Robotic Sigmoid Colectomy with NOSE

Jesse M Cheney, CST, CSFA

Modern advances in medical treatment and procedures coupled with technological gains have allowed surgeons to offer new ways of treating diseases. The introduction of the robotic surgical platform has had a profound impact on such treatment, allowing surgeons to perform more challenging tasks while keeping the procedure minimally invasive.

A traditional sigmoid colectomy is performed in an open fashion, which leaves the patient with a large midline laparotomy incision and a longer recovery time. An elective sigmoid colectomy utilizes the surgical robot, which allows for retrieval of the specimen through a natural opening of the body, thus resulting in four small incisions and a greatly reduced hospital stay. Although it is a relatively new method in the United States, this procedure offers a viable way of eliminating diverticular disease without the pain of a large incision.

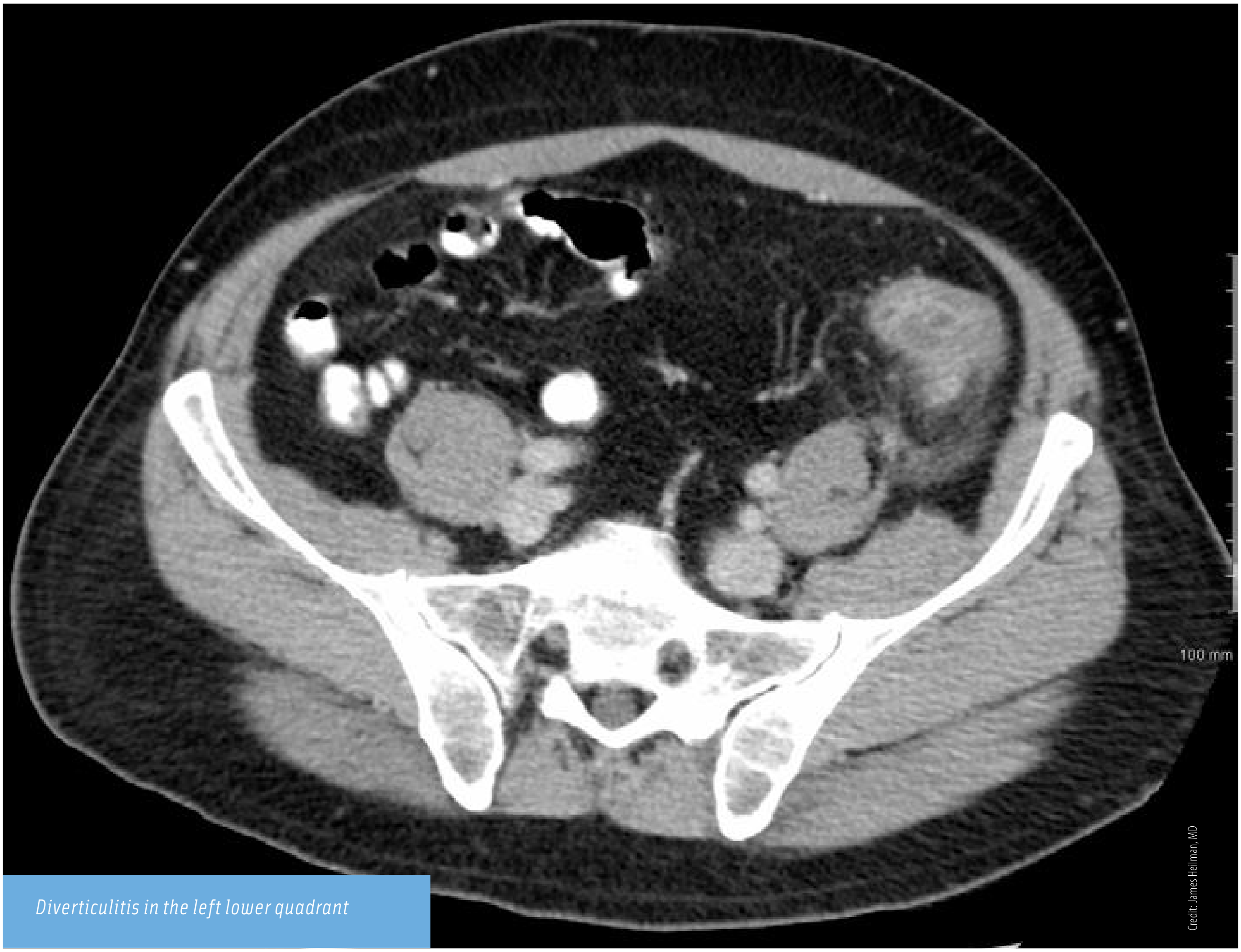
This article will explore a robotic sigmoid colectomy with natural orifice specimen extraction.

ANATOMY

The sigmoid colon is a terminal section of the large intestine that connects the descending colon to the rectum. Its main function is to store fecal material until it's ready for disposal. The sigmoid colon gets its

LEARNING OBJECTIVES

- Learn about a robotic sigmoid colectomy with natural orifice specimen extraction
- Compare and contrast a traditional sigmoid colectomy with a robotic procedure
- Review the affected anatomy related to this operation
- Recall the necessary trocar placement and docking required during a robotic sigmoid colectomy
- Examine the required equipment and instrumentation needed for this procedure



Diverticulitis in the left lower quadrant

name due to its S shape (Greek: sigma). The diameter of the sigmoid colon is determined by the amount of waste in the colon. The sigmoid colon can be as small as 2.5 cm in diameter when completely empty.

The sigmoid colon has a similar cellular makeup as the rest of the colon with some subtle differences. The lining is composed of a mucus membrane that secretes mucus and can also absorb some fluid. The inner layers of the sigmoid colon are composed of a circular muscle and a sheath of longitudinal muscle. Both muscles aid in the movement of waste through the colon, and the longitudinal muscle layer also is responsible for the disposal of waste out of the colon and into the rectum. Fecal waste material can be stored in the sigmoid colon for seven hours or more until new waste material needs to be moved into this area and the waste needs to be expelled.

DIVERTICULITIS

The etiology of diverticulitis is not known, but a low fiber diet has proven beneficial. Without fiber to add bulk to the stool, the colon has to work harder to move stool out of the colon. This puts pressure on the weak portions of the colonic wall, where the blood vessels enter and the pressure creates small pouches. One theory is that the stool becomes trapped in these pouches where bacteria grows, which may lead to inflammation and infection.

INDICATIONS FOR SURGERY

Most people with diverticulosis remain asymptomatic throughout their lives. Only 10% to 25% develop symptoms and have to seek medical treatment. The most common clinical manifestations include perforation, abscess development, fistula formation, obstruction and hemorrhage. Other patients may present with non-acute complaints such as chronic left lower quadrant pain, irregular bowel issues and abdominal distention. Elective surgery for sigmoid colectomy for the treatment of diverticulitis is normally based on the number of episodes and a patient's overall discomfort. Other contributing factors include the level of disease and patient comorbidities.

INSTRUMENTS, EQUIPMENT AND SUPPLIES

A robotic sigmoid colectomy with natural orifice specimen retrieval involves two separate setups. One setup is for the sterile abdominal portion of the case and the other is for the non-sterile specimen retrieval portion. Both tables need to be setup by the surgical technologist to ensure that sterile technique is met and maintained throughout the entire case for the best patient outcome and infection prevention.

PROCEDURE

Positioning

The patient will be brought into the OR and moved to the OR table. The sequential compression boots will be placed on the patient to help avoid blood clots during surgery. The patient will be given 2 to 3 grams of cefoxitin as a preoperative antibiotic. Once intubated, the patient will be moved to the correct position on the table, with the coccyx just superior to the break in the table. Gel pads will be placed around the patient's arms and tucked to the side ensuring the pressure points are observed and padded to avoid a radial nerve injury. The patient will be placed in the lithotomy position. The peroneal and femoral nerves will need to be properly padded to avoid injury. An upper bair hugger will be placed to ensure that proper patient temperature will be maintained throughout the case. A protective shield will be used over the patient's face to protect against any instrument arm injury during the case. A three-way 16FR Foley catheter then will be inserted and the flush port will be capped with a Foley plug. This will allow the circulating nurse easy access to the catheter in case of bladder injury. If needed, the bladder will be easily injected back with methylene blue to test for any perforations. The patient then will be placed in steep Trendelenburg to test for movement on the table before the draping process begins. The circulating nurse will prep the patient with chloraprep from the xiphoid to the anus and the midthigh. The patient will be draped with leggings, an under-the-buttocks drape, four towels squaring off the abdomen and a U-Bar drape. The surgical technologist will pass off the cords and tubing, and a time out will be conducted.

Trocar Placement

Local anesthetic will be placed 2 cm above and 2 cm to the right of the umbilicus. A 12-mm incision will be made and the Veress needle will be used to insufflate the abdomen. Once a pressure of 15 is achieved, a 12-mm trocar will be placed and the camera will be inserted. The camera will be used to insert two more 8-mm trocars on the patient's left side: one 5 cm superior and 10 cm lateral to the camera trocar, close to the subcostal margin. The other left lateral 8-mm port will be placed 5 cm above the ASIS (anterior superior iliac spine) and as lateral as possible without coming in contact with the abdomen. The camera then will be turned and another 12-mm trocar will be placed superior and medial to the right of ASIS and in the best possible position for stapling the colon. The patient will be moved to the Trendelenburg position to aid in the exposure of the sigmoid colon and to displace the small intestine upward for better visualization.

> A robotic sigmoid colectomy with natural orifice specimen retrieval involves two separate setups. One setup is for the sterile abdominal portion of the case and the other for the non-sterile specimen retrieval portion.

Docking

The robot will be driven into place by the circulating nurse on the patient's left side facing upward toward the head. The post of the robot will need to face the patient's left hip at a slight angle in order for the best access. The camera arm will be docked with the internal elbow-facing arm one. Arm one will be docked with the arm number facing outward, and the number two and three arms will be docked with the numbers facing inward toward the base of the robot. This placement ensures the best range of motion for the surgeon while he or she works.

Sigmoid colon showing multiple diverticula. The diverticula appears on both sides of the longitudinal muscle bundle

Surgery

A small grasping retractor will be placed in arm three, a double fenestrated grasper will be placed in arm two and a monopolar-curved scissor will be placed in arm one. The surgeon will sit down at the console and begin the surgery by placing the small bowel in the upper right quadrant, out of the way of the target anatomy. Surgeon's preference will dictate the approach of the dissection of the sigmoid colon. The peritoneum will be incised laterally moving the colon medially in order to identify the ureter. The ureter will need to be identified before the colon can be further dissected. The colon will be dissected away from the wall and the diseased area will be identified through a mesenteric window that is made proximally to the diseased area. An endoscopic stapler then will be inserted and the colon will be transected proximally and distally leaving the mesentery and the blood supply attached to the colon. Caution needs to be applied to not to disturb blood supply to the rectum and the proximal colon. The proximal portion of the colon will be mobilized further proximally giving the length need for anastomosis.

The rectum will be sized from below to determine the correct circular stapler size. The rectum will be cleaned with a betadine solution, suctioned, rinsed with normal saline and then suctioned again. The surgeon will then cut the staple line off the rectal stump exposing the lumen of the rectum. A large specimen retrieval bag will be inserted from below, into the abdomen and opened. The surgeon will place the specimen in the bag and trim all of the mesentery off the specimen, leaving the mesentery in the bag and the sigmoid colon inside the abdomen. The bag then will be extracted through the rectum. A ringed forceps will be inserted from below through the rectum and into the abdomen. The sigmoid colon specimen will be placed in the jaws of the forceps and the specimen will be extracted through the anus. The anvil grasper from the EEA stapler will then inserted from below into the abdomen and handed to the surgeon. The rectal opening will be stapled or sutured closed again. The surgeon will cut open the proximal portion of the descending colon and places the anvil inside. A 2-0 silk stich will be used to pursestring the opening closed around the anvil grapser. The stapler will be inserted from below and the colon will be anastomosed. The surgeon will use a

EQUIPMENT SET UP
Top Table
Robotic Instrument Kit
Robotic Trocar Kit
Robotic Suction Irrigator
Robotic Vessel Sealer
Raytex Sponges
Needle Counter
Closing Suture
12mm Long Trocar-Camera
12mm Trocar-Stapler
Veres Needle
Insufflation Tubing
Monopolar Cord
Endo GIA Stapler
3-60mm Purple Loads for Stapler
Drapes
Leggings
Under Buttock Drape
Square with Towels
U-Bar Drape Set
Bottom Table
Bulb Syringe
2 Basins
Betadine
Saline
Kelly
Snap
Ring Forcep
Poole Suction Tip
EEA Seizers
Lap Sponges
Flexible Colonoscope
Lubrication


Top table set up

Credit: Jesse Cheney, CST, CSFA


Bottom table set up

Credit: Jesse Cheney, CST, CSFA

3-0 silk suture to oversow the anastomosis in a Lembert fashion.

The surgeon will then copiously irrigate the area and drain out the pelvis. The pelvis will be the filled with irrigation again and a flexible colonoscope will be inserted from below. The colon will be clamped by the surgeon and inflated using the colonoscope. The colonoscope will be advanced until the anastomosis is visible, and will be inspected for bleeding. The surgeon will look for any bubbles on the inside that would indicate leaking. If no bubbles are observed, then the colon will be deflated and the scope will be removed. The robotic instruments then will be removed and the abdomen will be deflated.

The fascia will be closed with 0 polydioxanone suture followed by 4-0 poliglecaprone 25. Steri-strips will be applied with adhesive bandages covering them. The patient will be extubated and transferred to the postoperative recovery unit.

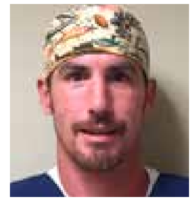
> An elective sigmoid colectomy utilizes the surgical robot, which allows for retrieval of the specimen through a natural opening of the body, thus resulting in four small incisions and a greatly reduced hospital stay.

COMPLICATIONS AND POST-OP CARE

Complications for this procedure include ileus, anastomotic leak, bladder/ureter damage and nerve damage. The typical stay for a patient in the hospital is two to three days, which is significantly less than an open procedure. The patient will be monitored for potential complications, and the patient's diet will gradually advance to allow for proper healing of the colon. The patient will be monitored for any leaks in the anastomosis. Normally, wound care would be a part of the observation, but with the use of natural orifice specimen retrieval this portion of the observation has been simplified. This method has proven a significant decrease in post-op ileus and a drastic decrease in post-op pain.

AUTHOR ACKNOWLEDGEMENTS

Special thanks to Dr Patricia Auty for help with this article.



ABOUT THE AUTHOR

Jesse Cheney, CST, CSFA, specializes in general surgery robotics. He graduated from Great Bay Community College in Portsmouth, New Hampshire, with an associate degree in surgical technology. He gained his first assistant certification from Meridian Institute of Surgical Assisting.

Jesse would like to give thanks to the hard work and dedication of the operating room staff at Wentworth Douglass Hospital. It was at WDH that he gained most of his knowledge and skill in the general surgery field. He would also like to give special thanks to the surgeons that have spent so much time and effort training him in the field of general surgery, Dr David Coppola, Dr Patricia Auty and Dr Joseph Rodriguez. Without their guidance and mentoring he would never be where he is today.

He would also like to thank his wife Stephanie because without her support, encouragement and understanding he would have never even entered into the field of health care. Jesse currently works at Seacoast General Surgery in Dover, New Hampshire as a private CSFA. He will be attending Franklin Pierce University in the fall to further his education and become a physician's assistant.

REFERENCES

1. Bedirli, A; Salman, B. (2015). Robotic surgery for rectosigmoid junction tumor with ovarian metastases. *J Min Access Surg*, 11(1), 99. http://dx.doi.org/10.4103/0972-9941.147720
2. Colon Resection Technique: Approach Considerations, Laparoscopic Left and Sigmoid Colectomy, Low Anterior Resection, and Abdominoperineal Resection, Laparoscopic Right Colectomy. (2016). Medscape. Accessed July 27, 2016. http://emedicine.medscape.com/article/1891505-technique#c2
3. Diverticulitis Causes, Symptoms, Treatments, Prevention. WebMD. Accessed March 12, 2015. http://www.webmd.com/digestive-disorders/tc/diverticulitis-topic-overview.
4. Egger, B; Peter MK; and Candinas, D. Persistent symptoms after elective sigmoid resection for diverticulitis. *Dis Colon Rectum*. (2008). Accessed March 21, 2015. http://www.ncbi.nlm.nih.gov/pubmed/18449609
5. Klarenbeek, BR; Samuels, M; van der Wal, MA; van der Peet, DL; Meijerink, WJ; Cuesta, MA. Indications for elective sigmoid resection in diverticular disease. Ann Surg. (2010). US National Library of Medicine. Accessed March 21, 2015. http://www.ncbi.nlm.nih.gov/pubmed/20224374.
6. Sigmoid Colon, Anatomy. Encyclopedia Britannica Online. Encyclopedia Britannica. March 12, 2015. http://www.britannica.com/EBchecked/topic/543687/sigmoid-colon.Sigmoid Colectomy Your Operation Explained. Stepping Hill Hospital. Stockport, GB: Stepping Hill Hospital. 2014. http://www.stockport.nhs.uk/documents/PIL/33482_SUR90.pdf