5 Inserting the Endoscope and Advancing It in the Colon

A. Probst

Inspection and Palpation

**Inspection.** The examination begins with an inspection of the perianal region. The patient should be in the left lateral position with his knees bent and pulled up. A simple inspection can detect skin changes, scars, anal skin tags, hemorrhoids, anal fissures, anal venous thromboses, fistula, injuries, or prolapse (anal or rectal prolapse). Any findings must be noted later in the examination report. Figures 5.1, 5.2 show examples of pathologies detected during inspection. The diagnostic report should include exact localization: for example, distance from the anus or a description of location as if the patient were in the dorsal recumbent position (at the 12-o’clock position ventral to the anus).

**Palpation.** Following inspection, a digital examination of the anal canal and distal rectum must be completed before the actual endoscopic examination begins. Attention should be paid to palpable endoluminal abnormalities (polyps, tumors, foreign objects) as well as to extraluminal appearances. Male patients can also undergo a prostatic check. An assessment of sphincter tonus as well as any noticeable discomfort during the examination (inflammation, fissures) should be included in the palpation findings. Patients who have been prepared for routine endoscopy will have an empty rectal ampulla. Emergency patients are another matter, however. Especially in the event of acute gastrointestinal bleeding, in addition to endoluminal inspection, characterization of stool contents can provide important additional information (melena, fresh blood, coagulum, stool), helping to infer the source and intensity of bleeding and making the rest of the diagnostic procedure easier. Figure 5.3 provides some examples of endoscopic pathological findings that can be detected during digital palpation.

Table 5.1 provides a summary of possible findings from inspection and palpation prior to endoscopy.

**Passing the Anal Sphincter**

After completing inspection and palpation and, if necessary, administering an analgesic, the actual endoscopic examination can begin. A local anaesthetic lubricating jelly, such as a lubricant containing Lidocain, should be applied liberally. The endoscope tip is then inserted in the rectum and guided digitally without visualization. The examiner should explain to the patient the steps being taken and inform the patient that he may experience the urge to evacuate his bowels. The endoscope tip is inserted in the direction indicated by preceding palpation; as a rough guide, the direction of the anal canal runs in a line between the anus and the navel. After “blindly” inserting the endoscope 4–5 cm,
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Air is insufflated and the endoscope tip is pulled back until the lumen of the distal rectum can be seen (Fig. 5.4). The rectal lumen is then centered in the middle of the monitor screen (Fig. 5.5) and the endoscope is advanced under visualization of the lumen to the rectosigmoid junction.

At this point in the examination there has not yet been sufficient inspection of the distal rectum or anal canal, which will be more closely examined on withdrawal of the endoscope later (possibly also using retroflexion of the endoscope in the rectum; see below).

Fig. 5.4 After “blindly” advancing the endoscope in the rectum, the instrument is withdrawn. Direct view of the rectal wall. After withdrawal and air insufflation the lumen can be seen (lower right).

Fig. 5.5 Centering the rectal lumen before continuing colonoscopy.

Fig. 5.6 Colostomy (appositional streaks of blood due to acute lower gastrointestinal bleeding).

Endoscopy Insertion in Postoperative Patients (Colostomy/Ileostomy)

Examination options. If the patient has a colostomy/ileostomy as a result of an operation with lost intestinal continuity, endoscopy of the colon via the anus and ileum is often impossible and must be performed through the stoma (Fig. 5.6). Before the examination, the examiner should know the extent of the operation(s), the type of stoma, and its location. In the case of an end ileostomy, only the anastomosed small intestine can be examined endoscopically; the remaining colon, if there is any, is not reachable via the stoma. If the patient has a colostomy, the
proximal colon and terminal ileum can normally be examined without a problem. If the patient has a double-barreled ileostomy or a colostomy, the intestinal segments proximal and distal to the stoma can be examined (Fig. 5.7).

**Inspection and palpation.** Before the actual endoscopy, a thorough inspection of the area surrounding the stoma and digital palpation of the anastomosed intestinal segment should be performed. Special attention should be paid during inspection to signs of prolapse and mucosal abnormalities involving the visible intestinal mucosa as well as irregularities on the surrounding skin. Along with detecting endoluminal irregularities, the purpose of palpation is to ascertain the width of the lumen and the direction of the anastomosed intestinal segment. Knowing the width of the stoma and insertion direction is essential for inserting the endoscope and choice of instrument used is determined in part by the palpated diameter of the lumen.

**Inserting and advancing the endoscope.** Insertion of the instrument is eased by the examiner’s finger and the use of air insufflation; it is inserted until the intestinal lumen comes into view. The lumen is then centered on the monitor screen before further advancing the endoscope. The rest of the examination ultimately depends on remaining intestine. Colonoscopy through the stoma can be made more difficult by loss of original intestine, increased postoperative mobility of the remaining intestine, or angulation as a result of postoperative adhesions.

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**Advancing the Endoscope in the Sigmoid Colon (Sigmoidoscopy)**

**Normal procedure.** After reaching the rectosigmoid junction about ca. 16 cm proximal to the anocutaneous line, the endoscopy of the sigmoid colon begins. The sigmoid colon is situated intraperitoneally and is highly variable in length. The junction between rectum and sigmoid colon often appears as an acute bend in the lumen. The sigmoid colon can also be recognized by its prominent, circular folds. Passing the sigmoid colon with the patient lying in the left lateral position is unproblematic in simple cases where the sigmoid colon shortens itself, enabling easier passage through curves. Passing the sigmoid-descending junction is often more difficult in this position, especially for more slender patients, as the sigmoid colon is forced into the left abdomen, narrowing the angle of the junction with the descending colon. Changing position to the supine position—or, especially for slender patients, to the right lateral position—allows the sigmoid colon to fall more into the middle and right lower abdomen, thereby straightening the angle and making passage of the endoscope tip into the descending colon significantly easier.

Constant visualization of the lumen is desirable for passing the sigmoid colon. The instrument should be kept as straight as possible, without significant bowing or looping. However, individual differences in length and course of the sigmoid colon can make viewing the lumen more difficult and in some patients, looping cannot be avoided.

**“Blind” advancement of the endoscope and changing patient position.** If the view of the colonic lumen is obstructed or prevented by sharp angling, the examiner can attempt to ascertain luminal direction and briefly point the instrument tip without visualization in the presumed direction of the lumen, using gentle pressure to advance the endoscope in this direction. The presumed direction of the lumen is often indicated by shadowing (Fig. 5.8). Such maneuvers, which are performed only in exceptional cases, require experience, a light touch, and extreme concentration. The procedure must be stopped if macroscopic changes to the nearby mucosal surface (blanching, bloodless-
ness of mucosal vessels) are observed, or if there is increased resistance to advancement of the instrument and discomfort to the patient as these are signs of increased danger of perforation. Sharp kinks of the lumen can often be minimized or even eliminated by changing the position of the patient; the intraperitoneal location of the mobile sigmoid colon makes this easier. In addition to the supine position, the right lateral position can also be helpful in some situations. Changing the patient’s position does not increase risk and thus must always be attempted first before resorting to “blind” advancement of the instrument.

Bowing and Looping. An additional problem in passing the flexible sigmoid colon is bowing and looping of the endoscope. Disparity between the amount of colonoscope introduced into the rectum and the amount of advancement of the tip in the lumen is a sign that a loop is forming. In extreme cases, the instrument tip no longer moves proximally in the colon when advanced or even moves “paradoxically” in the direction of the anus. Pronounced looping in the sigmoid colon can result in the entire instrument being “used up” before reaching the descending colon; it can also create discomfort for the patient and increase risk of perforation, and, ultimately, make it impossible to complete the colonoscopy.

To counteract looping, the examiner can withdraw the instrument prematurely, and, if necessary, repeatedly, to the beginning of the loop. This can straighten the already intubated colon segment and allow gradual advancement proximally. Suctioning air when withdrawing the instrument can also be helpful (Fig. 5.9a).

If looping still cannot be entirely prevented or counteracted, and is impeding the continuation of the procedure, the use of external hand pressure can be helpful in fixing or “splinting” the sigmoid colon (Fig. 5.9b; see below). Using external compression preventively can often counteract looping (prophylactically). The optimal localization for applying pressure...
can be found by palpation. In rare cases of pronounced or atypical looping, brief use of radiography may be necessary for orientation.

A further option for straightening the lumen and making it easier to pass the proximal sigmoid colon and the sigmoid-descending junction is the so-called alpha-loop maneuver. Rotating the endoscope 180° counterclockwise in the sigmoid colon creates a loop (similar in shape to the Greek letter alpha; Fig. 5.10a) which makes further advancement easier. The loop can be straightened after reaching the descending colon or the splenic flexure (by rotating the colonoscope clockwise). The procedure is detailed schematically in Fig. 5.10b–d.

**Advancing Further to the Hepatic Flexure**

**Sigmoid-descending junction.** After passing the sigmoid colon, the junction with the descending colon is reached. Sharp angling of the lumen, due to the “secondary retroperitoneal” position of the descending colon, can make it difficult to pass the sigmoid-descending junction. Unlike the flexible sigmoid colon, which is located intraperitoneally, the descending colon is fixed on the posterior abdominal wall. Looping or excess air insufflation in the sigmoid colon during preceding advancement of the endoscope can increase angling. Thus, after passing the sigmoid-descending junction, it is recommended that the sigmoid loops should be straightened by carefully withdrawing the instrument and suctioning excess air. This reduces the pull on the mesentery, which can cause discomfort to the patient, and also makes further advancement of the instrument easier.

In the case of a long and highly flexible sigmoid colon, applying external hand pressure or using the alpha maneuver can make entering the descending colon easier (Fig. 5.10). The actual beginning of the descending colon (corresponding to its distal endpoint) is usually evident when a longer intestinal section with a somewhat oval-shaped lumen and a relatively straight path becomes visible (Fig. 5.11). A visible fold in the lumen on the other side of this segment often indicates the splenic flexure. Another—albeit less reliable—sign that the splenic flexure has been reached is the “bluish” coloration of the spleen visible through the colon wall (Fig. 5.12). After successfully passing the sigmoid-descending junction, advancing the endoscope in the descending colon is generally unproblematic. Nonetheless, splinting the sigmoid colon can still be helpful.

**Splenic flexure.** At the proximal end of the descending colon the splenic flexure is reached, marking the transition to the transverse colon. The transverse colon is located intraperitoneally, running across the upper abdomen to the hepatic flexure. The splenic flexure is highly variable with regard to position and degree of angling. A high flexure, which is located beneath the diaphragm, results in a larger angle (>90°) between the descending colon and the transverse colon compared with a more caudal location (<90°). In extreme cases, the flexure can be made of an ascending and a descending limb (Payr disease),

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**Fig. 5.10 Alpha loop technique.**
| a | Alpha loop. |
| b–d | Straightening the loop by pulling the endoscope back and rotating the shaft clockwise. |

**Fig. 5.11 View into the descending colon.** Relatively straight path, oval lumen, and evenly spaced haustrations.
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Creating an angle of 180° (Fig. 5.13). Passage can be especially difficult if the splenic flexure is displaced vertically. In such cases, “pushing up” the endoscope in the more distal colon (especially the sigmoid colon) followed by withdrawing the instrument can advance the endoscope in the left side of the transverse colon. This is basically the same procedure as the alpha maneuver described above, though instead of forming a complete loop in the sigmoid colon, merely the beginning of a bend or an incomplete loop (combined with external pressure if necessary) is sufficient (cf. Fig. 5.9b, Fig. 5.10).

Transverse Colon. Recognizing that the transverse colon has been reached is usually simple, given its typical triangular-shaped lumen and strong, evenly spaced haustrations (Fig. 5.14). Compared with the relatively uniform, straight path of the descending colon, the position of the transverse colon is more variable due to its intraperitoneal position and fixation on a mesocolon, which may vary in length. The fixation on both retroperitoneal fixated colon flexures causes it to bend convexly and ventrally. The middle of the transverse colon, however, droops caudally. The path between splenic and hepatic flexures can vary greatly; at the one extreme, the transverse colon can be nearly horizontal, while at the other it can “droop” all the way down to the minor pelvis (Fig. 5.15). This results in any number of related difficulties in passage and therefore also advancing the endoscope in the hepatic flexure.

External pressure can lift a drooping midtransverse colon cranially and enable the advancement of the endoscope to continue (see below). It is also possible to push the endoscope “up” after reaching the most caudal point in the drooping transverse colon. If the instrument is then carefully withdrawn, a cranial displacement of the midtransverse colon and corresponding straightening of the transverse colon can ease passage and retrieve “used-up” endoscope length. Passage of the transverse colon...
colon and reaching the hepatic flexure is sometimes only possible using a combination of advancing/withdrawing and external hand pressure. Optimal cooperation between examiner and assistant is essential. Pronounced angling of the lumen toward the ascending colon is a sign that the endoscope is reaching the hepatic flexure (Fig. 5.16).

**Hepatic flexure.** The fixation of the hepatic flexure and the ascending colon to the posterior abdominal wall combined with the mobility of the intraperitoneally located transverse colon can result in sharp angling at the hepatic flexure. The situation is similar to the transition described above from the intraperitoneally situated sigmoid colon to the retroperitoneally fixed descending colon; the difficulties passing the hepatic flexure are analogous. If at this point the patient is still in the left lateral position, it is strongly recommended that he should change position if problems passing the hepatic flexure are encountered; the patient should be supine or even in the right lateral position. In some cases, simply changing the position of the patient results in visualization of the previously displaced lumen of the ascending colon and can enable the examiner to overcome the flexure without a problem. If passage continues to be difficult, it is often necessary to push the endoscope up until the instrument tip is placed where the ascending colon begins. This part of colonoscopy often causes discomfort to the patient. As soon as the instrument tip is positioned in the ascending colon, it should be straightened by pulling back. This assists further advancement considerably and often the endoscope tip moves further toward the cecum as a result.

Applying external pressure can also be a significant help with the hepatic flexure. Splinting the sigmoid colon, a drooping transverse colon, or both can help straighten the endoscope, preventing repeated looping which “uses up” endoscope length while helping to reach the ascending colon successfully. If this does not work, additional external hand pressure on the right flank with the flat of the hand placed dorsally or slanted laterally to apply pressure directly to the flexure can be very helpful (see below).

**Proximal Colon**

After passing the hepatic flexure, the view opens up to the proximal segments of the large intestine. In addition to the capacious ascending colon, the cecal pole and ileocecal valve are often visible at the end of the field of vision (Fig. 5.17). Often after passing the hepatic flexure, there can be a certain unnecessary advancement of the endoscope in the more distal colon segments. Thus, after positioning the endoscope tip securely in the ascending colon, it is recommended that the endoscope be carefully withdrawn and straightened. This alone can often further advance the instrument, in some cases even reaching the base of the cecum. If this does not succeed, active advancement of the endoscope is necessary. For passing the ascending colon,
advancing and withdrawing to straighten it, applying external hand pressure to prevent inefficient loss of instrument length in the flexible, more distal colon segments, or a combination of both procedures can be helpful. In some cases, the base of the cecum can ultimately be reached only by additionally repositioning the patient; especially for advancement in the right hemicolon, positioning the patient on his right side can make advancement easier.

**Base of the cecum.** Identifying the base of the cecum is usually unproblematic, given its characteristic morphology and the proximity of the ileocecal valve. The base of the cecum is characterized by a folded pattern produced by the three converging taenia; the appendix valve or invaginated appendiceal orifice is located at its center (Fig. 5.18). The ileocecal valve is located a few centimeters distally, and usually appears as a yellowish, thickened fold, separating the cecum from the ascending colon (Fig. 5.19). Position and flexibility of the cecum vary depending on its fixation to the dorsal abdominal wall. A broadly fixated cecum on the posterior wall of the abdominal cavity (as a continuation of the fixation of the ascending colon) results in a mostly immobile cecum. The range of normal anatomy encompasses all possible variations, including the complete lack of such a fixation, resulting in extreme cases in a highly mobile cecum and a possible inversion of the cecal pole or only the appendix. This explains why the base of the cecum can in some cases be completely visualized from the proximal ascending colon, but not in the case of an inverted or tilted cecum, which requires precise advancement in the cecum (Fig. 5.19). It is a good idea to document the images of the cecum (with or without the ileocecal valve) as a record of completion of colonoscopy. Along with the typical endoluminal morphology, reaching the cecum can often also be confirmed by visible transillumination of the endoscope tip in the lower right abdomen (Fig. 5.20).