ORIGINAL ARTICLE

Risk factors for complications after total colectomy in ulcerative colitis

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Background/aims: *Ulcerative colitis can be cured by total proctocolectomy. The aim of this study was to investigate the risk factors for colectomy-related complications in ulcerative colitis patients.* ***Materials and Methods:*** *All patients with ulcerative colitis who underwent total colectomy at Seoul National University Hospital from 1990 to 2009 were identified through a surgical database. Their demographic and clinical characteristics were reviewed retrospectively. They were followed for a mean of 6.2 years, and risk factors affecting the development of complications were analyzed.* ***Results:*** *A total of 85 ulcerative colitis patients (M:F = 35:50) were enrolled and analyzed. Eighty (94.1%) patients received total proctocolectomy with ileal pouch-anal anastomosis. Thirty-nine (45.9%) patients had readmitted (95 hospitalizations) and 23 (27.1%) underwent further surgical procedures (44 operations) due to complications. Multivariate analysis showed that female gender (odds ratio [OR], 2.99; p=0.046), delayed surgery (OR, 3.45; p=0.03), and postoperative pathological diagnosis of dysplasia/cancer (OR, 4.22; p=0.03) were the risk factors for complication-related rehospitalization. Pouchitis (OR, 6.31; p=0.007) and frequent previous ulcerative colitis flare-up (OR, 1.39; p=0.023) were the risk factors for complication-related reoperation.* ***Conclusions:*** *Female gender, delayed surgery, pathological diagnosis of dysplasia/cancer, pouchitis, and frequent previous flare-up are the risk factors for postoperative complications.*

Key words: Ulcerative colitis, colectomy, complications

Ülseratif kolitte total kolektomi ertesinde komplikasyonlar ile ilişkili risk faktörleri

Amaç: *Ülseratif kolitte total proktokolektomi ile kür sağlanabilir. Bu çalışmanın amacı, kolektomi ile ilişkili komplikasyonların risk faktörlerinin tespit edilmesidir.* ***Gereç ve Yöntem:*** *Cerrahi veri tabanı taranarak tespit edilen 1999 - 2009 yılları arasında Seul Ulusal Üniversitesi'nde total kolektomi uygulanmış tüm ülseratif kolit hastaları çalışmaya dahil edildi. Demografik ve klinik verileri retrospektif olarak değerlendirildi. Hastalar ortalama 6,2 yıl takip edildiler ve komplikasyonların gelişimi ile ilişkili risk faktörleri analiz edildi.* ***Bulgular:*** *Toplam 85 ülseratif kolit hastası (Erkek: Kadın= 35:50) çalışmaya dahil edildi. Seksen (%94,1) hastaya total proktokolektomi ve ileal poş-anal anastomozu uygulandı. Otuzdokuz (%45,9) hasta hastaneye tekrar yatırıldı ve 23 (%27,1) hasta tekrar operasyona (toplam 44 operasyon) alındı. Multi-variate analizde kadın cinsiyet (OR:2,99; p=0,046), gecikmiş cerrahi (OR:3,45; p=0,03) postoperatif olarak displazi veya kanser tanısı (OR:4,22; p=0,03) komplikasyona bağlı hastaneye yatış ile ilişkili bulundu. Poşit (OR:6,31; p=0,007) ve sık ülseratif kolit alevlenme hikayesi (OR:1,39; p=0,023) ile komplikasyona bağlı reoperasyon ile ilişkili bulundu.* ***Sonuç:*** *Kadın cinsiyet, gecikmiş cerrahi ve displazi/kanser tanısı, poşit ve sık alevlenme hikayesi postoperatif komplikasyonlar ile ilişkilidir.*

Anahtar kelimeler: Ülseratif kolit, kolektomi, komplikasyon

INTRODUCTION

Although medical therapy has advanced during the past decades, surgical treatment continues to play an important role in ulcerative colitis (UC).

Since the first description of proctocolectomy in the treatment of UC in 1978 (1), restorative proctocolectomy with an ileal pouch-anal anastomosis

(IPAA) has evolved as a standard surgical treatment for UC. Surgery for UC can be curative, whereas for Crohn's disease it would be palliative. Although IPAA is known to be safe with a low mortality rate (0.2-0.4%) (2), it causes morbidity in a significant number of patients. These complications require rehospitalization and further unexpected surgical treatment.

A series of studies have reported complications after colectomy in patients with UC. Leijonmarck and his colleagues (3) followed 483 patients discharged from the hospital after colectomy for a mean of 11.6 years, and they performed an additional 932 surgical procedures in 325 (67%) patients. That study included patients who underwent colectomy before 1985, at which time the IPAA had been just introduced and was not yet very popular. A retrospective study showed that IPAA was done for 1005 patients, most of whom had been diagnosed with UC (n=812) and the rest with familial adenomatous polyposis (FAP), indeterminate colitis, Crohn's disease, and various other miscellaneous causes. During the 11 years of follow-up, the overall morbidity rate was 62.7% (1218 complications in 630 patients) and the reoperation rate was 24% (4). Other studies showed that the postoperative complication rate in UC ranged between 30-60% (5,6). Complications of IPAA described in published articles have included anastomosis site dehiscence, pouch fistula, pelvic infection/abscess, small bowel obstruction, and anal stricture (7). This increased burden of postoperative complications increases medical costs as well as decreases the patients' quality of life.

UC was a rare disease in Asia; however, the incidence and prevalence of UC have been rapidly increasing over time (8-11). Although a previous study has reported lower surgical rates among irritable bowel disease (IBD) in Asia compared to Western countries (12), the total number of patients who will require colectomy treatment is expected to increase in the future in Asia. Therefore, the aims of this study were to investigate complications after total colectomy in patients with UC and to identify the risk factors for postoperative complications.

MATERIALS AND METHODS

1. Patients and Analytic Methods

All adult patients who underwent UC-related total colectomy at Seoul National University Hospital between January 1990 and December 2009 were identified through a surgical database. The initial diagnosis of UC was based on clinical, radiological, endoscopic, and histological findings (13). The patients who underwent total colectomy at an age under 18 were excluded. Patients whose diagnosis had been changed to Crohn's disease during the postoperative period were also excluded from enrollment into the study.

We reviewed the medical records of all the patients to trace clinical, surgical, and histological characteristics, including gender, age at the time of diagnosis, age at the time of the total colectomy, duration of the disease prior to the total colectomy, preoperative medications, indications for surgical treatment, the frequency of UC flare-ups, which was represented by hospitalization before surgery, extent of the disease, postoperative pathological diagnosis, and cytomegalovirus (CMV) infection. In addition, we included surgical characteristics such as the urgency of colectomy (elective vs. delayed), type of anastomosis (double-stapled vs. hand-sewn), number of stages of the operation (1-, 2-, or 3-stage), and the extent of the final resection. We followed the occurrence of postoperative complications. Follow-up after colectomy was standardized by regular outpatient visits: One early postoperative visit two weeks after the repair of the ileostomy, followed by two visits every third month, two more visits every sixth month, and finally annual visits thereafter.

Elective colectomy was defined as the case in which the decision for surgery had been made in the outpatient clinic, and the operation was done within seven days from the admission. Delayed colectomy was defined as the case in which the decision for surgery was made during medical treatment in the hospital. The main indication for operation in delayed colectomy was medical intractability. Emergency colectomies due to perforation or massive bleeding during medical treatment were also included into delayed colectomy. 1-, 2- and 3- stage operation indicated total proctocolectomy without ileostomy, total proctocolectomy with IPAA followed by ileostomy repair, and subtotal colectomy followed by completion proctectomy with IPAA and later ileostomy repair, respectively. All surgical treatments were done by experienced colorectal surgeons. Postoperative pathology included existence of dysplasia/cancer, the extent of the disease, and CMV immunohistochemistry (IHC) stain results. CMV IHC identified the CMV early antigen using monoclonal antibodies.

Complications were defined as colectomy-related problems that required rehospitalization more than one day after colectomy. Admissions for scheduled ileostomy repair or complete proctectomy were excluded from this category. Complications were divided into early and late according to a criterion of 30 days from the date of the total colectomy. Among these complications, we selected complications that required further surgical intervention. When pouchitis was suspected clinically, sigmoidoscopy was done with multiple biopsies. Pouchitis was diagnosed when erosion/ulceration, mucosal granularity, or hyperemic mucosa was identified by the sigmoidoscopy after IPAA. The study protocol was approved by the institutional review board at the hospital.

2. Statistical Analysis

Demographic, clinical, and surgical parameters were compared for complication-related rehospitalization and reoperation using chi-square test, Fisher's exact test, and independent t-test. A multivariate logistic regression analysis was done to identify independent predictors of complications among the candidate predictors. The threshold for statistical significance was predefined as $p<0.05$. For the multivariate analysis, all variables with $p<0.2$ in univariate analysis were included. Delayed colectomy was included in multivariate analysis although its p-value was >0.2 because it was thought to be clinically associated with the surgical outcome. All analyses were done using the Statistical Package for the Social Sciences (SPSS) 17.0 for Windows (SPSS Inc., Chicago, IL).

RESULTS

1. Demographic Features and Clinical Characteristics of Patients

A total of 85 UC patients (M:F=35:50) were enrolled and analyzed in this study. Demographic and clinical characteristics of the patients are summarized in Table 1. Patients were followed for a mean of 6.2 years. Mean ages of UC diagnosis and total colectomy were 36 and 44 years, respectively. The mean disease duration from diagnosis to surgery was 7.4±6.6 years. Before the colectomy, 83 (97.6%) patients were diagnosed with UC based on

Table 1. Demographic and clinical characteristics of patients

Variables	No. of patients (%)
Male : Female	30:50 (41.2:58.8)
Age at diagnosis of UC (yrs, mean ± SD)	36.1±14.2
Age at surgery of total colectomy (yrs, mean ± SD)	43.5±14.0
Disease duration prior to total colectomy (yrs, mean ± SD)	7.4±6.6
Mean follow-up after total colectomy (yrs, mean ± SD)	6.2±4.1
Mean hospitalization time before total colectomy	2.9±2.1
Preoperative pathologic diagnosis	
Ulcerative colitis	83 (97.6)
Indeterminate colitis	2 (2.4)
Indication of total colectomy	
Medical intractability	56 (65.9)
Intractable bleeding	12 (14.1)
Cancer/dysplasia	8 (9.4)
Perforation	6 (7.1)
Stricture	2 (2.4)
Toxic megacolon	1 (1.2)
Medication during 6 mos before total colectomy	
IV steroid	57 (67.1)
PO steroid	58 (68.2)
Topical steroid	14 (16.5)
PO 5-ASA	73 (85.9)
Topical 5-ASA	13 (15.3)
IV cyclosporine	25 (29.4)
Infliximab	1 (1.2)

UC: Ulcerative colitis. SD: Standard deviation. ER: Emergency room. IV: Intravenous. PO: Per oral. 5-ASA: 5-Aminosalicylate.

clinical, radiological, endoscopic, and histological findings. For the other 2 patients with indeterminate colitis, the diagnosis was changed to UC after colectomy through pathological examination of the total resected specimen. There was no patient whose diagnosis was changed from Crohn's disease to UC after colectomy.

The patients had been hospitalized 2.9±2.1 times related to disease flare-up including the index admission for total colectomy. Medical intractability accounted for the majority of the preoperative indications for total colectomy (56, 65.9%). The other indications were bleeding (12, 14.1%), perforation (6, 7.1%), cancer (4, 4.7%), dysplasia (4, 4.7%), stricture (2, 2.4%), and toxic megacolon (1, 1.2%). Reviewing the medications six months before surgery, most of the patients were prescribed oral 5-aminosalicylates (5-ASAs) and systemic steroid. Oral 5-ASAs were prescribed for 73 patients (85.9%). Almost all patients received at least one formulation of steroid therapy (77, 90.6%): intravenous (IV) steroid for 57 (67.1%) patients, oral steroid for 58 (68.2%) patients, and both for 38 (44.7%) patients. Twenty-five (29.4%) patients received IV cyclosporine therapy.

2. Surgical Treatment

The characteristics of the surgical treatment for UC are summarized in Table 2. Two-thirds of the patients (n=53, 62.4%) underwent delayed colectomy after they failed to respond to medical treatment, which included 12 (14.1%) emergency surgeries due to perforation or bleeding. Thirty-two (37.6%) patients underwent elective colectomy. There was a significant difference between the two groups in the mean duration from admission to operation (elective group, 4.19±1.80 days vs. delayed group, 28.1±20.5 days, p<0.0001). Most of the patients (n=78, 91.8%) received a 2-stage operation. The IPAA procedure was applied to 80 patients (94.1%) who all had a J-shaped pouch. Four patients received Brooke ileostomy because their conditions were too severely debilitated to receive IPAA, showing mortality soon after colectomy. The other patient received Kock's pouch operation. The double stapler technique was applied for most of the IPAA surgeries (n=72, 90%). Nine patients eventually had to keep permanent ileostomies. One patient received converting surgery from Kock's pouch to permanent ileostomy due to pouch malfunction, and 1 underwent en-bloc resection including anus due to pouch failure. The other 7 patients never received ileostomy repair; 5 died

before ileostomy repair and 2 refused it. There were 5 mortalities after colectomy including 2 cancer-related deaths and 3 for uncontrolled sepsis.

Postoperative pathology confirmed dysplasia and/or cancer in 21 (25.1%) cases. Thirty-four postoperative specimens were processed with IHC stain for CMV, and 14 (41.2%) were determined to be positive (Table 3).

Table 2. Characteristics of surgical treatment

Variables	No. of patients (%)
Timing of surgery	
Elective	32 (37.6)
Delayed	53 (62.4)
Extent of resection	
Total proctocolectomy	82 (96.5)
Total colectomy	3 (3.5)
Type of colectomy	
Total proctocolectomy with IPAA	80 (94.1)
Total colectomy with Brooke ileostomy	3 (3.5)
Total proctocolectomy with Brooke ileostomy	1 (1.2)
Total proctocolectomy with Kock's pouch	1 (1.2)
Anastomosis technique (n=80)†	
Double stapler technique	72 (89.4)
Hand-sewn technique	8 (10.0)
Ileostomy repair	
Done	76 (89.4)
Undone	9 (10.6)
Stage of operation	
1-stage operation	2 (2.4)
2-stage operation	78 (91.8)
3-stage operation	5 (5.9)

IPAA: Ileal pouch anal anastomosis. † Anastomosis technique was identified in the 80 patients who received IPAA.

Table 3. Postoperative pathologic results

Variables	No. of patients (%)
Presence of dysplasia/cancer	
Colitis	64 (75.3)
Low-grade dysplasia	12 (14.1)
High-grade dysplasia	5 (5.9)
Cancer	4 (4.7)
Extent of disease	
Left-sided colitis	19 (22.4)
Extensive colitis	66 (77.6)
CMV immunohistochemistry stain (n=34) †	
Positive	14 (41.2)
Negative	20 (58.8)

CMV: Cytomegalovirus. †Among total 85 postoperative specimens, 34 specimens were processed for CMV immunohistochemistry stain.

3. Complication-Related Rehospitalization after Total Colectomy

There were a total of 95 complication-related rehospitalizations in 39 patients. Admissions for planned takedown of ileostomy or complete proctectomy were excluded from this calculation. Twenty-five patients were readmitted more than once (range, 2-6). Early and late complications are listed in Table 4. In univariate analysis, complication-related rehospitalization was associated with female gender (p=0.18), urgent surgery after medical treatment failure (p=0.23), pathological diagnosis of dysplasia/cancer (p=0.03), pouchitis development (p=0.02), and a young age at diagnosis (p=0.17). In a multivariate logistic regression model, female gender (odds ratio [OR], 2.99; 95% confidence interval [CI], 1.02-8.78; p=0.046), dysplasia/cancer (OR, 4.22; 95% CI, 1.14-15.63, p=0.03), and delayed colectomy after failed medical treatment (OR, 3.45; 95% CI, 1.1-10.87, p=0.03) were the independent risk factors for complication-related rehospitalization (Table 6).

4. Complication-Related Reoperation after Total Colectomy

A total of 23 patients (27.1%) received 44 further unexpected reoperations due to complications after total colectomy. Expected surgical procedures such as proctectomy and ileostomy repair were excluded. Twelve patients underwent reoperation more than once (range, 2-5). Table 5 shows the causes of complications that required reoperation. The most common cause of early reoperation concerned wound problems (2.4%). Common causes of late reoperation were pouch-vaginal fistula (11.8%), anal fistula (7.1%), adhesive ileus (7.1%), and intra-abdominopelvic abscess (5.9%). In a univariate analysis, reoperation was associated with female gender (p=0.09), hand-sewn anastomosis (p=0.196), pouchitis development (p=0.01), longer disease duration (p=0.07), longer follow-up periods (p=0.05), and frequent previous disease flare-up (p=0.09). In a multivariate logistic regression model, pouchitis development (OR, 6.31; 95% CI, 1.64-24.27, p=0.007) and frequent previous disease flare-up (OR, 1.39; 95% CI, 1.05-1.84, p=0.023) were the independent risk factors for complication-related reoperation (Table 7).

DISCUSSION

Since it was introduced by Parks and Nicholls in 1978 (1), IPAA has been established as a surgical option for the treatment of chronic UC principally because of the low surgical mortality and favorable long-term outcomes with excellent quality of life for most patients (4,14-16). The postoperative course can be troubled by several complications, such as small bowel obstruction, anastomosis site stricture or leak, and pelvic abscess in the short-

Table 4. Causes of complication-related rehospitalization

Early (n=11)	No. of Cases (%)
Wound problem	3 (3.5)
Intra-abdominopelvic abscess	2 (2.4)
Small bowel obstruction	2 (2.4)
Anastomosis site dehiscence	1 (1.2)
Pouchitis	1 (1.2)
Pneumonia	1 (1.2)
Kock's pouch malfunction	1 (1.2)
Late (n=84)	**No. of Cases (%)**
Pouchitis	24 (28.2)
Pouch-vaginal fistula	8 (9.4)
Small bowel obstruction	21 (24.7)
Anal fistula	7 (8.2)
Intra-abdominopelvic abscess	7 (8.2)
Wound problem	7 (8.2)
Anal sphincter defect	2 (2.4)
Anastomosis site problem (narrowing)	2 (2.4)
Enterocutaneous fistula	2 (2.4)
Incisional hernia	2 (2.4)
Kock's pouch malfunction	1 (1.2)
Watery diarrhea	1 (1.2)

Table 5. Causes of complication-related reoperation

Early (n=5)	No. of Cases (%)
Wound problem	2 (4.5)
Intra-abdominopelvic abscess	1 (2.3)
Anastomosis site dehiscence	1 (2.3)
Kock's pouch malfunction	1 (2.3)
Late (n=39)	**No. of Cases (%)**
Pouch-vaginal fistula	9 (20.5)
Pouch perforation	1 (2.3)
Anal fistula	6 (13.6)
Small bowel obstruction	6 (13.6)
Intra-abdominopelvic abscess	5 (11.4)
Wound problem	5 (11.4)
Anal sphincter defect	2 (4.5)
Incisional hernia	2 (4.5)
Anastomosis site problem	1 (2.3)
Enterocutaneous fistula	1 (2.3)
Kock's pouch malfunction	1 (2.3)

Table 6. Predictive factors for complication-related rehospitalization by multivariate analysis

Variables	Frequency of Rehospitalization	HR (95% CI)	*P*-value
Gender		2.99 (1.02-8.78)	0.046
Female	26/50 (52.0%)		
Male	13/35 (37.1%)		
Timing of operation		3.45 (1.1-10.87)	0.03
Elective	12/32 (37.5%)		
Delayed	27/53 (50.9%)		
Pathology		4.22 (1.14-15.63)	0.03
Dysplasia/cancer	14/21 (66.7%)		
Colitis	25/64 (39.1%)		
Pouchitis development (N=79)†		2.14 (0.76-5.98)	0.15
Yes	22/37 (59.5%)		
No	14/42 (33.3%)		
Age at diagnosis of UC		1.00 (0.96-1.04)	0.91

HR: Hazard ratio. CI: Confidence interval. UC: Ulcerative colitis. † Pouchitis could be followed up in 79 among 85 patients: the other 6 (5 cancer patients and 1 patient who received Kock's pouch operation) were not followed for pouchitis development.

Table 7. Predictive factors for complication-related reoperation by multivariate analysis

Variables	Frequency of Reoperation	HR (95% CI)	*P*-value
Gender		2.99 (1.02-8.78)	0.16
Female	17/50 (34.0%)		
Male	6/35 (17.1%)		
Pouchitis development (n=79)†		6.31 (1.64-24.27)	0.007
Yes	16/37 (43.2%)		
No	6/42 (14.3%)		
Pathology		1.22 (0.27-5.48)	0.80
Dysplasia/cancer	8/21 (38.1%)		
Colitis	15/64 (23.4%)		
Time from diagnosis to total colectomy		1.07 (0.97-1.17)	0.15
Follow-up duration		1.00 (0.82-1.22)	1.00
Previous UC flare-up times		1.39 (1.05-1.84)	0.023

HR: Hazard ratio. CI: Confidence interval. UC: Ulcerative colitis. †Pouchitis could be followed up in 79 among 85 patients: the other 6 (5 cancer patients and 1 patient who received Kock's pouch operation) were not followed for pouchitis development.

term follow-up, and small bowel obstruction, pouch fistula, pouch dysfunction, and pouchitis in the long-term follow-up (17).

In the present study, 39 patients experienced 95 unexpected rehospitalizations due to complications during a median follow-up of 6.2 years. Among these patients, 23 received 44 unplanned reoperations. The combined rate of short- and long-term surgical morbidity was up to 45.9%, and the reoperation rate had reached 27.1%. A previous study reported that 60% of patients developed at least one complication during a median follow-up of 5.4 (range, 0.5-9.0) years after UC-related IPAA surgery (6). Another study showed that the early postoperative complication rate was 27%, and 35% finally developed septic or obstructive complications

during a median follow-up of 6.5 years (5). In our study, complication rates including surgical complication were similar to those of previous studies.

The present study showed that the most common complications among the 95 cases were pouchitis (26.3%) and small bowel obstruction (24.2%). The most common complication that required reoperation was pouch-vaginal fistula. Nine (9.5%) pouch-vaginal fistula cases occurred, and 8 of the 9 cases required additional surgical correction. Pouch failure occurred in 1 patient (1.2%), who was then converted to permanent ileostomy. The majority of studies have reported that pouchitis is the most frequent long-term complication of the IPAA, ranging from 12% to 50% (18,19). Pouch-vaginal fistula has been reported as a major complication in

women undergoing IPAA, of which the incidence ranges from 3.3%-12% (20-22). Small bowel obstruction following IPAA varies between 12-24% (23). The complication rate and the specific profile in our study seem to be similar to the previous studies with adequate follow-up periods.

In this study, female gender, delayed colectomy after medical treatment failure, and postoperative pathologic diagnosis of dysplasia/cancer were associated with complication-related rehospitalization. In addition, pouchitis development and previous frequent UC flare-up were associated with complications that required unexpected reoperation. There have been a few studies that tried to demonstrate the risk factors for complications after colectomy in UC. A series of studies have reported that final pathological diagnosis of indeterminate colitis or Crohn's disease (24-27), delayed surgery in acute severe colitis condition (6), and preoperative high-dose steroid use (28) were associated with complication development after IPAA. In the present study, 62.4% received delayed operation after medical treatment failure, and 37.6% received elective operation. There was a significant difference in the time from admission to operation between the two groups (4.2 vs. 28.1 days, p<0.0001). However, the delayed surgery was a risk factor for complication-related rehospitalization, but not for complication-related reoperation. There has been a controversy regarding the association of immunosuppressive agent use and the risk of postoperative complications. Some studies have shown that high-dose steroids were associated with septic complications after restorative proctocolectomy (28), and cyclosporine use was not associated with postoperative complication (29). This study demonstrated that the medication was not associated with overall complication or complication-related reoperation. Our study has value in the aspect that we discovered risk factors for overall complications, which were represented as unexpected hospitalizations, in addition to surgical complications. In contrast, previous studies focused on determining the risk factors for surgical complications or septic complication. The overall complications requiring rehospitalization could reflect the real burden affecting the patient's quality of life after colectomy.

There were three (3.5%) mortalities after colectomy excluding two cancer-related deaths. The causes for the three deaths were fulminant colitis and sepsis. We tried to evaluate predictable factors for poor prognosis; however, the number of study subjects was too small to identify significant risk factors. All three patients received colectomy due to perforations, and their surgical specimens were CMV-positive. Thus, we suggest that fulminant colitis with CMV infection accompanied by perforation could be fatal, and early decision for surgical treatment should be made in an emergency setting. The high morbidity and mortality rates in the present study reflect the severity of the underlying disease for timing of the surgical treatment. The mean medical treatment duration was longer than that recommended by guidelines, and the use of secondary immunomodulatory drug was limited. A secondary step-up treatment strategy is recommended in refractory UC after the administration of 7-14 days of IV corticosteroid. Our previous study, however, had reported that the combination treatment with corticosteroid and cyclosporine had no additional benefit over prolonged corticosteroid treatment (30). Meanwhile, the very limited use of infliximab in our study could be explained by the fact that this medication had not been covered by health insurance in Korea. It is also notable that postoperative pathology-revealed dysplasia/cancer was determined in 21 (23.3%) patients, although only 8 (8.9%) had been diagnosed preoperatively. This could be explained by the fact that physicians in this field tended to regard surgical treatment as a last resort, as reported by Sung et al. (31). The patients with UC require a multidisciplinary approach from the gastroenterologist and colorectal surgeon. As Andersson and Soderholm indicated (32), it is also important to see surgery as an additional therapeutic alternative and not as a 'failure of medical therapy' to achieve optimal outcome over the lifetime of the individuals afflicted with UC.

In conclusion, these results suggest that the postoperative complication rates after colectomy in patients with UC are considerable. Female gender, delayed surgery after medical treatment failure, and final pathological diagnosis of dysplasia/cancer were the risk factors for complication development. Previous frequent disease flare-up episodes and pouchitis were associated with complication-related reoperation.

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