24 Laparoscopic Total Abdominal Colectomy

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Introduction

Laparoscopic colectomy is a widely accepted and safe operation that has shown to be cost effective in selective patients with diseases of the colon and rectum. The indications for total abdominal colectomy are typically divided into urgent and elective (Table 24.1). These indications typically involve diagnoses including inflammatory bowel disease (IBD), synchronous colon neoplasia, large bowel obstruction with megacolon, and inherited or familial polyposis syndromes. The operative approach relies largely on surgeon experience, the patient's disease process with the acuity of presentation being a significant factor, and patient-related factors such as obesity and previous abdominal operations. In the case of synchronous neoplasia, removal of the entire colon is often compared to two separate segmental colon resections or staged segmental colon resections, and largely depends on the underlying disease process. The risks and benefits of these comparisons must be discussed with the patient preoperatively, as well as long-term sequelae such as functional disorders, need for more frequent endoscopic surveillance, and the potential need for additional colon resection. Patients with Lynch syndrome are at a significantly increased risk for synchronous and metachronous colorectal cancer [1, 2]. Although extended colectomy has shown to reduce the risk of metachronous colorectal cancer, it has not shown to provide significant survival benefit when appropriate endoscopic surveillance is performed [3, 4]. Similarly,

Table 24.1 Indications for total abdominal colectomy

Urgent	Elective
Toxic megacolon: Acute inflammatory bowel disease flare refractory to maximal medical therapy *Clostridium difficile* colitis Large bowel obstruction Colonic pseudo-obstruction (Ogilvie's syndrome) Ischemic colitis Sigmoid volvulus with megacolon	Inflammatory bowel disease: Refractory to medical therapy Dysplasia or dysplasia-associated lesion or mass Large pseudopolyp burden or inability to perform appropriate endoscopic surveillance
	Synchronous or metachronous colonic neoplasia
	Polyposis syndromes
	Repeat colectomy
	Functional disorders of the colon (*i.e.* colonic inertia)

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the risk of metachronous dysplastic lesions or worsening disease after segmental colectomy in IBD ranges from 30% to 50% [5]. Although total abdominal colectomy with ileorectal anastomosis has been shown to be safe and effective in a small and selective subset of IBD patients with rectal sparing, completion proctectomy is eventually required in a third of these patients for diverse reasons [6, 7].

Minimally invasive colectomy has been widely accepted for colorectal disorders. Compared to the open approach, laparoscopic total abdominal colectomy has been associated with faster recovery of bowel function, shorter hospital stays, and faster return to daily living activities; and in ulcerative colitis (UC) patients, sooner restorative proctectomy and ileostomy closure [8]. Although increased operating room costs and longer operative times have been associated with the laparoscopic approach, overall outcomes and costs are comparable, and many times lower with the laparoscopic approach [9–12]. Robotic colectomy will be discussed elsewhere in this work.

Preoperative Assessment

The clinical indications for minimally invasive colectomy are the same as those for traditional open colectomy. Postoperative adhesions and obesity can make the laparoscopic approach more difficult; however, obese patients have shown greater short-term benefits when the operation is successfully completed laparoscopically. Contraindications of total abdominal colectomy include medically unfit patients and unresectable metastatic disease (in the case of malignancy). Patients with poor cardiopulmonary function tolerate prolonged pneumoperitoneum poorly and should be evaluated preoperatively by an experienced anesthesia team. All patients are counseled on potential gastrointestinal and genitourinary functional disorders that may occur postoperatively. These may include chronic diarrhea, fecal urgency, accidental bowel leakage, chronic electrolyte and fluid imbalances; and in the case of pelvic dissection for rectal resection, retrograde ejaculation, as well as urinary retention, frequency, and incontinence.

All patients who may require fecal diversion receive preoperative teaching and undergo stoma marking by a wound-ostomy-continence (WOC) nurse. Additional preoperative interventions at our institution include selective assessment of nutritional laboratory values (albumin, prealbumin, and transferrin), routine mechanical bowel preparation with oral antibiotics, and additional postoperative teaching pertaining to an enhanced recovery after surgery (ERAS) protocol. Immediately preoperative, all patients receive appropriate parenteral antibiotic prophylaxis, as well as mechanical and chemical venous thromboembolism (VTE) prophylaxis. The use of transversus abdominis plane or quadratus lumborum blocks with a long-acting anesthetic (bupivacaine liposome injectable suspension [Exparel®]) has become a routine intervention of our ERAS protocol, as well as the preoperative administration of an anti-inflammatory agent (acetaminophen or Celecoxib), gabapentin, and alvimopan (Entereg®). Parenteral antibiotics are given preoperatively and stopped at 24 h postoperation.

Positioning and Operating Room Setup

Patients are placed in modified lithotomy position with yellofin® stirrups (Allen Medical, Acton, MA) and both arms are padded and secured at the patient sides (Fig. 24.1). This allows for improved access to all abdominal quadrants and dynamic positioning of the operating surgeon and assistants. The laparoscopic equipment or tower should be placed off either shoulder with mobile video monitors placed on either side of the patient. A Foley catheter and orogastric tube are placed in all cases.

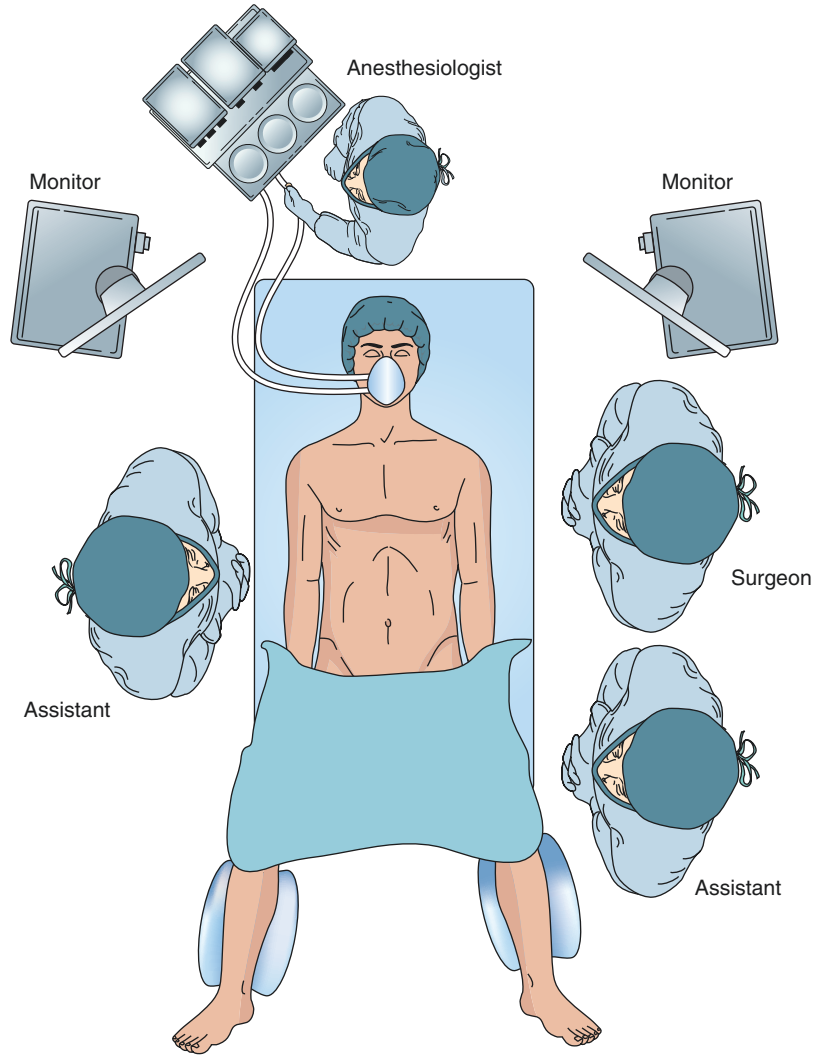

Fig. 24.1 Patient position for laparoscopic total abdominal colectomy

Operative Steps

Abdominal Access and Trocar Placement

Access to the peritoneal cavity to establish pneumoperitoneum can be performed using an open (Hassan) or closed (Veress needle or integrated camera trocar) technique. We prefer an open technique, especially in patients with previous abdominal operations or abdominal distension. The closed technique is typically performed via a periumbilical or left upper quadrant incision.

Correct trocar placement is imperative to the progress of the operation (Video 24.1). Although our description of port placement is quite standard, different anatomic circumstances may lead to variations or additions in trocar placement. In our practice, we have a low threshold for adding a 5-mm trocar to assist with improved retraction or suction when the dissection is difficult or intraoperative variations or complications are encountered. Our preference is to place a 10-mm supraumbilical trocar using an open (Hassan) technique. This port is used as the camera port. The operative team must be aware that both

10-mm and 5-mm 30 degree angled laparoscopes may be needed. After assessing the peritoneal cavity, additional trocars are placed at the mid right abdomen (12-mm), suprapubic area (5-mm), lower left abdomen (5-mm), and upper left abdomen (5-mm) (Fig. 24.2). This variation of the typical diamond configuration allows for complete and facile access to all quadrants of the abdomen and the pelvis. Furthermore, the presence of two left-sided trocars helps with efficient mobilization of the flexures and transverse colon, which are frequently the most technically challenging portions of the operation.

Sigmoid Mobilization

Although one may start this operation by mobilizing the right or left colon depending on surgeon preference, patient-related factors, and operative indication, we prefer to start with mobilization of the sigmoid colon as it allows for early transection of the rectosigmoid junction, which allows for facile mesenteric transection, and efficient dissection of the splenic flexure and transverse colon. We must disclose that total abdominal colectomy with concomitant proctectomy is rarely performed at out institution, for both IBD or malignancy. When total abdominal proctocolectomy is indicated, our current practice is to perform total abdominal colectomy first and return approximately 2 months later for proctectomy with or without anastomosis.

This step is performed with the patient in Trendelenburg position with right-side down. The sigmoid colon is mobilized using a lateral-to-medial or medial-to-lateral approach. For oncologic patients, we prefer the medial-to-lateral approach with high ligation of the inferior mesenteric artery and vein as it allows for improved mesenteric harvesting in our experience. However, there is no convincing evidence that high vascular ligation has been associated with significantly improved oncologic outcomes in colorectal cancer.

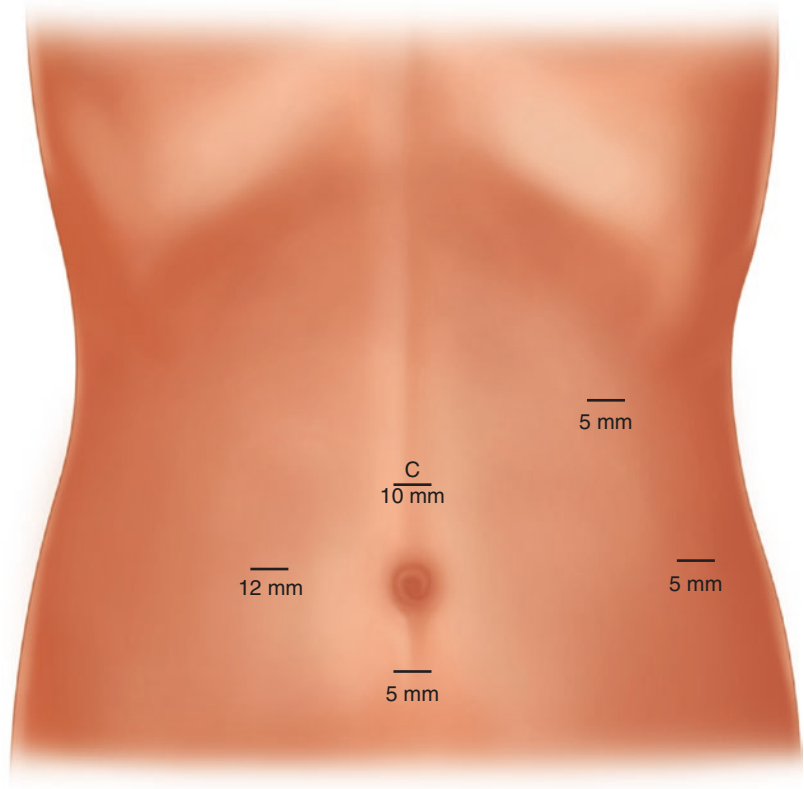

Fig. 24.2 Trocar placement and specimen extraction for laparoscopic total abdominal colectomy with end ileostomy

In our practice, the lateral-to-medial approach is typically preferred in IBD patients. The left abdominopelvic side-wall structures including the left ureter and left gonadal vein must be identified during this step. In patients with a past history of previous pelvic surgery or radiation, previous genitourinary or retroperitoneal surgery, or inflammation involving the pelvic side walls, we have a low threshold to place lighted ureteral stents in order to identify both ureters.

Rectosigmoid Transection

Next, a mesenteric window is dissected at the rectosigmoid junction, which anatomically correlates with the sacral promontory, typically where the tenia of the colon splay open. We prefer to perform transection of the rectosigmoid colon intracorporeally with an endoscopic stapler as it allows for improved specimen manipulation during the remainder of the colon dissection and specimen extraction via the ileostomy site; however, one can omit rectosigmoid transection if specimen extraction is planned through a lower midline or Pfannenstiel incision. We typically prefer this approach when an ileo-sigmoid or ileorectal anastomosis is to be performed during the same operation. For endoscopic stapling, we prefer to use a 60-mm long stapler to avoid multiple staple lines at the rectosigmoid junction.

Once the rectosigmoid junction has been transected, the mesentery of the sigmoid colon is divided with a vessel-sealing device. In patients with mesenteric atherosclerosis or in those who are undergoing high ligation of the vascular pedicles, we prefer to use an endoscopic stapler with a vascular staple load. The level of division will depend on the underlying pathology. For IBD patients, we prefer to stay relatively close to the bowel; however, in the setting of malignancy, it is important to transect the mesentery close to its origin for adequate lymphadenectomy.

Mobilization of the Left Colon

The entire left colon is mobilized using a lateral-to-medial approach. All lateral attachments are transected with a vessel-sealing device. The retroperitoneal dissection plane is used to identify the splenic flexure attachments (Fig. 24.3). Frequently, the greater omentum is attached to this segment of colon. Early dissection of the omentum from the distal transverse and descending colon is recommended for adequate visualization. Care must be taken to avoid excessive retroperitoneal dissection at the level of the splenic flexure to prevent dissecting behind the tail of the pancreas, as well as excessive retraction to prevent splenic capsule tears.

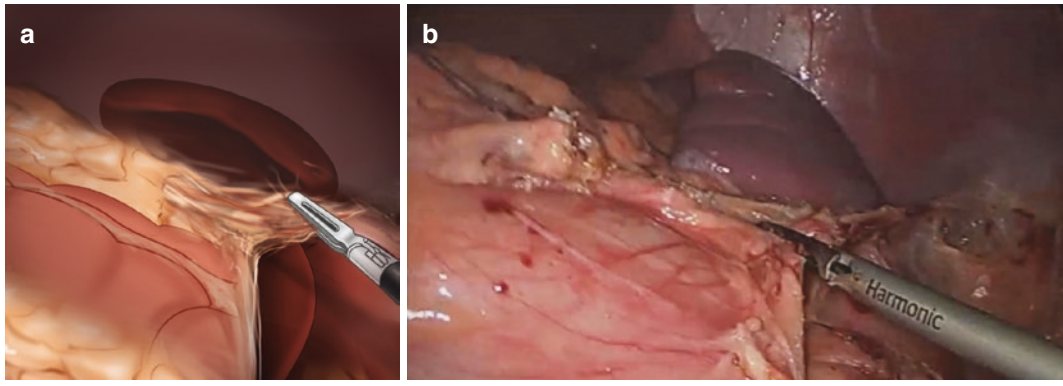

Fig. 24.3 (**a**) Illustration providing a lateral to medial takedown of the splenic flexure. (**b**) Paired operative image demonstrating the lateral to medial approach for mobilization of the left colon

Mobilization of the Transverse Colon

This step is performed in reverse Trendelenburg position, initially with right-side down, and subsequently with left-side down. As the splenic flexure is taken down and the greater omentum is dissected off of the distal transverse colon, the lesser sac is entered and the posterior aspect of the stomach is identified. Care must be taken to avoid injury to the stomach and short gastric vessels during this dissection. In cases involving neoplasia or when the omentum appears devascularized or unhealthy-appearing, we prefer to perform an infracolic omentectomy with a vessel-sealing device during this step. After transecting the gastrocolic attachments, the mesentery of the transverse colon is transected with a vessel-sealing device. Identification of the middle colic artery is crucial to prevent inadvertent injury or bleeding, and to perform high ligation with adequate lymphadenectomy in selective cases. Transection of the transverse mesocolon is the most time-consuming and meticulous portion of this operation in our experience, mainly because of the extent of omental dissection, bi-leaflet and often thickened mesentery, and proximity of the spleen, pancreas, stomach, duodenum, and gallbladder. Precise dissection and counter-traction is essential during this step; therefore, if lack of progress occurs, placement of a periumbilical or Pfannenstiel hand port is highly recommended. A key step during this portion of the operation is to completely mobilize the mid and proximal transverse colon and dissect the retroperitoneal attachments off of the duodenum before transecting the mesentery. This provides confidence at the time of mesenteric transection and avoids potential duodenal injuries. After this, the entire hepatic flexure is taken down in a top-to-bottom manner.

Mobilization of the Ascending Colon and Terminal Ileum

Most lateral attachments of the mid and distal ascending colon are dissected in continuum after taking down the hepatic flexure. The patient is then replaced in the Trendelenburg position with left-side down. It is our preference to not dissect the lateral cecal attachments in order to mobilize and transect the right colon mesentery using a medial-to-lateral approach. This allows for early identification and transection of the ileocolic vessels. Conversely, the right colon mesentery can also be transected continuing the top-to-bottom transection of the proximal transverse colon mesentery. Proper dissection of the lateral attachments of the terminal ileum as well as the mesentery of the terminal ileum from the retroperitoneum is crucial for both fashioning an end ileostomy or performing an ileorectal anastomosis. Identification of the right ureter is also key during this step of the operation. For patients who will likely undergo an ileal J-pouch in the future, it is our preference to dissect the entire ileal mesentery up to the duodenum in order to achieve adequate intestinal length, in preparation for a minimally invasive J-pouch procedure. Care must be taken to not injure the mesentery in these patients as well, in order to preserve valuable blood supply to the terminal ileum.

Specimen Extraction

After corroborating that the entire colon is mobilized and hemostasis has been achieved, the proximal rectosigmoid staple-line is grasped with a locking laparoscopic grasper. Pneumoperitoneum is desufflated and an extraction incision is planned. It is our preference to extract the specimen through a previously marked right-sided abdominal incision (typically the 12-mm trocar site). If a hand-sewn ileorectal anastomosis is to be performed or the specimen is too large for a 3–4 cm circular incision, a Pfannenstiel or lower midline incision is placed. Commercially available wound protectors are helpful for specimen extraction.

End Ileostomy or Ileorectal Anastomosis

After dissecting the ileocecal fold or ligament of Treves, the terminal ileum is transected proximal

to the ileocecal valve. This can be performed with a surgical stapler if an end ileostomy is to be performed, or sharply if an ileorectal anastomosis is planned. End ileostomy is constructed in a Brooke fashion pointing downwards to facilitate stoma pouching. Ileorectal anastomosis is typically performed by securing an EEA (circular stapler) anvil into the terminal ileum with a purse-string suture, re-insufflating pneumoperitoneum, and performing the anastomosis laparoscopically in an end-to-end fashion with an EEA stapler.

Postoperative Cares

All patients are started on a liquid diet the day of the operation and progressed as tolerated to a low residue diet on postoperative day 1. Postoperative analgesia with a narcotic-limiting strategy is highly encouraged. Parenteral antibiotics are limited to 24 h postoperative, and the urinary catheter is removed on postoperative day 1. Ileostomy patients must show proficiency in stoma cares before discharge to home.

Postoperative Sequelae

Common postoperative sequelae after total abdominal colectomy include chronic diarrhea, fecal urgency, and accidental bowel leakage. After ruling out infectious, inflammatory, and dietary etiologies; helpful interventions include bulking agents such as fiber supplements, as well as anti-diarrheal agents including loperamide, diphenoxylate/atropine, and tincture of opium. Cholestyramine is typically helpful in patients with prior cholecystectomy. For patients with IBD, endoscopic evaluation of the rectum is imperative and will dictate the need for completion proctectomy with end ileostomy or ileal pouch-anal anastomosis.

Infertility after total abdominal colectomy, especially in women, is typically not discussed preoperatively. Although female fertility has been reported to be lower than the average population in both UC and familial adenomatous polyposis (FAP) after colorectal resection [13–15], fertility has been reported to be preserved after total abdominal colectomy with ileorectal anastomosis in UC patients [16].

The risk of rectal neoplasia and persistent inflammation is another major concern after ileorectal anastomosis and requires frequent endoscopic surveillance with biopsies, as well as regular multidisciplinary discussions.

Discussion

Laparoscopic total abdominal colectomy with or without restoration of bowel continuity is a safe and effective operation that has significant benefits over the open approach without significantly compromising functional or oncologic outcomes. This operation often requires upfront and diligent discussions with patients and a multidisciplinary team in order to optimize postoperative outcomes. Preparation with regards to the operative technique is crucial for success.

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