Operative Outcomes of Open versus Laparoscopic Total Proctocolectomy with Ileal Pouch Anal Anastomosis in Ulcerative Colitis

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Purpose: During the course of disease, nearly 30% of ulcerative colitis patients receive surgical therapy. Total proctocolectomy with ileal pouch anal anastomosis is a standard procedure. However, the effectiveness of laparoscopic surgery in ulcerative colitis has not yet been proven. We aimed to evaluate the clinical course of both laparoscopic and open surgeries of a total proctocolectomy with ileal pouch anal anastomosis.

Methods: We reviewed charts of 34 patients who underwent a total proctocolectomy with ileal pouch anal anastomosis between April 2005 and April 2014. The laparoscopic group (n=21) and the open group (n=13) were compared retrospectively in accordance with patients' demographics, clinical features, operative data, and postoperative complications within and after 30 days after the operation.

Results: Patient characteristics were not significantly different between the two groups. The laparoscopic group had a longer duration of disease before the operation (42.3 ± 48.5 vs. 105 ± 97.6 , $p=0.019$). The operative results, including operation time and estimated blood loss, were not different in both groups. The postoperative outcomes of laparoscopic surgery were not different from those of open surgery in postoperative complications within and after 30 postoperative days. The rate of reoperation and readmission was not different, and the days until first gas passing and soft diet were not significantly different.

Conclusion: Laparoscopic surgery in ulcerative colitis is a feasible and safe procedure. Laparoscopic surgery may provide an alternative approach to open surgery in carefully selected ulcerative colitis patients.

Keywords: Ulcerative Colitis, Surgery, Laparoscopy

Received June 30, 2015

Revised August 18, 2015

Accepted August 24, 2015

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INTRODUCTION

Ulcerative colitis (UC) is a type of inflammatory bowel disease (IBD) and is a lifelong disease. UC is characterized by mucosal inflammation with confinement to the colon. The etiology of UC is still unknown, but generally recognized

as an interaction of genetic and environmental factors.¹ The medical treatment, which is aimed at the attenuation of the immune mechanism of the bowel, is preferentially tried. Patients usually receive medications such as corticosteroid, 5-aminosalicylic acid, sulfasalazine, mesalazine like other IBD patients. However, even though there is effective medical

treatment, 30~35% of UC patients finally need operative treatment in their lives.² The indication for surgery includes refractoriness to medical treatment, toxic megacolon, intestinal perforation and uncontrolled gastrointestinal bleeding.³ Also intractable abdominal or rectal pain, and anatomical deformity such as stricture can be the candidate for surgery.³ The goal of surgical therapy is to relieve symptoms such as abdominal and hematochezia, to lower the risk of malignancy and to upgrade the quality of life by changing bowel habits.⁴ Generally, for surgical treatment, a total proctocolectomy with ileal pouch anal anastomosis (TPC-IPAA) is preferred.

With the development of the laparoscopic technique, the laparoscopic colectomy was introduced in UC patients from early 1990s. However, until now, studies comparing between laparoscopic surgery and open surgery are not enough. Only the cosmetic effect of the laparoscopic method was proven.⁵ As for colon cancer, there was a huge study, "The Clinical Outcomes of Surgical Therapy Study Group (COST Study Group)", which is about the clinical outcomes comparing laparoscopic and open colectomies. This study confirmed that there is no difference in postoperative clinical outcomes, recurrence rates and survival rates between the two groups.⁶ Likewise, a comparative study is needed to support laparoscopic technique in UC patients. Therefore, this study is aimed at the comparison of postoperative complications and clinical outcomes between open and laparoscopic surgeries in UC.

MATERIALS AND METHODS

Patient selection

We identified patients from a hospital database and included patients who underwent surgical treatment for UC between April 2005 and April 2014 at Severance Hospital, Yonsei University College of Medicine, Seoul, Korea. All patients were treated with at least one type of medication such as steroid, azathioprine and sulfasalazine. Despite medical therapy, patients who had persistent symptoms of UC were included. Additionally, the UC patients were regularly followed up with a colonoscopy for monitoring the effects of medical therapy and screen for malignancy. Finally, surgical indication included newly developed colorectal cancer and medically intractable symptoms or complications such as hematochezia, abdominal pain, anal pain, stricture, and diarrhea. A total of 40 patients had undergone surgery during the period. We retrospectively reviewed charts to determine patient demographics, clinical features, operative data, postoperative course, complications within and after 30 days of operation, and long-term follow up data.

Operation

Two patients who had a subtotal colectomy were excluded. And four patients who had a total colectomy but had an end ileostomy were excluded. Finally a total of 34 patients who had a TPC-IPAA with or without a loop ileostomy are included in this study. A total of 13 patients had the open method TPC-IPAA and 21 patients had the laparoscopic TPC-IPAA in this study. In case of malignancy, the laparoscopic surgery was performed. However, in other cases, the type of surgery between laparoscopy and open was determined by severity of inflammation and preference of the operator. There was only one case of open conversion due to anatomic abnormality. The operations were performed by 5 general surgeons who are specialized in colorectal surgery. The procedures of dissection, resection and anastomosis were not different in laparoscopic and open surgery.

Patient data

The medical records of the patients were reviewed retrospectively. The basic characteristics including sex, age, body mass index (BMI), smoking, alcohol drinking, comorbidity and disease duration of UC were analyzed. The comorbidity was categorized as ASA physical status classification.⁷ Preoperative data of medication use, presence of rectal bleeding was analyzed and laboratory data were analyzed. The operative data was evaluated with operation time, estimated blood loss and amount of transfusion during the operation. Postoperative complications were categorized as Clavien-Dindo grade.⁸ Complications are divided into short-term and long-term complications by 30 postoperative days. Furthermore, the number of reoperations, days until return of bowel movement, postoperative hospital stay and the number of readmission are recorded.

Statistics

All data from the laparoscopic (LG) and open (OG) groups were compared. The normality of quantitative outcomes was analyzed with the Kolmogorov-Smirnov and Shapiro-Wilk test. For quantitative outcomes with normality, the results were presented as mean and standard deviations, and without normality, the results were presented as quartiles. Categorical results are presented as frequencies and percentage. Statistical analysis was performed using the SPSS version 20.0 (IBM, Armonk, NY, USA). A student's t test was used to compare continuous variables with normality, and the Mann-Whitney U test for continuous variables without normality. Fisher's exact test was used to compare discretized variables and $p < 0.05$.

was considered statistically significant.

RESULTS

Patient demographics and clinical features are presented

in Table 1. The duration of disease before the operation was longer in the LG (42.3 ± 48.5 vs. 105 ± 97.6 , $p=0.019$). There were no other demographic differences between the two groups.

The operative data is described in Table 2. The most common

Table 1. Patients characteristics

	OG (n=13)	LG (n=21)	p value
Sex (M:F)	7:6	12:9	0.851
Age (year) $\pm$ SD	41.7 ± 9.8	43.4 ± 14.4	0.705
BMI (kg/m^2) $\pm$ SD	21.3 ± 3.4	20.3 ± 2.9	0.358
ASA (n (%))			1
1	11 (84.6%)	16 (81.0%)	
2	2 (15.4%)	3 (14.3%)	
3	0 (0%)	2 (4.8%)	
Smoking (n (%))	1 (7.7%)	1 (4.8%)	1
Alcohol (n (%))	2 (15.4%)	1 (4.8%)	0.544
Duration of disease (months) $\pm$ SD	42.3 ± 48.5	105 ± 97.6	0.019
Preoperative steroid use (n (%))	9 (69.2%)	13 (61.9%)	0.727
Preoperative medication (n (%))			
Azathioprine	1 (7.7%)	3 (15.0%)	1
Sulfasalazine	12 (92.3%)	17 (81%)	0.627
Preoperative CRP (mg/L) (median (IQR))	9.72 (3.71, 47.5)	22.11 (9.98, 78.70)	0.246
Preoperative rectal bleeding (n (%))	11 (84.6%)	15 (75%)	0.676
Preoperative Hb (g/dl) $\pm$ SD	10.2 ± 1.6	11 ± 2.2	0.232

M = male; F = female; BMI = body mass index; ASA = American Society of Anesthesiologist physical status classification.⁷; SD = Standard deviation; IQR = interquartile range; CRP = C-reactive protein.

Table 2. Operative data

	OG (n=13)	LG (n=21)	p value
Indication of operation (n (%))			0.206
Intractable symptom	10 (76.9%)	15 (71.4%)	
Cancer	1 (7.7%)	3 (14.3%)	
Hematochezia	2 (15.4%)	0 (0%)	
Other	0 (0%)	3 (14.3%)	
		Stricture (n=2)	
		Anal pain (n=1)	
Operation time (minute) (median (IQR))	303 (240, 395)	325 (268.5, 390)	0.484
Estimated blood loss (ml) $\pm$ SD	273.1 ± 379.5	197.6 ± 217.1	0.522
Transfusion (ml) $\pm$ SD	190 ± 259.6	47.6 ± 125.0	0.084

SD = standard deviation; IQR = interquartile range.

indication for an operation is intractable symptom with medical treatment in both groups. And the trend of indication of surgery is not different in both groups ($p=0.206$). Other indications included malignancy arising from underlying UC, hematochezia, anal stricture and anal pain induced by ulcerative lesion. The operation time was not different between the two groups ($p=0.484$). The estimated blood loss was similar in both groups ($p=0.522$), but the amount of transfusion was lower in LG, even though it is not statistically significant ($p=0.084$).

Perioperative and postoperative outcomes are described in

Table 3. The rate of readmission and reoperation were higher in LG, but they were not statistically significant ($p=0.718$, $p=1.000$). The return of bowel motility was not different between the two groups. However, the LG showed a shorter tendency than the OG in days until first gas passing ($p=0.060$). Postoperative hospital days were similar in the two groups ($p=0.484$). The rate of readmission was not different in both groups, and the majority of readmission was due to intestinal obstruction. Table 4 describes the immediate postoperative outcomes in both groups. The grade of early postoperative complications within 30 postoperative days has no differences

Table 3. Perioperative and postoperative outcomes

	OG (n=13)	LG (n=21)	p value
Reoperation (n (%))	4 (30.8%)	7 (33.3%)	1
Days until first gas passing (median (IQR))	4 (2, 4)	1 (1, 3)	0.06
Days until first soft diet (median (IQR))	7 (5.5, 8)	6 (5, 9)	0.381
Postoperative hospital day (median (IQR))	14 (12, 35.5)	13 (11.5, 20.5)	0.484
Readmission (n (%))	4 (30.8%)	9 (42.9%)	0.718

SD = standard deviation; IQR = interquartile range.

Table 4. Postoperative complications

	OG (n=13)	LG (n=21)	p value
Short term complication ^{*,†} (n (%))			0.578
Grade 1	0 (0%)	0 (0%)	
Grade 2	1 (7.7%)	3 (14.3%)	
Intestinal obstruction	1	1	
Wound infection		2	
Grade 3	0 (0%)	0 (0%)	
Grade 4	2 (15.4%)	6 (28.6%)	
Intestinal obstruction	1	1	
Panperitonitis	1	3	
Ileostomy revision		2	
Long term complication [‡] (n (%))	4	10	0.399
Rectovaginal fistula	0 (0%)	4 (19%)	
Intestinal obstruction	2 (15.4%)	2 (9.5%)	
Pouchitis	0 (0%)	1 (4.8%)	
Panperitonitis	1 (7.7%)	1 (4.8%)	
Ileostomy revision	0 (0%)	2 (9.5%)	
Ileostomy reopening	1 (7.7%)	0 (0%)	

*Complication grade was categorized as Clavien-Dindo grade.⁸ †Postoperative complication: complication within 30 postoperative days. ‡Long term complication: complication after 30 postoperative days.

between the two groups ($p=0.578$). There was no mortality within 30 days after the operation. Table 4 also describes of long-term postoperative outcomes. The grade of long term postoperative complications after 30 postoperative days was not significantly different ($p=0.399$).

DISCUSSION

Our study demonstrated that laparoscopic surgery for UC patients is feasible and safe comparable to open surgery. There were no significant differences in operative and postoperative outcomes between the laparoscopic and the open groups. However we could not show any benefits of laparoscopic surgery in the postoperative course.

Before the 1950s, a total colectomy with an end ileostomy was the standard technique for UC patients. After this, a subtotal colectomy with ileorectal anastomosis was tried instead of total colectomy with an end ileostomy. This method was selectively performed in patients without severe inflammation because there was no need of a permanent ileostomy.⁹ The first experience of a total colectomy with ileal-pouch anal anastomosis (TPC-IPAA) was described in 1978 by Parks et al.¹⁰ Currently, TPC-IPAA is widely performed, and the European Crohn's and Colitis Organization designated it as a standard technique.¹¹

With the development of the laparoscopic technique, the proportion of laparoscopic surgery has increased. In the field of IBD including UC, laparoscopic surgery has not been performed much because of bowel inflammation and anatomical variations owing to the IBD itself. Laparoscopic surgery was introduced in UC, and from the 1990s, laparoscopic surgery has been widely used.¹² The laparoscopic technique has cosmetic, functional long term benefits and better quality of life when compared to open surgery.¹³ However, compared to the laparoscopic cholecystectomy, the laparoscopic colectomy is more complicated since there are more vessels and structures. The intraabdominal anatomy and colon needs to be carefully studied. Therefore, it is inevitable that the learning curve of laparoscopic colectomy is longer than that of a laparoscopic cholecystectomy.¹⁴ Furthermore, compared to the laparoscopic colectomy, a laparoscopic total colectomy is much more complicated.¹⁵ Until now, the open method has been the mainstay of surgery of UC patients, but there are many researches associated with laparoscopic surgery.

According to the majority of research, the postoperative course of laparoscopic surgery is not that different from that of open surgery in UC patients.¹⁶⁻¹⁸ The timing of oral diet, which represents the return of bowel movement, is not different between the two groups.¹⁷ Laparoscopic surgery has

the benefit of smaller incisions and shorter hospital stay.¹⁶ And in the long term, postoperative intestinal obstruction and incisional hernia is lower in the laparoscopic group.^{19,20} However, the longer operation time and higher medical expenses are the disadvantages of laparoscopic surgery in UC patients.^{16,20} In this study, the laparoscopic group had a longer operation time and the postoperative complication rate is higher than the open group. This is caused by a small sample size, and the initial learning curve of laparoscopic technique in UC.

The use of a biologic drug before an operation can postpone surgery during the disease. A biologic drug does not influence most postoperative complications but does influence complications related with an ileal pouch.^{21,22} Patients with steroid use before the operation have more morbidity than the patients without steroids.²³

Though this is not dealt with in this study, there are several researches about the quality of life after a total proctocolectomy with ileal pouch anal anastomosis. Postoperative frequent night defecation, urgency and incontinence lower the quality of life after an operation.²⁴ However, this study includes every UC patient who received an operation, but the follow up results after the operation method was not studied. Therefore, a follow-up study about the quality of life after an operation should be studied.

The limitation of this study is the insufficient number of patients, so the statistical validity is not sufficient. Also the selection of surgical method can be a bias in this study. There was no definite indication for laparoscopic or open surgery. Comparing with LG, OG has included many patients with severe inflammation. To correct this bias, the prospective study with randomization is needed. However, this study is very new in comparing the pros and cons in laparoscopic and open surgeries in UC, in the introducing era of laparoscopic surgery in UC. Because of the rarity of UC patients who need an operation in Korea, a multicenter research is needed to retain enough statistical validity. In this study, the earliest laparoscopic surgery was in 2005, which is the early stage of laparoscopic surgery of UC. Therefore, the result of this study is influenced by the learning curve of the surgeon. Further studies should compare the results of laparoscopic and open surgeries, operated by experienced surgeons.

Laparoscopic surgery in UC patients is generally considered as difficult because of inflammation and anatomical deformation. This study concluded that there is no difference in postoperative outcomes between laparoscopic and open surgeries. Laparoscopic surgery may provide an alternative approach to open surgery in carefully selected UC patients.

ACKNOWLEDGEMENTS

The authors would also like to thank MiSun Park (professional editor) for her English correction of the manuscript.

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