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# Laparoscopic Ileostomy and Colostomy

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**Objective**
The technical features of laparoscopic ileostomy and colostomy are described.

**Summary Background Data**
A diverting ileostomy or colostomy can be performed with minimal trauma by laparoscopic techniques. This is distinct from the complex laparoscopic and laparoscopic-assisted resections of small and large bowel. To date, the technical features of creating a diverting ileostomy or colostomy have not been emphasized sufficiently.

**Methods**
Standard laparoscopic techniques are used to create a pneumoperitoneum. After mobilization of the ileum or colon, a stoma is made on the abdominal wall. A trocar is introduced at the site where the stoma is located, thus reducing the technical problems associated with creating and maturing a stoma while the abdomen is insufflated.

**Results**
This approach obviates the need for a laparotomy while creating an ileostomy or colostomy. The technical features of creating a double-barrel ostomy, an end-ostomy with a stapled distal limb, and a loop ostomy are described. The postoperative recovery is prompt with a rapid return of intestinal function and early discharge from the hospital.

**Conclusions**
Laparoscopic ileostomy and colostomy are straightforward procedures that reduce postoperative discomfort and ileus, and reduce the length of hospital stay.

The advantages of laparoscopic procedures over laparotomy include decreased postoperative pain and ileus, and a reduction in recovery time.[1] Although laparoscopic cholecystectomy illustrates most clearly the advantages of this approach, laparoscopic and laparoscopic-assisted operations on the small bowel and colon are being performed at an increasing rate as experience and new instruments become available. Although an intestinal anastomosis can be performed solely by laparoscopic techniques, these procedures often incorporate a small laparotomy incision to remove the resected intestine, at which time an extracorporeal intestinal anastomosis is performed.[2] Operations in which the intestine is not resected usually can be performed without an inci-

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sion, including the creation of diverting colostomies and ileostomies.

The creation of a diverting colostomy with the use of a drain has been described previously. The drain was passed through the sigmoid mesentery with both ends grasped and drawn through a special 0.5-cm trocar inserted in the left lower quadrant.[3] By gentle traction on the drain and simultaneous removal of the trocar, the sigmoid colon was extracted through the abdominal wall for the length needed to create a loop colostomy. The ostomy was then matured. Using this approach, diverting colostomies were attempted, but the technical feasibility of the procedure appeared to be limited by the availability of the special 3.5-cm trocar and the creation of an adequate stoma in the abdominal wall while maintaining the pneumoperitoneum. This was particularly troublesome in obese patients or in the presence of ascites. Therefore, a revision of this procedure was undertaken and is described here. The intestinal stoma, including skin, fascia, and rectus muscle (but not the peritoneum) was matured before placement of a trocar through the site. The intact peritoneum allowed a pneumoperitoneum to be maintained while the bowel was mobilized to the stoma, yet it was opened easily to allow the stoma to be created, and matured quickly, minimizing the loss of the pneumoperitoneum. As expected, the avoidance of a laparotomy led to a decrease in postoperative pain and ileus and a rapid postoperative recovery. This experience with laparoscopy in diverting colostomies and ileostomies is reviewed with emphasis on the technical features that improve performance of the operation and the result.

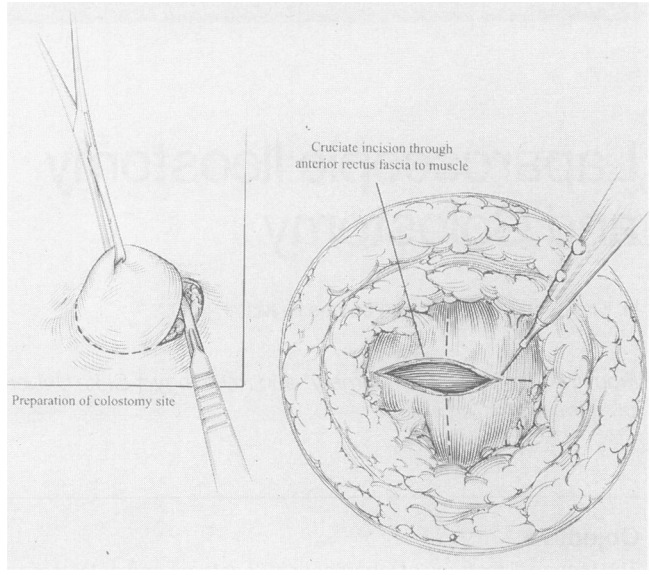


**Figure 1.** The stoma is usually placed in a position that allows the intestine to pass through the rectus muscle. An Allis clamp is used to grasp the skin at the site of the stoma and an ellipse of skin is excised. After removal of a portion of the subcutaneous fat, a cruciate incision is made through the anterior rectus fascia with an electrocautery. The underlying rectus muscle is split using a Kelly clamp, and the posterior rectus fascia is divided, but the peritoneum is not incised.

## Case Reports

*Case #1.* A 29-year-old, white man with a 14-year history of ulcerative colitis presented with lower gastrointestinal bleeding and was noted at colonoscopy to have a carcinoma of the right colon. The patient underwent exploratory laparotomy, and a neoplasm of the colon was found with ascites and carcinomatosis. A palliative right colectomy and ileotransverse colostomy were performed, and the patient made an uneventful recovery. Despite adjuvant chemotherapy, the disease progressed and within 6 months, the patient reported nausea, vomiting, and diarrhea with increasing ascites. On barium enema, a local recurrence was found at the anastomosis; a colonoscopic biopsy confirmed the diagnosis of carcinoma. Progressive symptoms of small bowel obstruction developed and required a colostomy.

At operation, a pneumoperitoneum was established using an open technique with a blunt port (registered trademark, U.S. Surgical, CT), with $CO_2$ insufflation at a rate of 6 L/min. The intra-abdominal pressure was maintained at 15 mm Hg. A diagnostic laparoscope was placed through the umbilical port for initial exploration of the abdominal contents and revealed carcinomatosis, distended loops of small bowel, and ascites. A 5-mm trocar was placed in the left upper abdomen for introduction of a blunt dissecting instrument to mobilize the colon and the small intestine. Several adhesions of the colon and small bowel to the anterior abdominal wall were dissected carefully with scissors (Endoshear, U.S. Surgical), and hemostasis was achieved by electrocautery. Many points of fixation of the colon and small bowel were identified and seem to be caused by peritoneal implants of carcinoma. However, a segment of terminal ileum that was free of tumor and proximal to the obstructing cancer was identified easily. This bowel segment was raised against the anterior abdominal wall at the site of the stoma.

Careful attention was given the creation of a stoma before placement of the trocar through the peritoneum. (Fig. 1) A circular incision was made in the skin, sharp dissection was used to excise subcutaneous fat, and a cruciate incision was made in the anterior fascia. The rectus muscle fibers were then split by blunt dissection and the peritoneum was identified. The incision was prepared to allow adequate placement of the ileostomy; however, the peritoneum was left intact without entering the peritoneal cavity with concomitant loss of the pneumoperitoneum.

A 10-mm port was then placed through the prepared stoma site into the peritoneal cavity through the peritoneum. A blunt dissector was used to grasp the terminal ileum, which was drawn to the level of the stoma on the

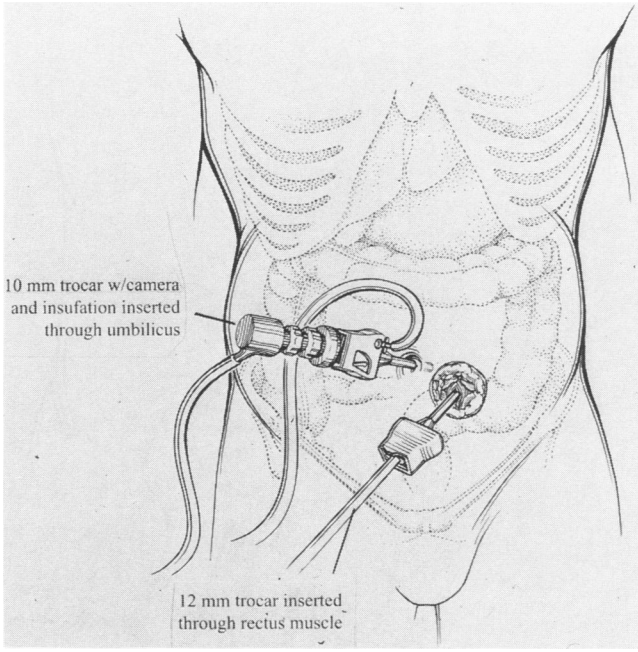


**Figure 2.** A 10-mm trocar is placed in the periumbilical region, and a laparoscopic camera is placed through the trocar after insufflation of $CO_2$ into the abdominal cavity. A 12-mm trocar is inserted through the defect created in the skin, rectus fascia, rectus muscle, and through the peritoneum into the peritoneal cavity.

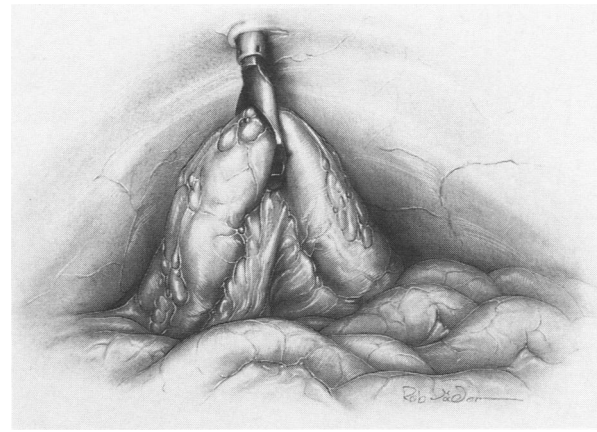

**Figure 3.** A laparoscopic Babcock clamp is depicted grasping the antimesenteric border of a mobile segment of the sigmoid colon. This site is selected after demonstrating that it can be drawn to the anterior abdominal wall without tension while maintaining the pneumoperitoneum. At this point, the trocar has been placed through the previously created stoma. The defect in the peritoneum is opened to accommodate the bowel with loss of the pneumoperitoneum. The Babcock clamp is used to withdraw the loop of sigmoid colon through the defect in the anterior abdominal wall with simultaneous removal of the trocar. The loop of sigmoid colon reseals the abdominal cavity, allowing a pneumoperitoneum to be re-established. Visual inspection of the abdominal cavity and the mesentery of the sigmoid colon is performed, ensuring there is no tension or torsion on the sigmoid colon.

anterior abdominal wall to be certain that it was without tension or torsion. A blunt dissecting instrument was used to grasp the antimesenteric border of the ileum, and the defect in the peritoneum was then enlarged around the trocar site releasing the pneumoperitoneum. By gentle traction on the blunt dissector and simultaneous removal of the trocar, the ileum could be extracted under direct visualization through the abdominal wall to create a loop ileostomy. The ileum completely occluded the peritoneal defect at the site of the stoma. This allowed reconstitution of the pneumoperitoneum and visualization of the small bowel to prevent torsion or tension. The ileostomy was then matured in the standard manner, and the operation was completed in 30 minutes. The postoperative course was uneventful, and the patient immediately began a clear liquid diet after recovery from general anesthesia. The ileostomy functioned within 12 hours. The patient received instruction regarding ileostomy care preoperatively and was discharged 24 hours after operation, tolerating a regular diet.

*Case #2.* A 69-year-old man with adenocarcinoma of the prostate underwent radical perineal prostatectomy. The operative procedure was complicated by a rectal laceration that was repaired primarily. The postoperative course was complicated by fever and a large amount of fecal drainage through the perineal wound on the fifth postoperative day. On abdominal examination, signs of peritoneal irritation were present and the leukocyte count was elevated.

A pneumoperitoneum was established under general anesthesia using an open technique with a blunt port (registered trademark, U.S. Surgical), with $CO_2$ insufflation at a rate of 6 L/min. The intra-abdominal pressure was maintained at 15 mm Hg. A diagnostic laparoscope was placed through the umbilical port for initial inspection of the abdominal contents, which revealed that the sigmoid colon was redundant without evidence of intra-abdominal soilage. A site for the stoma in the left lower quadrant was prepared as described previously. A 10-mm trocar was placed through the peritoneum, and a blunt dissecting instrument was used to mobilize the sigmoid colon to be certain that it could be brought to the level of the anterior abdominal wall. (Fig. 2) The blunt dissecting instrument was used to grasp the antimesenteric border of the sigmoid colon. (Fig. 3) The defect in the peritoneum was then enlarged around the trocar site releasing the pneumoperitoneum. With gentle traction and simultaneous removal of the trocar, the sigmoid colon could be drawn through the abdominal wall as far as required to create a loop colostomy under direct visualization. (Fig. 4) At this point, the sigmoid completely occluded the peritoneal defect at the stomal site, which allowed reconstitution of the pneumoperitoneum and visualization of the sigmoid colon to exclude torsion or tension. In this example, a TA-55 stapler was then passed underneath the loop of sigmoid colon to staple the distal limb of the loop colostomy. (Fig. 5) The proximal limb of the loop colostomy was then matured, creating a completely diverting colostomy.

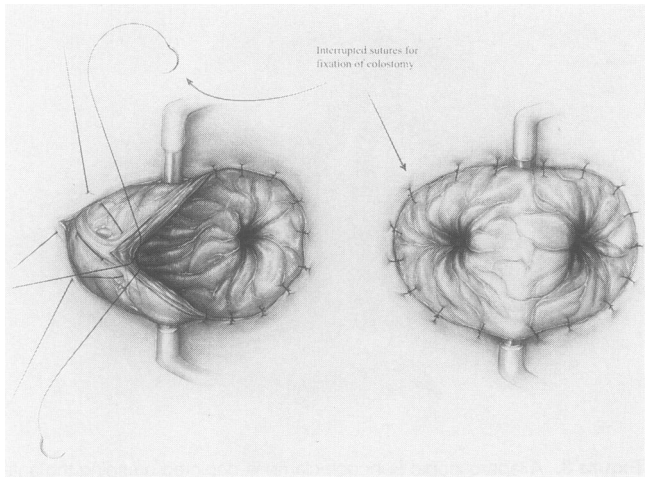


**Figure 4.** Once the sigmoid loop is brought through the site of the stoma, it is matured as a double-barreled loop colostomy, as shown. In this example, a glass rod is passed through the mesentery of the colon and between the colon and the skin to ensure that the colon does not return into the peritoneal cavity. The colostomy is matured by opening the colon along a tenia and placing full thickness interrupted 3-0 chromic sutures through the colon, approximating the mucosa and the skin.

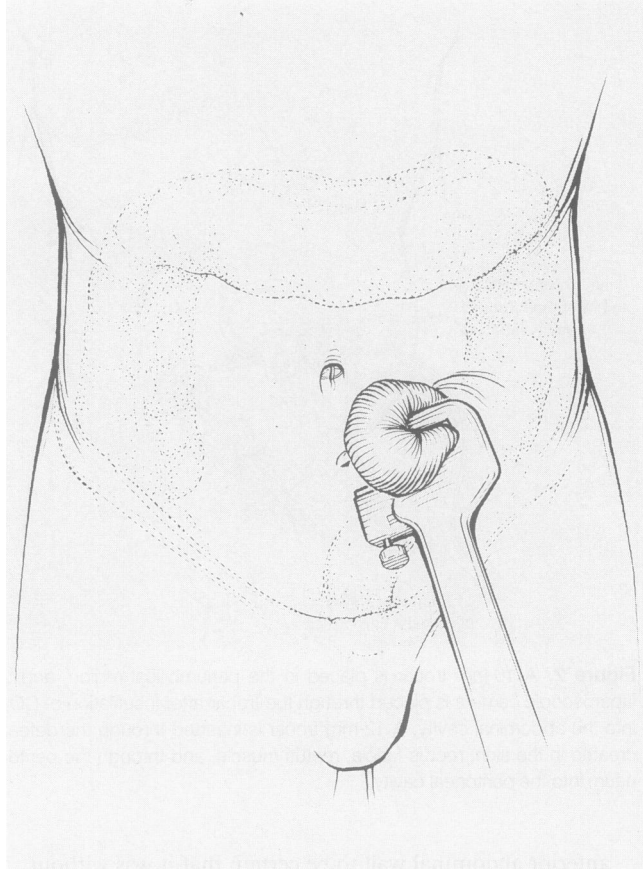

**Figure 5.** Alternatively, a loop of colon has been brought out through the anterior abdominal wall to create a completely diverting colostomy by placing a staple line across the distal limb diverting the fecal stream. A TA-55 stapler is placed across the distal limb of the loop. Maturation of the stoma is accomplished by opening the proximal limb along a tenia and placing full thickness interrupted 3-0 chromic sutures through the colon approximating the mucosa and the skin.

The perineum was irrigated, drained, and packed. The patient had a stable postoperative course, tolerating a regular diet and having function of the colostomy within 24 hours. The rectal laceration healed and the diverting colostomy was taken down 8 weeks after operation with reestablishment of intestinal continuity and normal bowel function.

*Case #3.* A 42-year-old man with a 3-year history of squamous cell carcinoma of the anus treated by chemotherapy and radiation had a large fixed mass obstructing the rectum with multiple enterocutaneous fistulas. Biopsy of the mass revealed recurrent squamous cell carcinoma. The patient was noted to have possible peritoneal tumor implants, but refused further chemotherapy and radiotherapy. He was evaluated for a diverting colostomy to control enterocutaneous fistulas and incontinence. Under general anesthesia, a pneumoperitoneum was established using an open technique with a blunt port and $CO_2$ insufflation at a rate of 6 L/min. The intra-abdominal pressure was maintained at 15 mm Hg. A diagnostic laparoscope was placed through the umbilical port for initial inspection of the abdominal contents and revealed the sigmoid colon to be redundant without evidence of intra-abdominal implants. A laparoscopic colostomy was then treated as described in the second patient, and *both* limbs were then matured creating a *loop* colostomy. The patient was discharged on a regular diet with a functional colostomy the day after operation.

*Case #4.* A 70-year-old man with an adenocarcinoma of the rectum and multiple hepatic metastases treated with chemotherapy and radiation therapy was seen. The tumor was fixed to the pelvis and was thought to be unresectable. After a routine mechanical and antibiotic bowel preparation, general anesthesia was induced and a pneumoperitoneum was established using an open technique with a blunt port, with $CO_2$ insufflation. The intra-abdominal pressure was maintained at 15 mm Hg. A diagnostic laparoscope was placed through the umbilical port for initial inspection of the abdominal contents and revealed the sigmoid colon to be redundant with evidence of intra-abdominal implants and hepatic metastases. A decision was made to create a diverting end colostomy and mucous fistula.

Two sites were selected for the stomas in the left lower quadrant and a 10-mm trocar was placed through the peritoneum in the superior one. (Fig. 6) A blunt dissector was used to mobilize the sigmoid colon to ensure that it could be brought to the level of the anterior abdominal wall. After the sigmoid colon was mobilized, a 12-mm trocar was placed through the peritoneum in the inferior stomal site. Endoscopic scissors were introduced through this trocar, and a mesenteric defect was created at the site of

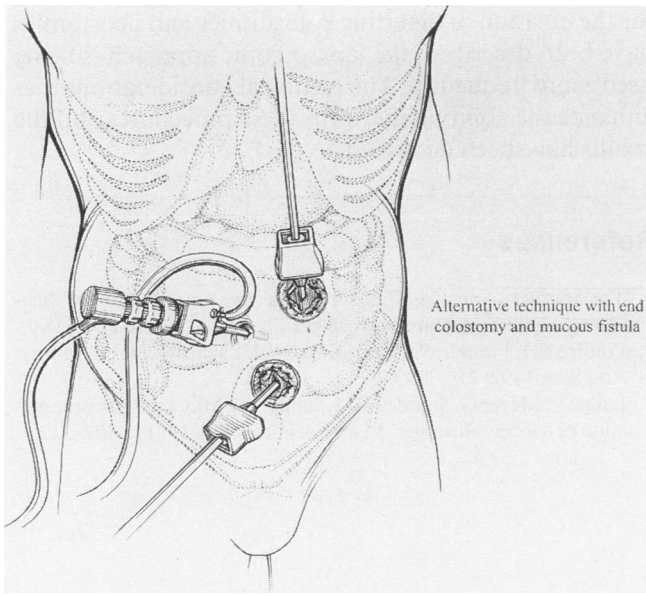


**Figure 6.** A completely diverting colostomy and mucous fistula is created. Two sites for the stomas have been selected and prepared as described previously.

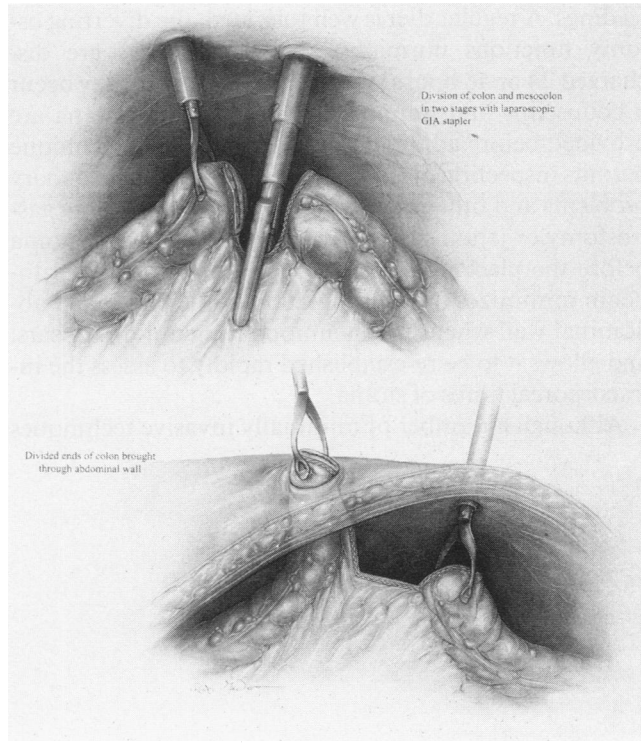


**Figure 7.** (Upper panel) Using the two stomal sites shown, trocars of 10- or 12-mm diameter are passed through the sites. An appropriate segment of the sigmoid colon is selected for creation of an end colostomy and mucous fistula. The ability to mobilize the colon to the anterior abdominal wall is ensured, and a defect is created in the mesentery by sharp dissection at the site of the end colostomy with Endoshears (U.S. Surgical) and the electrocautery. An Endo-GIA 30-mm stapler (U.S. Surgical) is introduced through the 12-mm trocar and used to divide the sigmoid colon, creating two stapled ends. After division of the sigmoid colon, vascular stapling should be used to divide the mesentery of the sigmoid colon. This second staple line in the mesentery allows the two ends of the colon to be separated and used as an end colostomy and mucous fistula. (Lower panel) A Babcock clamp is passed through the trocar to bring the proximal colon through the prepared stoma after the peritoneum is divided. Simultaneous withdrawal of the trocar with a second Babcock clamp is done to draw the distal end of the colon through the second stoma after enlarging the peritoneal defect to create the mucous fistula. The division of the mesentery must be performed to allow physical separation of the two loops of colon. Re-establishment of pneumoperitoneum after placement of the stomas as an end colostomy and mucous fistula allows inspection of the abdominal cavity to exclude tension or torsion.

the sigmoid colon to be used as an end colostomy. An Endo-GIA stapler (registered trademark, U.S. Surgical) was introduced through the 12-mm trocar and used to divide the sigmoid colon. A second Endo-GIA staple line (vascular) was used to divide the mesentery between the divided ends of the sigmoid colon. (Fig. 7) Division of the mesentery allowed the proximal and distal ends of the sigmoid colon to be separated to create an end colostomy and mucous fistula. A blunt dissecting instrument was introduced into each of the trocars and passed through the stomas to grasp the staple line of the proximal and distal limbs of the sigmoid colon. The defect in the peritoneum was then enlarged around the trocar, releasing the pneumoperitoneum. An end colostomy and mucous fistula were then created as described. The patient was begun on a regular diet and had normal function of the colostomy within 24 hours. He was discharged on the second postoperative day.

## DISCUSSION

It is frequently necessary to construct diverting end colostomies and ileostomies for palliation in patients with metastatic carcinoma or previous abdominal operations. Standard techniques for the creation of a diverting colostomy with a minimal laparotomy incision are safe and effective. However, many patients requiring palliation may have had a previous procedure or may have metastatic disease with peritoneal or mesenteric implants, which limit the ability of minimal incisions to create a diverting colostomy or ileostomy. Moreover, such procedures usually are complicated by postoperative ileus and longer hospitalization. The application of laparoscopic techniques is desirable in patients with malignant disease and those with rectal injuries or complicated intestinal fistulas, which require fecal diversion.

In the technique described, intestinal function is disrupted minimally, allowing patients to begin immediate

feedings. A regular diet is well tolerated, the diverting ostomy functions normally, and the patients are discharged 24 or 48 hours later. Earlier discharge may occur if counseling and training in the care of the stoma are provided before admission. The laparoscopic technique permits inspection of the abdominal cavity for secondary problems and other procedures, including a feeding gastrostomy or jejunostomy. The preparation of the stoma before the placement of the trocar through the peritoneum minimizes the manipulation of the bowel and abdominal wall when the pneumoperitoneum disappears, and allows it to be re-established rapidly to assess the intracorporeal limbs of stoma.

Although a number of minimally invasive techniques for the creation of diverting colostomies and ileostomies have been described, the laparoscopic approach is being used more frequently. The technical considerations that enhance the ability to perform these procedures and the results have been described.

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