Laparoscopic right hemicolectomy: how I do it

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Abstract: Modern laparoscopy was introduced into the world of abdominal surgery in the late 1980's. Since then, laparoscopic colorectal surgery has quickly evolved, and it has become the preferred surgical approach for most patients with colorectal disease. A laparoscopic approach to right colon resection can be performed for a variety of benign and malignant conditions. Many studies have demonstrated the 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. Large prospective, multicenter trials have proven its safety in colorectal cancer treatment with similar oncologic outcomes to open surgery. The procedure can be performed by the surgeon with an assistant/camera operator. Laparoscopic right hemicolectomy is now routinely performed at our center. Several techniques have been described for laparoscopic right hemicolectomy and they vary in terms of colon mobilization approach, blood vasculature control, anastomosis construction technique, and extraction site. In this article, we demonstrate our technique for laparoscopic right hemicolectomy 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 right colectomy; laparoscopic hemicolectomy; technique; intracorporeal; medial-to-lateral approach

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Introduction

In 1991, laparoscopic colorectal surgery was introduced in the field of gastrointestinal surgery as the role of minimally invasive surgery continued to expand to treat abdominal conditions (1,2). Soon after, major centers such as the Mayo Clinic started reporting their early experience with large series of patients (3). Much debate ensued questioning the safety and adequacy of laparoscopic surgery for the treatment of cancer and concerns were raised around the globe by skeptics regarding the emerging minimally invasive approach. Such concerns were eventually laid to rest after major randomized clinical trials such as the COST trial demonstrated the favorable oncologic outcome for patients undergoing laparoscopic surgery (4-8). Recognizing the benefits of laparoscopic surgery, the early 21st century saw the gradual global implementation of minimally invasive surgery. In addition to the short-term benefits which included faster recovery and shorter length of stay compared to traditional open surgery, the long-term advantages of laparoscopic surgery included a lower rate of intestinal adhesions formation, fewer bowel obstructions, and a decrease risk for incisional ventral hernia. A large study from Kaiser Permanente in California looked at the outcome of 4,765 colorectal resections over a 3-year period and confirmed the positive long-term benefits of laparoscopy with a significant lower incidence of small bowel obstruction and incisional ventral hernia (9).

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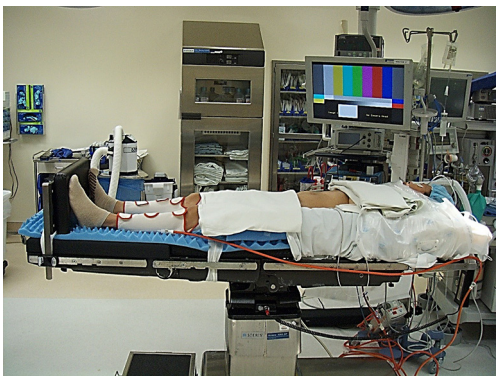


Figure 1 Patient positioning.

Since its initial description by Schlinkert at the Mayo Clinic in 1991, several approaches to laparoscopic right hemicolectomy have been reported (10-13). These various techniques depict a variety of methods for colon mobilization, control of the mesocolic vasculature, anastomosis construction, and specimen extraction sites. Previously the senior author of this publication has described the extracorporeal anastomotic technique for laparoscopic right hemicolectomy (10). In this technical paper, we would like to demonstrate the intracorporeal anastomosis approach for laparoscopic right hemicolectomy for cancer.

Surgical technique

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 images/video. A copy of the written consent is available for review by the editorial office of this journal.

This case was a 58-year-old male who was diagnosed cecal adenocarcinoma. Right hemicolectomy with total mesocolic excision was done. Duration of the operation was 128 minutes. Blood loss was 150 milliliters. Length of hospital stay was 4 days.

Step by step

Step 1—patient preoperative preparation

In our practice, we currently administer the standard mechanical oral bowel preparation the day prior to the operation. The debate regarding bowel cleansing preoperatively has been ongoing for several decades and the recommendations have varied based on the scientific evidence.

Step 2—patient intraoperative preparation and positioning

The operation is performed under general endotracheal anesthesia. The patient is placed in the supine position with both upper extremities tucked to the side. The patient is secured across the shoulders' prominence to the table with tape. A vertical footboard supports the soles of the feet for added security. An orogastric tube is inserted to decompress the stomach prior to establishing the pneumoperitoneum. The orogastric tube is removed at the completion of the operation. A urinary bladder catheter is introduced to monitor urine output during the case and it is usually removed within 12 hours of operation. Bilateral transversus abdominis plane (TAP) block is performed under ultrasound guidance prior to performing the operation. It is part of our multimodal postoperative pain management. Pneumatic compression stockings are applied. Intravenous antibiotics are administered prior to incision. Our preferred regimen is a third-generation cephalosporin along with metronidazole for patients without penicillin allergy. Deep venous thrombosis prophylaxis is given with subcutaneous unfractionated heparin. The abdomen is prepped and draped in a sterile fashion. The video monitor is placed at the right upper aspect of the surgical table (*Figure 1*).

Step 3—pneumoperitoneum insufflation and trocar placement

The operation is performed via a 4-trocar technique. The abdominal cavity is insufflated with a Veress needle through a 12 mm supraumbilical vertical incision. An additional 10 mm trocar is placed in the left mid lateral abdomen, a 5 mm trocar in the left lower quadrant, and a 5 mm trocar in the right mid abdomen laterally. The 12 mm trocar sites will be interchangeably used for a 10 mm camera and for the endoscopic stapler (*Figure 2*).

Step 4—mesocolic vessels division

Laparoscopic colorectal surgery requires frequent tilting of the operative table in various positions in order to provide exposure and repositioning the small bowel out of the way. Most of the operation is performed with the patient ride side rotated upward. Periodically the patient is titled in the Trendelenburg position or reverse Trendelenburg position

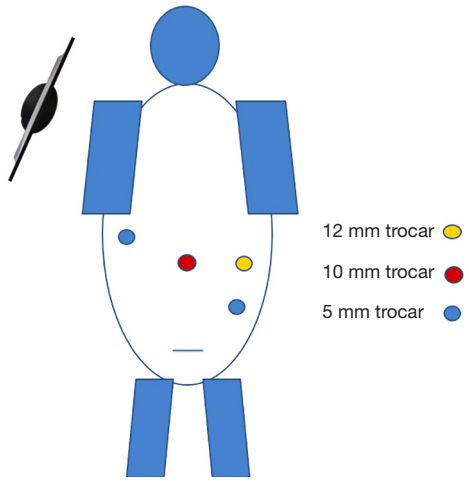


Figure 2 Trocar placements.

depending on the phase of the operation. After exposing the right mesocolon, the ileocolic pedicle is identified and we proceed with the dissection from a medial to lateral approach. We use the Harmonic® Scalpel (Ethicon Endo-Surgery, Inc., OH, USA) for dissection. It is important to note that there is a variation in arterial anatomy for the right colic vasculature. In some patients, there is a common trunk for the ileocolic and right colic vessels while in other patients, they have separate takeoffs. Yet in a subgroup of patients, the right colic vessels are not present. A mesenteric window is opened around the base of the ileocolic pedicle which is reflected anteriorly away from the duodenum by creating a dissection plane behind the mesocolon and anterior to the retroperitoneum. After isolating the ileocolic vascular pedicle, the vessels are clipped with a Vas-o-clip® polymer locking ligation clips (Nanova Biomaterial, Inc., Columbia, USA) and divided with the energy source. If present separately the right colic pedicle is addressed in a similar fashion. For a standard right hemicolectomy, the middle colic vessels are preserved but if indicated by the clinical scenario, they can be divided similarly. After vascular division, blunt dissection is used to completely free the mesocolon from the retroperitoneum ensuring that the dissection remains anterior to the duodenum and head of the pancreas.

Step 5—hepatic flexure takedown

After vascular division, complete mobilization of the right colon is achieved by reflecting the colon from a lateral to medial and then top-down approaches. Using the energy device, the lateral attachments are taken down by incising initially and then dividing the colon attachments laterally. The greater omentum is divided coming along the mid transverse colon and separating it from the greater curvature of the stomach and eventually dividing the hepatic flexure attachments.

Step 6—dividing the bowel

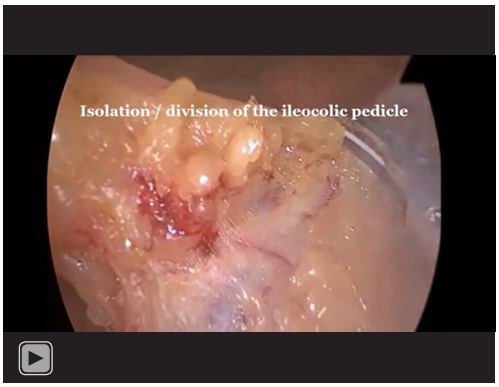
The proximal bowel margin is marked at the terminal ileum followed by identification of the distal bowel margin at the transverse colon. The mesenteric and mesocolic aspects of the margins is further divided with the energy device as needed. An endoscopic linear stapler, Echelon Flex™ Endopath® 60 mm green cartilage (Ethicon Endo-Surgery, Inc.) is introduced through the 12 mm trocar and the bowel is transected, preferably with a single cartridge firing for each proximal and distal margins. The specimen is pushed towards lower abdomen out of the surgical field.

Step 7—intracorporeal anastomosis

A side-to-side intracorporeal anti-peristaltic anastomosis is performed. A single suture is initially placed to approximate the small bowel and colon. The suture can be anchored to the abdominal wall for adequate exposure and retraction. An enterotomy and colotomy are performed using the energy device and a single endoscopic stapler, Echelon Flex™ Endopath® 60 mm green cartilage (Ethicon Endo-Surgery, Inc.), is performed side to side to create the luminal aspect of the anastomosis. The open apex of the anastomosis is then closed with a running absorbable suture, V-Loc™ (Medtronic, Minneapolis, USA). Additional single interrupted absorbable sutures can be used to reinforce some areas of the anastomosis. The mesenteric window can be left open or closed at the discretion of the surgeon. The trocars are removed under direct visualization and checked for bleeding. The fascia of the 10 and 12 mm sites are closed with an absorbable suture.

Step 8—specimen extraction

A 6 cm horizontal Pfannenstiel incision is made in the lower abdomen. An Alexis™ wound protector (Applied Medical, Rancho Santa Margarita, CA, USA) is placed and the specimen is exteriorized and sent for histologic evaluation. The fascia is closed using a running absorbable suture and the skin of the midline extraction site and trocar sites is closed with an absorbable subcuticular suture. An example of this technique is shown in *Video 1* so you can follow these steps visually.



Video 1 Laparoscopic right hemicolectomy: how I do it.

Comments

A minimally invasive approach to right colectomy provides several benefits to the patient and it is a rewarding operation for the surgeon. Complete mesocolic excision (CME) is preferred by our team in laparoscopic right hemicolectomy. CME provides more lymph node harvest and more accurate oncologic surgery and increases survival. CME is not inferior to standard laparoscopic surgery in terms of anastomotic leakage, blood loss, and overall postoperative complications. Traditional laparoscopic right hemicolectomy has a shorter operative time and lower conversion rate to open surgery (14). It is important to note that several techniques have been described and the variations encompass the different approaches to colon mobilization, control of the vascular pedicle, anastomosis construction, and specimen extraction site. These variations include pure laparoscopic technique, laparoscopic assisted, hand assisted, single port surgery, and more recently robotic surgery. The 2 main anastomotic techniques are intracorporeal and extracorporeal. All techniques are acceptable and it is important for the surgeon to be consistent in the technique he/she uses while at the same time being familiar with the other options which may prove useful under some circumstances. In the past years extracorporeal anastomosis was frequently performed in laparoscopic surgeries because the intracorporeal anastomosis technique required more experience. With the development of surgical experience and laparoscopic staplers, intracorporeal anastomosis is now more frequently performed. Studies have shown that although there is no significant difference in terms of anastomotic leakage and oncological results, the duration of hospitalization and even the operation time are shorter. Smaller incision is needed for the removal of the specimen, resulting in less wound complications and less pain (15). 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.

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Footnote

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. 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 images/video. A copy of the written consent is available for review by the editorial office of this journal.

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