Laparoscopic left hemicolectomy with extracorporeal anastomosis surgical technique: how I do it

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Abstract: First laparoscopic surgery was done in 1987. Since then, laparoscopic surgery is accepted as a revolution in surgical field. Now minimal invasive surgery is used almost in every surgical specialty. Although robotic surgery is evolving rapidly in the world, cost of robotic surgery is still not optimized. Laparoscopic colon resection is a well-established technique which has become the preferred surgical approach for most patients with colorectal disease. Benefits of laparoscopic colorectal surgery which include faster patient recovery, smaller incisions with better cosmesis, decrease in postoperative pain, early return of bowel function, and shorter hospital stay, and safety in colorectal cancer treatment with similar oncologic outcomes to open surgery have been published in many large series in the literature. Laparoscopic left hemicolectomy is now routinely performed at our center. Several techniques have been described for laparoscopic left hemicolectomy and they vary in terms of colon mobilization approach, blood vasculature control, anastomosis construction technique, and extraction site. In this article, we demonstrate how we are doing laparoscopic left hemicolectomy in a stepwise manner, illustrating key anatomical landmarks in a patient who presented with colon cancer. Our sincere hope is that this video material will provide invaluable information to surgical trainees and young surgeons early in their surgical careers.

Keywords: Laparoscopic left colectomy; laparoscopic hemicolectomy; technique; intracorporeal; medial-to-lateral approach

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Introduction

Laparoscopic colorectal surgery was performed in 1991. Since then, with the new technologies in biomedical field, minimal invasive surgery expanded and now it is commonly used to treat colorectal pathologies (1,2). The indications for a laparoscopic left hemicolectomy are similar to open left hemicolectomy and include malignancy, endoscopically unresectable adenomatous polyps, diverticulitis, infectious diseases, inflammatory bowel disease, ischemic colitis, colonic volvulus, bleeding. Contraindications may depend on the surgeon's experience. Hemodynamic instability or cardiopulmonary disease that does not allow peritoneal insufflation and Trendelenburg positioning are absolute contraindications. Relative contraindications are morbid obesity, locally advanced cancers, complicated Crohn disease or diverticulitis, large intestinal obstructions, peritoneal carcinomatosis, previous operations. Indications and contraindications are not limited to these. Large series of patients was reported in the literature. Mayo Clinic is one of the established institutes in the world and they shared their early experience in 1994 (3). In the beginning, there was much debate and questioning in terms of safety and sufficiency for cancer treatment. Surgeons had concerns about minimal invasive surgery in oncologic surgery, but after major randomized clinical trials such as the COST

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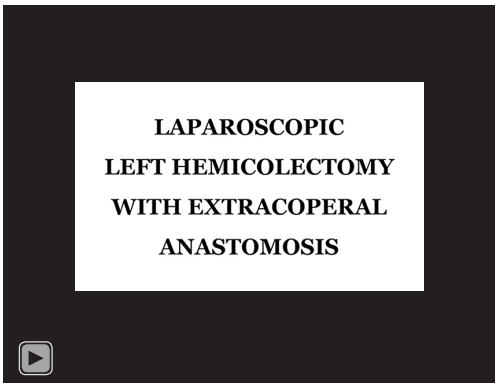

Video 1 Laparoscopic left hemicolectomy: how I do it.

trial laparoscopic surgery became acceptable procedure with the favorable oncologic outcome for cancer patients (4-13). In the early 21st, minimal invasive surgery implemented globally. Benefits of laparoscopic surgery has been recognized all over the world. Laparoscopic surgery has short-term benefits like faster recovery and shorter length of stay compared to traditional open surgery, and also the long-term advantages including less intestinal adhesions formation, less risk of incisional ventral hernia. Kaiser Permanente in California published a large series of 4,765 colorectal resections over a 3-year period. In this study, significant lower incidence of small bowel obstruction and incisional ventral hernia has been confirmed as a positive long-term benefit of laparoscopy (14).

A complete splenic flexure mobilization (SFM) is considered an essential step during colorectal resections (15).

Highlight box

Surgical highlights

- Highlights about this procedure are identification of inferior mesenteric artery and vein, splenic flexure take down, and anastomosis. These are shown in the video in details.

What is conventional and what is novel/modified?

- This is a conventional technique already described in the literature. In this conventional technique dissection of the main vessels from their origin is very important to harvest enough lymph nodes and splenic flexure take down should be done for the surgical margins and the safety of the anastomosis.

What is the implication, and what should change now?

- Although laparoscopic left hemicolectomy is a well-known and described technique, this procedure should be done properly in terms of enough lymph node harvesting and safety of anastomosis.

SFM provides a tension-free and well-perfused colon for the anastomosis, as well as the adequate resection margins for cancer. In this technical paper, we would like to demonstrate the conventional technique of laparoscopic left hemicolectomy extracorporeal anastomosis approach with SFM for colon cancer. In this study we aim to provide information about this procedure to surgical residences and young surgeons who are interested in colorectal surgery. We present this article in accordance with the SUPER reporting checklist (available at https://ales.amegroups.com/article/view/10.21037/ales-22-70/rc).

Patient

The patient is a 61-year-old man who presented himself with change of bowel habits and abdominal pain to Al Zahra Hospital Colorectal Unit. Colonoscopy showed splenic flexure tumor proven by biopsy as adenocarcinoma. Computed tomography (CT) scan showed splenic flexure mass. No distant metastasis was detected. Patient had no comorbidities or prior surgical history. Pre-operative staging was assessed as stage II colonic carcinoma. The patient was advised to undergo laparoscopic left hemicolectomy. Surgery was done at Al Zahra Hospital which is a private community hospital located in Dubai with highest surgical standards and Joint Commission International (JCI) accreditation. Operation was performed by the authors who have done several hundred colorectal surgeries in their practice. Operation took 116 minutes.

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this article and accompanying video. A copy of the written consent is available for review by the editorial office of this journal.

Surgical technique

Step by step (Video 1)

Step 1—patient preoperative preparation

Mechanical oral bowel preparation was given to the patient the day prior to the operation. Patient had bowel preparation with Klean-Prep® (Norgine Limited, Harefield, UK). There is debate regarding pre-operative bowel preparation and there are many studies with different recommendations on scientific evidence. In our current

practice we routinely prefer to clean the bowel before the surgery (16-18).

Step 2—patient intraoperative preparation and positioning

General endotracheal anesthesia is given to patient. The patient is in the lithotomy position, and secured across the shoulders' prominence to the table with tape. Both upper extremities are tucked to avoid any brachial injury during the positioning. A decompression orogastric tube is inserted to the stomach prior to establishing the pneumoperitoneum. The tube can be kept for 24 hours or can be removed after the operation. Catheter is placed in the bladder to monitor urine output and is removed according to post-operative urine output in 24–48 hours. Prior to the operation bilateral transversus abdominis plane (TAP) block is performed to reduce the post-operative pain under ultrasound guidance. If patient does not have penicillin allergy a third-generation cephalosporin along with metronidazole is given for prophylaxis. Ciprofloxacin can be used for patients with penicillin allergy. Unfractionated heparin or low molecular weight heparin can be used for deep venous thrombosis prophylaxis. Pneumatic compression stockings are advised especially for the patients with high risk of thrombosis. The abdomen is prepped and draped in a sterile fashion. The video monitors are placed at the left upper and lower aspect of the surgical table to ensure for good visualization of the surgical team.

Step 3—pneumoperitoneum insufflation and trocar placement

Four-trocar technique is preferred for the operation. In case of difficulty especially during SFM additional trocars can be placed. Veress needle is inserted through supraumbilical vertical incision which is eventually used as an extraction site. Initial insufflation to 15 mmHg is established. An additional 10 mm trocar is placed in the right lower abdomen between the belly button and spina iliaca anterior superior, a 5 mm trocar in the right upper quadrant between the belly button and anterior axillary line at the xiphoid level, and a 5 mm trocar in the left mid abdomen 2/3 lateral of the line between belly button and anterior axillary line. A 30-degree 1o mm angled camera is used. Main surgeon stands on the left side, cameraman/assistant stands on the left side of the surgeon, scrub nurse stands between the legs. The peritoneal cavity is inspected carefully. The patient is initially positioned in Trendelenburg tilted with the right side down in order to retract the small bowel away from the left colon as gravity plays a key role in exposure.

Step 4—identification of the inferior mesenteric artery and vein

The primitive root of left mesocolon is incised from caudal to cephalad, starting from the sacral promontory to the duodenojejunal juncture. Inferior mesenteric vein is identified close to the inferior pancreatic edge and dissected clean from surrounding structures. We use the Harmonic® Scalpel (Ethicon Endo-Surgery, Inc., Ohio, USA) for dissection. The vein is controlled with a Vas-o-clip® polymer locking ligation clips (Nanova Biomaterial, Inc., Columbia, USA) prior to division. The left Toldt fascia is dissected free from the prerenal fascia, from a medial to lateral approach. Here we try to dissect as much as possible from the medial to lateral to free all retroperitoneal structures such as the left ureter. Once the left ureter is seen and reflected posteriorly and laterally, we identify the inferior mesenteric artery. After inferior mesenteric artery identification, the left colic artery is isolated and divided at its origin.

Step 5—splenic flexure takedown

After vascular division of the inferior mesenteric vein and left colic vessels, retroperitoneal space is accessed by blunt and sharp dissection above and to the left from the duodenojejunal flexure (Treitz). Here, dissection should be done over the anterior surface of the pancreas towards the tail. Energy device is advised to release posterior attachments of the transverse mesocolon, thus separation of transverse mesocolon from the retroperitoneum is finalized. After that the left colon is completely mobilized by taking down the splenic flexure. Care is taken not to injure the splenic capsule by avoiding pulling down on the flexure. After initial division of the vasculature and reflecting the left mesocolon off the retroperitoneal structure, the fatty portion of the mesocolon including the left branch of the middle colic divided with the energy source to the proximal and distal bowel surgical margins. The left paracolic gutter is incised from caudal to cephalad, joining the previous dissection of the left Toldt fascia. Division of splenocolic and gastrocolic ligaments from lateral to medial complete the splenic flexure mobilization releasing the distal third of transverse colon. The greater omentum is divided using the energy device.

Step 6—specimen extraction and extracorporeal anastomosis

The supraumbilical trocar site incision is extended to a 6-cm

wound which is used as extraction site. An Alexis™ wound protector (Applied Medical, Rancho Santa Margarita, California, USA) is used to retract the wound. The specimen is exteriorized. Anatomical resection of the large bowel from mid-transverse colon to junction of descending colon and sigmoid colon was considered due to the location of the tumor. Before the resection the bowel wall vascularity was checked by visualization, and the degree of oozing from the cut edge of two bowel segments for conduit vascularity of the colon. A side-to-side extracorporeal anastomosis is performed with a Covidien Reloadable Stapler GIA 100 mm–4.8 mm green cartilage (Medtronic, Minneapolis, USA). The linear stapler is used for the side-to-side lumen in addition to closing the apex of the anastomosis and dividing the proximal and distal aspect of the bowel margins. A few single interrupted sutures are used to reinforce areas where staple lines cross. The mesenteric defect is left open. After removal of the wound protector, the gloves are changed and midline fascia closed with a running absorbable suture. All skin wounds are closed with an absorbable subcuticular suture.

Comments

A minimally invasive approach to left colectomy provides several benefits to the patient and it is a rewarding operation for the surgeon. Main advantages of laparoscopic surgery are faster recovery, less pain, shorter hospitalization, faster return to work, less long-term adhesions formation, less long-term ventral hernia compared to open surgery. The main disadvantage is that the cost of laparoscopic surgery and it must be performed by people who are technically proficient in laparoscopy. Several techniques such as pure laparoscopic technique, laparoscopic assisted, hand assisted, single port surgery, and more recently robotic surgery have been described for left colectomy. There are variations while performing colon mobilization, anastomosis, extraction the specimen and vascular pedicle closure. For anastomosis both intracorporeal and extracorporeal techniques can be used. It is important for the surgeon to be familiar to the technique he/she uses for the safety of the anastomosis. On the other hand, surgeons must be trained for both techniques to have option to use under some circumstances. The intracorporeal technique can carry potential advantages in terms of smaller extraction side wound, decreased postoperative narcotic use, and decreased length of stay and morbidity. It is also associated with earlier return of bowel function (19). The general key principles are good visualization, good mobilization, proximal vascular pedicle control for adequate lymphadenectomy (which is critical for neoplastic condition), reliable and safe anastomotic construction technique, and extraction site wound protection to avoid wound infections or extraction site tumor recurrence in case of malignancy. The pitfalls of these procedures along with any other laparoscopic colon procedures are more related to patient body habitus and level of obesity. The higher BMI of the patient with greater extent of visceral obesity would make the procedure more challenging in terms of dissecting the colic vessels and taking down the splenic flexure.

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Footnote

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