

## ORIGINAL RESEARCH

# Laparoscopic Surgery for Inflammatory Bowel Disease—The Experience in China

Yi Han, MD, Mou-Bin Lin, MD, Yong-Gang He, MD, Hao-Bo Zhang, MD, Ya-Jie Zhang, MD, Lu Yin, MD

Department of general surgery, Ruijin hospital affiliated Shanghai Jiaotong University school of medicine, Shanghai, China

### ABSTRACT

**Background:** The incidence of inflammatory bowel disease (IBD) has risen rapidly in China over the last 15 years. Increasing numbers of people with IBD require surgery during their lifetime, but few reports of IBD in Eastern populations have been described to date. The aim of this study was to assess the short-term effects of the laparoscopic surgery for IBD in Chinese patients. **Materials and methods:** From February 2010 to March 2012, 35 patients with IBD underwent laparoscopic operations and the clinical data obtained for these patients were reviewed. **Results:** Patients with Crohn's disease (CD) ( $N = 21$ ) and ulcerative colitis (UC) ( $N = 14$ ) underwent laparoscopic surgery. In the CD group, the mean age was 37.4 years. Two patients (9.5%) required conversion to an open procedure. The median length of postoperative hospitalization was 9 (7–40) days. Overall morbidity was 26.3% and no patients required re-operation. In the UC group, the mean age was 55.2 years. The conversion rate was 14.3% (2/14). The median time to regular diet was 4 (3–10) days and the median length of postoperative hospitalization was 8 (7–25) days. Four patients developed postoperative complications and one patient developed ileostomy retraction requiring urgent operative intervention to rebuild the stoma. **Conclusions:** Laparoscopic surgery in patients with IBD can be accomplished safely and with reasonable operative times, conversion rates and morbidity rates. The main advantages of the laparoscopic approach are rapid recovery, improved cosmesis, less postoperative pain, and patient satisfaction.

**Keywords:** inflammatory bowel disease; laparoscopy; complications; outcome; Crohn's disease; ulcerative colitis

### INTRODUCTION

Inflammatory bowel disease (IBD) comprises Crohn's disease (CD), ulcerative colitis (UC), and indeterminate colitis (IC) [1, 2]. The mainstream treatment for IBD is medical therapy. Surgery is undertaken only in cases of medication-resistant IBD or in the event of complications such as perforation, bowel hemorrhage, and development of strictures and fistulas. In China, the incidence of IBD has increased rapidly in the last 20 years. Epidemiological data has shown a 3- to 8.5-fold increase since the 1990s in Asian areas, including China [3]. For those afflicted with CD, almost 75% will require surgery during their lifetime and the rate of reoperation exceeds 45% [4]. Furthermore, restorative proctocolectomy is a curative treatment for those with medication-resistant UC [5].

Laparoscopic techniques have evolved rapidly over past decades. Compared with open surgery, minimally invasive colorectal procedures have been shown to have better outcomes, such as faster recovery, improved cosmetic results and less postoperative pain. Currently, laparoscopy is a proven and often preferred approach to even the most complex operative problems. Since the first case series of laparoscopic ileo-colectomy for CD was reported in the early 1990s [6], several reports describing the laparoscopic approach to the treatment of IBD have demonstrated significant short-term benefits compared with open surgery [7]. However, few studies have focused on the feasibility of minimally invasive approaches to IBD management in Eastern populations. The aim of this study was to assess the surgical details, perioperative management, and short-term effects of the laparoscopic approach

Received 6 June 2012; accepted 18 September 2012.

Address correspondence to Lu Yin, Department of general surgery, Ruijin hospital affiliated Shanghai Jiaotong University school of medicine, No.197, Ruijin Er road, Shanghai, China. E-mail: yindalu@yahoo.com.cn

to the management of IBD in a single center in China.

## MATERIALS AND METHODS

We performed a retrospective descriptive study of 35 consecutive patients with a preoperative diagnosis of IBD who underwent a laparoscopic operation at our institution between February 2010 and March 2012. Diagnosis of IBD [8–10] was achieved preoperatively by physicians based on a combination of standard laboratory tests, serological biomarkers, small bowel CT scans and gastrointestinal endoscopy with biopsies.

Indications for elective surgery consisted of medication-resistant IBD (inadequate control of symptoms despite optimal medical management), complications such as bowel hemorrhage, strictures, chronic perforation with abdominal fistula, abscess, inflammatory mass, and the occurrence of polyps associated with risk of malignancy.

### Preoperative Preparation

Polyethylene glycol electrolyte solution and oral antibiotics (metronidazole, 2 g; Gentamicin, 400,000 unit) were administered one day prior to operation for bowel preparation. Prophylactic antibiotics (cefuroxime, 2.25 g) was administered intravenously just before operation. For patients with severe malnutrition, parenteral nutrition, and human albumin were used preoperatively. For patients with severe anemia, blood transfusion was administered.

### Surgical Procedures

For patients suffering from CD, we performed small bowel/ileocolic resections or partial colectomy with extracorporeal anastomosis according to the location of lesions.

For patients afflicted with UC, we performed a single stage procedure consisting of laparoscopic restorative proctocolectomy (LRPC), ileal J-pouch-anal anastomosis (IPAA) and protective ileostomy. Ileostomy closure was performed from three to six months postoperatively.

All patients underwent general anesthesia.

### Creation of the Primary Trocar

We used an open access technique [11] for the primary trocar with a blunt-tipped trocar to minimize the potential for injury to internal structures such as fragile or inflamed bowel, inflammatory masses, and adhesions.

### Surgical Technique: Small Bowel/Ileocolic Resections and Partial Colectomy

Patients were placed in a horizontal position. Typically, four ports were used: one in the umbilicus as the camera port in the open access technique, two in each lower quadrant and one 12 mm surgical port in the upper left quadrant. Mobilization of the small bowel and/or the ileocecal region, right colon (the left colon or transverse colon in partial colectomy) was performed laparoscopically and subsequently, the bowel was exteriorized through a small abdominal incision. The resection and anastomosis, as well as complete examination of the small bowel for additional areas of disease, were then performed extracorporeally.

### Surgical Technique: LRCP and IPAA Procedures

Patients were placed in a modified lithotomy position with the head tilted downward. Five ports were used: a camera port was created in the supraumbilical region and the laparoscope was inserted via this port, three 5-mm surgical ports were created in the upper right, upper left, and lower left abdominal quadrants and a 12-mm surgical port was created in the right lower quadrant. After completing mobilization of the colon, the ileocecal region and the rectum, a circumferential incision of the distal rectum at the level of dentate line was completed transanally. Subsequently, a small Pfannenstiel incision was made and after extracting and resecting the specimen via the incision, the ileal J-pouch was created extracorporeally through the incision using a stapler (Ethicon, PROXIMATE® Linear Cutter 100, Shanghai, China). After replacing the pouch into the abdominal cavity, a circumferential, hand-sewn, end-to-end pouch-anal anastomosis was created transanally. A temporary protective ileostomy is always sited in the location of right lower trocar.

Conversion was defined by creation of a larger incision than initially planned or one that was made earlier than usual in a laparoscopy-assisted resection.

## RESULTS

Thirty-five patients underwent laparoscopic operations for IBD at our institution during February 2010 to March 2012. Patients with final diagnoses of CD ( $N = 21$ ) and UC ( $N = 14$ ) and are considered separately.

### Crohn's Disease

Demographic and operative data for the 21 CD patients are presented in Table 1. The mean age at the time of operation was 37.4 years, the median BMI was 21.5 kg/m<sup>2</sup>

TABLE 1 Demographic and perioperative data

	CD	UC
Mean age at operation	37.4 ± 13.1 years	55.2 ± 5.0 years
Gender (male:female)	12:9	10:4
Median body mass index	21.04 (17.3–25.5) kg/m <sup>2</sup>	22.7 (20.3–25.9) kg/m <sup>2</sup>
Median time from diagnosis to operation	2 (1–11) years	5 (1–12) years
Indication for surgery		
Chronic perforating complications (abscess/mass/fistula)	14	–
Stricture	3	–
Obstruction	3	–
Medication resisted	–	11
Others	1	3
Median operative time	125 (70–150) min	245 (185–300) min
Conversion rate	9.5%	14.2%
Median estimated blood loss	100 ml	200 ml
Median days to regular diet	6 (4–14) days	4 (3–10) days
Median length of postoperative hospitalization	9 (7–40) days	8 (7–25) days

and the median time from diagnosis to operation was two years. The most common indication for surgery was chronic perforating complications, including abdominal abscesses in nine patients, abdominal inflammatory masses in three patients, and external fistulas in two patients. Other indications were colon stricture in three patients, obstruction in three patients and severe anal fistula in one patient. All of the patients were undergoing active medical therapy and some of the patients received infliximab to control the symptoms before surgery. Only one patient had previously undergone a laparotomy for small bowel resection.

In our group, the median operative time was 125 (70–150) min, the median estimated blood loss was 100 ml, with a maximum estimated blood loss of 400 ml. Two patients converted to open procedure due to extensive abdominal adhesion in one patient and internal fistula between the jejunum and transverse colon in one patient. No patient required narcotics beyond the day of the operation. The median time to regular diet was 6 (4–14) days. The median postoperative hospitalization was 9 (7–40) days.

Nineteen cases of laparoscopy-assisted surgery were performed in 19 patients. The majority of patients ( $N = 10$ ) underwent ileocelectomies and two patients received a protective ileostomy to prevent anastomotic leakage. Six patients underwent small bowel resections and two patients underwent partial colectomy for descending colon stricture. The remaining patient underwent dysfunctioning ileostomy due to severe anal disease.

There were no instances of operation-related mortality. A high incidence (15.8%) of postoperative wound infection was observed among our patients. One patient developed an enterocutaneous fistula which progressed to a spontaneous stoma. One patient developed an intestinal obstruction and was treated conservatively (Table 2). No complications necessitated operative intervention. There were no instances

of anastomotic leakage even in cases where no protective ileostomy was performed.

## Ulcerative Colitis

Demographic and perioperative data for the 14 UC patients are presented in Table 1. The mean age at the time of operation was 55.2 years, the median BMI was 23.2 kg/m<sup>2</sup> and the median time from diagnosis to operation was five years. The most common indication for surgery was medication-resistant UC in 11 patients, followed by fulminating colitis in two patients and risk of malignancy in one patient.

Twelve operations were successfully performed laparoscopically and two of the cases (14.2%) required conversion to open surgery due to an abdominal adhesion and suspected small bowel injury. The median operative time was 245 (185–300) min. The median estimated blood loss was 200 ml, no patient required narcotics beyond the day of the operation. The median days to regular diet was 4 (3–10) days. The median postoperative period of hospitalization was 8 (7–25) days.

There was no operation-related mortality happened. Two patients developed postoperative wound infection and one patient developed intestinal obstruction and was treated conservatively. Ileostomy retraction

TABLE 2 Complications following laparoscopic procedures

Disease	Complication	<i>n</i> (%)
CD	Wound infection	3 (15.8%)
	Enterocutaneous fistula	1 (5.2%)
	Intestinal obstruction	1 (5.2%)
UC	Wound infection	2 (16.7%)
	Intestinal obstruction	1 (8.3%)
	Ileostomy retraction	1 (8.3%)

occurred in one patient and urgent operative intervention was required to rebuild the stoma (Table 2).

## DISCUSSION

IBD has been rare in Eastern populations in the past but is now being reported more commonly [12]. The incidence of IBD has increased by 3 to 8.5 times since the 1990s in Asian areas, including China [3] due to increasing Westernization of diet and social habits and improved diagnosis technology. Nowadays, increasing numbers of people with IBD in China require surgery. For those with medication-resistant UC, restorative proctocolectomy is a curative treatment, but for CD, the objective of surgery is to solve the complications. In our group, chronic perforation, which can result in fistulas, abdominal abscesses and inflammatory masses, was the most frequent indication in CD patients and surgery was the only treatment in these cases. It was consistent with the conclusion of Wang that abscess formation was the most common complication in Chinese patients with CD, which was noted in 27.5% of patients in their study. Most abscesses required treatment with operative drainage and intestinal resection [13]. In contrast, intestinal obstruction was the indication in 73% patients in the report of Nguyen [14] in the United States, abdominal abscess was the indication only in 3% patients. The indications to surgery for UC consisted mainly of medication-resistant and risk of malignancy in our group.

Most IBD patients receive immunosuppressive therapy prior to surgery, which may increase the benefits of less traumatic surgery. Furthermore, many IBD patients are young and a fast return to normal activities, a satisfactory cosmetic result and good body image are important in this group. In our study, the mean age at the time of operation was 37.4 and 55.2 years in CD patients and in UC patients respectively. Laparoscopic operations provide such advantages in addition to lower levels of postoperative pain, which improve patient comfort and satisfaction. Thus, we believe that the promise of superior cosmesis and faster recovery has largely driven the increase in requests for the laparoscopic approach from patients. In our study, patients complained of minimal postoperative pain and did not require narcotics beyond the day of the operation. The median time to regular diet was six days in CD patients and four days in UC patients, the median length of postoperative hospitalization was nine days in CD patients and eight days UC patients, which were shorter than that associated with open surgery [15, 16]. However, the length of postoperative hospitalization was slightly longer than the reports of laparoscopic procedures for IBD in USA [17, 18]. It was the initial experience in laparoscopic procedures for IBD in our hospital. In our group, the incidence of postopera-

tive wound infection was relatively high. For patients with wound infection, dressing change was performed in hospital. Hospital discharge was administered after the wound infection was controlled and the granulation tissue was fresh. Furthermore, discharge from hospital was administered after removing the stitches for patients in this group in order to have enough time to preclude the complications. We think, it is the main reason for the longer hospitalization.

Because of the complex pathological features of IBD, such as increased fragility of inflamed bowel, inflammatory masses, and adhesions, laparoscopic procedures for IBD represent a significant surgical challenge. CD and UC have to be distinguished clearly prior to the application of laparoscopy as the operative procedures differ. The indications for laparoscopic surgery in CD are comparatively broad as only partial bowel resection is required. Early reports [19, 20] of the application of laparoscopy in CD demonstrated its feasibility and short-term benefits for the creation of stomas and for limited segmental bowel involvement. Whereas in UC, restorative proctocolectomy is the standard operation in elective situations [5], ongoing controversy is associated with numerous uncontrolled and controlled studies assessing the safety and efficacy of laparoscopic surgery for UC, especially due to high morbidity rates and problems with bowel function [21, 22].

In our study, the conversion rate (11.4%) was consistent with other reports [17, 23]. Interestingly, only two instances of conversion occurred in those undergoing the LRPC + IPAA procedure, which is the most technically demanding of the operations. It can be speculated that this is because the laparoscopic LRPC + IPAA procedure is used only in patients with no history of surgery and urgent surgery is excluded in our group. For CD patients, abdominal adhesion was not severe in the majority of patients, even those with chronic perforation and abdominal infections. This may be attributed to the long-term use of steroids prior to surgery. Only one patient required conversion due to abdominal adhesion in our study.

The observed complication rate of 29% in our study was similar to other reports [17, 24, 25]. The incidence of wound infection was not reduced (16.1%), but serious complication such as peritoneal abscess, anastomotic leakage, intestinal obstruction which may lead to reoperation was rare, and the reoperative rate of 3.2% was certainly well accepted for these relatively complex patients. The reason for this high incidence of wound infection may be due to the formation of fistulas, abdominal abscesses, and inflammatory masses caused by chronic perforation, which was the most frequent indication in our study and the abdominal incision can be passed through the mass or fistula to avoid a second scar. Furthermore, we observed that most wound infections developed in patients with long-term malnutrition, which can result

in anemia and hypoalbuminemia in the perioperative period. It can be speculated that the absence of complications during the operation was due to the use of a blunt-tipped trocar for the open access technique. This method for creation of the primary trocar minimizes the potential for injury at the start of the operation.

The creation of a protective stoma during laparoscopic surgery for IBD has been identified as a significant predictor of rapid recovery. The presence of a stoma allows early postoperative feeding. However, our study shows the stoma creation was not clearly associated with lower morbidity even though this procedure can offset the impact of anastomotic leakage. Thus, these data do not emphasize the need for a diverting ileostomy in small bowel/ileocolic resections and partial colectomy if the anastomosis is satisfactory.

Several limitations of our study should be noted. The design is retrospective and was conducted in small numbers of patients and therefore, selection bias may have affected the observed outcomes. Furthermore, the laparoscopic technique was not compared with the open approach. Despite these limitations, to the best of our knowledge, our study represents the first case series of IBD patients undergoing laparoscopic surgery in China and reveals some clinical characteristics of IBD in Eastern populations.

## CONCLUSIONS

In summary, laparoscopic surgery in patients with IBD can be accomplished safely and with reasonable operative times, conversion rates, and morbidity rates. Conversion did not adversely affect short-term outcomes. The main advantages of the laparoscopic approach are fast recovery, less postoperative pain, and improved cosmesis, with the majority patients being satisfied with their surgery scar.

## ACKNOWLEDGMENTS

The authors would like to thank Dr Xing-Sheng Lu, Dr Ke-Zhi Lv, Ms Zhi-Li Hua, and Ms Xue-Lei Wu for their participation in the operation.

*Declaration of interest:* The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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