34 Laparoscopic Total Abdominal Colectomy for Emergent and Elective Indications: Perioperative Considerations and Techniques

Meagan Costedio and Luca Stocchi

Introduction and Rationale

In hemodynamically stable patients, the laparoscopic approach is associated with decreased length of stay, blood loss, and morbidity [1, 2]. Laparoscopic total abdominal colectomy (TAC) is currently performed for a number of indications including malignant and benign disease. The short-term benefits of decreased length of stay, blood loss, and pain are well established laparoscopically versus the open approach. Malignant indications include patients with synchronous carcinomas and/or polyps and/or with a background of familial adenomatous polyposis (FAP) or hereditary nonpolyposis colorectal cancer (HNPCC). Benign indications include inflammatory bowel disease (IBD), *Clostridium difficile* (*C. diff.*) colitis, and colonic inertia. Typically, TAC when performed in the setting of medically refractory ulcerative colitis (UC) results in the creation of an end-ileostomy and preservation of the rectum or rectosigmoid stump. This is the most common reason for emergent or urgent TAC. Initially these cases were performed open, but recent data support short-term recovery benefits of laparoscopy in skilled hands despite the emergent nature of the surgery. When TAC is performed for Crohn's disease (CD) or slow transit constipation, a restorative procedure can be performed with creation of an ileorectal anastomosis.

M. Costedio (✉)
Department of Colorectal Surgery, Ahuja Medical Center of University Hospitals, Beachwood, OH, USA

L. Stocchi
The Story-Garschina Chair in Colorectal Surgery, Cleveland Clinic Department of Colorectal Surgery, Digestive Disease and Surgery Institute, Cleveland, OH, USA
e-mail: stocchl@ccf.org

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Indications and Contraindications

An increasing number of patients undergoing surgery for UC require a TAC without anastomosis, which has become the most common initial operation for UC [3, 4]. This procedure is most often performed laparoscopically [5]. In a substantial proportion of cases, the procedures are performed urgently after patients have been admitted with either severe or fulminant UC (Table 34.1). When patients are acutely ill and on high-dose steroids, immediate total proctocolectomy with ileal pouch-anal anastomosis has an increased incidence of leak and pelvic sepsis [6, 7]. The operation of choice is an initial TAC with creation of an end-ileostomy and preservation of the rectum or rectosigmoid stump to reduce postoperative morbidity while preserving the anatomy and dissection planes in the pelvis. Most of these patients are suitable for a delayed, elective completion proctectomy and ileal pouch-anal anastomosis after a 3–6 month recovery period. Other candidates for an initial TAC are those patients who have become progressively anemic or malnourished as a result of a combination of severe disease and prolonged treatment with high doses of steroids or other immunosuppressive medications.

The indication for initial total abdominal colectomy in patients with medically refractory UC who have received biologic medications within the last 3 months preceding surgery is more controversial [8]. There are data, however, indicating that the increased morbidity associated with an immediate total proctocolectomy and ileal pouch-anal anastomosis [9, 10] can be mitigated by an initial TAC [11].

Another relative indication for initial TAC is in morbidly obese patients with central adiposity who can be offered the opportunity to reduce their weight to maximize the reach of the pouch increasing the chance of successful surgery.

Crohn's disease (CD) can also manifest as severe acute colitis requiring total abdominal colectomy due to unresponsiveness to medical management, although this is less common than in UC. In some cases, an initial TAC may be preferable regardless of the severity of inflammatory bowel disease (IBD) to clarify the diagnosis of CD versus UC or indeterminate colitis and therefore guide subsequent management and counseling. Patients with Crohn's colitis and rectal sparing who

Table 34.1 Preoperative risk factors for urgent or emergent surgery for ulcerative colitis and Crohn's disease and the risk of immediate stage 2 (TPC-IPAA) versus stage 3 (TAC) pouch surgery

Preoperative risk factors	TAC	TPC-IPAA
Steroids >20 mg	Preferred	Avoid
Malnutrition >10% weight loss	Preferred	With caution
Anemia	Safe	Safe
Morbid obesity	Safe	Risk of reach issues
Pregnancy	With caution	Avoid
Unclear diagnosis	Safe	Avoid in CD
Biologics	Safe	With caution
Multiple risk factors	Preferred	Avoid

TAC total abdominal colectomy, *TPC-IPAA* total proctocolectomy with ileal pouch-anal anastomosis, *CD* Crohn's disease

become unresponsive to medical management or develop complications of disease such as colonic strictures precluding colonoscopic cancer surveillance or fistulae are also candidates for laparoscopic TAC with IRA.

Laparoscopic TAC with IRA is a viable option for patients with colonic inertia after workup and aggressive trial of prokinetic medications. Initially, patients should have a colonoscopy confirming no intraluminal pathology and blood work ruling out endocrine or metabolic abnormalities. Patients should have manometry looking for the rectoanal inhibitory reflex. Barium or MR defecography can help determine if the patient has pelvic floor outlet dysfunction. If pelvic floor dysfunction is diagnosed then pelvic floor physical therapy is recommended. If the sitz marker test shows greater than 20% retention of markers at 5 days off laxatives, the test is consistent with slow transit. If the patient fails aggressive medical therapies, then laparoscopic TAC with IRA is warranted (Fig. 34.1).

Laparoscopic TAC is warranted in FAP when there is relative rectal sparing (less than 20) or when rectal polyps are amenable to endoscopic excision. Prophylactic surgery is recommended in patients with a known mutation or phenotype of disease in their early 20s or at a younger age in the case of symptoms or high-grade dysplasia. Patients with significant rectal polyp burden or rectal cancer should proceed with total proctocolectomy with reconstruction [12]. Patients with a significant family history of colon or rectal cancer or patients known to have HNPCC are watched closely, but if they do develop a colon cancer, TAC is the operation of choice.

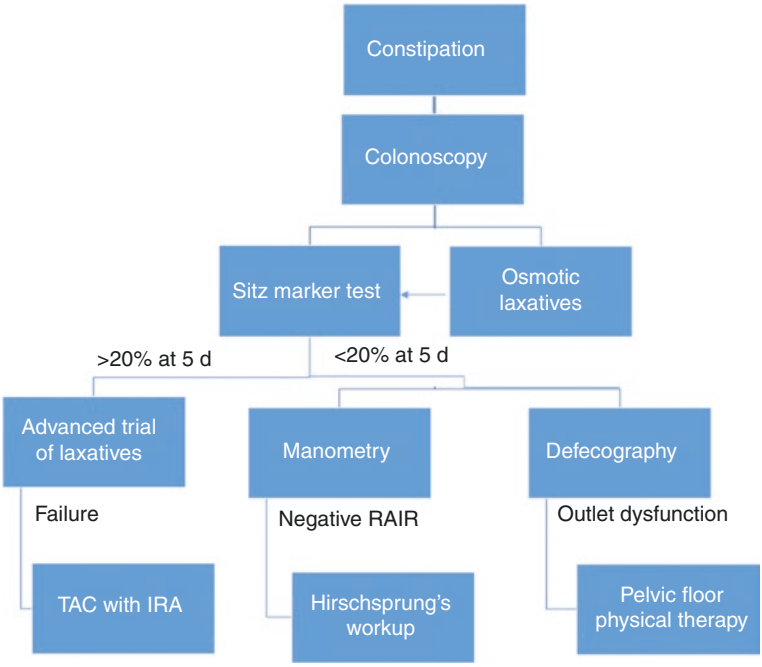

Fig. 34.1 Algorithm for decision-making for the treatment of constipation. TAC total abdominal colectomy, RAIR rectoanal inhibitory reflex, IRA ileorectal anastomosis

Laparoscopy is the approach of choice when the patient is stable and the surgeon feels comfortable with the approach. Relative contraindications to laparoscopy include massive bleeding, colonic perforation with fecal peritonitis, and toxic megacolon. A TAC is an accepted option for obstructing left-sided colon cancer, but again the degree of colonic dilatation can become a significant obstacle in the conduct of a laparoscopic operation, particularly where high ligation of the vessels is essential. There are also insufficient data to support laparoscopy in the pregnant patients developing severe acute UC requiring surgery [13]. In addition, there may be circumstances in which the surgeon can make an individual judgment that poor quality and friability of the tissues excessively increase the risk of intra-abdominal colonic injury during laparoscopy, thus making an open approach preferable. The role of TAC in the management of *C. difficile* colitis is covered in Chap. 35.

Principles and Quality Benchmarks

Laparoscopic TAC can be performed with technical variations based on the specific indication. If the indication is management of a biopsy-proven carcinoma, polyp, or dysplasia it is necessary to perform high vascular ligation with oncologic mesenteric dissection throughout the colon. Ligation at the origin of the lymphovascular pedicles is not necessary for benign disease, which can facilitate and expedite the conduct of the operation. The ileorectal anastomosis should be typically performed at the level of the upper rectum, recognized by the confluence of the teniae, which frequently occurs at the level of the sacral promontory. Some surgeons prefer to leave a shorter segment of rectum if the indication is colonic inertia to facilitate bowel function, which remains controversial. In CD the specific length of residual rectosigmoid is based on the principle that the large intestine left in place should have minimal or absent gross disease. In the case of nonrestorative procedures, the inflamed upper rectum can be transected laparoscopically to create a longer defunctionalized rectosigmoid segment which can be implanted in the subcutaneous tissues or left just underneath the abdominal fascia. Overall morbidity and pelvic sepsis rates are comparable regardless of whether the rectal stump is left under the fascia or secured above the fascia; therefore the decision is at the individual surgeon's discretion [14].

Preoperative Planning, Patient Workup, and Optimization

Preoperative planning and workup largely depend on the individual diagnosis and urgency of the indications for TAC. The following paragraph is relevant for patients undergoing elective resection. A complete colonoscopy should be ideally performed in all patients requiring TAC. It is imperative that patients with a history of colitis for more than 8 years undergo surveillance if medically feasible, to ensure that there is no dysplasia prior to proceeding with planned colectomy without high ligation of

the vessels. Nutrition assessment is essential in operative planning to make sure that patients are optimized prior to surgery when there is time to postpone surgery. Also, an anemia workup should be performed and iron and B12 replaced prior to surgery to optimize blood levels. Patients should be seen by a specialist to mark the appropriate site for a stoma, optimally in the right lower or upper quadrant. For patients on biologics who are doing poorly, if possible, it is optimal to wait close to the timing of the next dose of medication to have the lowest serologic levels of drug while the patient retains some benefits from the medication. When performing a TAC for UC, the authors choose to leave patients on the dose of steroids where the patient can best function, as forcing a decrease in steroids can lead to fulminant colitis. Severe acute IBD is a relative contraindication to complete colonoscopy due to increased risk of perforation, in which case a sigmoidoscopy can be sufficient to confirm the severity of disease as well as perform biopsies to rule out CMV infection. Infectious causes of diarrhea should be excluded. Stool studies for *Clostridium difficile*, ova and parasites, and bacterial pathogens should be performed. Computed tomography (CT) or magnetic resonance (MR) enterography can be performed to rule out small bowel CD when the diagnosis of colitis is in question. For patients hospitalized with fulminant colitis, giving intravenous iron can help build up stores for postoperative recovery. There is no demonstrated benefit in delaying colectomy to give preoperative parenteral nutrition [15].

Patients with colonic malignancy should be adequately staged with CT of the chest abdomen and pelvis and a CEA level. In patients who are younger than 50 or with a strong family history of colorectal, ovarian, endometrial, or renal cancer, genetic counseling is recommended preoperatively, as the patient may want to consider concomitant preventative surgery such as hysterectomy and oophorectomy. Concurrent conditions within hereditary syndromes should be assessed and addressed as well. A type and screen is encouraged in all of these patients as it is common for patients to be anemic as well as have antibodies to blood with IBD. A mechanical bowel preparation with oral antibiotics is recommended in all hemodynamically stable patients to help decrease the risk of surgical site infection.

Operative Setup

The patient is positioned on the operating room table in the supine split-leg or lithotomy position. This positioning is helpful for two reasons: the operating surgeons can stand between the legs, and the surgeon has access to the rectum for the anastomosis or to help define the anatomy by inserting a rectal probe. The OR mattress should be taped to the bed base and nonslip padding, or bean bags can be used to prevent movement of the patient during surgery. If an ileorectal anastomosis is planned, the perineum needs to be positioned over the end of the bed to allow for any cephalad sliding which might occur with steep Trendelenburg tilt. Both arms are tucked, and the patient is secured to the table to minimize sliding. Ensuring that the patient has adequate IV access and two blood pressure cuffs on can help to prevent untucking the arms later in the case. Two laparoscopic monitors that are mobile

are helpful as the operation progresses in all four quadrants of the abdomen. Prophylactic antibiotics that cover aerobes and anaerobes such as a third-generation cephalosporin or ciprofloxacin and metronidazole are administered within 1 hour of incision. A prophylactic subcutaneous heparin dose is administered even if the patient is anemic preoperatively. This is an important step as the majority of the patients needing a TAC will have IBD or cancer and are at increased risk for venous thromboembolism (VTE). The benefit of stress dose intravenous steroids should be discussed with the anesthesia team prior to surgery if the patient has been taking steroids within the preceding 6 months.

Operative Technique: Surgical Steps

Port placement varies based on the surgeon's preference and indication for surgery. An umbilical trocar is placed that will house the laparoscopic camera (5 or 10 mm based on surgeon preference). Classically ports in the midclavicular line in the right and left lower and upper quadrants are used (Fig. 34.2). In many cases the patient will need an end or diverting loop ileostomy, so it is preferable to place a 12 mm port in the right lower quadrant position at the previously marked stoma site if a laparoscopic stapler will be used, so that the fascial defect will not need to be closed. If the patient does not need a stoma, then the extraction site, which is at the discretion of the surgeon, can be used for the 12 mm port site as well. Alternatively, it is possible to start with the stoma or extraction site and place a wound protector with a 12 mm port held in place with a Penrose drain and penetrating towel clamps, or a specialized port with a wound protector, as it is easier to enter the peritoneal cavity through a larger incision. If the surgeon feels comfortable with single incision laparoscopic surgery (SILS), then the stoma site or extraction site can be used (Fig. 34.3). Another option for port placement keeping the extraction site off the midline would be to place the extraction incision in the suprapubic site and

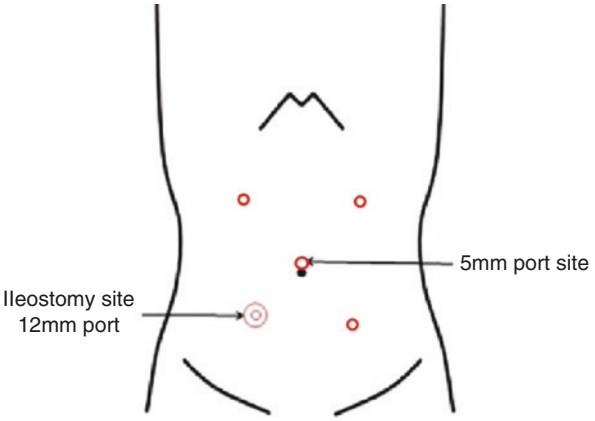

Fig. 34.2 Laparoscopic port placement for TAC

Fig. 34.3 Single incision laparoscopic port placement in the right lower quadrant ileostomy site

use that as a either a SILS port or a hand-assist port for patients with a bulky mesentery. Additional 5 mm ports can be added as necessary to complete the surgery safely.

Total Abdominal Colectomy for Benign Disease

After safe port placement, in cases of colitis, the small bowel is briefly inspected to ensure that there is no gross evidence of CD. The camera is placed in the umbilical port, and the operating surgeon stands on the left side of the patient and operates through the left-sided ports or the right lower quadrant and left lower quadrant ports. With the patient placed in Trendelenburg and left side down position, the mesentery is grasped just under the ligament of Treves and retracted laterally and anteriorly. The terminal ileum is positioned in the pelvis, and the remainder of the small bowel falls into the left abdomen. This will tent up the ileocolic artery and vein. The groove under the ileocolic vessels is then scored, and blunt dissection is used to dissect the posterior aspect of the mesentery from the retroperitoneum and anterior duodenum (Fig. 34.4a, b). Finding the plane just anterior to the duodenum ensures the correct avascular dissection up to the hepatic flexure. When the ileocolic vessels are divided, a high ligation is not necessary in benign disease but can facilitate reach for an ileoanal anastomosis if that is planned for a later date. In UC cases, the authors prefer high ligation of the ileocolic vessels so that the J-pouch operation is always the same whether it is performed for malignancy or benign disease as far as reach maneuvers and blood supply, although this remains at the discretion of the individual surgeon.

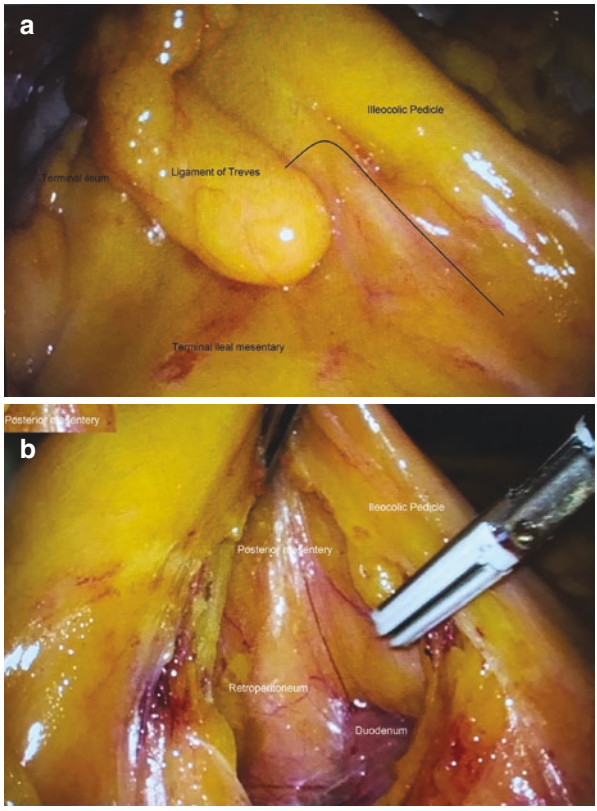

Fig. 34.4 (**a**) Ileocolic pedicle when the ligament of Treves is retracted anterolaterally. The black line depicts the plane between the retroperitoneum and the posterior mesentery. (**b**) Once the peritoneum is scored, this photo demonstrates how to identify the anterior duodenum, which will lead the surgeon to the correct avascular plane between the posterior right mesocolon/mesentery and retroperitoneum

The mesentery is dissected free from the retroperitoneum up to the hepatic flexure and laterally to the abdominal wall. The terminal ileum is then retracted cephalad and anteriorly. There is an avascular plane between the small bowel mesentery and the retroperitoneum containing the ureter and gonadal vessels. That avascular plane is scored and the prior dissection is joined (Fig. 34.5a, b). Often the surgeon can see a dark/red area behind the mesentery which corresponds to the previously dissected space. Once the dissections are joined, the lateral attachments of the right colon are divided with monopolar cautery or a vessel sealer up to the hepatic flexure. The operating surgeon then changes the table position to the reverse Trendelenburg and left side down position and moves to operate between the legs from the RLQ and LLQ ports. The hepatocolic attachments are taken with care to avoid the duodenum and stomach. If the surgeon chooses to spare the omentum, the omentum is retracted over the colon and dissected free from the transverse colon eventually entering the lesser sac closer to the splenic flexure. The previously dissected mesentery of the right colon is retracted anteriorly and caudally to demonstrate the transverse colon mesentery (Fig. 34.6). In cases where it is difficult to dissect the lesser omentum from the transverse mesocolon, the lesser omentum can be taken with the transverse colon mesentery close to the colon wall across the

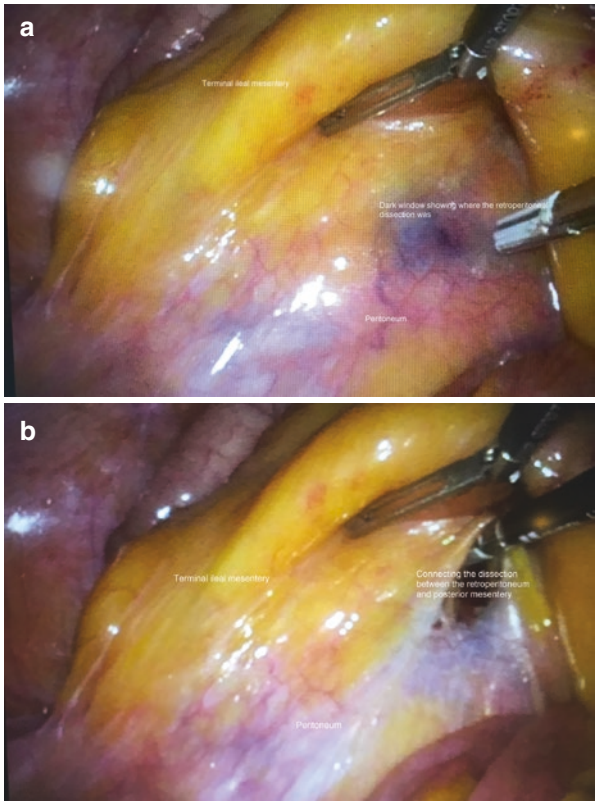

Fig. 34.5 (**a**) The terminal ileal mesentery is retracted anteriorly and cephalad showing a dark area which is the previously dissected space between the mesentery and retroperitoneum. (**b**) The peritoneum is scored, and the prior dissection plane is entered ensuring identification of the correct plane, after which the right lateral attachments can be expeditiously taken down

Fig. 34.6 With the patient in reverse Trendelenburg position and the middle colic vessels and lesser omentum tented over a grasper, the transverse mesocolon is above the ligament of Treitz and can be taken close to the colon wall in benign disease

transverse colon and the omentum removed with the colon. The patient is then transitioned into the reverse Trendelenburg and right side down position. Once the transverse mesocolon starts to curve to become the descending colon mesentery, the lesser sac is entered, and the lesser omentum is taken off the splenic flexure (Fig. 34.7). The splenic flexure is then retracted caudally, and the splenocolic

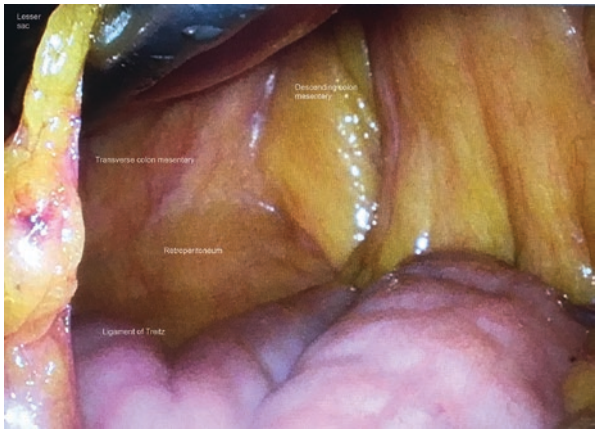

Fig. 34.7 The transverse mesocolon comes to an end as it sweeps around to become the descending mesocolon. The lesser sac must be entered and dissected off the splenic flexure to the abdominal wall so that the descending colon can then be medialized and the mesocolon dissected off Gerota's fascia and taken close to the colon wall

attachments are taken. The left colon attachments are taken as well, and the descending colon is medialized off Gerota's fascia. The left colon is dissected free from the retroperitoneum, and the mesentery can be taken close to the wall of the left colon. The sigmoid is dissected from the retroperitoneum, ensuring the left ureter and gonadal vessels are kept retroperitoneally. The authors prefer to keep the dissection of the mesocolon anterior to the superior hemorrhoidal vessels to ensure adequate blood flow to the proximal rectum. Patients with IBD or *C. diff.* on high-dose steroids and biologics, severely malnourished, and/or having severe rectal inflammation, are at increased risk of staple line breakdown. In this case, the mesorectum is then taken to the rectal wall at the rectosigmoid junction in an area that will reach up to the suprapubic abdominal wall to prevent intra-abdominal rectal stump leak. A small horizontal extraction site is created in the suprapubic area splitting the rectus muscles. The terminal ileum is transected and grasped, and the colon is removed through this site through a wound protector. The rectosigmoid is stapled either intracorporeally or extracorporeally, and the rectal stump mesentery can be sutured to the surrounding fascia, and the skin can be closed or left open. If the patient is on less than 20 mg of prednisone/day or 100 mg of hydrocortisone, with normal nutrition and tissue integrity, then the mesentery is taken up to the rectal wall close to the peritoneal reflection, and the rectum is transected with a laparoscopic stapler. This will minimize the amount of inflamed rectum left in place. A common practice is to leave a rectal tube to decrease the pressure on the staple line until the patient is able to mobilize and try to evacuate air and mucous on their own. A potential side effect of pelvic surgery is decreased fecundity; it is important to minimize dissection near the ovaries and irrigate and remove any blood products to prevent scarring near the fallopian tubes in female patients. Once assured that the mesentery is appropriately oriented without twists, the specimen and the terminal ileum are delivered through the wound protector at the stoma site and matured.

In the case of a subtotal colectomy for slow transit constipation, the laparoscopic colectomy portion of the operation is the same, but the mesentery is taken to the top of the proximal rectum, approximately 7–9 cm from the anterior peritoneal

reflection. The rectosigmoid is transected using a laparoscopic stapler, and a circular stapler, anvil, is secured into the terminal ileum using a purse-string suture through the extraction site. The correct mesenteric orientation is again ensured, and an end-to-end anastomosis is created intracorporeally and checked with air leak testing. For patients with Crohn's colitis, a point of normal colon or rectum is chosen for the anastomosis. If the patient is young and has a normal colon, an ileosigmoid anastomosis can be performed. It can be difficult to get the EEA stapler to the end of the transected sigmoid colon, so in these cases, a handsewn end-to-end anastomosis is preferred for ease of small bowel endoscopic surveillance. A diverting loop ileostomy is always an option for patients on >20 mg of prednisone daily or who have lost greater than 10% of their body weight.

Total Abdominal Colectomy for Malignancy/Dysplasia

The laparoscopic setup is the same as described for benign disease. The operation proceeds as in the benign setting, but a complete mesocolic excision is required for the entire colon (Fig. 34.8). When the ileocolic vessels are identified, they are dissected back above the duodenum and taken at the bifurcation at the last branch of the superior mesenteric artery (SMA). The hepatic flexure is taken down as described in the benign section. The patient is placed in the reverse Trendelenburg position, and the omentum is retracted over the colon, and the lesser sac is then entered in the mid-transverse colon, and the omentum is dissected free from the colon to the splenic flexure. The posterior aspect of the stomach is dissected from the transverse mesocolon toward the right to facilitate high ligation of the middle colic vessels. The middle colic vessels can then be taken in a high ligation with care to avoid the fourth portion of the duodenum as it courses through the transverse mesocolon. The transverse mesocolon is then taken just above the ligament of Treitz ensuring a high

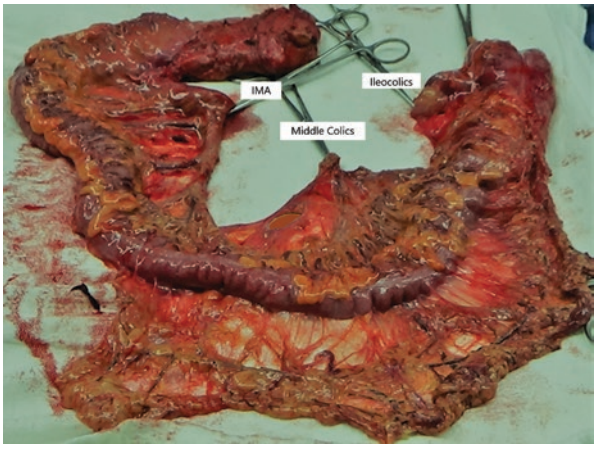

Fig. 34.8 Complete mesocolic excision is required for the entire colon for TAC for malignancy/dysplasia

ligation. The splenic flexure can be released at this point, but the authors prefer to transition to the left colon in a medial to lateral approach for a high ligation of the inferior mesenteric artery (IMA) and vein (IMV). The patient is placed back into the Trendelenburg and right side down position. The superior hemorrhoidal vessels are identified and tented up, and the plane between the posterior mesorectum and presacral fascia is identified, sweeping the inferior hypogastric nerves, ureters, and gonadal vessels posteriorly. The superior hemorrhoidal artery is traced back to the base of the IMA, and the IMA is taken close to the aorta to ensure a high ligation. The posterior aspect of the left colon mesentery is dissected free from the retroperitoneum. The IMV is then taken in a high ligation, and the previous dissection from the transverse mesocolon and splenic flexure should be met. The lateral attachments of the left colon are taken down to the pelvis.

Following division of the IMA, the blood supply to the rectum relies on middle rectal artery backflow. It is essential for adequate blood supply as well as for oncologic reasons that the true rectum be transected rather than the distal sigmoid. The authors select a transection point along the rectum, approximately 7–9 cm proximal to the peritoneal reflection for a planned end-to-end anastomosis. Drains are not routinely used for total abdominal colectomy. If the rectal stump is implanted suprapubically, the authors routinely close the skin as only 15% will blow out and become a mucous fistula [14]. Rarely the rectum will be so inflamed it will not hold sutures or staples, in which case it should be matured as a mucous fistula.

Pitfalls and Troubleshooting

Common Errors: Injury to the Fragile Colon/Mesentery

A dreaded and common complication of this surgery is perforation of the colon and intraperitoneal stool contamination. It is essential that the colon is grasped as little as possible for retraction. Utilization of steep table positioning as well as tenting of the mesentery for retraction can obtain adequate visualization without grasping the colon wall. The authors use an open bowel grasper under the mesentery to adequately expose planes posterior to the colon with minimal tension on the weakened colon wall.

In cases of IBD, the mesentery is often thickened and fragile and bleeds easily. The authors chose to stay in the avascular planes posterior to the thickened mesentery and use a vessel sealing device with multiple firings to control this fragile and thickened mesentery. While most procedures can be completed with minimal blood loss, surgeons should be prepared for the possibility of severe bleeding from the fragile Crohn's mesentery.

Intraoperative Difficulties: Megacolon and Microperforation

Megacolon was initially considered a contraindication to laparoscopy. Since laparoscopic equipment and experience have increased, that is no longer the case, and

laparoscopy can provide short-term recovery benefits even under emergent circumstances. If the patient has significant small bowel or colonic dilation, then open surgery may still be required, as there may not be sufficient domain to maneuver laparoscopically. As long as the megacolon is caused by benign pathology, there are tricks to performing this surgery safely, and in experienced hands, the risk of colonic perforation during laparoscopic TAC in this setting is equivalent to that during open surgery.

A medial to lateral approach is often not possible due to bowel dilation. In this case steep table positioning can be helpful to move the dilated and often heavy colon, and great care is taken to grasp or tent the mesentery rather than the dilated colon to help avoiding perforation. Gauze can be used to retract and manipulate the bowel. The patient is placed in the steep Trendelenburg and left side down position. The terminal ileal mesentery is retracted cephalad and toward the abdominal wall and the avascular plane between the posterior aspect of the mesentery, and the retroperitoneum is developed to the hepatic flexure. The terminal ileum can be transected laparoscopically and the mesentery divided with a vessel sealing device at the level at the colon wall and the lateral attachments taken all while tenting the colon and mesentery upward. The patient is then positioned in reverse Trendelenburg, left side down, and once the colon has fallen into the pelvis, then the procedure can be performed as described as for benign disease, for the remainder of the colon as the lateral to medial dissection is safer in this case. For benign disease, particularly if the right side of the colon is the most dilated, if pneumoperitoneum is inadequate, the surgeon can transect the transverse colon using a laparoscopic stapler and remove the proximal, dilated bowel through a wound protector to reduce a portion of dilated colon and improve exposure and maneuverability.

Management of Intraoperative Complications: Tips and Tricks, Salvage, and When to Convert

Perforation

As alluded to above, acutely ill patients with UC are at a very high risk for intraoperative perforation both open and laparoscopically. Just grasping the colon or sometimes even putting pressure on the colonic wall can cause perforation. The authors attempt to tent under the colon and mesentery to avoid putting pressure on the fragile colon wall. If a perforation is encountered with stool spillage, a suction irrigator is needed to control fecal soilage, and either sutures or a laparoscopic stapler can be used to control further fecal contamination. If the surgeon is unable to contain fecal spillage, they should convert to open.

Bleeding

The authors use a vessel sealing device to control the major colonic vessels. If bleeding is encountered, the vessel is occluded with a bowel grasper or Maryland

grasper, and the blood vessel can be controlled with a repeat application of the vessel sealing device, assuming the surrounding structures are safely out of harm, clips, or intracorporeal suturing. If the surgeon cannot gain control of the vessel, then conversion to open is appropriate.

Injury to Other Organs

Small bowel injury most often occurs during adhesiolysis. As long as the small bowel is mobilized and freed from other adhesions, often the entire small bowel can be run through a stoma or extraction site. The surgeon can pull up the concerning area and place a stitch on the area extracorporeally and then run the entire bowel and repair any areas of concern without having to formally covert to open. Injury to the ureters should prompt a urology consult and may require conversion to open based on the experience of the consulting urologic surgeon. Injury of the duodenum can be repaired laparoscopically or open based on the comfort of the individual surgeon. Splenic injury is a rare laparoscopic complication but can happen, and its management can range from use of hemostatic agents to splenectomy, based again on the comfort of the surgeon. A very rare but concerning complication of a total colectomy would be injury to the superior mesenteric artery or superior mesenteric vein (SMA, SMV) which could compromise small bowel viability. In this scenario, the authors recommend conversion to open with repair and intraoperative consultation with a vascular surgeon.

Level of Difficulty of Particular Approach, Prerequisite Skills, Learning Curve

Total colectomy is a difficult procedure which requires knowledge of the anatomy over the entire abdominal cavity as the surgeon is working in all four quadrants. There is a significant learning curve for efficient retraction in this case as well. If the surgeon is well versed in right, extended right, and left colectomy, then TAC for benign disease is reasonable. For cases of dysplasia or malignancy, the surgeon needs specific training for complete mesocolic excision with high ligation of the ileocolic, middle colic, and inferior mesenteric vessels. If the surgeon does not feel comfortable with these techniques, then additional training or proctoring should be sought.

Outcomes

The largest available evidence on the outcomes of laparoscopic TAC comes from the evaluation of large administrative databases. There is evidence that the laparoscopic technique is more commonly performed for constipation and IBD compared with neoplasm in the assessment of 744 patients included in the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) undergoing

TAC, including any indication for surgery, both laparoscopic and open techniques and both restorative and nonrestorative procedures. Median operative times were longer for laparoscopic surgery (230 vs. 178 min, $p < 0.001$), and the difference remained similar regardless of the diagnosis. The laparoscopic approach resulted in a significant decrease in the median length of hospital stay among patients with neoplasm or IBD (6 vs. 8 days, $p < 0.001$, and 7 vs. 9 days, $p < 0.001$, respectively), but not in patients operated on for colonic inertia [16]. In another series limited to restorative procedures, 326 patients undergoing laparoscopic TAC and ileorectal anastomosis for any indications were compared with an equivalent number of patients who underwent an open procedure. The laparoscopic technique was again associated with a significantly longer mean operative time (242 minutes versus 202 minutes, $p < 0.001$) but a significantly shorter length of hospital stay (9.4 versus 13.3 days, $p < 0.001$) and decreased rates of ileus (24% versus 31%, $p = 0.04$). The morbidity and mortality rates were comparable, in particular anastomotic leak rates (5.2% in each group) and sepsis rates (5.2% after laparoscopic surgery vs. 8.9% after open surgery, $p = 0.07$) [17]. There is evidence from a single institution indicating that TAC with ileorectal anastomosis is associated with increased morbidity when carried out for colonic inertia compared with neoplasm. However, when assessing the specific subgroup of patients undergoing laparoscopic surgery, the rates of anastomotic leakage and postoperative abscess were statistically similar, and the difference in readmission and overall morbidity favoring patients operated on for neoplasm was statistically borderline ($p = 0.05$) [18]. The comparison of morbidity rates after TAC according to specific diagnosis in the abovementioned NSQIP study did not indicate significant differences, in particular for septic complications, except for increased urinary tract infection rates and neurologic and renal complication in constipation patients when compared to IBD [16]. Contemporary results of laparoscopic TAC for IBD from individual institutions are reported in Table 34.2. The laparoscopic approach has been generally associated with recovery

Table 34.2 Selected series of laparoscopic total abdominal colectomy and end-ileostomy for severe acute inflammatory bowel disease

Author	Year	Patients (*n*)	Laparoscopic technique used	Overall morbidity (%)	LOS (days)
Ouaïssi [23]	2008	23	Standard	35	9.3
Chung [24]	2009	37	HALS and standard	51	5
Watanabe [25]	2009	30	HALS	37	23
Telem [26]	2010	29	Standard	28	4.5/10.3[a]
Bartels [27]	2012	36	HALS and standard	17	N/A
Parnaby [28]	2013	32	Standard	72	7
Frid [29]	2013	42	Standard	43	6
Gu [30]	2014	197	HALS and standard	40	6
Messenger [31]	2014	131	Standard	31	7 (median)
Buchs [32]	2017	117	Standard	32	10.5

LOS length of hospital stay. LOS reported as means, *HALS* hand-assisted laparoscopic surgery
[a]Reported separately for patients with unremarkable postoperative course and experiencing postoperative complications

benefits when compared with open TAC while maintaining similar postoperative morbidity, as also confirmed by a systematic review and meta-analysis [19]. Within the subgroup of TAC for colonic inertia, a number of single institutional series have also demonstrated earlier return of bowel function, reduced postoperative pain, and shorter length of hospital stay after laparoscopic surgery [20]. With respect to anorectal function, it is generally accepted that laparoscopic TAC is associated with similar function to their open counterparts, although a recent small series indicated improved function after laparoscopic surgery [21] for still unclear reasons. There is also evidence based on the Nationwide Inpatient Sample (NIS) database that laparoscopic TAC is associated with decreased hospital charges. In an analysis of 26,721 patients who underwent elective TAC between 2009 and 2012, almost 63% had an open operation, while slightly more than 37% had a minimally invasive approach including a less than 1% rate of robotic surgery. The most common indication for surgery was UC. While the conversion rate for laparoscopic surgery was significantly higher than that of robotic TAC (13.3 versus 1.5%, $p < 0.01$), patients undergoing laparoscopic surgery have significantly lower total hospital charges compared to patients who underwent open surgery. Total hospital charges for the robotic approach were also significantly higher than for the laparoscopic approach [22]. While this retrospective analysis remains associated with possible selection bias when comparing different surgical approaches and assessed charges rather than direct hospital costs, its results corroborate the widespread use of laparoscopic surgery for TAC.

Conclusions

Laparoscopic TAC is associated with recovery advantages when compared to open surgery and can be successfully performed for a number of indications. Besides recovery benefits, laparoscopic TAC is also associated with substantial cost savings when compared to open surgery. Laparoscopic surgery is the established technique of choice for TAC for both benign and malignant disease. With technical advancement and increased experience, laparoscopic TAC can be considered as the initial approach even in emergent situations, depending of the individual surgeon comfort.

References

1. Keller DS, Pedraza R, Flores-Gonzalez JR, LeFave JP, Mahmood A, Haas EM. The current status of emergent laparoscopic colectomy: a population-based study of clinical and financial outcomes. Surg Endosc. 2016;30(8):3321–6.
2. Sujatha-Bhaskar S, Alizadeh RF, Koh C, Inaba C, Jafari MD, Carmichael JC, et al. The growing utilization of laparoscopy in emergent colonic disease. Am Surg. 2017;83(10):1068–73.
3. Geltzeiler CB, Lu KC, Diggs BS, Deveney KE, Keyashian K, Herzig DO, et al. Initial surgical management of ulcerative colitis in the biologic era. Dis Colon Rectum. 2014;57(12):1358–63.

4. Bikhchandani J, Polites SF, Wagie AE, Habermann EB, Cima RR. National trends of 3- versus 2-stage restorative proctocolectomy for chronic ulcerative colitis. Dis Colon Rectum. 2015;58(2):199–204.
5. Causey MW, Stoddard D, Johnson EK, Maykel JA, Martin MJ, Rivadeneira D, et al. Laparoscopy impacts outcomes favorably following colectomy for ulcerative colitis: a critical analysis of the ACS-NSQIP database. Surg Endosc. 2013;27(2):603–9.
6. Ritter KA, Burke JP, Stocchi L, Aiello A, Holubar S, Ashburn JH, et al. Postoperative steroid taper is associated with pelvic sepsis after ileal pouch-anal anastomosis. Inflamm Bowel Dis. 2019; 25(8):1383–9.
7. Zittan E, Wong-Chong N, Ma GW, McLeod RS, Silverberg MS, Cohen Z. Modified two-stage ileal pouch-anal anastomosis results in lower rate of anastomotic leak compared with traditional two-stage surgery for ulcerative colitis. J Crohns Colitis. 2016;10(7):766–72.
8. Kulaylat AS, Kulaylat AN, Schaefer EW, Tinsley A, Williams E, Koltun W, et al. Association of preoperative anti-tumor necrosis factor therapy with adverse postoperative outcomes in patients undergoing abdominal surgery for ulcerative colitis. JAMA Surg. 2017;152(8):e171538.
9. Selvasekar CR, Cima RR, Larson DW, Dozois EJ, Harrington JR, Harmsen WS, et al. Effect of infliximab on short-term complications in patients undergoing operation for chronic ulcerative colitis. J Am Coll Surg. 2007;204(5):956–62; discussion 62–3.
10. Mor IJ, Vogel JD, da Luz Moreira A, Shen B, Hammel J, Remzi FH. Infliximab in ulcerative colitis is associated with an increased risk of postoperative complications after restorative proctocolectomy. Dis Colon Rectum. 2008;51(8):1202–7; discussion 7–10.
11. Gu J, Remzi FH, Shen B, Vogel JD, Kiran RP. Operative strategy modifies risk of pouch-related outcomes in patients with ulcerative colitis on preoperative anti-tumor necrosis factor-alpha therapy. Dis Colon Rectum. 2013;56(11):1243–52.
12. Wu JS, Paul P, McGannon EA, Church JM. APC genotype, polyp number, and surgical options in familial adenomatous polyposis. Ann Surg. 1998;227(1):57–62.
13. Ooi BS, Remzi FH, Fazio VW. Turnbull-Blowhole colostomy for toxic ulcerative colitis in pregnancy: report of two cases. Dis Colon Rectum. 2003;46(1):111–5.
14. Gu J, Stocchi L, Remzi F, Kiran RP. Intraperitoneal or subcutaneous: does location of the (colo)rectal stump influence outcomes after laparoscopic total abdominal colectomy for ulcerative colitis? Dis Colon Rectum. 2013;56(5):615–21.
15. Salinas H, Dursun A, Konstantinidis I, Nguyen D, Shellito P, Hodin R, et al. Does preoperative total parenteral nutrition in patients with ulcerative colitis produce better outcomes? Int J Colorectal Dis. 2012;27(11):1479–83.
16. Alves-Ferreira PC, de Campos-Lobato LF, Zutshi M, Hull T, Gurland B. Total abdominal colectomy has a similar short-term outcome profile regardless of indication: data from the National Surgical Quality Improvement Program. Am Surg. 2011;77(12):1613–8.
17. Onder A, Benlice C, Church J, Kessler H, Gorgun E. Short-term outcomes of laparoscopic versus open total colectomy with ileorectal anastomosis: a case-matched analysis from a nationwide database. Tech Coloproctol. 2016;20(11):767–73.
18. Reshef A, Gurland B, Zutshi M, Kiran RP, Hull T. Colectomy with ileorectal anastomosis has a worse 30-day outcome when performed for colonic inertia than for a neoplastic indication. Colorectal Dis. 2013;15(4):481–6.
19. Bartels SA, Gardenbroek TJ, Ubbink DT, Buskens CJ, Tanis PJ, Bemelman WA. Systematic review and meta-analysis of laparoscopic versus open colectomy with end ileostomy for non-toxic colitis. Br J Surg. 2013;100(6):726–33.
20. Tillou J, Poylin V. Functional disorders: slow-transit constipation. Clin Colon Rectal Surg. 2017;30(1):76–86.
21. Khan M, Jayne D, Saunders R. Comparison of defecatory function after laparoscopic total colectomy and ileorectal anastomosis versus a traditional open approach. Ann R Coll Surg Engl. 2018;100(3):235–9.
22. Moghadamyeghaneh Z, Hanna MH, Carmichael JC, Pigazzi A, Stamos MJ, Mills S. Comparison of open, laparoscopic, and robotic approaches for total abdominal colectomy. Surg Endosc. 2016;30(7):2792–8.

23. Ouaissi M, Lefevre JH, Bretagnol F, Alves A, Valleur P, Panis Y. Laparoscopic 3-step restorative proctocolectomy: comparative study with open approach in 45 patients. Surg Laparosc Endosc Percutan Tech. 2008;18(4):357–62.
24. Chung TP, Fleshman JW, Birnbaum EH, Hunt SR, Dietz DW, Read TE, et al. Laparoscopic vs. open total abdominal colectomy for severe colitis: impact on recovery and subsequent completion restorative proctectomy. Dis Colon Rectum. 2009;52(1):4–10.
25. Watanabe K, Funayama Y, Fukushima K, Shibata C, Takahashi K, Sasaki I. Hand-assisted laparoscopic vs. open subtotal colectomy for severe ulcerative colitis. Dis Colon Rectum. 2009;52(4):640–5.
26. Telem DA, Vine AJ, Swain G, Divino CM, Salky B, Greenstein AJ, et al. Laparoscopic subtotal colectomy for medically refractory ulcerative colitis: the time has come. Surg Endosc. 2010;24(7):1616–20.
27. Bartels SA, Vlug MS, Henneman D, Ponsioen CY, Tanis PJ, Bemelman WA. Less adhesiolysis and hernia repair during completion proctocolectomy after laparoscopic emergency colectomy for ulcerative colitis. Surg Endosc. 2012;26(2):368–73.
28. Parnaby CN, Ramsay G, Macleod CS, Hope NR, Jansen JO, McAdam TK. Complications after laparoscopic and open subtotal colectomy for inflammatory colitis: a case-matched comparison. Colorectal Dis. 2013;15(11):1399–405.
29. Frid NL, Bulut O, Pachler J. Acceptable short-term outcome of laparoscopic subtotal colectomy for inflammatory bowel disease. Dan Med J. 2013;60(6):A4645.
30. Gu J, Stocchi L, Remzi FH, Kiran RP. Total abdominal colectomy for severe ulcerative colitis: does the laparoscopic approach really have benefit? Surg Endosc. 2014;28(2):617–25.
31. Messenger DE, Mihailovic D, MacRae HM, O'Connor BI, Victor JC, McLeod RS. Subtotal colectomy in severe ulcerative and Crohn's colitis: what benefit does the laparoscopic approach confer? Dis Colon Rectum. 2014;57(12):1349–57.
32. Buchs NC, Bloemendaal ALA, Wood CPJ, Travis S, Mortensen NJ, Guy RJ, et al. Subtotal colectomy for ulcerative colitis: lessons learned from a tertiary centre. Colorectal Dis. 2017;19(5):O153–o61.