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Laparoscopic Surgery for Patients with Crohn's Colitis: A Case-matched Study

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Abstract

Introduction The purpose of this study was to compare short and long-term outcomes of laparoscopic colectomy with open colectomy in patients with Crohn's disease confined to the colon.

Materials and Methods We reviewed all patients undergoing laparoscopic colectomy for Crohn's disease at our institution between 1994 and 2005. Laparoscopic colectomies were matched to open colectomies by patient age, gender, American Society of Anesthesiologists score, type, and year of surgery. We excluded patients with concomitant small bowel disease.

Results Twenty-seven laparoscopic cases were matched with 27 open cases. There were seven conversions (26%). There was no mortality. Median operative times were significantly longer after laparoscopic colectomy (240 vs 150 min, $P<0.01$), and estimated blood loss was comparable (325 vs 350 ml, $P=0.4$). Postoperative complications were similar. Laparoscopic colectomies had shorter median length of stay (5 vs 6 days, $P=0.07$) and median time to first bowel movement (3 vs 4 days, $P=0.4$). When overall length of stay included 30-day readmissions, the difference in favor of laparoscopy became statistically significant ($P=0.02$). Recurrent disease requiring surgery was decreased after laparoscopy, although median follow-up was significantly shorter.

Conclusion Laparoscopic colectomy is a safe and acceptable option for patients with Crohn's colitis. Longer follow-up is needed to accurately establish recurrence rates.

Keywords Crohn's disease · Laparoscopy · Postoperative complications · Colitis · Colectomy

Introduction

Crohn's colitis is reported in 30–52% of patients with Crohn's disease[1–3] with rates of symptomatic recurrence in the order of 50%.[4] In spite of such a high incidence, the cases of Crohn's disease limited to the colon and rectum requiring abdominal surgery are relatively uncommon.

Increasing experience with laparoscopic colectomy (LC) has shown recovery benefits compared to open colectomy (OC) resulting in shorter hospital stay, more rapid return to bowel function, decreased use of postoperative narcotics, and lower rates of cardiopulmonary and wound complications.[5–7] Moreover, long-term recurrences after laparoscopic ileocolic resection for Crohn's disease were similar to open resections with the added advantage of reduced small bowel obstruction rates.[8,9]

Whereas most data on laparoscopic surgery for Crohn's disease is based on ileocolic disease, data on outcomes of laparoscopic colonic resection in patients with Crohn's colitis is still limited. Therefore, the purpose of this study was to compare open with laparoscopic colonic resections in patients with refractory Crohn's disease confined to the colon with respect to short and long-term outcomes.

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Material and Methods

We reviewed all consecutive patients undergoing elective LC for Crohn's disease of the colon at our institution between 1994 and 2005. Patients were identified from a

Table 1 Demographics and Details of Surgical Procedures

	LC	OC	*P* value
Total patients	27	27	
Age (years)[a]	35.5 (±18.5)	32.6 (±14.2)	0.65
Gender			
Male	15	15	
Female	12	12	1
ASA			
II	19	19	
III	8	8	1
BMI[a]	24.9 (±4.6)	26.7 (±5.2)	0.2
Type of surgical procedures			
Right-side colectomy	1	1	
Left-side colectomy	6	6	
Low anterior resection	1	1	
Total colectomy+IRA	10	10	
Total colectomy+EI	4	4	
Total proctocolectomy+EI	4	4	
Proctocolectomy IPRA	1	1	1
Previous surgery[b]	1	5	0.08

LC Laparoscopic colectomy, *OC* open colectomy, *IRA* ileorectal anastomosis, *EI* end ileostomy, *IPRA* ileal pouch-rectal anastomosis, *NS* not significant

[a] Mean (standard deviation)

[b] Details of specific surgical procedures in text.

prospective, IRB-approved institutional Crohn's disease database. LC cases were computer-matched to OC by patient age (±5 years), gender, American Society of Anesthesiologists (ASA) physical status classification, type of surgical procedure, and year of surgery (±3 years). Patients with concomitant small bowel disease or indeterminate colitis were excluded from the analysis. Both cohorts were compared for operative time, estimated blood loss (EBL), time to return to bowel function through anus or stoma, length of hospital stay, readmissions within 30 days of discharge, morbidity, mortality, and Crohn's disease recurrence episodes during follow-up. We defined postoperative ileus as a period of transient cessation of bowel function lasting longer than 5 days after surgery. Other data included demographics, duration of disease, medication use, and indication for surgery. Recurrence was defined as any endoscopic or radiological evidence of active Crohn's disease requiring medical or surgical treatment. Recurrences requiring surgery vs medical treatment were recorded separately. Data from the approved database were supplemented by direct chart review as necessary. Six and eight different colorectal surgeons performed LC and OC cases, respectively, during the study period. The discharge criteria were similar in both groups and included tolerance of three meals without nausea or vomiting, passage of flatus or stoma function, adequate pain control with oral analgesia, and independent ambulation. An intention-to-treat analysis was performed including, in the same group, all surgical procedures initiated laparoscopically whether they were completed laparoscopically or converted to open.

Statistical Analysis

Comparisons of the LC and OC groups were performed using chi-square or Fisher exact tests with respect to categorical data and using the Wilcoxon rank sum test with respect to quantitative data. The comparison with respect to recurrence was performed using a log-rank test with the Kaplan–Meier method used to estimate recurrence time. Parametric data were reported as means and nonparametric data as medians. A level of $\alpha=0.05$ was used to establish statistical significance of individual *P* values.

Results

Twenty-seven LCs were matched with 27 OCs. Thirty patients were males (56%). Groups were well matched for age, gender, ASA, BMI, and surgical procedures as shown in Table 1. Eight patients in each group had significant comorbidities (ASA III). Among these, five LC patients had cardiovascular disease, one insulin-dependent diabetes mellitus, one deep venous thrombosis, and one severe immunosuppression. With regard to the OC group, five patients had severe cardiovascular disease, one severe chronic obstructive pulmonary disease, and two insulin-dependent diabetes mellitus. A total of six patients had undergone previous abdominal surgical procedures (Table 1), involving either a single abdominal quadrant or a limited intra-abdominal area. In particular, one patient from each group had undergone creation of diverting loop ileostomy, which was subsequently converted to Brooke ileostomy at the time of their colectomy. One OC patient had also a previous diverting loop ileostomy, which was maintained for 3 months after proctectomy and coloanal anastomosis. Three additional OC patients had undergone appendectomy, open cholecystectomy, and transabdominal hysterectomy, respectively. The indications for surgery

Table 2 Indications for Surgery

	Total	LC	OC	*P* value
Stricture/obstruction	21 (38.9%)	11 (40.8%)	10 (37.1%)	0.8
Unresponsiveness to medical treatment	17 (31.4%)	9 (33.3%)	8 (29.6%)	0.8
Fistulas/abscess	9 (16.7%)	3 (11.1%)	6 (22.2%)	0.3
Dysplasia	7 (13%)	4 (14.8%)	3 (11.1%)	0.7

LC Laparoscopic colectomy; *OC* open colectomy

Table 3 Postoperative Morbidity

	LC	OC	*P* value
Postoperative ileus	4 (14.8%)	5 (18.5%)	0.8
Anastomotic leak	1 (3.7%)	1 (3.7%)	1
Intra-abdominal abscess	2 (7.4%)	2 (7.4%)	1
Wound infection	1 (3.7%)	2 (7.4%)	1
Intra-abdominal bleeding	1 (3.7%)	0	1
Deep venous thrombosis	0	1 (3.7%)	1
Portal vein thrombosis	1 (3.7%)	0	1
Acute renal failure	1 (3.7%)	0	1
Pneumonia	1 (3.7%)	0	1
Total complications	12	11	0.8
Patients with at least one complication[a]	7 (26%)	9 (33.3%)	0.5

LC Laparoscopic colectomy, *OC* open colectomy
[a] Some patients had more than one complication

were not statistically different between the groups (Table 2). There were seven conversions (26%). Causes of conversion were intra-abdominal phlegmon or abscess (six patients) and small bowel distension (one patient). Postoperative complications occurred in seven LC patients vs nine OC (26 vs 33%, respectively; $P=0.5$) as reported in Table 3. There were no deaths. Stoma creation was related to intractable rectal disease and/or extensive perianal involvement in 87% of cases. In the remaining two patients, the rectum was preserved, and a subsequent ileorectal anastomosis was performed.

Median operative times were significantly longer after LC (240 vs 150 min OC, $P<0.01$), and EBL was comparable (325 ml LC vs 350 ml OC, $P=0.3$). Median time to first flatus or stoma function was 3 days for LC vs 4 days for OC ($P=0.4$), and median length of stay was not significantly shorter after LC (5 days for LC vs 6 days for OC, $P=0.07$). Intraoperative results and postoperative morbidity are summarized in Table 4. One patient had a LOS of 68 days after LC because of multiple complications. One out of seven patients developed postoperative pneumonia as the only postoperative complication among laparoscopic cases requiring conversion. Thirty-day readmission rates were increased in OC group (Table 5). When overall LOS included 30-day readmissions, the difference in favor of LC became statistically significant ($P=0.02$, Table 4).

Table 5 Causes of 30-day Readmissions

	LC	OC	*P* value
Postoperative ileus	–	2	
Perianal abscess	–	1	
Total number (%)	0	3 (11%)	0.02

LC Laparoscopic colectomy, *OC* open colectomy

Three OC patients had incisional hernias vs none after LC during follow-up. One LC patient had a late adhesive obstruction requiring readmission and was managed without surgery. Two OC patients developed late adhesive obstruction, one had explorative laparotomy, and the other was treated conservatively (Table 6).

The overall recurrence rate was 37%, corresponding to 11 LC patients and 9 OC patients based on a median follow-up of 20 months (range 1–114 months). Recurrences requiring surgery or medical therapy occurred at the anastomosis in 69% of cases. Overall recurrence rates were similar between the two groups. Recurrent Crohn's disease requiring surgery was not significantly decreased after LC (one case vs six cases after OC, 4 vs 22%, respectively, $P=0.2$). However, the median follow-up was significantly longer after OC (12 vs 40 months; $P=0.02$). Summary of long-term outcomes is shown in Table 6.

Discussion

Our study shows that LC for Crohn's colitis had longer operative times but similar morbidity, shorter return to bowel function, and LOS when compared with OC in an intent-to-treat analysis. Whereas these differences were not statistically significant for primary LOS, they became significant when the total LOS was inclusive of hospital stays because of readmissions. In fact, despite their longer

Table 4 Intraoperative and Postoperative Results

Median (interquartile)	LC	OC	*P* value
Operative time (min)	240 (180–310)	150 (120–180)	<0.01
EBL (ml)	325 (200–450)	350 (250–540)	0.4
First flatus (days)	3 (2–4)	4 (3–4)	0.4
LOS (days)	5 (3–7)	6 (5–8)	0.07
Overall LOS (days)[a]	5 (3–7)	6 (6–10)	0.02

LC Laparoscopic colectomy, *OC* open colectomy, *EBL* estimated blood loss, *BM* bowel movement, *LOS* length of hospital stay
[a] Inclusive of 30-day readmission

Table 6 Long-term Outcomes

	LC	OC	*P* value
Incisional hernia[a]	0	3 (11.1%)	0.07
Adhesive obstruction[a]	1 (3.7%)	2 (7.4%)	0.5
Overall recurrence[a]	11 (41%)	9 (33%)	0.1
Recurrence requiring surgery[a]	1 (4%)	6 (22%)	0.2
Follow-up (months)[b]	12 (7–19)	40 (21–70)	0.02

LC Laparoscopic colectomy, *OC* open colectomy
[a] Patient (%)
[b] Median (interquartile)

LOS after surgery, readmissions were more common after OC. It is reasonable to presume that the small sample size did not allow detecting more striking variations. In addition, a reduction in our 26% conversion rate could have also optimized the recovery advantages in favor of laparoscopic surgery as reported in larger studies on ileocolic Crohn's disease.[8,10–12]

Our conversion rate is comparable to conversion rates reported in multicenter prospective randomized trials comparing LC and OC for colon cancer, which range from 17 to 29%.[5,6,13] However, it is higher than what was reported in two prospective randomized trials comparing laparoscopic and open ileocolic resections for Crohn's disease, which had conversion rates of 6 and 10%, respectively.[10,12] Other retrospective studies on Crohn's disease included small number of patients and a conversion rate ranging from 0 to 29%.[8,11,14–18] This wide variability encountered in the literature might be associated with both specific pathologic features of Crohn's disease and the effect of a learning curve in laparoscopic techniques.

With respect to the former, it should be noted that a substantial portion of our conversions occurred in the presence of pericolonic phlegmon or abscess. An unexpected intraperitoneal abscess or fistula was reported to predict conversion of laparoscopic ileocecal resections for Crohn's disease.[19] In our series, two out of our six converted patients had pericolonic phlegmons detected on preoperative CT scan obtained because of a clinical presentation concerning for intra-abdominal sepsis. An additional patient underwent preoperative CT scan for the same indication, which did not identify intra-abdominal infections. In spite of this, a phlegmon was subsequently detected at the time of surgery. Four more patients had a phlegmon identified intraoperatively and did not undergo preoperative CT scan.

With respect to the latter point, conversions of LC were reported by two out of the six laparoscopic surgeons included in the study at a relatively early stage of their laparoscopic experience. Unfortunately, an accurate measurement of previous laparoscopic experience is difficult for our study, which includes a variety of often complex surgical procedures. However, our findings would seem to confirm that conversion rates for LC are at least partially related to the learning curve for individual surgeons.[20–23] In spite of relatively high conversion rates, it is reassuring that our study showed appreciable recovery benefits deriving from LC, confirming the validity of this surgical approach. Furthermore, whereas based on small numbers, our series also suggests that LC might reduce incisional hernia and small bowel obstruction rates as previously reported.[7,24]

Our study design also optimizes the validity of our conclusions for Crohn's disease limited to the colon. Whereas in theory, a prospective randomized trial would be the most accurate study design to reach meaningful conclusions, this would not be practical to study a relatively uncommon condition requiring surgery such as Crohn's colitis without small bowel involvement. It is therefore not surprising that, while few prospective randomized trials were published on ileocolic Crohn's disease,[10,12] none has ever been produced for Crohn's disease limited to the colon. In fact, most of the literature on LC for Crohn's disease analyzes ileocolic resections alone or combined with colonic resections.[14,15]

On the other hand, whereas our design strengthens the accuracy of our study, a small sample size and an uneven follow-up between groups hamper the value of any conclusions regarding the ability of LC to reduce the incidence of recurrent Crohn's disease. With this regard, our recurrence rate requiring surgery was not significantly higher after OC (22 vs 4% after LC). However, our median follow-up was only 12 months for LC vs 40 months for OC. Therefore, our data is still insufficient to contradict what was reported by recent studies reporting that LC and OC for ileocolic disease have similar long-term recurrence rates[9] and result in comparable quality of life.[25]

Finally, our study was conducted over a long period of time, including different surgeons, practices, and available technology. Further studies for LC in Crohn's colitis with longer follow-up may help elucidate differences in recurrence rates and additional benefits to this patient population.

Conclusion

Laparoscopic colectomy is a safe option for patients with Crohn's disease limited to the colon and is associated with more rapid postoperative recovery. Longer follow-up is needed to accurately establish recurrence rates when compared to OC.

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