16 Robotic Small Bowel Resection

Kelsi Hirai, Miranda Lin, Georgios V. Georgakis, and Joseph Kim

Introduction

There are many indications for small bowel resection including obstruction, disorders such as Meckel's diverticulum or Crohn's disease, malignancy, and trauma. In this chapter, we will describe small bowel resection for malignancy. Primary small bowel malignancies, including adenocarcinoma, carcinoid, lymphoma, and stromal tumors, and small bowel metastases from distant sites are indications for small bowel resection [1, 2]. Malignancy can result in obstruction or bleeding, which was observed in our patient. In this chapter, we present a step-by-step approach to robotic small bowel resection.

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K. Hirai · G. V. Georgakis
Department of Surgery, Stony Brook University Hospital, Stony Brook, NY, USA
e-mail: kelsi.hirai@stonybrookmedicine.edu; Georgios.georgakis@stonybrookmedicine.edu

M. Lin · J. Kim (✉)
Department of Surgery, University of Kentucky, Lexington, KY, USA
e-mail: joseph.kim@uky.edu

Preparation

Detailed patient history and physical examination are important measures for preoperative planning. Laboratory studies including complete blood count, coagulation status, and electrolytes help to determine perioperative risk factors. Prior to surgery, fluid and electrolyte balance should be established and blood volume should be optimized. Prophylaxis for deep venous thrombosis is initiated with subcutaneous heparin or enoxaparin and mechanical sequential compression devices. Perioperative antibiotics are administered to reduce the risk of surgical site infection [3].

Under select circumstances, early surgical planning may not be available. Emergent small bowel resection is mandatory for uncontrolled bleeding, while endoscopic and interventional radiologic procedures are typically ineffective. Under urgent conditions, it is important to obtain type and screen and cross-matching of blood, to administer perioperative antibiotics, and to expedite bringing the patient to the operating room while concurrently providing resuscitative care. Once in the operating room, a nasogastric tube is placed (if not already placed) for gastric and intestinal decompression, and a Foley catheter is recommended to monitor urinary output during the procedure. We do not advocate performing minimally invasive procedures when the patient is unstable and requires immediate exploration. We will consider robotic small bowel resection

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when the patient is hemodynamically stable. For this procedure, the patient will be placed supine with the legs split. It is our routine to have both arms tucked for all robotic procedures for patient safety when docking the robot.

Port Placement

We first place a 5-mm port in Palmer's point in the left lateral upper quadrant. This port will be replaced by a robotic 8-mm port. A second 5-mm port may be placed to verify the location of the lesion. Typically, we prefer placing five ports along a semicircular line with the base of the semi-circle near the right lower quadrant facing toward the left upper quadrant. Under direct visualization, ports are placed approximately 10–20 cm away from the area of interest with the periumbilical camera port in the middle of the semicircular line. Three robotic 8-mm ports are placed one handbreadth apart to avoid collisions of the robotic arms during surgery (Fig. 16.1). We use one 10-/12-mm assistant port, which is also placed in the semicircular line. Distances between the ports are measured after insufflation for improved accuracy. After placement of the ports, the robot is docked over the left shoulder with the Da Vinci Si [4].

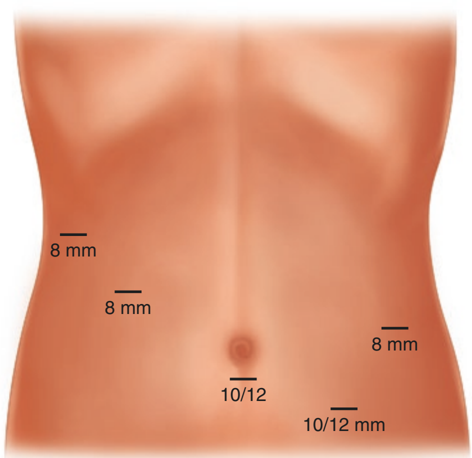

Fig. 16.1 Modified trocar/port placement for robotic small bowel resection

Instruments and Materials

We use a 5-mm 30 °-angled laparoscope for initial exam of the abdomen and a 10-mm 30 ° robotic camera. We use the following robotic instruments: fenestrated bipolar forceps, cadiere forceps, monopolar hook, the vessel sealer, and the mega needle driver. We also utilize the endoscopic gastrointestinal anastomosis (GIA) stapler and an endoscopic specimen bag. We employ two different techniques for intracorporeal suturing including 3-0 V-Loc 90 suture on a taper point needle and the Lapra-Ty Absorbable Suture Clip with 3-0 Vicryl sutures on a taper point needle. The Carter-Thomason device is used to close the fascia at the 10-mm ports with 0 Vicryl suture.

Small Bowel Resection

Video 16.1

First, the location of the cancer is verified by laparoscopy prior to docking the robot. After the robot is docked (Fig. 16.2), we utilize the fenestrated bipolar grasper in arm 2 and the cadiere forceps in arm 1 to lift up the intestine proximal and distal to the tumor. The robotic hook is placed into arm 1 to create a mesenteric defect proximal and distal to the location of the tumor at the proposed sites of small bowel transection [5]. We prefer to use the endo-GIA stapler to divide the small intestine, rather than creating a 15-mm port to utilize the robotic stapling device. We utilize 60-mm tan cartridges to divide the small intestine. The small bowel mesentery is then divided using the vessel sealer. For adenocarcinoma, we obtain generous margins (5 cm) and harvest lymphatic tissue in the mesentery at the base of the cancer. The surgical tissues are placed in a specimen bag and brought out through the 10-mm assistant port site.

Anastomosis

We perform a side-to-side, functional end-to-end anastomosis. First, the stapled ends of the proximal and distal bowel are aligned. Using the

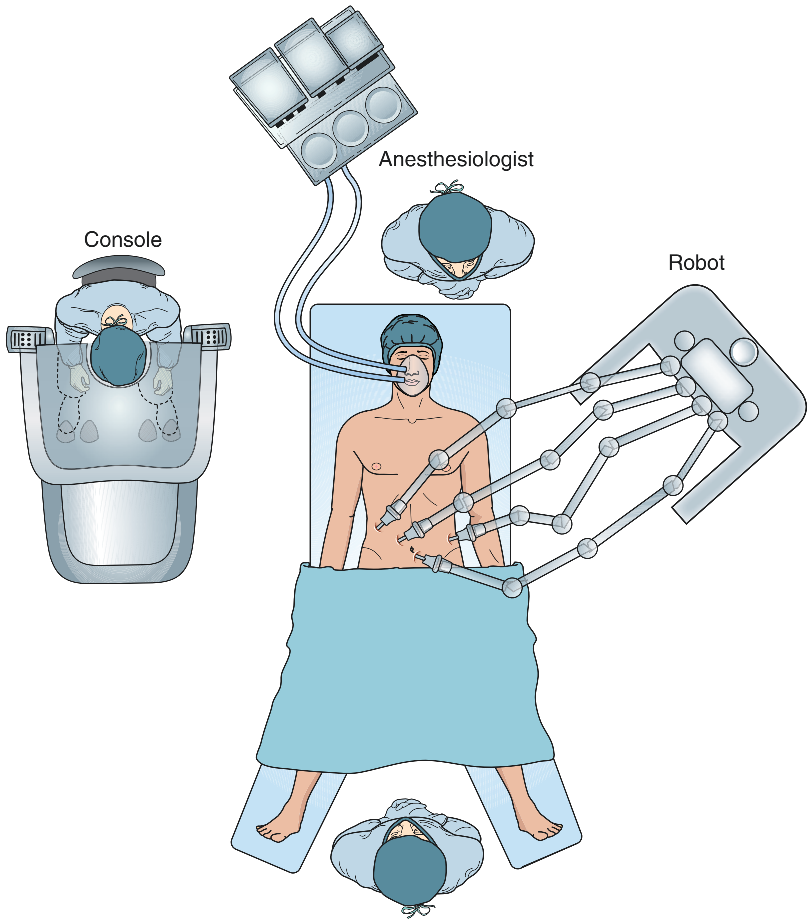

Fig. 16.2 Patient positioning and operating room setup for robotic small bowel resection

robotic hook, small bowel enterotomy is created approximately 1 cm from the stapled end on the superomedial aspect of the proximal and distal small bowel. The two jaws of the endo-GIA stapler are placed in each enterotomy, ensuring that the mesenteric borders of the proximal and distal small bowel are aligned (Fig. 16.3). The jaws are fully inserted to maximize the diameter of the anastomosis. Once the two ends of small bowel are parallel and the anti-mesenteric border is aligned, the stapler is fired to create a common channel. After stapling, the suture line is inspected for bleeding. Any bleeding is controlled with the fenestrated bipolar grasper or with sutures as necessary.

Closure of Common Enterotomy

We prefer to close the common channel with suturing rather than stapling. We employ two different techniques to close the common channel, either with robotic suturing using running suture with Lapra-Ty Absorbable Suture Clips or with V-loc sutures. When using the Lapra-Ty, we place one of these clips at the end of the suture and then perform standard serosa-to-mucosa and mucosa-to-serosa suturing in running fashion. Another Lapra-Ty Absorbable Suture Clip is placed on the completed end of the suture line. This precludes the need for robotic tying of knots. With the V-Loc suture, the needle must be threaded

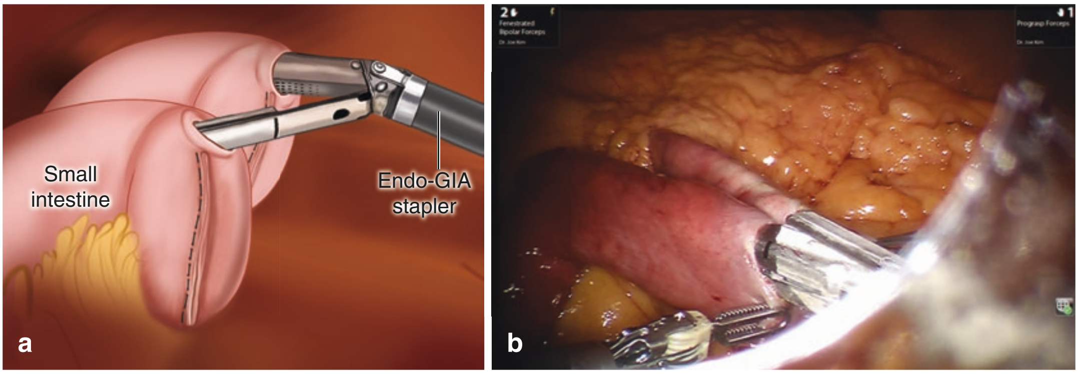

Fig. 16.3 (**a**) Illustration demonstrating placement of the linear stapler into the enterotomy defects in the small intestine. (**b**) Paired intraoperative photo demonstrating robotic assistance to place the linear stapler into the enterotomy defects of the two limbs of the small intestine

through the loop at the end of the suture following the first set of corner bites to lock the suture. Standard robotic suturing can be performed along the length of the common enterotomy. It is important to cinch the sutures while closing the defect. We do not tie a knot at the end of the suture line and instead simply cut the suture. We are careful to avoid leaving exposed barbs of the V-loc suture.

We typically perform a second, outer layer of the common channel closure. The second layer of the bowel wall anastomosis is completed in a similar fashion with running suture using either the Lapra-Ty or V-Loc techniques. However, we employ seromuscular bites for the outer layer. The small bowel mesenteric defect is approximated with running 3-0 Vicryl suture.

Fascial and Skin Closure

Once the anastomosis is complete, the laparoscope is used to view the abdominal cavity and ensure hemostasis. The fascia at the 10-/12-mm port site is re-approximated using the Carter-Thomason device. We do not close the fascia at the robotic port sites. The pneumoperitoneum is deflated, and ports are removed. Skin is then closed at all port sites with 4-0 Monocryl subcuticular interrupted sutures.

Postoperative Care

At the end of the operation and prior to leaving the operating room, the nasogastric tube is removed. Routine intravenous fluids are administered and a clear liquid diet is started on postoperative day 1. The diet is advanced to a regular diet as bowel function returns. Pain management with minimal narcotics and deep venous thrombosis prophylaxis are continued. Early ambulation is encouraged, and patients are routinely discharged in 2–3 days following robotic small bowel resection.

Conclusion

Robotic small bowel resection can be performed safely and effectively for small bowel malignancies. The robotic platform enables the common enterotomy to be closed securely and with ease. In our experience, the utilization of small incisions has resulted in less pain, quicker return of bowel function, and shorter hospital stays. Randomized studies to directly assess the benefits of the robotic platform for small bowel malignancies may be difficult to organize and complete due to the lower incidence of these cancers. Additional nonrandomized retrospective and prospective data will be important to provide outcome data.

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