Laparoscopic left colectomy: surgical technique

Mackenzie C. Morris, Ian M. Paquette

Division of Colon and Rectal Surgery, Department of Surgery, University of Cincinnati College of Medicine, Cincinnati, OH, USA

Correspondence to: Ian M. Paquette, MD. Associate Professor of Surgery, Division of Colon and Rectal Surgery, Department of Surgery, University of Cincinnati College of Medicine, 2123 Auburn Avenue #524, Cincinnati, OH 45219, USA. Email: ian.paquette@uc.edu.

Abstract: Laparoscopic colectomy is the standard of care for a variety of colorectal disease processes. Enhanced recovery pathways have revolutionized the post-operative recovery of these patients. In brief, the left colectomy consists of sigmoid and descending colon mobilization, isolation and transection of the vascular pedicle, and anastomosis. Hand-assisted laparoscopy is our preferred technique when a conversion is needed in difficult cases. With modern enhanced recovery pathways and excellent surgical technique, 24-hour post-operative length of stay is a realistic expectation for many patients.

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Introduction

A true left colectomy is considered to be resection of the mid-transverse colon to the descending/sigmoid junction, though a standard sigmoid colectomy is a much more common surgical procedure. The distal extent of the descending or left colon does not have a definitive landmark. However, the descending colon lacks serosa on the posterior aspect and it is considered to become the sigmoid colon when it detaches from the lateral abdominal wall and becomes an entirely intraperitoneal organ again. The distal aspect of the sigmoid colon is the area where the taenia fuses together (1). Transection margins are dictated by the disease process, where proper oncologic margins are needed in cancer surgery, and the resection typically from healthy descending colon, to the top of the rectum in a diverticulitis case.

The most common indication for left colectomy is colon cancer (2,3). Other indications for resection include diverticulitis (4), ischemic colitis (5), segmental Crohn's disease (6). The work-up also depends on the pathology, but normally consists of blood work, cross sectional imaging and colonoscopy. In our institution, patients receive a pre-operative package that consists of multimodal analgesia, dextrose containing drinks (7-9), mechanical bowel prep and oral antibiotics to facilitate an enhanced recovery protocol.

The aim of this manuscript is to detail the pre-operative, peri-operative and post-operative care of a patient undergoing a left colectomy for a variety of diseases. The patient selection and work-up for colon cancer, diverticulitis, polyps and colonic Crohn's disease will be discussed. The technical aspects, with tips and tricks, will also be presented in detail.

Patient selection and work-up

Patient selection

Left colectomy is indicated for patients with a distal transverse or descending colon cancer without evidence of distant metastatic disease. Some patients with liver metastases can be considered for resection. Other indications include ischemic colitis, colonic polyps not amenable to endoscopic resection, diverticulitis and segmental Crohn's disease.

Patients with colorectal cancer and liver metastasis can be considered for surgery in the pre-operative setting, though they should be discussed in a multidisciplinary conference. The goal of the operation is to remove the tumor completely with at least a 5cm margin proximally and distally. An R0 resection is associated with good long-term outcomes (10-12). Ischemic colitis is an indication for

Table 1 Equipment preference card

Equipment
Trocars: 5 mm (×3), 12 mm (×1): laparoscopic endocutter stapler (60 mm)
Endoloop (PDS): wound protector device
Energy sealing device: green and blue stapler reloads

Figure 1 Medial to lateral dissection of the inferior mesenteric artery pedicle (17).
Available online: http://www.asvide.com/article/view/29869

operative intervention when associated with peritonitis on physical exam, significant bleeding or fulminant colitis (5). Colectomy is indicated if polyps are unable to be completely removed during endoscopy due to the risk of harboring malignancy (13). The management of uncomplicated diverticulitis has evolved, and the decision for colectomy is made on an individual basis (4). Segmental colonic Crohn's disease is uncommon, but does occur. Complications, such as stricture, perforation, fistula formation, intractable pain, failure of medical therapy, are indications for operative intervention (6).

Pre-operative preparation

All patients having an elective operation undergo a complete history and physical examination. Adjunct testing, such as blood tests, additional imaging or cardiac testing, is performed when indicated. The patients are also seen by a wound ostomy nurse for ostomy teaching and stoma marking if appropriate, though this is rarely needed in the elective setting.

We use a formal enhanced recovery protocol (14) and a mechanical bowel preparation in combination with oral antibiotics. The use of mechanical bowel prep and oral antibiotics has had much controversy over the years. Recent literature has shown decreased rates of surgical site infection, wound dehiscence, ileus and anastomotic leak (15,16).

The necessary equipment should be available to perform a laparoscopic equipment as described (*Table 1*).

Procedure

Positioning

The patient is placed in the lithotomy position with both arms tucked and the thighs positioned at no more than a 10-degree angle to the torso. A beanbag or similar device is used to secure the patient to the table, and care should be taken to avoid any pressure points. We use a 5 mm port above the umbilicus, a 5 mm right upper quadrant port, a 5 mm left sided port, and a 12 mm right lower quadrant port, typically placed 2 fingerbreadths medial and 2 fingerbreadths cephalad to the anterior superior iliac spine.

Operative details

Vascular pedicle isolation and transection

A medial to lateral approach is generally the preferred approach unless the surgeon is unable to safely identify the anatomy. This approach allows the surgeon to safely separate the left colonic mesentery from the retroperitoneum and protect the ureter, retroperitoneal blood vessels, and sympathetic nerves (*Figure 1*). The exposure is facilitated by reflecting the small bowel out of the pelvis. This is accomplished with a combination of Trendelenburg positioning and rotating the bed with the right side down.

We can identify the right ureter, the sacral promontory, and the inferior mesenteric artery (IMA) pedicle from this view. Once the pedicle is placed on a gentle stretch, a mesenteric window is created with cautery. The pedicle is lifted upwards and a gentle blunt dissection in the proper congenital fusion plane between the mesentery and retroperitoneum. Once the mesentery is lifted off the retroperitoneum, the left ureter and gonadal vessels are swept away from the pedicle. We typically do a high ligation of the IMA regardless of the indication for surgery, as it allows for excellent visualization of the tissue planes. We prefer an energy device to transect the mesentery, but a vascular load stapler is also acceptable. The surgeon should have a grasper ready to gently occlude the pedicle,

Figure 2 Splenic flexure mobilization (18).
Available online: http://www.asvide.com/article/view/29870

Figure 3 Transection of the rectum (19).
Available online: http://www.asvide.com/article/view/29871

should it bleed, thus allowing a controlled application of an endoloop/clip if necessary.

Sigmoid colon mobilization

If the dissection was done correctly from the medial approach, there should not just be a purple and thin appearance to the peritoneum laterally (*Figure 2*). The colon is grasped with an atraumatic bowel grasper and retracted medially. The colon is mobilized off the retroperitoneum by dissecting through this thin peritoneal layer. The location of the ureter, gonadal vessels and iliac vessels are confirmed and the sigmoid colon is mobilized until it is a midline structure. In the same manner, the remainder of the descending colon is mobilized off the lateral retroperitoneal attachments.

Splenic flexure mobilization

In many instances, simple mobilization of the descending

Figure 4 Colorectal anastomosis (20).
Available online: http://www.asvide.com/article/view/29872

colon is not enough to achieve a tension free anastomosis. In this case, the splenic flexure should be mobilized, and this can easily be accomplished laparoscopically. Typically, the lateral dissection continues, rolling the colon mesentery medially away from Gerota's fascia over the kidney. The renocolic, splenocolic, and phrenicocolic attachments are released. The gastrocolic ligament is then taken down to enter the lesser sac and mobilize the omentum off the transverse colon until the midline or middle colic vessels are reached depending on the indication for the operation (*Figure 3*). If the colon still does not reach, ligation of the IMV near the inferior border of the pancreas may be needed, but this is rarely necessary outside of low rectal cancer surgery.

Distal transection

Lastly, the remaining peritoneal attachments are divided, taking care to protect both ureters and the sympathetic nerves at the sacral promontory. An energy device is used to thin out the rectal mesentery to prepare the rectum for a transection. The rectum is transected with a laparoscopic linear cutter stapler, ideally in one single firing (*Figure 4*).

A Pfannenstiel incision for extraction is preferred due to its lower risk of incisional hernia formation and wound complications (21-23). The colon is then exteriorized and the proximal transection margin is identified. The anvil of an EEA stapler is inserted into the proximal cut end and secured with a purse string. The colon is placed back into the abdomen and insufflation is reestablished. An assistant inserts an EEA stapler into the anus and up to the apex of the rectal segment. The anvil is then docked onto the spike. It is important to confirm correct orientation of the colon by using the cut edge of the mesentery. The stapler

Figure 5 Hand-assisted technique in a difficult diverticulitis case (24). Available online: http://www.asvide.com/article/view/29873

is then closed, fired and removed. The stapler "donuts" are removed and examined to ensure an intact staple line. Finally, a leak test is performed by filling the pelvis with water and performing sigmoidoscopy to ensure an airtight anastomosis (*Figure 5*).

After the leak test, the abdomen is irrigated and adequate hemostasis is confirmed. Pneumoperitoneum is allowed to deflate and the 12 mm port site is closed in a figure-of-eight fashion. The skin is closed with interrupted, absorbable sutures.

Hand-assisted laparoscopic surgery

In a select subset of patients, a totally laparoscopic approach may not be able to be safely performed. These operations could be amenable to a hand-assisted approach rather than converting to open. Hand-assisted laparoscopy gives the added benefits of tactile feedback, additional dissection and helps facilitate retraction. This approach has been shown to be helpful in cases where dense adhesions, unresolved diverticular phlegmon, bulky tumors and inability to gain adequate exposure are encountered (25,26).

Post-operative management

Post-operatively, the patients are placed on an enhanced recovery pathway. The orogastric tube is removed in the operating room prior to awakening from anesthesia. Following the operation, the patient is given a clear liquid diet and intravenous fluids. Their diet is normally advanced to a low residue diet on post-operative day 1. Intravenous fluids are discontinued once the patient is tolerating adequate oral intake. Pain is controlled in multimodal fashion. Immediately post-operatively, intermittent intravenous narcotics control pain or a patient-controlled anesthesia (PCA) device is ordered. They are given scheduled acetaminophen, gabapentin, famotidine and ketorolac, if appropriate. Pain control is transitioned to oral medications as their diet is advanced. They are also given the gastrointestinal specific opioid antagonist alvimopan, which is continued until discharge or to a maximum of 7 days, whichever occurs first (27). A Foley catheter remains post-operatively and is normally discontinued on post-operative day 1. Patients are usually discharged on POD 1 or 2.

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