Single Incision Laparoscopic Colectomy: A Series of Five Patients, Lessons Learned

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Abstract

INTRODUCTION: Recent advances in laparoscopy have promoted surgical innovations such as natural orifice transluminal surgery (NOTES) via transvaginal routes and transoral routes. Laparoscopic colon surgery uniquely adapts itself to SILS. Here, we present our initial series of colonic resections done through a SILS multiple instrument access port. In addition, we highlight initial problems and how we solved for these problems. METHODS: From May 2008 to September 2009, five single incision laparoscopic colectomies were performed by two general surgeons at a single academic institution. A retrospective review of the electronic medical record was performed analyzing demographic characteristics, operative time, pathology, post-operative length of stay, and post-operative complications. RESULTS: There were three males and two females with the average age 70.6+/-14 years. SILS right hemicolectomy was successfully preformed on these patients. Mean operative time for all cases in this series was 151.8+/-48.5 minutes. There were no intraoperative complications. All patients remained hospitalized four to five days postoperatively. DISCUSSION: SILS colectomy is a technically challenging operation. Single incision laparoscopic colectomy is not a variation in technique, but rather a variation in approach to colon resection. Single incision colon resections should only be done when the operative surgeon feels comfortable with laparoscopic colectomy.

KEYWORDS: Single incision laparoscopic surgery, colon cancer, novel technique
INTRODUCTION

The benefits of laparoscopy have been well established in the literature. Recent advances in laparoscopy have promoted surgical innovations such as natural orifice transluminal surgery (NOTES) via transvaginal routes and transoral routes. In addition, single incision laparoscopic surgery (SILS) has recently gained more prominence. SILS procedures utilize the umbilicus to gain access into the abdomen. The standard benefits of laparoscopic surgery including less incisional pain, shorter length of stay, and decreased postoperative narcotic requirements are also seen with SILS. To date, single incision laparoscopy has successfully been employed in many aspects of surgery including cholecystectomy, appendectomy, splenectomy, urologic procedures and inguinal hernia repair\textsuperscript{1,2,3,4,5,6}.

Laparoscopic colon surgery uniquely adapts itself to SILS. Lengthening of a laparoscopic trocar incision, or an extraction incision needs to be made on the anterior abdominal wall for specimen retrieval. This incision needs to be at least 4cm to adequately remove the specimen portion of the colon for pathologic examination and for anastomotic creation. This small extraction incision is now the only incision required on the patients abdomen, minimizing scars and enhancing post-operative cosmesis.

Theoretical benefits of SILS include decreased wound infections and potentially a decreased risk of port site hernias\textsuperscript{1}

Here, we present our initial series of colonic resections done through a SILS multiple instrument access port. In addition, we highlight initial technical challenges we
encountered in our initial series of SILS colectomies and how we have improved our technique with experience.

METHODS

From May 2008 to September 2009, five single incision laparoscopic colectomies were performed by two general surgeons at a single academic institution. A retrospective review of the electronic medical record was performed analyzing demographic characteristics, operative time, pathology, post-operative length of stay, and post-operative complications.

Patients included in this study were 18 years or older who required colectomy for either benign or malignant disease. Patients were chosen because they did not have extensive prior abdominal surgery and would have otherwise been candidates to undergo traditional laparoscopic colectomy. All patients signed informed consent.

SURGICAL TECHNIQUE

All patients were administered pre-operative antibiotics (one gram of Cefoxitin intravenously). Prior to incision the patient was placed in either supine or in dorsal lithotomy position on the operating room table. A Foley catheter was inserted. After general endotracheal anesthesia was established, a 3 cm umbilical incision was made to gain access into the abdominal cavity. The fascia was opened and a single port with three
working chambers (Covidien, Mansfield, MA) was inserted (Figure 1). The abdomen was insufflated to a pressure of 15 mm Hg. A 5 mm 30 degree laparoscope (Stryker, Kalamazoo, MI) with both straight and reticulating laparoscopic instruments (Covidien, Mansfield, MA) was used. With a right sided lesion, the terminal ileum, cecum, and ascending colon were mobilized in a medial lateral fashion using the ligasure device (Covidien, Mansfield, MA). The right ureter was identified and preserved in all right colectomies. The SILS port was removed once the right colon was mobilized. The incision was extended 4-5cm. A wound protector was placed. The terminal ileum and the ascending colon was exteriorized via the umbilical incision (Figure 2). Prior to dividing the colon, a suture was placed to fix the orientation of the small bowl to the colon to avoid twisting or misorientation of the anastomosis. The Endo GIA stapler was used to divide the ascending colon and the ileum proximal to the ileocecal valve. One enterotomy was created in the terminal ileum and another enterotomy created in the ascending colon to make a side to side anastamosis with a GIA 3.5 mm. The enterotomy was closed with a TIA 60 Blue load. The mesenteric defect was closed with nonabsorbable suture and the anastomosis was gently reduced through the incision.

With left sided lesions, the mesentery of the sigmoid colon was divided in a medial lateral fashion. The proximal rectum was identified and the rectum was stapled off. The sigmoid was exteriorized through the umbilical incision which did not have to be extended. The sigmoid was stapled off proximally with an EndoGIA (Covidien, Mansfield, MA) to eliminate redundancy. The staple line on the descending colon was opened and a 31 Anvil was placed in the colon and tied down with a nylon pursestring. The anvil was placed back into the abdominal cavity and the SILS port was inserted back
into the umbilical incision. The stapler was then placed in the rectum through the anus. The EEA Stapler and the anvil were mated together under laparoscopic guidance. The stapler was then fired and the anastamosis was tested for an air leak.

In all cases the SILS port fascia was closed with interrupted 1-0 PDS in a figure of eight fashion. Prior to skin closure with 4-0 monocryl subcuticular stitches, the incision was betadined clean (Figure 3).

RESULTS:

Of the five patients, there were three males and two females with the average age 70.6+/−14 years. The average BMI was 24.4 kg/m² (range 18.8-33.3 kg/m²). Single incision laparoscopic colectomy was preformed successfully in all of our cases (100%). Four patients were known to have malignant lesions based on pre-operative colonoscopy and biopsy. SILS right hemicolecetomy was successfully preformed on these patients and pathology was positive for adenocarcinoma. The size of the adenocarcinoma in the cecum ranged from 3.3 to 5 cm. Proximal and distal margins were negative on all specimens. A range of 8-22 lymph nodes were removed en block with the specimen. One patient presented with a sigmoid volvulus and after colonic decompression, required sigmoidectomy. Mean operative time for all cases in this series was 151.8+/−48.5 minutes. There were no intraoperative complications. All patients remained hospitalized four to five days postoperatively. Patients have been followed in the outpatient surgical office for six months with no post-operative wound complications or hernias to report. All patients remain disease free to date.
DISCUSSION

Over the past several years single incision surgery has become increasingly popular. Initially, only common general surgery procedures like cholecystectomy and appendectomies were performed. This was soon followed by bariatric procedures, gynecologic procedures, and urologic procedures. More recently case reports of single incision colon resections have appeared in the literature. We present our series of single incision colon resections and the technical lessons we learned from them.

All cases in our series were done in a timely fashion and were technically feasible. Right colon resections were the most frequently performed operation in our series because of our familiarity with the challenges of single incision appendectomy. We viewed SILS right colectomy as an extension of the SILS appendectomy and used all of the same equipment with the exception of the 5mm ligasure device. The two major differences between SILS appendectomy and SILS right hemicolecction were the addition of the ligasure device to divide the mesentery and the need to exchange the 10 mm inner cannulas with the 5 mm cannula in the SILS port to accommodate different equipment. In addition, we used extreme table positioning from left side down to trendelenburg and reverse trendelenburg to mimic an assistant’s retracting hand.

We learned several lessons along the way. Medial to lateral dissection of the mesentery greatly aided in ease of dissection because, as in conventional laparoscopy, the colon is autoretracted by its lateral attachments. The first case in our series was performed with lateral to medial dissection. This technique of lateral to medial mesentery dissection
made identification of the duodenum a challenge and also made it difficult to maintain
adequate traction along the colon during dissection. We now routinely perform a medial
to lateral dissection to decrease the bulk of the mesentery which makes the colon and
small bowel easier to exteriorize at the end of the case through a 4cm incision. We
usually have a medial to lateral approach in dissection for traditional laparoscopic right
hemicolectomies and therefore we were able to easily adapt to this technique for the SILS
colecotomy. If however, individual surgeons are more comfortable with lateral to medial
dissection for their laparoscopic colectomies they may not want to drastically change
their technique. In this case, a step wise approach may be better.

After exteriorization of the bowel via the umbilical trochar site, in our third patient in this
series, we divided the small bowel and ascending colon. It was difficult to visualize the
route of the small bowel mesentery to ensure that it was not twisted in a 360 degree
fashion. To confirm orientation, we removed the wound protector, replaced all the bowel
in to the abdomen and re-inserted the SILS port to regain proper orientation. This was
cumbersome and time consuming. After bringing the small bowel out of the wound
protector for the second time, we placed a stay suture between the large and small bowel
to keep the small bowel properly oriented. We then modified our technique to always
place a stay suture between the small and large bowel proximal to the specimen
transection site, prior to dividing the bowel to maintain proper alignment and prevent
twisting.

SILS colectomy is a technically challenging operation. Within our practice, significant
challenges still exist which prevent us from offering this operation to all patients. These
challenges include our current inability to form intracorporeal anastomosis as we do in
standard laparoscopic hemicolecotomies. With the SILS technique the port is located too close to the anastomotic site on the transverse colon to effectively create an intracorporeal anastomosis. Multiple cannula exchanges lengthen the case and make it more cumbersome. In addition, as we attempt to operate on more obese individuals, we anticipate the need for a fourth retracting hand which can make clashing at the umbilicus more prominent.

Single incision laparoscopic colectomy is not a variation in technique but rather a variation in approach to colon resection. In our series, patients did not go home sooner, they did not require less narcotics nor can we show decreased pain postoperatively. The only perceptible benefit is cosmesis. In our patients with virgin abdomens the scars were almost all hidden within the umbilicus and were no greater than 4cm. Single incision colon resections should only be done when the operative surgeon feels comfortable with laparoscopic colectomy and after having attempted several single incision appendectomies. Patients should be chosen carefully in the beginning with smaller lesions and low BMIs. In addition, having a patient with virgin belly greatly aids in the ease and progression of the operation.

Acknowledgements: Drs Feinberg, O’Connor, Vemulapalli and Camacho have no conflicts of interest or financial ties to disclose.


