



Laparoscopic ileocecal resection in Crohn's disease

A case-matched comparison with open resection

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Abstract

Background: Despite some encouraging preliminary results, the role of laparoscopic surgery in the treatment of Crohn's disease (CD) is a subject of controversy and still under evaluation. The aim of this case-matched study was to compare the postoperative course of laparoscopic and open ileocecal resection in patients with CD in order to define the potential role of laparoscopic surgery in CD.

Methods: From 1998 to 2001, 24 consecutive patients with isolated Crohn's terminal ileitis treated by laparoscopic ileocecal resection (laparoscopy group) were compared with 32 patients matched for age, gender, duration of disease, preoperative steroid treatment, fistulizing disease, and associated surgical procedure, and treated by open resection (open group).

Results: In the laparoscopy group, four procedures (17%) were converted. There were no deaths. The morbidity rate was 20% in the laparoscopy group and 10% in the open group (NS). There was no significant difference between the two groups in operating time, size of bowel resection and resection margin, postoperative morphine requirement, resumption of intestinal function, tolerance of solid diet, or length of hospital stay.

Conclusions: Laparoscopic ileocecal resection in CD is safe and effective, even for fistulizing disease. There are no significant differences between laparoscopic and open ileocecal resection, especially in terms of the mortality and mortality rates. Consequently, because laparoscopic surgery seems to offer cosmetic advantages, it should be considered the procedure of choice for patients with ileocecal CD.

Key words: Crohn's disease — Laparoscopic surgery — Ileitis — Intestinal resection — Laparotomy

Laparoscopic intestinal resection is now being performed with increasing frequency, especially for benign colorectal disease such as colonic polyps and diverticular disease [20]. In this setting, the laparoscopic approach offers some significant benefits over the traditional open approach [16, 18, 21]. Crohn's disease (CD) represents a more difficult challenge for the laparoscopic approach because of the inflammatory processes associated with CD, such as inflammatory mass, unexpected enteric fistulas, and abscesses, which can make even open surgery challenging. Moreover, the use of the laparoscopic approach for CD requires extensive experience and advanced surgical skills not only in laparoscopic surgery but also in the management of inflammatory bowel disease.

Despite the technical challenge, the theoretical benefits of laparoscopy, such as improved cosmetic results, minimal pain, and an early return to full activity, could be very attractive to young patients with CD. Several reports have shown that laparoscopic ileocolic resection is feasible and safe in selected patients with CD [5, 8–10, 15]. However, although a few comparative studies have been reported, the benefit of laparoscopic vs. open ileocolic resection has not been clearly demonstrated in patients with CD. Indeed, in the only one case-matched comparative study to be published thus far, severity of disease was not included in the confounding criteria, which could bias the interpretation of the results [23]. Furthermore, in the only published prospective randomized study [12], only "good" patients with a low degree of inflammatory process were selected and enrolled after diagnostic laparoscopy, resulting in the selection of a very special subgroup of patients. In addition, because of the exclusion from the analysis of patients converted to laparotomy, all endpoints were not evaluated using an intention-to-treat study design, which could bias the results.

Thus, the aim of this case control study was to compare the postoperative course of laparoscopic vs open ileocecal resection in patients with CD of the terminal ileum according to the severity of disease.

Patients and methods

Patient population

Between February 1998 and June 2001, 24 consecutive patients who underwent laparoscopic ileocecal resection for CD confined to the terminal ileum and cecum, were enrolled in this study (laparoscopy group). All surgery performed was primary surgical intervention for CD. Laparoscopic procedures for the treatment of CD recurrence were not included in this study. Furthermore, patients with preoperative evidence of multiple disease sites were also excluded.

From 1989 to 2001, we prospectively collected specific data on all 140 consecutive patients undergoing primary ileocecal resection for CD to create a database. As previously described [11], each of the patients operated by laparoscopy was matched with identical patients from the database who had been treated with the open conventional technique. In other words, for each patient operated by laparoscopy, one or more individuals from the database of patients treated via the open technique who fulfilled all the confounding criteria were also enrolled in the study. During the selection process, the investigators were blind to the operative morbidity and mortality. The confounding criteria were age, gender, duration of disease, duration of preoperative steroid treatment, disease presentation (fistulizing disease or not), type of surgery (elective or emergency), and associated surgical procedures. Thirty-two patients fulfilled all of the confounding criteria and comprised the control group (open group).

In addition to evaluation by history and physical examination, the preoperative evaluation also included small bowel contrast radiography, colonoscopy, and in most instances computed tomography (CT) scanning. Patients with a preoperative diagnosis of localized abscess were initially drained percutaneously whenever feasible.

Surgical procedure

For the laparoscopic approach, the patient was placed in a modified lithotomy position in steep Trendelenburg position with the left side down. Ports were placed in the umbilical area for the camera and suprapubically and in the left upper quadrant of the abdomen for dissection. In some instances, a fourth auxiliary port was placed in the right upper quadrant for retraction. To exclude other lesions, the small bowel was completely examined from the terminal ileum to the ligament of Treitz using a two-handed technique.

The parietal peritoneum of the ascending colon and hepatic flexure were incised via scissors cautery. By retracting the ascending colon and cecum to the left and incising the surrounding areolar tissue, the mesentery of the right colon and terminal ileum was fully mobilized to the midline. The second and third portions of the duodenum were identified as the mesentery of ascending colon was dissected. Any adherent loops of intestine or sigmoid colon were carefully dissected and examined; if fistulization to normal intestine was present, these fistulas were divided and the normal intestine was sutured either intra- or extracorporeally. Similarly, after dissection, all bladder fistulas were closed with sutures or, if very small, left to heal with 8 days of postoperative catheter drainage. Ileoileal fistulas were incorporated into the resected segments of intestine. A small incision (5–7 cm) was then created as low as possible in the right lower quadrant. The bowel targeted for resection was extracted through the incision, which was protected by a plastic ring drape. Mesentery division, resection of the affected bowel with a 2-cm macroscopically normal margin, and side-to-side hand-sewn anastomosis were performed extracorporeally. The bowel was returned to the abdominal cavity, and the incision was closed in standard fashion.

Conventional surgery was performed using a lower midline laparotomy incision extended up to the umbilicus in all but two cases; in the latter cases, a right transverse laparotomy was preferred. The abdominal wall was protected by a plastic ring drape. Treatment of internal fistulas was similar to the laparoscopic approach. Hand-sewn anastomosis was fashioned in the same manner as for the laparoscopic technique. In both groups, the abdominal cavity was not drained.

Postoperative course

No spinal or epidural anesthetics were used in any case. Every patient was given either patient-controlled analgesia via an infusion pump or

repeated morphine injection. In both groups, the patients were permitted liquid oral intake the day after surgery, unless the patient was nauseated or distended. Solid foods were started when flatus passage was reported. Patients were discharged when they were able to tolerate a regular diet and after complete resolution of any abdominal pain.

Study criteria

The patients were analyzed until the day of discharge. The outcome measures included operating time, conversion rate, intraoperative complications, postoperative complications, death, incision length, postoperative pain (as reflected by narcotic requirement), duration of ileus, resumption of oral intake, length of hospital stay, and return to full activity. Mortality was defined as death occurring in the hospital or within 30 days. Complications were defined as major if they resulted in an increase in hospital stay above the average length of stay for each group or if they posed a potential threat to the patient's vital functions. Complications were considered to be minor when they did not influence the average postoperative length stay for each group. Conversion to open surgery was defined as any unplanned incision or a planned incision that was made longer than necessary for simple exteriorization of the resected specimen and fashioning of the anastomosis. Because it was measured accurately only in the laparoscopic group, the incision length of the two groups was not compared. Return to full activity was assessed by the ability to return to work or (for the youngest patients) to the university. It was assessed in 20 patients in the laparoscopy group and 25 in the open group.

Statistical analysis

Comparisons between the two groups were analyzed by the chi-square test with Yates' correction, the Mann Whitney U test, or the Student *t*-test for quantitative and qualitative variables, as appropriate. Comparison was made in intention to treat. Significance was defined as $p < 0.05$. Statistical analysis was performed using biomedical software (SPSS for Windows 6.0; Microsoft, Chicago, IL, USA).

Results

The characteristics of the patients and their disease are summarized in Table 1. There was no significant difference between the two groups, especially in severity of disease. The surgical procedures performed are shown in Table 2. One patient in each group underwent urgent operation for acute obstruction.

In the laparoscopy group, a conversion to an open procedure was required in four cases (17%). The reasons for conversions were bladder fistula, ileosigmoid fistula requiring sigmoid resection, large inflammatory mass difficult to dissect, and pelvic abscess. Of the four patients who were converted, two benefited in that laparoscopic assessment and mobilization permitted a lower and smaller extraction incision.

Three patients in the laparoscopy group and five patients in the open group underwent a two-stage procedure with a temporary diverting stoma for abscess and fistula. The mean operating time was lower in the laparoscopic group (179 ± 29 min) than in the open group (198 ± 62 min), but the difference was not significant. Two patients (6%) in the open group and none in the laparoscopy group required postoperative blood transfusions (NS). Specimen length was comparable in both groups (37 ± 16 vs. 42 ± 14 cm) (NS). The mean resection margin, as assessed by histological examination, was comparable in both groups (3 ± 1.5 vs. 3.5 ± 2 cm) (NS). The mean size of the extraction wound,

Table 1. Clinical and disease characteristics in 56 patients undergoing primary ileocecal resection for Crohn's disease

	Open group (<i>n</i> = 32)	Laparoscopy group (<i>n</i> = 24)	
Age (years) (yr)	31 ± 10	32 ± 9	NS
Gender (female/male)	17/15	12/12	NS
Body mass index (kg/m ²)	22 ± 3.5	23.5 ± 4	NS
ASA status > 1	3 (9%)	2 (8%)	NS
Previous laparotomy	14 (43%)	13 (54%)	NS
Duration of disease (mon)	66 ± 60	54 ± 49	NS
Preoperative medical treatment ^a			
None	10 (31%)	7 (29%)	NS
Steroids > 6 mon	16 (50%)	15 (62%)	NS
Azathioprin	5 (16%)	3 (12%)	NS
Others	5 (16%)	5 (21%)	NS
Indication for ileocecal resection			
Abscess or fistulas	8 (25%)	9 (38%)	NS
Chronic obstruction	23 (71%)	14 (58%)	NS
Acute obstruction	1 (3%)	1 (4%)	NS
Severity of disease			
Nonfistulizing disease	24 (75%)	15 (62%)	NS
Fistulizing disease ^b	8 (25%)	9 (38%)	NS
<i>Internal fistulas</i>	8	5	
<i>Localized abscess</i>	3	3	
<i>Enterocutaneous fistulas</i>	0	1	

ASA, American Society of Anesthesiologist; NS, not significant

^a Several patients had multiple treatment

^b In the group, some patients had abscess plus fistulas

Table 2. Surgical procedure in 56 patients undergoing primary ileocecal resection for Crohn's disease

	Open group (<i>n</i> = 32)	Laparoscopy group (<i>n</i> = 24)	
Emergency surgery	1 (3%)	1 (4%)	NS
Ileocecal resection			
With anastomosis	27 (84%)	21 (88%)	NS
Without anastomosis	5 (16%)	3 (12%)	NS
Additional surgical procedures	6 (19%)	7 (29%)	NS
Left colonic resection	1 (3.5%)	1 (4%)	NS
Small bowel resection	1 (3.5%)	1 (4%)	NS
Suture of fistulas	2 (6%)	2 (8.5%)	NS
Cholecystectomy	—	2 (8.5%)	NS
Meckel's diverticulectomy	—	1 (4%)	NS
Salpingo-oophorectomy	2 (6%)	—	NS

NS, not significant

including the converted procedures, was 5.8 ± 1.6 cm (range, 4–12) in the laparoscopy group and <6 cm in 19 patients (79%). In the open group, the incision length was not measured; however, a lower midline laparotomy incision extended up to the umbilicus is usually >10 cm in our experience. No intraoperative complications occurred in either group.

There were no deaths. Five patients (20%) in the laparoscopy group and three in the open group experienced postoperative complications (Table 3). In the laparoscopy group, one patient (4%) required reoperation on day 10 for small bowel obstruction. At laparotomy, no anastomotic leak was found and the small bowel obstruction was attributed to small bowel volvulus without intestinal necrosis. After reoperation, the postoperative course was uneventful. In the open group, one patient (3%) had an anastomotic leak and required further surgery on postoperative day 5 for diffuse peritonitis. The anastomosis was removed. The postoperative course was uneventful, and stoma closure was

performed 3 months later. In the open group, another patient had a postoperative intraabdominal abscess that was successfully treated by percutaneous drainage under CT guidance and antibiotic therapy.

Although 1 day shorter in the laparoscopy group, the postoperative mean time to passage of flatus was not significantly different in both groups (Table 4). Similarly, there were no significant difference between the two groups in analgesic use, tolerance of solid diet, or length of postoperative stay. Patients returned to work 22 ± 9 days after operation in the laparoscopy group and 29 ± 15 days in the open group (NS). Furthermore, there were no known readmissions to the hospital in the 1st month after surgery in either group.

When the results were assessed only in the subgroup of patients with an uneventful postoperative course (19 in the laparoscopy group and 29 in the open group), the mean hospital stay was shorter in the laparoscopy group than the open group (6.5 ± 1.5 vs. 8 ± 1.4 days) ($p < 0.01$). There were no significant differences between the

Table 3. Postoperative complications in 56 patients undergoing primary ileocecal resection for Crohn's disease

	Open group (<i>n</i> = 32)	Laparoscopy group (<i>n</i> = 24)	
Major complications	2 (6%)	1 (4%)	NS
Anastomotic leak	1 (3%)	—	NS
Small bowel obstruction	—	1 (4%)	NS
Intraabdominal abscess	1 (3%)	—	NS
Minor complication	1 (3%)	4 (16%)	NS
Wound infection	—	2 (8%)	NS
Wound hematoma	—	1 (8%)	NS
Urinary tract infection	1 (3%)	1 (4%)	NS
Total ^a	3 (10%)	5 (20%)	NS

NS, not significant

^a Some patients had several complications**Table 4.** Postoperative course in 56 patients undergoing primary ileocecal resection for Crohn's disease

Postoperative days ^a	Open group (<i>n</i> = 32)	Laparoscopy group (<i>n</i> = 24)	
Passage of flatus	3.3 ± 3	2.5 ± 0.7	NS
Analgesic requirement	2.2 ± 2	2 ± 0.7	NS
Tolerance to solid diet	3.5 ± 3	2.8 ± 1.4	NS
Hospital stay	8 ± 2	7.7 ± 3	NS

NS, not significant

^a Value are mean ± STD

two subgroups in tolerance of solid diet or passage of flatus (although it was 1 day shorter in the laparoscopy group).

Discussion

The use of laparoscopic methods in CD has been controversial. On one hand, Crohn's surgery can be one of the most challenging areas of intestinal surgery owing to thickened bowel loops, shortened and thickened mesentery, and fistula to uninvolved viscera. On the other hand, patients who suffer from CD are often young and extremely concerned about minimal scarring of the abdominal wall, as well as desirous of a rapid return to full activities.

Our study, which included unselected patients with fistulizing disease, suggests that ileocecal resection for CD can be performed safely via a laparoscopic approach with no mortality and only minimal morbidity. It also confirms the results of previous reported series, which demonstrated the feasibility of laparoscopic ileocolic resection for CD even in the presence of internal fistula, localized abscess, or phlegmons [2, 5, 14, 22]. Our conversion rate of 17% compares favorably with those previously reported (range, 2–40%) [2, 5, 9, 10, 15, 17]. As in other series [2, 10, 15, 17], the mean reasons for conversion in our patients were internal fistulas and extensive inflammation. However, most of our patients with fistulizing disease were managed successfully by the laparoscopic approach. Furthermore, none of the specific complications of the laparoscopic approach, such as bleeding or intestinal injuries, were observed in our converted patients. Therefore, we believe that preoperative selection is unnecessary and that the laparoscopic approach should be attempted in as many patients as possible [22].

Although this study confirms the feasibility of the laparoscopic technique, its relative benefits or disadvantages vis à vis the traditional open approach have not yet been established. First, despite its potential advantages, the laparoscopic approach is justifiable only if the associated morbidity and the mortality are not increased and the quality of intestinal resection is similar. In accordance with previous comparative studies [1, 2, 7, 19, 23], the mortality rate in our series was nil and the major postoperative complication rate was comparable to that seen after open resection. Concerning the quality of resection, as assessed by length of specimen and margin resection, it is not surprising that no significant differences were observed between laparoscopic and open resection because intestinal resection was performed extracorporeally during the laparoscopic procedure.

In contrast with our study, significant advantages such as the earlier resumption of bowel function, earlier tolerance of a solid diet, less analgesic use, and a shorter hospital stay after laparoscopic ileocolic resection for CD have been reported in most of the comparative studies [1, 3, 13, 19, 23]. However, in those series, although the outcome of the laparoscopic groups appeared to be better than the open group, the results are difficult to interpret because of differences in the patient populations [1, 3, 19, 23]. Indeed, the patients undergoing open ileocolic resections often had more severe disease. In addition, the protocol regarding postoperative feeding was not strictly defined and not comparable for the two techniques. The length of hospital stay can be influenced by several factors, such as cultural norms and social pressure. For example, in one study [13], the hospital stay of 8.3 days in the laparoscopic group was significantly shorter than that for the open group but longer than observed in our open group.

Although our study was retrospective, it constitutes, to our knowledge, the first case-matched study in which

severity of disease was included in the confounding criteria; thus, both groups were comparable. This measure ensured the stringency of the conclusions derived from the analysis. In the present study, there were no significant differences between the laparoscopic and open groups in terms of analgesic use, return of gastrointestinal function, length of hospital stay, and return to full activity. It confirms the results previously reported in the only prospective randomized study published to date [12]. Consequently, our results suggest that the laparoscopic approach is at least equivalent to conventional surgical methods in terms of safety and efficacy.

However, it has been reported that cosmesis and body image were better after laparoscopic than open ileocolic resection for CD [1, 3, 7]. In our study, in the laparoscopic group, the transverse 6-cm incision, which was fashioned as low as possible, in the lower right quadrant, seemed shorter and less apparent than the lower midline laparotomy incision required for an open approach. Therefore, because the laparoscopic technique seems to offer cosmetic advantages, we consider it the procedure of choice for the surgical treatment of CD of the terminal ileum and cecum.

Another crucial issue is the potential disadvantages of laparoscopic approach. First, it is important to assess whether a conversion to laparotomy could be deleterious. In accord with previous reported work [12, 17], in our study, all four of the converted patients recovered without complications and were discharged within the first 10 postoperative days. Like other authors [17], we think that there is no harm in an initial laparoscopic attempt if the surgeon does not hesitate to convert to laparotomy rapidly if necessary. With this policy, if conversion is required, colorectal surgery can be performed safely without additional morbidity. The second potential problem with the laparoscopic technique concerns the learning curve [4, 14, 16, 22]. Indeed, it would not be acceptable if the morbidity rate were to increase because a new technology was being developed. One reason for the low conversion rate in our series may be the extent of our prior experience with laparoscopic colorectal surgery before this study began.

In conclusion, this case-matched study showed that there was no difference in postoperative course between laparoscopic and open ileocecal resection. It indicates that the laparoscopic approach for CD is feasible and safe, even for fistulizing disease. In addition, when compared to open resection, laparoscopy not only offers cosmetic advantages but also a possible reduction of intraperitoneal adhesions and incisional hernia in patients exposed to a high risk of iterative surgery.

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