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Minimal Access Laparoscopic Surgery for Treatment of Ulcerative Colitis and Familial Adenomatous Polyposis Coli in Children and Adolescents

Lena Perger, MD,[1] Danny C. Little, MD,[1] Oliver J. Muensterer, MD, PhD,[2] Albert J. Chong, MD, MPH,[3] Vincent E. Mortellaro, MD,[4] and Carroll M. Harmon, MD, PhD[4]

Abstract

Background: Laparoscopic restorative proctocolectomy is standard surgical treatment for patients with ulcerative colitis (UC) and familial adenomatous polyposis coli (FAP). Scar burden can be minimized by reducing the number of laparoscopic ports. The aim of this study is to review the authors' experience with reduced-port laparoscopy in this setting and to compare it with conventional laparoscopy using multiple ports.

Materials and Methods: Charts of pediatric patients undergoing colectomy for UC or FAP between 2009 and 2012 were retrospectively reviewed. Patients who had the operation performed through one or two multichannel ports were assigned to the minimal access (MA) study group. Patients who had four or five single-channel ports with or without an additional small laparotomy were assigned to the LAP group.

Results: Twenty-two patients were identified. Ages at first operation were 2–18 years (median, 13.5 years). There were no conversions to laparotomy and no mortality. Mean operative times for the MA and LAP groups, respectively, were 250 and 284 minutes for abdominal colectomy with end ileostomy ($P=.15$), 198 and 301 minutes for completion proctectomy with diverting loop ileostomy (DLI) ($P=.26$), and 455 and 414 minutes for proctocolectomy with ileal pouch–anal anastomosis and DLI ($P=.72$). A major complication requiring laparotomy occurred in 1 patient (9%) in the MA group and in 2 patients (18%) in the LAP group.

Conclusions: Minimal access laparoscopic surgery for UC and FAP is safe and feasible. A slightly larger incision at the ostomy site facilitates extraction of the specimen and extracorporeal construction of a J-pouch. Operative times and hospital stay are comparable to those with multiport laparoscopy.

Introduction

Laparoscopy has become the standard of care in adult and pediatric colorectal surgery for a variety of diseases. In ulcerative colitis (UC), laparoscopy compares favorably with open surgery in the adult population, with a lower rate of postoperative complications, less blood loss, less thromboembolism, faster return of bowel function, and shorter hospital stay.[1–3] This is in addition to the established advantages of laparoscopy over open surgery in terms of reduced pain and improved cosmesis. In children with medically refractory UC, total proctocolectomy (TPC) with ileal pouch–anal anastomosis (IPAA) is the procedure of choice. In severely symptomatic children with profuse bleeding and nutritional deficiencies, a staged approach is preferred with total abdominal colectomy (TAC) and end ileostomy, followed by delayed proctectomy and IPAA once patients have clinically improved. Laparoscopic TPC IPAA is becoming the preferred treatment over open surgery for patients with familial adenomatous polyposis coli (FAP).[4] Laparoscopic restorative proctocolectomy data for the pediatric population appear to be comparable to those for open procedures.[5–8]

In an attempt to decrease surgical trauma, scarring, and trocar-related complications even further, minimally invasive surgeons are striving to minimize the number of laparoscopic ports. Single-incision laparoscopic surgery is being rapidly adopted for a variety of procedures, including appendectomy, cholecystectomy, urological and gynecologic

[1]McLane's Children's Hospital at Scott & White, Texas A&M College of Medicine, Temple, Texas.
[2]Weill Cornell Medical College, New York, New York.
[3]Kaiser Permanente Medical Center, Oakland, California.
[4]Children's Hospital of Alabama, University of Alabama at Birmingham, Birmingham, Alabama.

procedures, splenectomy, and bowel resections. The first two single-incision total colectomies were reported in 2010,[9,10] and since then several case reports and small series have been published.[11–14] Out of 26 patients collectively reported in the current literature, only two were adolescents (13 and 17 years old).

We incorporated single-incision laparoscopy into our pediatric surgery practice in 2009, and it has since become routine for all basic laparoscopic procedures, as well as in advanced cases like various intestinal resections. In the case of colectomy for UC and FAP, we prefer to place an ileostomy, either an end ileostomy with TAC or a diverting loop ileostomy (DLI) with IPAA. The ostomy site can be used for placement of a multichannel laparoscopic port. Keeping in consideration that the umbilicus is a natural scar that hides a small surgical scar very well, we initially used an additional umbilical trocar. After experience obtained from initial port reduction to two, we took the next step and performed surgeries using only a single multichannel trocar at the ileostomy site, avoiding the umbilical incision. The purpose of this study is to report the authors' initial experience with minimal access laparoscopic TPC IPAA in pediatric patients with UC or FAP, using one or two port sites, and compare it with the same procedures performed with multiport laparoscopy, with or without an additional small laparotomy.

Materials and Methods

After approval by the Institutional Review Board, we performed a retrospective chart review of all patients who underwent total colectomy at Children's Hospital of Alabama (Birmingham, AL) from June 2009 to November 2012 for diagnoses of UC or FAP. Patients whose laparoscopic procedures were performed through one or two port sites were assigned to the study group (minimal access [MA] group), and patients whose procedures were performed through multiple trocars with or without an additional small laparotomy (Pfannenstiel incision for external construction of J-pouch) were assigned to the control group (laparoscopic [LAP] group). Surgeon preference determined which approach was used. Additional minimal access laparoscopic colectomies performed by surgeons trained at Children's Hospital of Alabama, who have moved and incorporated single-incision techniques into practice at their new institutions, were added to the MA group after approvals by Institutional Review Boards of all involved institutions.

Recorded variables were demographic (age and sex), anthropometric (weight), disease related (diagnosis, medications before, at the time, and after surgery, and indication for surgery), operation related (training level of operating surgeons, type of operation, operative time, estimated blood loss, technical details, ports used, and intraoperative complications), and postoperative (length of stay, complications requiring medical or surgical intervention, and number of bowel movements at last follow-up).

A t test was used to compare operative time, estimated blood loss, and length of stay between the MA and LAP groups for each of the following procedures:

- TAC with end ileostomy
- completion proctectomy with IPAA and DLI
- TPC with IPAA and DLI.

Each group was described with means (standard deviation), and significance was set at a value of $P < .05$.

Results

Study population, diagnoses, and operations performed are described in Table 1.

Preoperative

All patients with UC have failed medical management with steroids and at least one anti-tumor necrosis factor-α antibody biologic therapy. At the time of surgery, 71% of UC patients were on steroid therapy, and 86% underwent a staged procedure (TAC with end ileostomy, followed by completion proctectomy with IPAA after being weaned off steroids and/or nutritionally improved). All FAP patients underwent TPC IPAA in one setting. The most common indication for operation in the UC group was bleeding, followed by intractable diarrhea, abdominal pain, failure to thrive, and iatrogenic Cushing's syndrome. In the FAP group, all colectomies were performed electively for cancer prophylaxis.

Operative

Sixty-four percent of operations were performed by pediatric surgery fellows, and 36% were done by pediatric surgery attending surgeons. For minimal access procedures, different commercially available multichannel ports were used according to surgeon preference. Standard nonarticulating 5-mm laparoscopic instrumentation was used. LigaSure™ (Covidien, Mansfield, MA) or Enseal™ (Ethicon, Blue Ash, OH) was used to divide the mesocolon, depending on institutional affiliation. Distal transection of the rectum was performed on the outside by eversion and application of a linear stapler just proximal to the dentate line. To achieve complete resection, the staple line was retracted with Allis clamps, and another firing of the linear stapler was used if

TABLE 1. COMPARISON BETWEEN MINIMAL ACCESS AND LAPAROSCOPIC STUDY GROUPS

	MA group (n = 11)	LAP group (n = 11)
% male	64	64
Age (years)	11.5 (2–18)	12.4 (6–18)
Weight (kg)	49.2 (15–104.7)	60 (25.6–129.2)
Diagnosis UC:FAP	8:3	6:5
Procedure		
TAC, end ileostomy	7	4
Proctectomy, IPAA, DLI	6	3
TPC, IPAA, DLI	4	7
TPC, IPAA, without DLI	0	1
Complications		
Major	2	2
Minor	3	0

Age and weight are expressed as mean (range) values

DLI, diverting loop ileostomy; FAP, familial adenomatous polyposis; IPAA, ileal pouch–anal anastomosis; LAP group, laparoscopic group; MA group, minimal access group; TAC, total abdominal colectomy; TPC, total proctocolectomy; UC, ulcerative colitis.

TABLE 2. OPERATIVE TIME, LENGTH OF STAY, AND ESTIMATED BLOOD LOSS BETWEEN MINIMAL
ACCESS AND LAPAROSCOPIC GROUPS

Procedure, parameter	MA group	LAP group	P
TAC, end ileostomy			
Operative time (minutes)	250 (182–369)	284 (172–495)	.69
EBL (mL)	39 (4.5–80)	43 (23–50)	.74
LOS (days)	5 (2–9)	20 (6–40)	.15
Proctectomy, IPAA, DLI			
Operative time (minutes)	198 (127–275)	301 (203–428)	.26
EBL (mL)	53 (25–100)	50	.78
LOS (days)	3.5 (1–6)	7 (6–8)	.009
TPC, IPAA, DLI			
Operative time (minutes)	455 (289–608)	414 (190–677)	.72
EBL (mL)	131 (50–250)	183 (10–800)	.70
LOS (days)	7 (5–8)	12.5 (4–35)	.26

Data are mean (range) values.
DLI, diverting loop ileostomy; EBL, estimated blood loss; IPAA, ileal pouch–anal anastomosis; LAP group, laparoscopic group; LOS, length of stay; MA group, minimal access group; TAC, total abdominal colectomy; TPC, total proctocolectomy.

needed to get low enough. The J-pouch IPAA configuration was used in all cases. In the MA group, the terminal ileum was externalized through the right lower quadrant port/ileostomy site, and in the LAP group it was done through a small Pfannenstiel incision. The J-pouch was constructed on the outside using an endoscopic stapler. IPAA was performed with a circular stapler in 86% of patients and was hand-sewn in 3 patients because of size limitations or because of surgeon preference. In a patient requiring a redo IPAA due to a retained symptomatic rectum, the circular stapler was used for the first operation, and the second IPAA was hand-sewn.

There were no intraoperative complications, no conversions to the open procedure, and no mortality. Comparisons of operative time, length of stay, and estimated blood loss are shown in Table 2.

Postoperative

All patients were managed with morphine patient-controlled analgesia for postoperative pain control. Complications requiring surgical correction occurred in 5 patients (42%) in the MA group: 3 required local revisions without making additional incisions (ileostomy malfunction, circular staple line dehiscence, and rectovaginal fistula), 1 required multiport laparoscopy (retained rectum with persistent bleeding and pain), and 1 required laparotomy (obstruction with perforation at DLI). In the LAP group, 2 patients (20%) experienced major surgical complications and required a laparotomy (both bowel obstructions requiring lysis of adhesions and revision of the ileostomy).

Twenty-one percent of the UC patients and none of the FAP patients suffered from pouchitis requiring antibiotics and anti-inflammatory therapy with mesalamine. Bleeding resolved in all patients, and all were able to wean off steroids. At follow-up, 18% of patients were on loperamide. All were fecally continent. The number of bowel movements per day ranged from three to eight, with a median of five.

Discussion

The important role of laparoscopy in adult population with UC is well established and has become the standard of care.[15]

Data for the pediatric population are less extensive, but Sheth and Jaffray[7] found laparoscopy comparable to laparotomy in terms of operative time and postoperative complications, while decreasing the length of stay and blood loss. Linden et al.[8] reported an equivalent length of stay for laparoscopic compared with open restorative proctocolectomy, whereas the rate of postoperative small bowel obstruction was significantly less in their laparoscopic group, and the operative times were longer for laparoscopy. In females, laparoscopic IPAA reduces the rate of infertility due to pelvic adhesions,[16,17] which is an important advantage in the pediatric population. In summary, the available literature supports the use of laparoscopy for restorative proctocolectomy in adult and pediatric populations with UC and FAP.

This study retrospectively reviews the authors' initial experience with reduced-port laparoscopic surgery for restorative proctocolectomy with IPAA in pediatric populations with UC or FAP. Costedio et al.,[18] in an adult study similar to ours, reported comparable short-term outcomes of reduced-port versus conventional laparoscopic TPC and ileal J pouch–anal anastomosis, with less blood loss and shorter operative times in the reduced-port group. They used a drain site in the left lower quadrant for an additional 5-mm port. We prefer not to leave drains after IPAA but did use an additional umbilical port at first to improve triangulation. After our initial experience, we transitioned to a single multichannel port at the ileostomy site in the right lower quadrant with a decrease in operative time over the course of the series.

Benefits of single-incision laparoscopy may not be confined to cosmesis. Multiple meta-analyses comparing single-incision versus traditional laparoscopy in common procedures like appendectomy and cholecystectomy do not consistently demonstrate benefits outside cosmesis,[19,20] but some meta-analyses were able to demonstrate decreased postoperative pain[21,22] and earlier discharge.[22,23] Potential benefit is avoidance of trocar injuries. These are rare and not amenable to quantification in present comparative studies, but placement of a single port with direct visualization and open entry into the peritoneal cavity does make such injuries practically impossible. The only drawback that has been demonstrated fairly consistently by

multiple studies is increased operative time with single-incision laparoscopic surgery. However, in the field of colon surgery, single-incision laparoscopic colectomy offered multiple benefits over multiport laparoscopic colectomy in a recent meta-analysis of adult studies, including shorter length of stay, shorter incision length, and less blood loss, while not differing in rate of complications or operative time.[24] In our study, operative times and length of stay did not significantly differ between the two groups.

Weaknesses of our study are its retrospective nature and small sample size. Nevertheless, it does provide encouragement to continue with the single-incision laparoscopic technique for restorative proctocolectomy, as it appears safe and comparable to the multiport conventional laparoscopic technique. Unfortunately, because of the inability to accurately retrospectively quantify postoperative pain medication use from charts, this aspect is not addressed in our study, even though it would provide important information to compare between groups.

Disclosure Statement

No competing financial interests exist.

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Address correspondence to:
Lena Perger, MD
Department of Surgery
Scott & White Hospital
2401 South 31st Street
Temple, TX 76508

E-mail: lperger@gmail.com