder 306–315
ileus with 267, 275, 307
gastrectomy (gastric resection) 133–146
carcinoma 158–159, 161–162
complications 146–149
distal see subtotal resection
MALToma 175
postoperative care see postoperative care
ulcer 133–146
gastric ... see stomach
gastrin measurement 133
gastrinoma 132, 149, 336, 366–369
post-gastrectomy 150
Gastrocolic ligament division 221, 222
gastroduodenal artery ligation 154, 155
gastroduodenostomy 145
gastroenterostomy, palliative gastric carcinoma 171
pancreatic carcinoma 336
gastroepiploic artery ligation, right 154, 155
gastroesophageal reflux disease (GERD) 111–114
gastrointestinal (gastroenterological/alimentary/digestive) tract or system appendicitis vs other conditions of 189
diaphragmatic hernia effects 79
hyperparathyroidism effects 46 neuroendocrine tumors 364–372
WHO classification 361
stromal tumors 372–376
see also specific regions
gastrointestinal series (contrast study), Crohn disease 178
gastrojejunostomy in Billroth II gastrectomy 141
gastroscopy cholodocholithiasis 308 esophageal/gastric varices 300
peptic ulcer 131
 genetically factors/predisposition colon cancer 215
 screening 229
 immunogenic hyperthyroidism 30
 medullary thyroid carcinoma in MEN II syndrome 39, 41, 42
genetic testing or analysis
MEN I 361
RET mutations 41
genitoenteric fistulas, Crohn disease 183
Glasgow Coma Scale 398
Glisson triads 282
glucagonoma 367
H
gaytum 26–27
 euthyroid 26–27
video-endoscopic resection via axillo-bilateral breast approach 24
Golddas rule, anal fistulas 251, 254
Gottstein–Heller myotomy 109
 gracilis muscle transposition in fecal incontinence 257
grafts see autotransplantation; stent graft
Graves disease 30–32
Grob method, inguinal hernia 93
growth plate fractures see epiphyseal fractures
guarding in peritonitis 349
Güttgemann post-gastrectomy reconstruction 167
gynecological disorders vs appendicitis 189
H
Haemoccult test 229
hamartomas, colonic 213
hanging maneuver, hemihepatectomy 292
Hansen–Stock classification, diverticulitis and diverticulous 201
Häring tube 171, 172
Hartmann operation/discontinuity resection
cancer 274
colon 219
rectum 239
diverticulitis 202
Hashimoto disease 35
hazards see complications
head injury 397–399
heart contusions 65, 66
see also cardiopulmonary symptoms
Heidelberg–Allenberg classification of aneurysms 385
Heinecke–Mikulicz pyloroplasty 144
Helicobacter pylori eradication
with MALToma 174
with ulcer 132
in etiology
gastric carcinoma 155
ulcer 129, 130
hemangioma, hepatic 283–284
hemicolecotomy 220–224
left 274
colorectal carcinoma 223–224
right 274
appendiceal carcinoid 194
appendiceal carcinoma 194
colorectal carcinoma 219, 220–222
hemifundoplication 113
hemiepatectomy 285, 287, 288–297
gastroduodenal 150–153
into pleural cavity 69
postoperative
gastric resection 146–147
thyroid surgery 24–25
hemorrhage/bleeding
diverticular 202, 205
esophageal varices 300, 301
gastroduodenal 150–153
into pleural cavity 69
postoperative
gastric resection 146–147
thyroid surgery 24–25
hemorrhoids 245–249
hemostasis
liver
in resection 292
traumatic 302
spleen without resection 279
hemothorax 69
heparin 5
hepatectomy (hepatic resection) 285, 287, 288–297
general technique 289–292
hepatic arteries 281–282, 305
right, mistaken for cystic artery 311
hepatic duct, common 304
stone in 307
hepatic veins 282
obstruction 299
hepatobiliary sequence scintigraphy 308
hepatocellular adenoma 283
hepatocellular carcinoma 284, 285, 341
hereditary factors and disorders
see genetic factors
Herfarth operation 170
hernia 78–81, 83–105
abdominal 83–105
classification 83–84
definition 83–84
epidemiology 83
etiology 83
external 83, 85–104
incarcerated see incarcerated hernia
internal 84, 104
palpation 269
diaphragmatic 77, 78–81, 113
herniotomy
femoral hernia 95–96
inguinal hernia 88–90
children and infants 93
heterotopic autotransplantation of parathyroid tissue 53
Heyrowsky method, gastric carcinoma palliation 171, 172
hiatus, diaphragmatic 77
diaphragmatic 77, 78–79, 80, 81, 113
sliding 78, 133
hiccup, postoperative 82
histology
esophageal 108
peritoneal 346
thyroid 9–10
histopathology
anal carcinoma 258
appendicitis, in classification 186
colorectal carcinoma, in grading 216
gastric carcinoma
in classification 156
in grading 156
gastric MALToma 173
in classification 164
history-taking in peritonitis 350
homeostasis 1
hormone-secreting tumors see endocrine pancreatic tumors;
neuroendocrine tumors
hormones
parathyroid see parathyroid hormone
thyroid 12
laboratory test 13, 14
postoperative preventive replacement therapy 25, 26
hot thyroid nodule, scintigraphy 15
Hunt (Hunt–Lawrence–Rodino) pouch 166, 170
hydatid disease 297–299
hydrocortisone, peritonitis 358
5-hydroxyindole acetic acid and neuroendocrine tumors 362
hypercalcemia in hyperparathyroidism 46, 47
effects 46
in secondary hyperparathyroidism 52
hyperparathyroidism 40, 45–54
familial 49
primary 45–51
secondary 46, 51–54
tertiary 46, 54
hyperplasia, hepatic 281
focal nodular 282–283
hyperplastic polypy 213
hypersplenism 277–280
hypertension, portal 299–301
hyperthyroidism 28–29
immunogenic 30–32
see also thyrotoxic crisis
hypertrophy, hepatic 281
hypocalcemia
after parathyroid surgery 51
after thyroid surgery 25
hypoparathyroidism 55–56
after thyroid surgery 25
iatrogenic damage see complications
ileo-anal pouch (ileal pouch-anal anastomosis) 212
ileocolostomy 197, 198
ileostomy, ulcerative colitis 209–210
iodine deficiency 12, 13
radioactive see radiiodine therapy
irreducible hernia 84
islets of Langherhans 323
carcinoma 332
diabetes mellitus 332
endocrine tumors 336
endocrine tumors arising from 336–337
Italian triple therapy, H. pylori eradication 132

J
J pouch 238
continence-preserving proctocolectomy 210, 211
Jaboulay gastroduodenostomy 145
jejenum diverticulum 184
in post-gastrectomy reconstruction 165, 166, 167–168
see also esophagojejunostomy
Johnson classification, gastric ulcer 130
joint dislocations 403–404
replacement (arthroplasty) prosthesis, infected 409

K
kidney hyperparathyroidism (primary) affecting the 46
hyperparathyroidism (secondary), caused by 51
transplantation 340
with kidney 343
c-KIT and gastrointestinal stromal tumors 373, 374, 375
Klatskin tumors, Bismuth–Corlette classification 319
Kocher mobilization of duodenum 136, 137, 321
pancreatic trauma 338
Kremer operation 170–171

L
laboratory tests
bile duct carcinoma 320
bowel disorders
appendicitis 187
Crohn disease 178
diverticulitis 202
obstructive 270
ulcerative colitis 206–207
cholecytitis (acute) 315
cholelithiasis 308
diaphragmatic hernia 80
esophageal carcinoma 117
gastric MALToma 174
hydatid disease 298
hymenosis 277
liver cancer 285
neuroendocrine tumors 362
pancreatitis (acute) 324
parathyroid
hypoparathyroidism 56
primary hyperparathyroidism 46
secondary hyperparathyroidism 52
peptic ulcer 131
peritonitis 351
portal hypertension 300
thyroid 13–14
acute purulent thyroiditis 35
cancer 39
chronic lymphocytic thyroiditis 35
de Quervain's thyroiditis 34
goiter 27
hyperthyroidism 28, 31
Lanz point tenderness 187
laparoscopy, interventional/operative
appendectomy 190–191
cholecystectomy 309–312
in cholecystitis (acute) 316
in choledocholithiasis 309–312
complications 314–315
colon carcinoma 199
diverticulitis 204
fundoplication 113–114
gastric carcinoma 159, 161
hiatal hernia 81
liver cysts 384
focal nodular hyperplasia 282, 283
metastases 296
rectosigmoid resection 243
splenectomy 279
see also endoscopic treatment/surgery; minimally invasive surgery
laparoscopy, non-interventional/diagnostic
esophageal carcinoma 118
gallbladder carcinoma 318
gastric carcinoma staging 158
peritonitis 352
portal hypertension 300
laparotomy vs minimally invasive surgery 5
see also relaparotomy
large intestine/bowel 196–262
anatomy 196–197
cancer see colorectal cancer
obstruction 263, 264, 268, 274–275
causes 264
diagnosis 270, 271
malignant 218–219, 274–275
treatment 272
Larrey hernia 77, 79
laryngeal nerve
internal branch 11
recurrent 11
exposure 19
injury 25
superior 10
laryngoscopy in thyroid cancer 39
laser ablation, hepatic metastases 288
Lauren classification, gastric carcinoma 288
leg, lower, deep vein thrombosis 393
see also limbs
Lichtenstein herniotomy 89
LigaSure, hepatic resection 340
limbs
amputation with soft-tissue tumors 380
arterial occlusions
acute 385–386
chronic 388–390
deep vein thrombosis in lower leg 393
injury including soft-tissue damage 406
lipopolysaccharide-binding protein levels in peritonitis 351
lithotripsy 309
liver 281–303
abscesses 307
acute failure indicating transplantation 341
advanced disease indicating transplantation 340
anatomy 281–282
benign tumors 282–284
malignant tumors 284–297, 340
primary 284–286, 341
secondary see metastases transplantation with 284, 341
liver transplantation 340–342
with hepatocellular carcinoma 284, 340
living-donor for liver transplant 342
lobes of liver 281
excision (lobectomy), left-sided 294–295
lobules, hepatic 282
Loewe and Rehn skin graft, incisional hernia 103
Longmire post-gastrectomy reconstruction 165, 166, 167
Longo operation 246, 249
Lotheissen herniotomy 96
lower leg, deep vein thrombosis 393
lungs acute injury, ventilation 358
anatomy 57
contusions 66–67
metastases from liver 284
see also cardiopulmonary symptoms
luxations (dislocations) 403–404
lymph node(s) gastric area 126, 127
liver hilum 288
pancreas 322–323
rectal area 231
thyroid area 11
ultrasound assessment 15
lymph node dissection (lymphadenectomy)
appendiceal carcinoid 194
appendiceal carcinoma 194
colorectal cancer 199, 219, 220
gastric carcinoma 158–159, 160–161, 163
ileal neuroendocrine tumor 370
tyroid carcinoma 41, 42, 43
lymph node metastases biliary carcinoma bile duct 319
gallbladder 317
colon cancer 197, 215
esophageal cancer 115
gastric carcinoma 127, 156, 157, 163
hepatic cancer 284, 285, 290
pancreatic carcinoma 332
rectal cancer 233
thyroid area 37, 38
lymphatic drainage colon 197
esophagus 107
liver 282
pancreas 322–323
peritoneum 346
rectum 231
stomach/duodenum 127
lymphocytic thyroiditis, chronic 35
lymphoma, gastric 173–175
Lynch syndrome 215
M
McBurney point tenderness 186
McVay herniotomy 96
McMahan classification, rectal cancer 233
Mayo–Dick fascial duplication 103
MCF regimen, gastric carcinoma 171
mechanical obstruction of bowel 263–264
Meckel diverticulum 184
media, arterial 381
mediastinitis 75–76
mediastinoscopy 73–74
esophageal carcinoma 118
mediastinum 72–76
anatomy 72, 73
lymph nodes, thyroid surgery and 11
see also transmediastinal esophageal resection
medullary thyroid carcinoma 40
diagnosis 39, 40, 41
familial 38, 41, 42
sporadic 42
megacolon, toxic 212
megaduodenum 82
men, mobilization of rectum (for anterior resection) 236–237
6-mercaptopurine, Crohn disease 181
Merendino operation 166
mesalazine, Crohn disease 180
mesenteric arteries 197
acute occlusion 387–388
mesentericocaval anastomosis 301
mesentery, division
left hemicolecetomy 224
right hemicolecetomy 222
transverse colectomy 225
see also mesocolon; mesorectal excision
mesh repair
abdominal hernia
epigastric hernia 104
incisional hernia 98, 99, 100, 101, 103
inguinal hernia 87, 90, 91, 92
umbilical hernia 104
hiatal hernia 81, 113
mesocolon, division
in low anterior rectal resection 236
in sigmoid colectomy 226
mesorectal excision, total and partial 235
metabolic causes of paralytic ileus 265
metastases (distant)
to liver 286–297
from colorectal cancer 218, 234, 286
from neuroendocrine tumors 361, 363, 364, 369, 370, 371
to lung from liver 284
source
bile duct carcinoma 319
colon cancer 215, 216, 217, 218, 227, 228, 229
esophageal carcinoma 116
gallbladder carcinoma 317
gastric carcinoma 156, 158, 159, 160, 171
hepatic carcinoma 284, 285
neuroendocrine tumors 361, 363, 364, 365, 368, 370, 371, 372, 373
pancreatic carcinoma 332
rectal cancer 233, 234, 240
soft-tissue tumors 378
thyroid carcinoma 37
see also TNM classification
metastases (lymph node) see lymph node metastases; TNM classification
methotrexate, Crohn disease 181
Milligan–Morgan operation 246, 257–258
minilaparotomy in laparoscopic cholecystectomy 311
minimally invasive surgery
colon 199–200
laparotomy vs 5
pancreatic pseudocyst 332
parathyroid 49
thyroid 22–24
see also endoscopic treatment
Mirizzi syndrome 307
monoclonal antibody therapy, Crohn disease 182
Moore classification of hepatic trauma 302
Morgagni hernia 77, 79
mortality (death)
gastric ulcer perforation 129
upper GI bleeding 151
motility, bowel, recovery after abdominal surgery 267
after bowel surgery 274
motor response in Glasgow Coma Scale 398
MRI see magnetic resonance imaging
mucinous cystadenoma of appendix 194
mucosa
esophageal 108
gastroduodenal
protective agents 133
resection of gastric mucosa with carcinoma 159
see also proctomucosectomy
mucosa-associated lymphoid tissue (MALT) lymphoma 173–175
multidisciplinary (interdisciplinary) care
fast-track surgery and 7
postoperative period 6
multiple endocrine neoplasia 38, 360–361
type I (MEN I) 46, 360–361, 368, 369
type II (MEN II) 39, 41, 42, 46
medullary thyroid carcinoma 38
multiple trauma 395–397
multivisceral resection
colorectal carcinoma 217, 219
gastric carcinoma 163–165
multivisceral transplantation 344
Murphy sign 308
muscle
compartment resection, soft-tissue tumors 379–380
injury 405
transposition (gracilis) in fecal incontinence 257
muscular arteries 381
muscularis, esophageal 108
Musshoff staging of MALToma 175
myotomy
anterior, in achalasia 109
cricopharyngeus 111
N
nasogastric tubes 6
nausea and vomiting, postoperative 1
neck lymph nodes (incl. cervical LN)
metastases in thyroid carcinoma 38
dissection (lymphadenectomy) 41, 42, 43
in thyroid surgery 11
assessment 15
necrotizing pancreatitis 324, 325, 326
needle aspiration biopsy see aspiration biopsy
neoadjuvant (preoperative) therapy
esophageal carcinoma 118, 119
gastric carcinoma 158, 160
hepatic metastases 287
rectal cancer 234
neointima formation 389
neonates, large bowel obstruction 264
neoplasms see tumors
nerve
injury 405, 409–410
removal for pain after inguinal hernia surgery 93
nerve supply
diaphragm 77
peritoneal 346
rectum 231–232
stomach/duodenum 127–128
thyroid 10–11
injury 25
neurapraxia 409
neurectomy for pain after inguinal hernia surgery 93
neuroendocrine tumors 360–372
   general aspects
      definition 360
      diagnosis 362–363
      epidemiology 360
      etiology 360
      prognosis 364
      symptoms 361–362
      treatment 363–364
   specific sites 364–372
      appendix 193–194, 370–371
      colon 371
      duodenum 364–369
      pancreas 336–337, 364–369
      stomach 364, 365
neurological examination in fecal incontinence 256
neuromonitoring (intraoperative)
   parathyroid surgery 50
   thyroid surgery 20, 22
neuromuscular effects of hyperparathyroidism 46
neuron-specific enolase and neuroendocrine tumors 362
neuropathic pain, inguinal hernia surgery 93
neurotmesis 409
newborns (neonates), large bowel obstruction 264
Nissen fundoplication 113, 115
nodule, thyroid
diagnosis 14, 15, 16, 17, 28
enucleation 20, 26
incidentally discovered 13
malignant 39, 40, 41
non-Hodgkin lymphoma, gastric 173–175
non-steroidal anti-inflammatory drug-related peptic ulcers 129, 130
norepinephrine, peritonitis 358
Notaras lateral submucous sphincterotomy 251
nutrition
   acute pancreatitis 326
   peritonitis 358
   preoperative 2–3
Nyhus classification, inguinal hernias 86
O
   observation see inspection
   onlay technique, incisional hernia 100
   open cholecystectomy 312–313
   aftercare 313–314
   in cholecystitis (acute) 316
   in choledocholithiasis 312–313
   complications 314–315
   open dislocation 404
   open minimally invasive parathyroidectomy (OMIP) 49
   open pneumothorax 68
   open postoperative peritoneal lavage 355
   open splenectomy 327
   orbitopathy, endocrine 31, 32
   organ transplantation see transplantation
   orthotopic autotransplantation of parathyroid tissue 53
   osteitis and osteomyelitis 407, 408
   outpatient review of fast-track colon surgery, post-hospital 8
P
   pain
   acute abdominal see acute abdomen
   appendicitis, diagnostic examination for 186–187
   motor response in Glasgow Coma Scale 398
   peritonitis 349
   postoperative, inguinal hernia surgery 93
   thyroiditis 34–35
   venous thrombosis 393
   palisade dressings for temporary abdominal closure 357
   palliative therapy
      anal carcinoma 260
      bile duct carcinoma 320
      colorectal carcinoma 217, 219, 227, 239–240
      esophageal carcinoma 119, 123
      gallbladder carcinoma 318
      gastric carcinoma 159, 171
   pancreatic carcinoma 336
      palpation
      obstructed bowel 269–270
      peritonitis 350
      rectal cancer 269
      pancreas 321–338
      anatomy 321–323
      peptic ulcer penetrating into 131, 142–143
      pseudocysts 324, 331–332
      transplantation 341–342
      trauma 337–338
      tumors 332–337
      neuroendocrine 336–337, 364–369
   pancreatoduodenectomy 329
      combined with drainage operation 334
      distal see subtotal resection total 333
      see also duodenopancreatectomy
   pancreatic duct
      anatomy 305, 321
      drainage procedure 329
      obstruction 327
      see also ductal adenocarcinoma
   pancreaticoduodenal arteries 321
      ligation 154, 155
   pancreatitis 323–330
      acute 323–326
      cholegenic 307
      chronic 327–330
      pancreatojejunostomy, Partington–Rochelle side-to-side 329
      resection procedure combined with 330
   pancreatoduodenectomy see duodenopancreatectomy
   papilla (duodenal/of Vater)
      incision (papillotomy) 308, 309
      local excision 333
   papillary thyroid carcinoma 36, 37, 41, 42, 43
   paraesophageal hernia 77, 79, 80, 113
   parafollicular C-cell carcinomas 38, 42
   paralytic ileus 263, 264
      after gastric resection 147
      causes 265, 387
      treatment 272
   paraproctium 230
parathyroid glands 44–56
anatomy 44–45
carcinoma 54–55
dystopic 49
imaging 15, 47
physiology 45
in thyroid surgery
dissection 19
postoperative insufficiency 25
parathyroid hormone (PTH; parathormone) 45
abnormal levels see hyperparathyroidism; hypoparathyroidism
parathyroidectomy 53
carcinoma 55
minimally invasive 49
subtotal 53
with simultaneous autotransplantation 53
without autotransplantation 53
parenchyma, hepatic
dissection with metastases 291
injuries 302
parenteral nutrition in acute pancreatitis 326
parietal pelvic fascia 230
parietal peritoneum 346
pain in peritonitis relating to
peristalsis
examination 269
in peritonitis, disturbed 349
peritoneal cavity
carcinomatosis
esophageal cancer 116, 118, 119
obstruction due to 266, 275
lavage 354, 355
pseudomyxoma (pseudomyxoma peritonei) 194
see also pseudoperitoneum
peritoneum, anatomy 346
peritonitis 346–359
classification 347–348
definition 346
diagnosis 349–352, 359
diffuse 349, 353
epidemiology 347
etiology 347
acute mesenteric artery
occlusion 387
primary 347–348, 352
risk in colorectal carcinoma
surgery 227–228
secondary 348, 352–353
symptoms 349
tertiary 348
treatment 348, 352–358
Perthes syndrome (traumatic asphyxia) 63
PET see positron emission tomography
pharmaceuticals see drug administration
pneumoperitoneum for laparoscopic cholecystectomy 311
polyglactin + polypropylene mesh 99
polyethylene terephthalate mesh 99
polypropylene mesh 99
polytetrafluoroethylene (PTFE/ePTFE)
grafts for vessel replacement 381, 381–382
mesh for hernia repair 99
polytrauma 395–397
poorly differentiated thyroid carcinoma 37, 42
portal hypertension 299–301
portal veins 282

aus: Schwarz u. a., General and Visceral Surgery Review (ISBN 9783131543110) © 2012 Georg Thieme Verlag KG
branch ligature, with liver metastases 287
pressure measurement 299
thrombosis 299
portocaval end-to-side anastomosis 301
portosystemic shunt, transjugular intrahepatic 301
positron emission tomography (PET)
cancer 285
gastrointestinal stromal tumors 374
neuroendocrine tumors 362
positron emission tomography-CT (PET-CT), esophageal carcinoma 118
post-hospital outpatient review of fast-track colon surgery 8
postoperative care (aftercare) 6
appendiceal carcinoid 194
appendicitis 192
bile duct carcinoma 320
bowel obstruction 276
cholecystectomy 313–314
colorectal carcinoma 227
deep vein thrombosis 393
fast-track colon surgery 7–8
fractures 403
gallbladder carcinoma 318
gastric resection
for cancer 173
for ulcer 146
gastroesophageal reflux disease 114
nausea and vomiting 1
parathyroid surgery
primary hyperparathyroidism 50
secondary hyperparathyroidism 53
peritoneal lavage in 355
proctocolectomy 212
splenectomy 280
tendon injury 411
thromboprophylaxis 3–5
thyroid surgery 24
postoperative complications see complications
postpartum thyroid disease 30, 36
pouch
post-gastrectomy reconstruction 165, 166, 169, 170–171
post-proctectomy reconstruction 238
post-proctocolectomy reconstruction 210, 211, 212
pouch of Douglas tenderness 187
precancerous/premalignant conditions
colon 213
esophagus 112, 116, 118, 124
stomach 155
prednisolone
Crohn disease 181
ulcerative colitis 207, 208
pregnancy
appendicitis diagnosis in 187
Graves disease during/after 30
prehospital care
first aid at accident site 406
head trauma 398
polytrauma 396
premalignant conditions see precancerous conditions
preoperative phase 1–5
colorectal carcinoma 218
fast-track surgery 7
parathyroid surgery for hyperparathyroidism 48
splenectomy 278
preperitoneal mesh repair of inguinal hernia, transabdominal (TAPP) 91
Pringle maneuver 291, 302
procalcitonin levels in peritonitis 351
proctectomy (rectal resection) 235–237
abdominoperineal intersphincteric 238
low anterior 235–237
blood supply after 230
ulcerative colitis 208, 210–212
proctocele (rectocele) 242, 244
proctocolectomy, ulcerative colitis 208, 210–212
proctodeal glands 232
proctomucosectomy, transanal 210
proctopexy (rectopexy) 243
programmed relaparotomy in peritonitis/abdominal sepsis 355–357
prolapse, rectal 242
protein C, recombinant activated, administration in peritonitis 358
proton pump inhibitors

gastroesophageal reflux disease 113
peptic ulcer 132
pseudoaneurysm (false aneurysm) 383
pseudoarthrosis 403
pseudocysts, pancreatic 324, 331–332
pseudodiverticulum see pulsion diverticulum
pseudohypoparathyroidism 55
pseudomyxoma peritonei 194
pseudo-obstruction of colon 267
psoas sign 187
PTFE see polytetrafluoreethylene
puerperal (postpartum) thyroid disease 30, 36
pulmonary problems see cardio-pulmonary symptoms; lungs
pulsion diverticulum (pseudo-diverticulum)
colon 200, 201
esophagus 110, 110–111
purse-string suture, bleeding

duodenal ulcer 154
purulent/pyogenic disorders
cholangitis with stones 307
thyroiditis (acute) 35
pyloromyectomy, extramucosal 144
pyloroplasty, Heinecke–Mikulicz 144
pyogenic lesions see empyema;
purulent/pyogenic disorders
Q
quinodeoxycholic acid 309
R

radiation thyroiditis 35
radiofrequency thermoablation, liver metastases 287, 288, 296
radiography (x-ray)
appendicitis 188
bowel obstruction 270
chest see chest X-ray
contrast see contrast-enhanced radiography
Crohn disease 178, 180
pancreatitis (chronic) 327
peptic ulcer 131
peritonitis 351
ulcerative colitis 180
radioiodine therapy
Graves disease 31–32, 32
thyroid carcinoma 41, 43
radiology see imaging and specific modalities
radionuclide scans see scintigraphy
radiotherapy
anal carcinoma 261
esophageal carcinoma, palliative 119, 123
gastric MALToma 175
neuroendocrine tumors 363
pancreatic carcinoma 334
rectal cancer 234
thyroid carcinoma 41
see also chemoradiotherapy
Ramirez component separation 102
RAP regimen, H. pylori eradication 132
reconstructive surgery
fecal incontinence 257
post-esophagectomy 121
post-gastrectomy 138–143
in gastric carcinoma 162, 165–169
post-partial duodenopancreatectomy 335
rectal arteries 230
rectocele 242, 244
rectopexy 243
rectosigmoid resection, laparoscopic 243
rectouterine (Douglas) pouch tenderness 187
rectum 230–244
amputation 239
with anal carcinoma 261
anatomy 230
cancer of (and not colon) 233–240
cancer of colon and see colorectal cancer
examination in peritonitis 350
neuroendocrine tumors 372
prolapse 242
stenosis in Crohn disease 182
ulcerative colitis involving 206
see also entries under procto-
sclerotherapy, hemorrhoids 247
rubber band ligation, hemorrhoids 247
S

sacral nerve stimulation 257
Salter–Harris classification of epiphyseal fractures 401
Santorini duct 305, 321
sarcoma, soft-tissue 377, 378, 379, 380
scarring phase of pleural empyema 61, 62
Schlatter operation 166
Schreiber post-gastrectomy reconstruction 167
Schumpelick classification, inguinal hernias 86
scintigraphy (radionuclide scans)
hepatobiliary sequence 308
neuroendocrine tumors 362
parathyroid 47
skeletal, esophageal carcinoma 118
thyroid 15, 16
carcinoma 39, 43
chronic lymphocytic thyroiditis 35
goiter 27
hyperthyroidism 28, 31
sclerotherapy, hemorrhoids 247
screening for colorectal cancer see colorectal cancer
segment(s), hepatic (vascular divisions) 281
segmental resection
colon
   in diverticulitis 205
   transverse, in gastric carcinoma 165
liver, with metastases 291, 295
spleen 279
see also bisegmental liver resection
Seo post-gastrectomy reconstruction 167
sepsis
abdominal 346, 351
   eradication of septic foci 353–354
diagnostic criteria 359
pancreatic necrosis complicated by 325, 326
splenectomy complicated by 280
see also infection
septic shock, diagnostic criteria 359
Seton drain 254
Sherden triangle tenderness 186
Shouldice herniotomy
femoral hernia 95–96
inguinal hernia 89
shunt operations in portal hyper tension 301
Siewert–Peiper Operation 166, 170
sigmoid colon 196
resection
   colorectal carcinoma 219, 226–227
   laparoscopic, in diverticulitis 204
see also rectosigmoid resection
volvulus 266
sigmoid mesocolon (mesosigmoid) division in low anterior rectal resection 236
skeletal scintigraphy, esophageal carcinoma 118
skeletonization of greater and lesser curvatures 136
skin graft with incisional hernia 103
slide fasteners (plastic) for temporary abdominal closure 356
sliding hernia
   abdominal 84
   hiatal 78, 133
small intestine/bowel 176–184
anatomy 176
   interposition in post-gastrectomy reconstruction 165, 166
   obstruction 263, 266, 267, 268
   causes 264
   imaging 270, 271
   treatment 272, 273–274
   transplantation 342–343
soft-tissue
   injury see trauma
tumors 377–380
see also specific soft tissues
somatostatin analogs with neuroendocrine tumors
diagnostic use (receptor detection) 362
therapeutic use 363
yttrium-90-labelled 363
somatostatinoma 367
sonography see ultrasonography
spasm, esophageal, idiopathic diffuse 109
spermatic cord pain after inguinal hernia surgery 93
sphincters see anal sphincters; esophageal sphincter
spleen 277–280
   anatomy 277
   hyperfunction 277–280
   physiology 277
   splenectomy 277–279
   aftercare and complications 280
   distal pancreatectomy with 159, 333, 335
gastric carcinoma 159
splenic artery 277
splenic vein 277
thrombosis 299
splenoportography 300
spleno-renal anastomosis, distal 301
squamous epithelial carcinoma
   anal 258, 260, 261
esophagus 115, 116
management approach 118
staging laparoscopy, gastric carcinoma 158
stapling
colon 198–199
esophagojunostomy 168
hemorrhoidectomy (Longo operation) 246, 249
liver resection for metastases 291
stomach and duodenum 134–136
stent graft for aneurysms 385
sterile plastic bag for temporary abdominal closure 357
sternal fractures 65–66
steroids (corticosteroids)
   Crohn disease 180–181
   refractoriness to 181
peritonitis 358
ulcerative colitis 207, 208
stomach 126–175
   anatomy 126–128
   atony, postoperative 147
   bleeding from 150–153
carcinoma see carcinoma
   neuroendocrine tumors 364, 365
   substitute (post-gastrectomy) 170–171
   functions 165–166
   ulcer see ulcer
   upside-down 79
stools see feces
strangulated obstruction of bowel 263
stromal tumors, gastrointestinal 372–376
subclavian steal syndrome 390–391
subcutaneous emphysema 74
sublay technique, incisional hernia 99–100
submucosa, esophageal 108
subtotal (partial/limited) resection
colon 212
   in malignancy 219, 274–275
   pancreas, distal (distal pancreatectomy) 163–165
   chronic pancreatitis 329
gastric carcinoma 159
   pancreatic carcinoma 333
   splenectomy with 159, 333, 335
pancreas, proximal (incl. head) 329, 333, 335–336
parathyroid 53
stomach (distal) carcinoma 158, 162
MALToma 175
ulcer 136
thyroid 17, 21 on contralateral side, hemithyroidectomy with see hemithyroidectomy goiter 27
Sudeck operation in pelvic floor insufficiency 244
Sudeck point 197
supportive therapy, peritonitis 357–358
sutures colon 197, 198
esophagojejunostomy 168
small bowel in Crohn disease 182
stomach and duodenum 134
Billroth I gastrectomy 139, 140, 141
Billroth II gastrectomy 141, 142, 143
bleeding ulcer 154
leakage 147
swallowing 108
symptomatic hernia 78
synaptophysin and neuroendocrine tumors 362
synthetic vessel replacement 381–382

T
T-cell lymphoma, gastric 174
TASC II classification of peripheral arterial occlusive disease 389
temperature in peritonitis 350
tendon injury 405, 410–411
tension pneumothorax 68
terminal ileostomy, ulcerative colitis 209
themoablation, liver metastases 287, 288, 296
thoracotomy, epiphrenic pulsion diverticulum 111
esophageal carcinoma 119, 121
esophageal rupture 125
pleural empyema 62
thorax see chest
thrombocytosis, post-splenectomy 280
thromboendarterectomy 390
thrombosis arterial
limbs, and its removal 385, 390
mesenteric, and it removal 387, 388
perioperative, and its prevention 3–5
venous see veins
thyroglobulin 12
measurement 14
thyroid (gland) 9–43
anatomy 9–11
complications of surgery 24–26
diseases/disorders 26–43
diagnostic approach 12–17
indications for surgery 17
postoperative care 24
recurrence of benign conditions, follow-up and prevention 25
treatment (in general) 17–26
physiology 12
thyroid arteries
inferior 10, 106
superior 10
thyroid ima artery 10
thyroid plexus, unpaired 10
thyroid-releasing hormone see thyroliberin
thyroid-stimulating hormone see thyrotropin
thyroid veins 10, 107
thyroidectomy (thyroid resection) subtotal see subtotal resection
total/near total 22
carcinoma 41, 42, 43
emergency 34
goiter 27
immunogenic hyperthyroidism 32
preventive replacement therapy after 26
see also hemithyroidectomy
thyroiditis 34–37
autoimmune see autoimmune thyroid disease
painful 34–35
painless 35–36
thyroliberin (TRH; thyroid-releasing hormone; thyrotropin-releasing hormone) 12
measurement 13
thyrotoxic crisis 33–34
thyrotropin (TSH; thyroid-stimulating hormone) 12
measurement 13
suppression of stimulation 16, 27
in thyroid carcinoma, postoperative use 43
thyrotropin-releasing hormone see thyroliberin
thyroxine (T 4) 12
measurement 13
suppression 16
thyroid carcinoma 41
TNFa, monoclonal antibody to, Crohn disease therapy 182
TNM classification/staging
anal carcinoma 259
biliary carcinoma bile duct 319
gallbladder 317
colorectal cancer 216
treatment approach depending on 217, 234
esophageal carcinoma 116–117
indicating treatment approach 118–119
gastric carcinoma 156
hepatic cancer 285
pancreatic carcinoma 332
thyroid carcinoma 38
tomography computed see computed tomography
conventional, sternal fractures 66
total extraperitoneal hernia repair (TEP) 92
toxic megacolon 212
tracheal injury 70–71
traction diverticulum 110, 111
transabdominal preperitoneal (TAPP) hernia repair 91
transanal procedures
  pouch advancement 212
  rectal resection
    in cancer 235, 244
      full-thickness 235, 244
      mucosal 210
    in prolapse 244
transjugular intrahepatic porto-systemic shunt 301
transmediastinal esophageal resection 122–123
transplantation 339–345
  autologous tissue see autotransplantation
  liver see liver transplantation
    multivisceral 343
    pancreatic 341–342
  renal see kidney
transsudative pleural effusions 57
transverse colon
  anatomy 196
  resection 225
    colorectal carcinoma 219, 225
    segmental 165
  trauma (injury) 395–412
    chest 62–71
      blunt 62–67
      diaphragmatic hernia due to 79, 80, 81
      emphysema due to 74, 75
      penetrating 67–71
      pleural empyema following 61–62
    esophageal 123–125
    head 397–399
    hepatic 302–303
    multiple 395–397
    pancreatic 337–338
    soft-tissue 405–407
      with closed fractures, classification 400
      nerve 405, 409–410
      tendon 405, 410–411
      splenic 279
    vascular 382–383, 405
      see also fractures
    Treitz hernia 84
    triiodothyronine (T3) 12
    measurement 13
    suppression 16
    tube drains, wound dressings made of 357
    tubular adenoma 213
    tubulovillous adenoma 213
    tumor(s) (neoplasms) 360–382
      diaphragmatic 82
      malignant see cancer
      neuroendocrine see neuroendocrine tumors
      pancreatic see pancreas
      parathyroid, ultrasonography 15
      soft-tissue 377–380
      thyroid 15, 16, 28, 29, 37–46
      tumor markers
        esophageal carcinoma 117
        pancreatic carcinoma 333
        tumor necrosis factor-alpha (TNFα), monoclonal antibody to, Crohn disease therapy 182
        tunica adventitia, arterial 381
        tunica intima, arterial 381
        tunica media, arterial 381
        Turnbull procedure for toxic megacolon 212
        tyrosine kinase inhibitors with gastrointestinal stromal tumors 374, 375
    U
    UICC see International Union Against Cancer
    ulcer, peptic/gastroduodenal 128–149
      acute 130
      bleeding 150
      chronic 130
    classification 130–131
      definition 128
      diagnostic approach 131–132
      epidemiology 129
      etiology 129–130
      postoperative care 146
      recurrence 149
    symptoms 131
    treatment 132–140
      conservative 132–133
      indications 132
      surgical 133–149
    ulcerative colitis 205
      differential diagnosis 207
      Crohn disease 179, 180
    ultrasonic dissectors/scissors
    hepatic resection 291
    laparoscopic colon surgery 199
    ultrasonography
      appendicitis 188
      bowel obstruction 270–271
      cholecystitis (acute) 315
      cholecystolithiasis 308
      colorectal cancer 217
      Crohn disease 178
      diaphragmatic hernia 80
      esophageal carcinoma 118
      gallbladder carcinoma 318
      hypersplenism 277
      liver
        focal nodular hyperplasia 282
        hepatic hemangiomia 283
        hydatid cyst 298
      liver cancer 285
      pancreatic carcinoma 333
      pancreatic trauma 337
      pancreatitis
        acute 324
        chronic 327
      parathyroid 15, 47
      peritonitis 351
      pleural effusions 58
      portal hypertension 300
      rib fractures 65
      sternal fractures 66
      thyroid 14–15, 16
        acute purulent thyroiditis 35
        carcinoma 39
        chronic lymphocytic thyroiditis 35
        de Quervain’s thyroiditis 34
      goiter 27
      hyperthyroidism 28, 31
      umbilical hernia 103–104
      undifferentiated thyroid carcinoma 38, 41, 43
      urease rapid test 131
      urological disorders vs appendicitis 189
      ursodeoxycholic acid 309
Vacuum dressings for temporary abdominal closure 356
vagus nerve 127–128
division (vagotomy) 134, 146
varicose veins (varices) 391–392
esophageal 150, 299, 300, 301
vascular (blood) supply
colon 196–197
diaphragm 77
esophagus 106–107
gallbladder/biliary tract 305
injury 382–383, 405
liver 281–282
in hepatectomy, exposure and ligation 290
peritoneum 346
rectum 230–231
spleen 277
stomach/duodenum 126
thyroid 9, 10
ligation 19
vascular surgery 381–393
vascularization of thyroid, ultrasound
see also devascularization operations
vasoactive intestinal polypeptide (VIP)-secreting tumor 336, 367
vasopressors, peritonitis 358
veins
as bypass graft material 381
draining various tissues/organisms
colon 197
diaphragm 77
esophagus 107
gallbladder/biliary tract 305
liver 282
pancreas 321
peritoneum 346
rectum 231
spleen 277
stomach/duodenum 126
thyroid 9, 10
structure/anatomy 391
thrombosis (phlebothrombosis) 392–394
deep 392–394
perianal 250
portal or splenic 299
varicose see varicose veins
vena cava (inferior) filter 393
ventilation in acute lung injury or acute respiratory distress syndrome 358
verbal response in Glasgow Coma Scale 398
vermiform appendix see appendix
vesicoenteric fistulas, Crohn disease 183
vibration pain in appendicitis 187
video-assisted surgery
parathyroid 49
thoracoscopic see thoracoscopy
thyroid 23, 23–24
video-endoscopic goiter resection via axillo-bilateral breast approach 24
villous adenoma 213
VIPoma 336, 367
Vichow triad 392
visceral pelvic fascia 230
visceral peritoneum 346
pain in peritonitis relating to
349
vitamin B12 replacement after gastrectomy 162
vitamin D 45
use in parathyroid insufficiency after thyroid surgery 25
vocal cord paralysis due to cancer 39
Vollmar classification of vascular injuries 382, 383
volume therapy see fluid administration
volumetry, thyroid 14
volvulus 266–267, 275
vomiting (emesis)
in bowel obstruction 269
postoperative nausea and 1 violent, causing esophageal rupture 124–125
Warren shunt 301
water jet dissection of liver 291
wedge excision/resection
gastric carcinoma, laparoscopic/endoscopic 159, 161
hepatic metastases 295
Wells operation in pelvic floor insufficiency 244
Werner syndrome (MEN I) 46, 360–361, 368, 369
Whipple operation (partial duodenopancreatectomy) 329, 333, 334–335
Whipple triad 366
WHO see World Health Organization
Winslow’s foramen 305
Wirsung duct 305, 321
Witzel fistula 171, 172
women
pelvic floor insufficiency, pathologies causing 241
rectal mobilization (for anterior resection) 237
World Health Organization (WHO) classification
gastric carcinoma 156
goiter 26
neuroendocrine tumors of digestive tract 361
thyroid carcinoma 37–38
x-ray see radiography
Zenker diverticulum 110, 110–111
zippers (plastic) for temporary abdominal closure 356
Zollinger–Ellison syndrome 131, 132, 149, 150