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Laparoscopic Loop Ileostomy Reversal: Reducing Morbidity While Improving Functional Outcomes

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ABSTRACT

Introduction: Loop ileostomy reduces the morbidity associated with pelvic sepsis. However, its reversal carries a 10% to 30% complication rate. We present our technique for laparoscopic ileostomy closure.

Methods: We conducted a retrospective chart review of subjects undergoing laparoscopic-assisted loop ileostomy closure between 2006 and 2009. Operating time, length of hospital stay, return of bowel function, and complication rates were assessed.

Results: There were 24 (13 males) patients. Average age was 63 with a BMI of 25.9. Eighteen (75%) had a planned loop ileostomy, and 6 (25%) were emergent. Average time to reversal was 135 days. Average length of surgery was 79 minutes (range, 48 to 186), average stay was 4 days and return to bowel function was 3.6 days. We had no wound infections. Our complication rate was 29% (n=7), and reoperation rate was 12.5% (n=3). Only 1 major complication occurred, an anastomotic dehiscence.

Conclusion: A thorough, well-visualized lysis of adhesions and mobilization of the stoma and surrounding small bowel is the main advantage of our approach. We had no wound infections and no reoperation for bowel obstruction, which we feel is a direct advantage of our technique. Our complication rate and surgical time are comparable to those of the open technique.

Key Words: Ileostomy, Bowel obstruction, Laparoscopy, Colonoscopy.

INTRODUCTION

Loop ileostomy is a common procedure performed for fecal stoma diversion for a variety of reasons but primarily for colorectal surgery, low anterior resection, high-risk patients, and others. The incidence of clinical anastomotic leak after colorectal resection has been reported to range from 1.8% to 15%.[1] Morbidity associated with colorectal anastomotic leaks include pelvic sepsis, intraabdominal abscess, infertility, pelvic fibrosis, and stricture formation. A defunctioning loop ileostomy is often created to reduce the incidence of anastomotic leaks and limit the deleterious effects in case of anastomotic leak.[2] Routine use of defunctioning ileostomy has led to decreases in the incidence of pelvic sepsis, anastomotic disruption, and lower mortality with pelvic operations.[2–4] However, ileostomy reversal requires a second operation and has significant morbidity, with complication rates reported in the range of 10% to 30%.[5] Studies examining ileostomy reversal reveal a wide range of methodologies and complication rates. The difficulty in reviewing the pertinent literature arises in part because of multiple complex and possibly confounding factors including preoperative diagnosis, reason for ileostomy formation, comorbidities, and closure technique.

Minimally invasive techniques have revolutionized and provided clear benefits to the art of surgical practice. At the Texas Endosurgery Institute (TEI), we have developed a laparoscopic approach to ileostomy closure. We consider one of the most important reasons to perform this procedure laparoscopically is the ease of adhesiolysis; the visualization of the loop ileostomy is easier thru laparoscopy. All ileostomy closures involve some form of adhesiolysis, and care must be taken while doing this. The purpose of the adhesiolysis is to make it easier to perform the ileostomy takedown, not to prevent future small bowel obstruction. We describe our technique and outcomes with laparoscopic ileostomy closure and demonstrate no wound infections (0%) with equivalent postoperative complications, length of hospital stay, and return of bowel function compared with reports of open ileostomy closure. Specific data points including reasons for ileostomy formation, elective versus emergent operation, neoadjuvant therapies, and technical complications were gathered. Outcomes, measured by operating time,

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length of hospital stay, return of bowel function, and complication rates were assessed.

METHODS

A retrospective chart review of subjects undergoing laparoscopic loop ileostomy closure at a single institution (TEI, San Antonio, Texas) between 2006 and 2009 was conducted under an IRB-exempt study. Appropriate demographic information pertaining to sex, age, BMI, preoperative diagnosis, and comorbidities was obtained. Patient-specific data points including reasons for ileostomy formation, elective versus emergent operation, neoadjuvant therapies, and technical complications were gathered. Outcomes, measured by operating time, length of hospital stay, return of bowel function, and complication rates were assessed.

Wounds were monitored during daily rounds and follow-up visits for signs of infection, which we defined as cellulitis, induration, or purulent discharge from the former stoma site. Return of bowel function was defined as first passage of flatus or bowel movement with tolerance of an oral diet. Ileus was defined as delayed return of bowel function, with abdominal distention, nausea, intolerance of an oral diet, or radiographic evidence of dilated bowel without clear obstruction. Bowel obstruction was defined as delayed return of bowel function, with abdominal distention, nausea, intolerance of an oral diet, and radiographic evidence of dilated bowel with clear obstruction.

Technique

Preoperatively, all patients undergo colonoscopy and/or Gastrografin enema. We do not routinely perform contrast studies through the ileostomy. A thorough discussion with the patient concerning the risks, benefits, and alternatives to stoma reversal is completed as well. All patients are advised to observe a clear liquid diet for one day prior to surgery, and no bowel prep of any kind. All patients receive one preoperative dose of first-generation cephalosporin unless allergic to penicillin. We position the patient in the lithotomy position with both arms tucked and thighs straight or at the most 15 * degrees from the hip. The skin around the stoma is sutured closed and an op-site clean adhesive bandage applied. The remainder of the abdomen is prepped and draped in sterile fashion. The procedure begins with placement of a Veress needle in the left upper quadrant lateral to the rectus sheath (on Palmer's point). Pneumoperitoneum is achieved to a pressure of 14 mm Hg using CO_2. The Veress needle is exchanged for a 5-mm trocar. A 5-mm, straight laparoscope is introduced, and the abdomen is examined. Another 5-mm trocar is placed in strategic locations to facilitate adhesiolysis and reduction of parastomal hernia if encountered. Most commonly, our configuration involves only a third 5-mm trocar placed in the left lower quadrant. We perform enough adhesiolysis to be able to work freely in the abdomen, which is needed in most cases. Most adhesiolysis can be accomplished using laparoscopic shears through a single 5-mm port. A thorough adhesiolysis is completed with minimal use of electrocautery. We lyse the serosa-peritoneal adhesions at the stoma site as well. If a parastomal hernia is encountered, it is reduced into the abdomen. The loop of terminal ileum is examined and any intraloop adhesions of the small bowel are lysed for easier mobilization and the length of the resection determined. With this method of mobilization, the only remaining significant attachment is the mucocutaneous junction. Once the adhesiolysis is performed, an on-the-table colonoscopy is done to examine the distal anastomosis. If a stricture is identified, or known by preoperative studies, it is addressed at the time of surgery by serial balloon dilation. We prefer an on-the-table colonoscopy because the patient is already under anesthesia, compared to performing a preoperative colonoscopy. At this point, the mucocutaneous junction is taken down sharply and the stoma spout elevated out of the field. A GIA is used to create a side-to-side functional end-to-end ileoileostomy through the ileostomy site. A limited enterectomy is performed to include the former exteriorized stoma. The bowel is then reduced into the abdomen. The fascia at the stoma site is partially closed with a running 1-Vicryl suture. A 10-mm trocar is placed through the partially closed stoma site, and a portion of covered polypropylene mesh is introduced through this trocar into the abdominal cavity. The 2-layer closure of the fascia at the stoma site is then completed, and the wound copiously irrigated with Betadine. The mesh is then positioned over the inside of the now closed fascial defect and secured using a spiral tacker. We do not routinely use transfascial sutures to secure the mesh with this procedure. The abdomen is again inspected to ensure hemostasis, and any blood or irrigant is evacuated. All trocar sites are closed with 4-0 Monocryl sutures. The stoma site skin is closed using skin clips. Sterile dressings are applied.

RESULTS

From 2006 to 2009, a total of 24 (13 males) patients underwent laparoscopic loop ileostomy closure. Average age was 63 with an average BMI of 25.9 **(Table 1)**. Eighteen patients (75%) had a planned loop ileostomy for fecal diversion. Twelve of these subjects had a rectal

Table 1.
Demographics

Sex	M 13/F 11
Age	63
BMI	25.9
Albumin	3.2
Length of surgery	79.6

cancer and received neoadjuvant chemoradiation, and had a low (<10cm from the anal verge) anastomosis. The remaining 6 had elective sigmoid colon resection for recurrent diverticulitis, but were felt to be at high risk for anastomotic complications due to nutritional status, comorbidities, or difficulty of dissection. Six (25%) patients underwent an emergent operation for which fecal diversion in addition to colon resection was deemed the best option. These 6 included diagnoses of perforated diverticulitis,[2] obstructing colon cancer, perforated colon cancer, toxic megacolon, and lower gastrointestinal bleeding. A diverting loop ileostomy was done in 2 additional subjects where the initial operative plan did not include fecal diversion. One subject was found to have an anastomotic leak after a stapled colorectal anastomosis, and the other subject had a rectal injury during an attempted transvaginal extraction. The average time interval between loop ileostomy formation and reversal was 135 days. Nine subjects had previous open abdominal surgeries.

Average length of surgery was 79 minutes (range, 48 to 186). Only 4 cases exceeded over 100 minutes. All 4 of these subjects had multiple previous open abdominal surgeries and required significant adhesiolysis at the time of ileostomy reversal. Despite the extensive adhesiolysis required, these 4 cases were completed without conversion to an open approach and did not require extension of the peristomal fascial incision. When these 4 cases are excluded, our average operating time was 64 minutes. Significant also is our practice of performing an intraoperative colonoscopy on all ileostomy closures. Six subjects were found to have a stricture on preoperative barium enema and were managed by intraoperative colonoscopy and balloon dilation.

No cases required conversion to laparotomy or extension of the fascial incision at the ileostomy site. Average length of hospital stay was 4 days. Return of bowel function, evidenced by passage of flatus or bowel movement, occurred on average on postoperative day 3.6. We routinely close the skin over the ileostomy site, and even with mesh reinforcement of the fascial closure, had no wound infections.

Table 2.
Complications

Complication	Number
Major	
Anastomotic Dehiscence	1
Stoma site hernia	1
Minor	
Urinary Retention	2
Atrial Fibrillation	1
Ileus	2
Re-operations	3

Patients were seen in follow-up at 1 month, 3 months, and then 1 year. Our total complication rate was 29% (n=7) and reoperation rate of 12.5% (n=3) **(Table 2)**.

Four subjects had minor complications, which included 2 patients with ileus that resolved without surgical intervention, an episode of atrial fibrillation, and urinary retention. One major complication, and anastomotic dehiscence, occurred in one patient. This required emergent open exploration, bowel resection, and re-creation of intestinal continuity. One patient was found to have an incisional hernia at the former stoma site at 1-year follow-up and had an uncomplicated elective repair. There were no postoperative bowel obstructions, deaths, or wound infections.

DISCUSSION

It is common practice among many surgeons to utilize fecal stream diversion by using a loop ileostomy. Many methods of ileostomy reversal have been described in the literature. We have described a single-center experience with laparoscopic ileostomy reversal.

Although ileostomy reversal is a common operation, the complication rate is significant. The rate of wound infection in ileostomy reversal has been reported as high as 40%.[6,7] Considering the frequency at which diverting ileostomy is used, methods to reduce the rate of wound infection are of paramount importance. We had no wound infections in our population. We have our patients adhere to a clear liquid diet 1 day prior to surgery. All patients receive 1 dose of preoperative antibiotics. We suture the ileostomy spout closed before beginning the procedure and exclude the spout from the sterile field. These prac-

tices are common in many surgical practices. We attribute our low infection rate success to our laparoscopic approach. By definition, ileostomy reversal is a contaminated procedure, thus the reported wound infection rate is not surprising. We perform laparoscopic adhesiolysis and mobilization of the small bowel to the point of having only the mucosa-skin interface of the ileostomy spout as the tethering point. The circumstomal incision is not made until adhesiolysis is done and the bowel fully mobilized. This results in less manipulation of the stoma and less trauma to the abdominal wall when the circumstomal incision is made and the ileum is mobilized through the fascial opening. We feel this results in less contamination of the wound and contributes greatly to preventing postoperative wound infection.

There is debate about primary versus delayed primary or secondary closure of the stoma site, with varying results even in randomized studies. In general, primary closure of the stoma site has resulted in increased wound infection rates. However, Lahat et al[6] demonstrated with a randomized study that there was no significant difference between primary closure versus delayed primary closure of the stoma site. Wound infection increases the cost associated with ileostomy reversal and prolongs hospital stays. We also feel that delayed primary closure or closure by secondary intent places an undue burden on the patient, and increases utilization of nursing care, both while in the hospital and home health services. Thus, we elect to close the stoma site at the time of reversal. Our infection rate was zero; thus, we feel primary closure of the stoma site can be done safely with laparoscopic ileostomy reversal.

Our mean operating time was longer than what is reported in the literature.[8–11] Miyano et al[8] reported a technique of laparoscopic-assisted ileostomy reversal in children with an average operating time of 23 minutes. Pokorny et al,[9] Mansfield et al,[10] and Hasegawa et al[11] report open ileostomy reversal with operative times ranging from 35 minutes to 60 minutes. When the 4 subjects from our population who had multiple open operations are excluded, our average operating time was 64 minutes, which is closer to reported ranges. Significant also is our practice of performing an intraoperative colonoscopy on all ileostomy reversals, which was not routinely done in the above-mentioned published reports. We feel that performing a colonoscopy allows for evaluation and intervention, if needed, of the colonic anastomosis. If we were to exclude the colonoscopy from the procedure, our operating times would be equivalent to the operative times reported in the literature. While our operating times may be longer than those in other published reports, the benefit of an intraoperative colonoscopy and the tradeoff of a thorough adhesiolysis in preventing wound infections and postoperative bowel obstruction are well worth the extra time.

Most investigators recommend an interval of at least 7 weeks to 12 weeks between ileostomy formation and reversal. This is to allow recovery from the initial surgery or inciting event as well as to lessen adhesions and edema.[2] Our time to reversal was longer than that in most reports. It is difficult to assess a benefit to early ileostomy reversal from the literature. However, Mansfield et al[10] demonstrated increased complication rates associated with earlier reversal of ileostomy. Our approach to reversal was to allow sufficient recovery time between the initial operation and reversal. A total of 6 subjects underwent diverting ileostomy as part of an emergency operation. These subjects presented with sepsis and severe debilitation from perforating colon cancer, diverticulitis, and a malignant colonic obstruction. Their subsequent hospital course and post discharge recovery was challenging. Eight subjects had neoadjuvant chemoradiation, and 7 had postoperative chemotherapy. We allow at least 8 weeks between initial operation and completion of adjuvant therapies to improve functional and nutritional status. We have also found that with a longer delay, the adhesions are less dense at the time of reoperation. No subjects had prereversal complications, such as dehydration and electrolyte abnormalities; thus, there was no disadvantage to waiting longer to reverse the ileostomy. Extending the time to ileostomy reversal allows the patient to fully recover from the initial surgery and associated events, complete adjuvant therapy, improve their nutritional status, and allows time for the adhesions to become less dense. We feel this is better for the patient and contributes greatly to our results.

Overall complication rates after ileostomy reversal range between 10% to 33%, with an all-cause reoperation rate of up to 12.5%.[10] Complications have been shown to be higher in subjects with increasing age, multiple comorbidities, and whose stomas were created as part of an emergency operation.[10] Our overall complication rate was within the range reported in the literature. Most of our complications were minor and were managed with no operative or medical therapy. Our reoperation rate was also within ranges reported in the literature, although at the higher end of that range. Despite prophylactically reinforcing the stoma site with a coated mesh, we had 2 occurrences of incisional hernia at the former stoma site at 1-year follow-up. An ostomy is by definition a controlled hernia. It has been proven that hernias >4cm should be repaired with mesh as opposed to primary closure. Wound infection certainly predisposes to fascial dehiscence thus hernia formation. We had no wound infections

at the former stoma site. We also found no correlation between preoperative diagnosis, comorbidities, or use of adjuvant chemotherapy, and stoma-site hernia formation. We thus attribute these hernias to technical errors. One subject had a devastating anastomotic leak, resulting in intraabdominal sepsis and a very prolonged hospital course. This subject had a complex surgical history complicated by an anastomotic leak after previous colorectal surgery resulting in intraabdominal sepsis. Despite a prolonged interval from ileostomy formation to reversal, this subject was functionally and nutritionally debilitated from her previous postsurgical course. We found no correlation between preoperative diagnosis and complication. We did find a low albumin level (<2.8) in all subjects who required reoperation.

Postileostomy reversal bowel obstruction rates are reported to be as high as 15%.[5] The definition of bowel obstruction and technique of ileostomy closure varies across studies, leading to methodological difficulties in examining this complication. Most episodes of postoperative obstruction in the literature are managed conservatively, but the reoperation rate is not insignificant. Return of bowel function amongst our subjects occurred on average between postoperative day 3 to 4, with a mode of 2 days. Two subjects had delayed return of bowel function, with return of full bowel function at postoperative day 6 and 7. No subjects required reoperation for obstruction. We attribute this to our technique. By performing a wide lysis of adhesions, potential sources of obstruction are eliminated. When done via a strictly open approach, mobilizing the ileostomy is often a blind procedure. With laparoscopy, we can address any adhesions that may become points of obstruction. We can manipulate the bowel with less trauma, which we also feel contributes to earlier return of bowel function. There is no consensus as to whether the ileostomy should be closed by stapled or hand-sewn technique. We elect to perform a limited enterectomy with a stapled side-to-side anastomosis. This creates a widely patent ileoileostomy, less likely to obstruct as a result of luminal narrowing or anastomotic edema, also contributing to early return of bowel function.

CONCLUSION

Ileostomy for fecal stream diversion is common practice. Ileostomy reversal is a common procedure but associated with significant morbidity. We have presented our method of laparoscopic approach to ileostomy reversal. A thorough, well-visualized lysis of adhesions and mobilization of the stoma and surrounding small bowel is the main advantage of our approach. We have demonstrated no wound infections and no reoperation for bowel obstruction, which we feel is a direct advantage of our technique. Compared with reports of open ileostomy reversal, we have also demonstrated equivalent results with complication rates, and return of bowel function. We were able to perform ileostomy reversal by our technique, including intraoperative colonoscopy, in comparable time as well. This was a small retrospective case review, and the potential to lower the significant morbidity associated with this common procedure warrants further evaluation.

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