Chapter 10.2

Laparoscopic Stoma Formation

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Stoma formation is well suited for a laparoscopic approach. It is technically simple to perform and requires a limited number of cannula sites. Unlike the Trephine (open) method of stoma formation, a thorough intraabdominal exploration with the laparoscope can be performed without making additional incisions. Although the benefits of laparoscopic surgery can be expected after laparoscopic stoma formation, to date, there is no prospective randomized trial comparing outcomes of open and laparoscopic stoma formation. There are some retrospective studies, which suggest a low complication rate, shorter hospitalization, and less pain after laparoscopic stoma formation.[1–4]

Indications

Indications for laparoscopic stoma formation do not differ from those of open surgery. Laparoscopic stoma formation can be performed independently for a variety of indications or as a part of more complex gastrointestinal surgery. A variety of intestinal sites can be chosen for stoma formation; the terminal ileum, transverse colon, and sigmoid colon are the most common sites chosen for stoma formation. The choice for different sites depends on indications and subsequent procedures planned. A loop ileostomy is preferred as a temporary stoma site especially when further colon and rectal surgery is planned in the future. For a permanent ostomy site, end sigmoid colostomy with less output is favored. For either, it is essential to carefully select the site of the stoma preoperatively in concert with a stoma nurse.

Patient Positioning and Operating Room Setup

General anesthesia is used, and we place an orogastric tube and a Foley catheter in order to minimize the chances of damaging the stomach or the bladder during cannula insertion. Pneumatic compression stockings are used in all patients. Two video monitors are placed angling

toward the patient at shoulder level. Some surgeons recommend performing the procedure with the patient in the supine position but we prefer the modified lithotomy position using padded stirrups. This position allows the surgeon or assistant to stand between the patient's legs, while the other surgeon stands on the left side of the patient (for ileostomy formation) and facilitates complete inspection of the small intestines (Figure 10.2.1). A mirror image of this setup is used for the sigmoid colostomy formation. The hips and knees are gently flexed to an angle no greater than 15°to avoid laparoscopic instruments colliding with the patient's thighs.

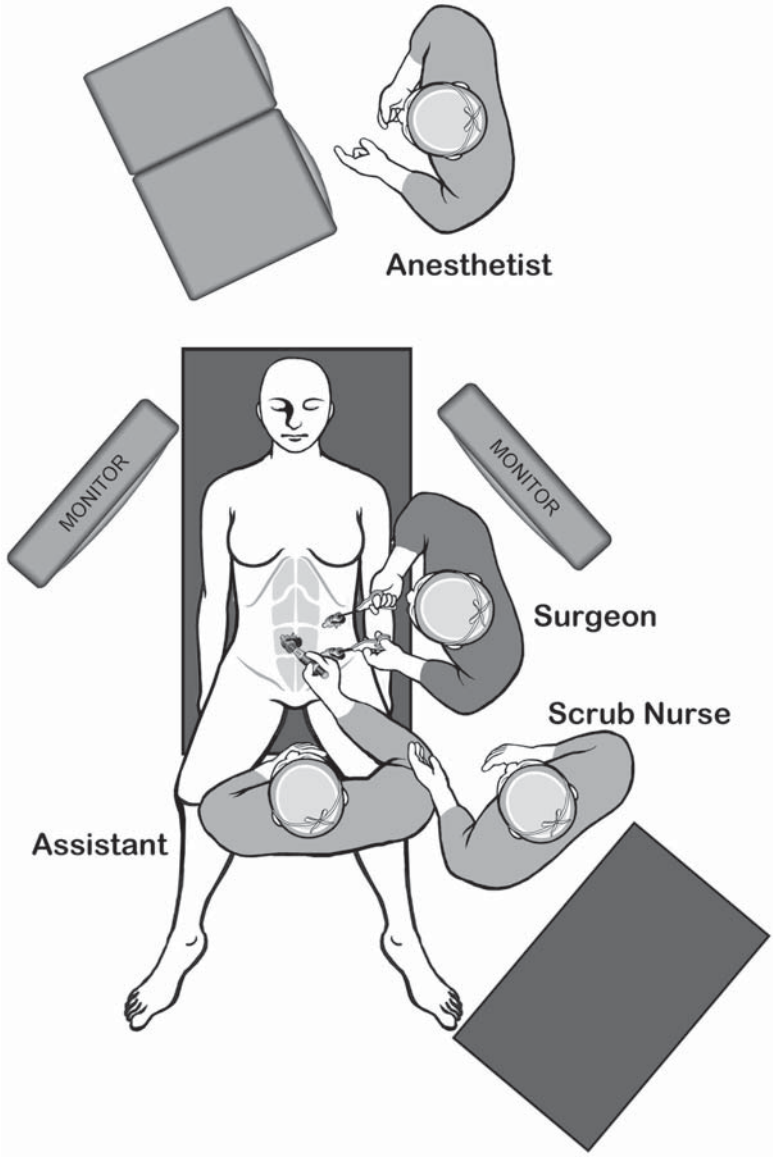

Figure 10.2.1. Positions of the surgical team and the equipment for the laparoscopic stoma formation procedure.

Table 10.2.1. Specific instruments recommended for laparoscopic stoma creation

2–4	Cannulae (1 × 12 mm, 1–3 × 5 mm)
2	Laparoscopic graspers
1	Laparoscopic needle holder

Instruments

Specific instruments recommended for laparoscopic stoma creation are listed in Table 10.2.1.

Cannula Positioning

Positioning and number of cannulae placed (Figure 10.2.2, for the ileostomy formation) largely depend on the extent of intraabdominal manipulations expected. Most patients with "virgin" abdomens, not requiring extensive adhesiolysis, can be performed using a more limited number of cannulae, whereas a thorough inspection of the entire small

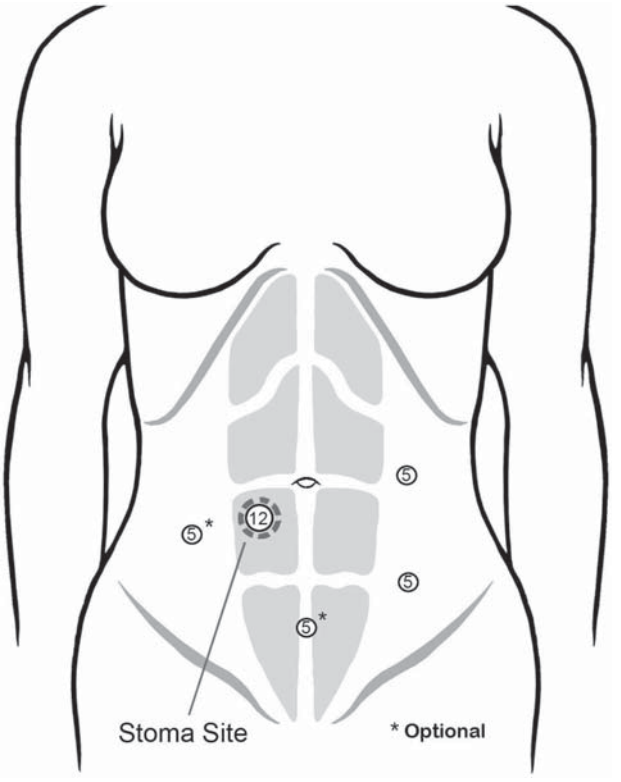

Figure 10.2.2. Positions of the cannulae for the laparoscopic ileostomy formation. Use of optional cannulae (*) should be used with a low threshold if this makes the procedure easier, especially when adhesions are present.

intestines may require at least four cannulae. Although it is tempting to minimize the number of cannulae, there should be no hesitation in inserting one or two additional 5-mm cannulae, if this will allow better exposure and easier manipulations of the tissues.

Technique

Loop Ileostomy

The peritoneal access is achieved through the preoperatively chosen ostomy site, nearly always planned inside the rectus sheath (Figure 10.2.2). For loop ileostomy formation, the right lower quadrant site is generally preferred. A 3-cm disk of skin is excised at the site. Subcutaneous tissue is divided longitudinally onto the abdominal fascia. The anterior leaf of the rectus sheath is divided longitudinally using a Bovie and the rectus muscle is spread in the direction of the muscle exposing the posterior rectus sheath. The peritoneum is entered using the open technique by dividing the posterior rectus sheath and peritoneum between the two Allis clamps. Posterior sheath is then divided to a length of 3 cm, large enough to accommodate insertion of two fingers. Three Allis clamps are then used to grasp the edges of the posterior rectus sheath equidistant from each other (Figure 10.2.3A). Three full-thickness bites of the posterior fascia are taken just underneath each Allis clamp, forming a "stay" purse-string suture (Figure 10.2.3B). The two ends of the purse-string suture are then drawn through a precut 2-inch-length 18-French red rubber catheter using a Rummel tourniquet (Figure 10.2.3C). A 12-mm cannula is inserted and the purse-string suture (Rummel tourniquet) is tightened around the cannula and secured using a hemostat clamp (Figure 10.2.4). A 12-mm cannula is best suited in terms of preventing leakage of pneumoperitoneum, and also allows any instrument to be inserted through it. It is not necessary to keep the size of this cannula small because it will be enlarged to accommodate the bowel at the end of the procedure anyway. An additional 5- to 10-mm cannula is inserted in the left lower quadrant of the abdomen lateral to the rectus sheath and above the level of pelvic brim under direct vision. An angled camera is inserted through the left lower quadrant cannula and a segment of ileum approximately 10–20 cm proximal to the ileocecal valve is gently grasped using a bowel grasper.

Identification of the terminal ileum is facilitated by retracting the small intestines in the cephalad direction out the pelvis and by gently grasping the cecum in the anterior-lateral direction. Visualization of the ligament of Treves, located on the antimesenteric border of the terminal ileum just proximal to the ileocecal valve is also helpful in identifying the anatomy. If extensive adhesiolysis is required, an additional 5-mm cannula should be placed in the left side of the abdomen approximately 4 fingerbreadths above the left lower quadrant cannula.

Once the suitable segment of the ileum is identified, it is then gently brought up to the abdominal wall and exteriorized through the ostomy site. The proximal and distal limbs of the intestine are then marked

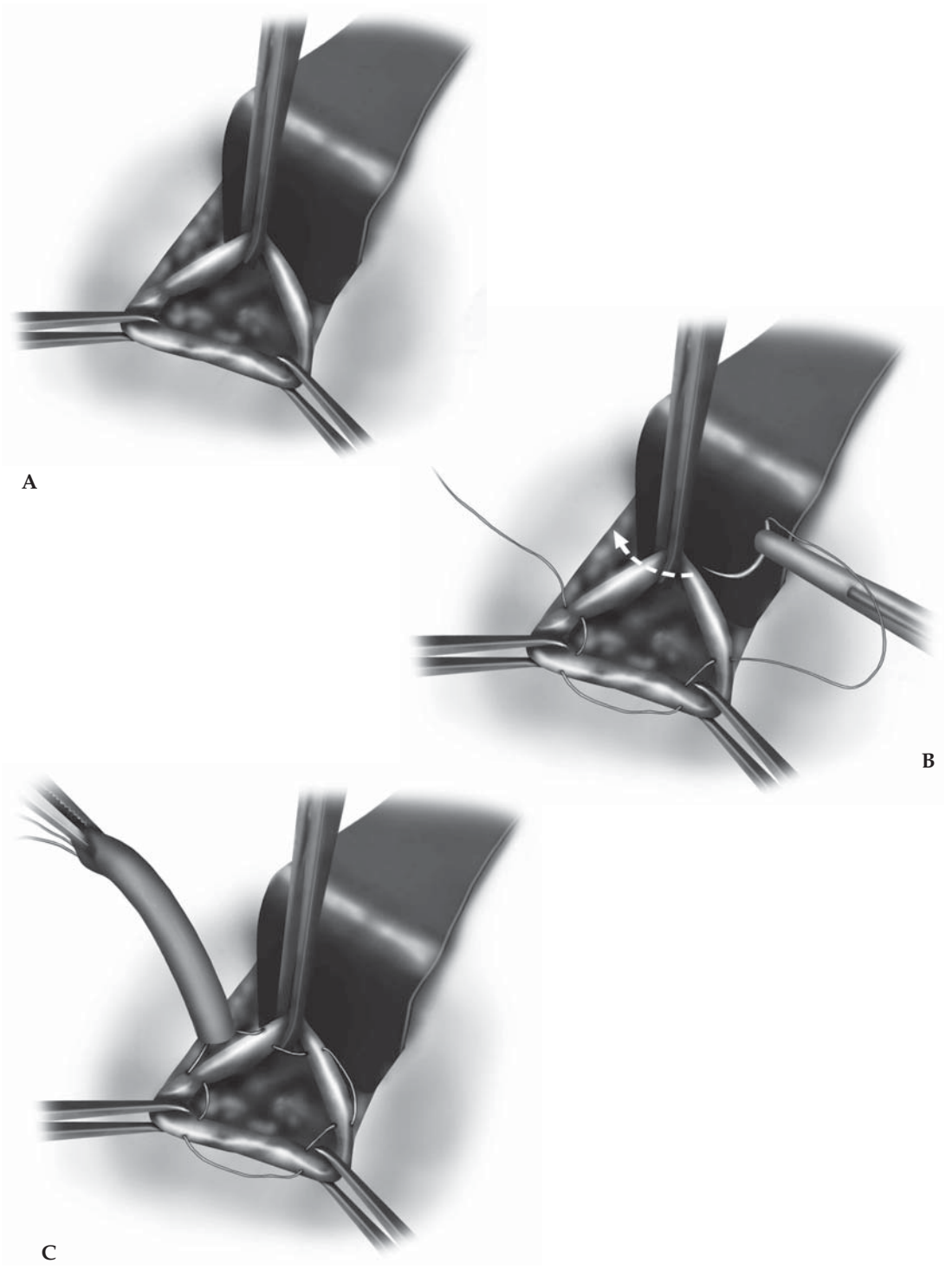

Figure 10.2.3. Insertion of the cannula at the stoma site. **A** Three Allis clamps are used to grasp the posterior sheath in performing the initial cannula insertion using an "open" technique at the stoma site. **B** Three "bites" of the posterior sheath are taken in preparation for making a "stay" suture for placement of an occluding Rummel tourniquet at the stoma site. **C** Placement of the Rummel tourniquet permits minimal leakage after cannula placement.

Figure 10.2.4. A 12-mm cannula is inserted and the Rummel tourniquet is tightened.

extracorporeally with different colored sutures for orientation. The marked intestinal loop is then replaced into the abdomen and a cannula is reinserted into the ostomy site and secured with the Rummel tourniquet. The proper orientation of the marking sutures is confirmed under pneumoperitoneum. Alternatively, the sutures may be placed laparoscopically (Figure 10.2.5). The left lower quadrant cannula site is closed and the stay suture at the ostomy site is removed. The ileum is exteriorized using an instrument placed through the stoma site, taking care to keep it oriented with the sutures placed properly. We use a purple or blue ("sky is up") colored suture material placed proximally, and a darker (chromic, "brown-is-down") colored one placed distally (Figure 10.2.6). Once a stoma bridge is placed under the loop, we dilate the fascia to 2 fingerbreadths, then exteriorize the loop onto the anterior abdominal wall. The ileostomy is then matured after placing sterile dressings over the other cannula sites (Figure 10.2.7).

In more complex cases such as in Crohn's disease, a thorough exploration of the small intestines, in addition to stoma formation is required. In this situation, more cannulae may be required to adequately inspect the entire length of the small intestines. The patients in this situation should be placed in the modified lithotomy position. Pneumoperitoneum is first established through the right lower quadrant ostomy site as described above. Two additional cannulae are placed in the left side

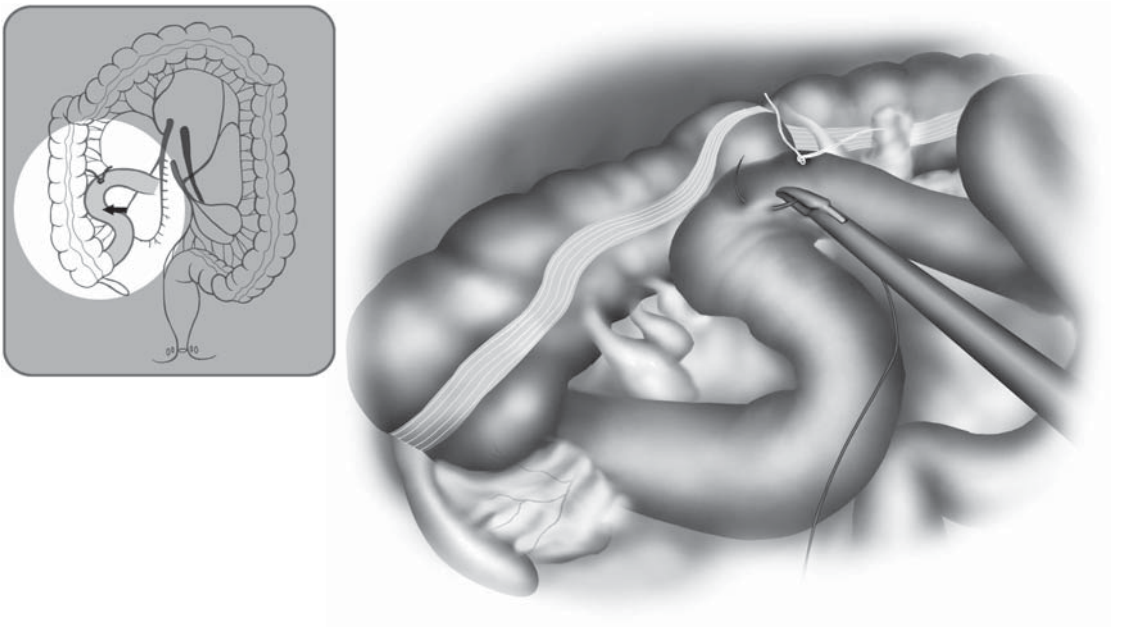

Figure 10.2.5. Marking sutures are placed in order that the bowel is properly oriented when it is drawn out through the stoma site cannula. The proximal suture is purple or blue, and the distal suture is brown (chromic, "brown is down").

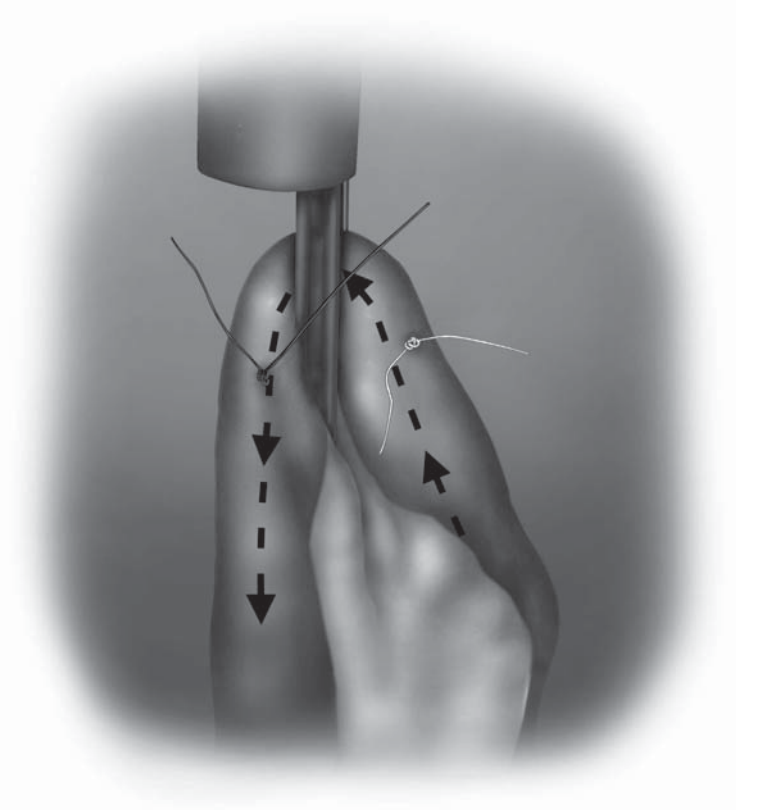

Figure 10.2.6. Careful orientation of the proximal and distal limbs of the intestine is necessary to be sure that the stoma is matured properly.

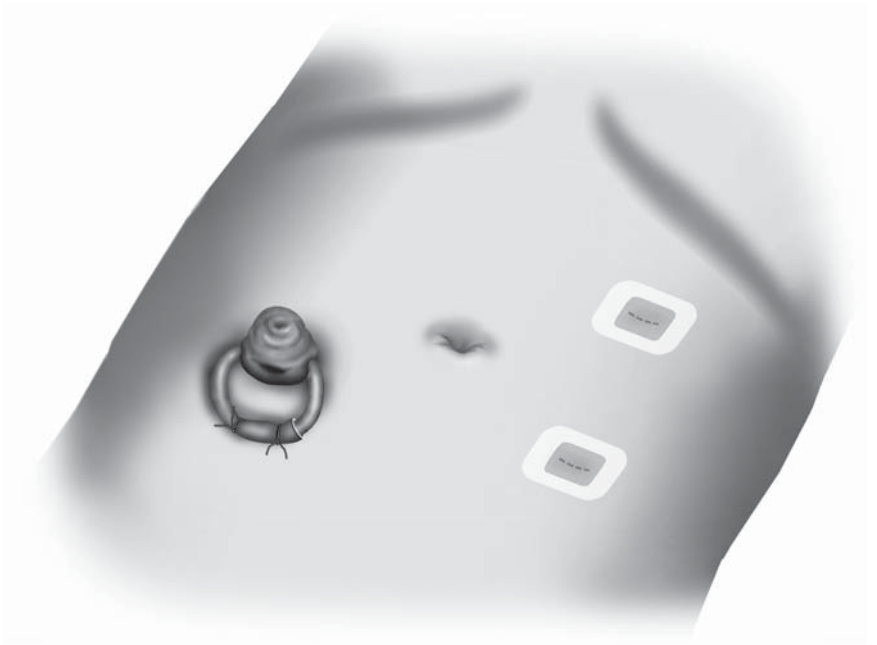

Figure 10.2.7. The stoma is matured after placing the occlusive dressings over the cannula site wounds.

of the abdomen, lateral to the rectus sheath. The inferior cannula is placed above the pelvic brim and the superior cannula is placed approximately 4 fingerbreadths above the inferior cannula. Placement of a 10-mm cannula in the left lower quadrant is useful if intracorporeal marking of the intestines is planned.

The patient is initially placed in the Trendelenburg position with the right side up to facilitate retraction of the small intestines into the left upper quadrant of the abdomen. The surgeon stands between the patient's legs and uses instruments placed through the two lower quadrant ports in order to run the bowel. For this, the patient is placed with the left side up and in a slight reverse Trendelenburg position (see Chapter 8.1). The ligament of Treitz is identified by placing the small intestinal loops over to the right upper quadrant of the abdomen. To best approach the terminal ileum, the surgeon operates through the two cannulae in the left side of the abdomen. Once the exploration of the small intestines is completed, a segment of the ileum can be exteriorized and the ostomy matured as described previously.

Sigmoid Colostomy

The technique for laparoscopic sigmoid colostomy formation is similar to that described for diverting loop ileostomy. The patient is placed in the modified lithotomy position. Two video monitors are placed at an angle near the patient's knees. A 12-mm cannula is inserted through

the premarked left lower quadrant colostomy site as described earlier. After establishing pneumoperitoneum, a camera is inserted and a cannula is placed in the right lower quadrant lateral to the rectus muscle above the pelvic brim. In patients with a less mobile sigmoid colon, an additional cannula is inserted approximately 4 fingerbreadths above the right lower quadrant port. Using a pair of laparoscopic scissors, the lateral attachments of the sigmoid colon are mobilized. If the descending colon needs to be mobilized, addition of a cannula in the suprapubic area is useful. In this case, the surgeon can operate while standing between the patient's legs. The assistant facilitates the dissection by standing on the right side of the patient and retracting the sigmoid colon toward the right side of the patient. In obese patients, it may be necessary to divide the mesentery and colon in order to perform an end colostomy. Intracorporeal division of the intestines can be accomplished by introducing a laparoscopic GIA stapler through the 12-mm cannula placed usually in the right lower quadrant of the abdomen. Alternatively, a mobilized loop of the sigmoid colon can be exteriorized and divided extracorporeally using a GIA stapler. The procedure is then completed as is usual with an open procedure.

Special Considerations

The laparoscopic approach to create a stoma is a straightforward procedure that combines a good intraabdominal inspection with a minimally invasive procedure.

Although there is no large prospective randomized controlled trial comparing laparoscopic versus open stoma formation to date, many studies report the laparoscopic method to be safe and effective. Hollyoak et al.[5] compared the outcomes of 55 patients who underwent either laparoscopic (40) or open (15) stoma formations in their institution. They reported significantly shorter operative time (54 versus 72 minutes), shorter time to return of bowel function (1.6 versus 2.2 days), and shorter length of stay (7.4 versus 12.6 days) for laparoscopic stoma formation. They also reported lower morbidity and mortality associated with the laparoscopic technique. In this series, 5% of the laparoscopic patients were converted to open technique because of extensive adhesions from previous surgery. Other studies also report extensive adhesions as the most common reason for conversion.[1–4] Most studies report extremely low conversion rates for patients with no history of previous abdominal surgeries.

Conclusion

A laparoscopic technique should be considered for all patients who are undergoing stoma formation because it is usually a simple and straightforward procedure. Laparoscopic techniques appear to be safe and effective. They allow a thorough evaluation of associated intraabdominal pathology without causing extensive surgical trauma.

Editors' Comments

Indications: We generally agree with the indications, and also prefer a loop ileostomy for temporary stoma. In an emergent situation with left-sided colon obstruction, it may be practical to consider transverse colostomy. In the absence of bowel distension, laparoscopy affords the opportunity to look around the abdomen.

Patient positioning: A nasogastric tube or Foley catheter is not always necessary, especially if the indication for stoma creation is not obstruction. A simple supine position can also be used in straightforward cases.

Instrumentation: In most cases, only two cannulae are needed to create a loop ileostomy.

Cannula positioning: We always start to dissect the stoma site and decide then where to place the other cannulae needed.

Technique: It is not always necessary to excise the skin for temporary stomas. A simple incision is sufficient. Some surgeons also prefer to incise the fascia horizontally. A rod may not be needed unless there is a lot of tension on the stoma. For a transverse colostomy, the initial incision is made more cephalad in the rectus sheath. Otherwise, the procedure is similar.

References

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