ORIGINAL ARTICLE

INTESTINAL RESEARCH

pISSN 1598-9100 • eISSN 2288-1956
https://doi.org/10.5217/ir.2024.00112
Intest Res 2026;24(1):117-128

Short-term and long-term outcomes of acute severe ulcerative colitis in Taiwan: a multicenter study with pre- and post-biologics comparison

Wei-Chen Lin[1], Chun-Chi Lin[2], Wen-Hung Hsu[3], Feng-Fan Chiang[4], Chen-Wang Chang[1], Tzu-Chi Hsu[5], Deng-Chyang Wu[6], Horng-Yuan Wang[1], Jau-Min Wong[7], Shu-Chen Wei[7]

[1]Division of Gastroenterology and Hepatology, Department of Internal Medicine, Mackay Memorial Hospital, Taipei, Taiwan; [2]Division of Colon and Rectal Surgery, Department of Surgery, Taipei Veterans General Hospital, Taipei, Taiwan; [3]Division of Gastroenterology, Department of Internal Medicine, Kaohsiung Medical University Chung-Ho Memorial Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan; [4]Section of Colon and Rectal Surgery, Department of Surgery, Taichung Veterans General Hospital, Taichung, Taiwan; [5]Division of Colon and Rectal Surgery, Department of Surgery, Mackay Memorial Hospital, Taipei, Taiwan; [6]Division of Gastroenterology, Department of Internal Medicine, Kaohsiung Medical University Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan; [7]Department of Internal Medicine, National Taiwan University Hospital, National Taiwan University College of Medicine, Taipei, Taiwan

Background/Aims: Data from Asia regarding the short-term and long-term outcomes for acute severe ulcerative colitis (ASUC) are limited. We assessed the outcomes of ASUC, identified the risk factors for colectomy, and compared colectomy rates between the pre-biologics and post-biologics eras in Taiwan. **Methods:** The patients with an ASUC diagnosis between January 2013 and March 2022 at 5 tertiary medical centers were retrospectively analyzed. **Results:** In total, 98 patients were enrolled, with 68.4% diagnosed in the post-biologics era. In 78.6% of the ASUC patients initially received intravenous steroid therapy, for which the success rate was 74.1%. As for rescue therapy, 15 patients (93.8%) received biologics and 1 (6.3%) received cyclosporin. Biologics rescue therapy had a 93.3% success rate. One (1%) mortality due to septic shock occurred. The colectomy rate for index ASUC admission was 11.2%. Patients receiving colectomy were predominantly male ($P=0.012$) and at older age ($P=0.016$). Higher C-reactive protein ($P=0.035$), lower albumin ($P=0.017$), and hemoglobin ($P=0.023$) levels were associated with colectomy risk. During a median follow-up of 24 months, 13 patients (15.1%) had recurrent ASUC and 23.1% of patients received colectomy. The accumulated colectomy rate at 3 years did not differ between the pre- and post-biologics eras (16.1% vs. 13.4%, $P=0.270$). **Conclusions:** This is the first Asian study on ASUC to compare colectomy rates between the pre-biologics and post-biologics eras, revealing no significant difference. The recurrent ASUC had a higher colectomy rate than the index ASUC. **(Intest Res 2026;24:117-128)**

Key Words: Biologics; Colectomy; Risk factors; Ulcerative colitis

INTRODUCTION

The clinical disease course of ulcerative colitis (UC) varies considerably; many patients achieve adequate control with medical therapy alone, but some patients require surgical intervention. A population cohort study demonstrated that 10% of patients with UC undergo surgery within 10 years of receiving their UC diagnosis.[1] Acute severe UC (ASUC) is a life-threatening condition and may be an onset feature in one-third of patients with UC.[2] Of patients with ASUC, 10% to 20% require surgical intervention at the first onset of ASUC, and ASUC is associated with a 30% to 40% risk of colectomy after one or more severe exacerbations.[2,3]

Received July 7, 2024. **Revised** October 6, 2024. **Accepted** October 14, 2024.
Correspondence to Shu-Chen Wei, Division of Gastroenterology and Hepatology, Department of Internal Medicine, National Taiwan University Hospital, No.7, Chung Shan S. Rd, Taipei City 100229, Taiwan. E-mail: shuchenwei@ntu.edu.tw

© 2026 Korean Association for the Study of Intestinal Diseases.
This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (https://creativecommons.org/licenses/by-nc/4.0/) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

First-line medical therapy for those admitted with ASUC is intravenous (IV) steroids, which are completely effective in 40%, partially effective in 30%, and ineffective in 30% of patients.[4,5] Rescue therapy for steroid non-responders includes timing surgery or medical therapy with infliximab (IFX) or cyclosporine. A systematic review comparing IFX with cyclosporine for rescue therapy in patients with ASUC demonstrated that IFX was associated with a lower risk of colectomy at 1 year than was cyclosporine.[4] The colectomy rate associated with IFX-based rescue therapy is approximately 20% at 2 years.[6]

In Asia, the clinical course of UC has been reported as less severe and with a lower colectomy rate than in Western countries.[7] Limited data from Asia exists regarding treatment outcomes in ASUC since biologics have become available and the consequences of biologics for colectomy rates.[8-10] In Taiwan, the National Health Insurance began to reimburse adalimumab (ADA) and golimumab (GOL) for patients with severe UC since 2016, and coverage began for vedolizumab (VED) since 2017. IFX, for which with the strongest evidence indicates it is an effective biologic for ASUC, was only available since 2018 because the endemic for tuberculosis which resulting in the necessity for establishing the risk management plan. The present study evaluated the real-world management and outcomes of ASUC in Taiwan and explored the risk factors for colectomy and recurrent ASUC. We also compared colectomy rates between the pre- and post-biologics eras.

METHODS

1. Patient Selection and Data Collection

Patients with ASUC at 5 tertiary medical centers in Taiwan between January 2013 (in which all 5 medical centers had the electric medical records available) and March 2022 who fulfilled the Truelove-Witts criteria were enrolled. The diagnosis of UC was based on clinical evaluation of patient medical history, clinical evaluation, and typical endoscopic and histological findings. The following patients were excluded from this study: those not fulfilling the Truelove-Witts criteria and those with malignancy, unidentified colitis, admission for elective colectomy, or prior colitis-related surgery (e.g., J-pouch or stoma). The database used contained computerized medical records of demographic data including age, sex, medication use, disease extent and severity at the time of ASUC diagnosis, concomitant infection, and underlying comorbidities. For each patient, we recorded the periods between UC diagnosis, the initiation of ASUC, ASUC recurrence, and last follow-up. The Charlson Comorbidity Index (CCI) was used to predict the impact of comorbidity on ASUC, with a high CCI score being defined as >2.[11]

2. Ethical Considerations

This study was approved by the institutional review board of each center (reference number: 201608018RINB; 2019-02-004BC#2; 17MMHIS038; KMUHIRB-E(I)-20180330). The requirement for informed consent was waived because of the study's retrospective design. Patient information was anonymized and deidentified prior to being analyzed.

Table 1. Basic Characteristics of Patients with ASUC

Characteristic	Value (n=98)
Male sex	65 (66.3)
Smokers	17 (17.3)
Age of UC diagnosis (yr)	46.7±14.1
Age of ASUC onset (yr)	54.4±14.0
ASUC as initial presentation	41 (41.8)
Charlson Comorbidity Index (score: 0/1/2/3/4)	52/23/12/7/4
Body mass index (kg/m^2)	21.4±3.4
UC location (E1/E2/E3)	9/21/68
Previous drug exposure	
Steroid	21 (21.4)
Azathioprine	5 (5.1)
Biologics	6 (6.1)
Ulcerative Colitis Endoscopic Index of Severity	6.6±0.9
Mayo endoscopic subscore	2.7±0.1
Initial lab at admission	
C-reactive protein (mg/dL)	10.4±8.9
Albumin (g/dL)	3.3±0.6
Hemoglobin (g/dL)	10.8±2.3
White blood cell (10^3/μL)	12.4±6.8
Platelet (10^3/μL)	376.7±154.2
Clostridium difficile infection	7 (7.1)
Cytomegalovirus infection	6 (6.1)
Toxin megacolon	7 (7.1)
Extraintestinal manifestations	6 (6.1)
Hospitalization duration (day)	19.8±14.3
Time to surgery (day)	11.9±9.1
Colectomy	11 (11.2)
Mortality	1 (1.0)

Values are presented as number (%) or mean±standard deviation.
ASUC, acute sever ulcerative colitis; UC, ulcerative colitis; E1, proctitis; E2, left side colitis; E3, pancolitis.

https://doi.org/10.5217/ir.2024.00112 • Intest Res 2026;24(1):117-128

3. Outcome Measures

The Truelove-Witts severity index was used to assess the clinical severity of disease on admission; ASUC was indicated by more than 6 bloody stools/d together with any one of the following: tachycardia (heart rate >90 beats/min), fever (temperature >37.8°C), hemoglobin level <10.5 g/dL, or C-reactive protein (CRP) level >30 mg/L.[12] Disease activity was assessed using the Mayo score and Ulcerative Colitis Endoscopic Index of Severity.[13] The response time to IV steroids was defined as within 10 days, and a clinical response to steroid therapy was classified as an improvement in clinical condition, including a decrease in stool frequency to fewer than 6 per day, little or no blood in the feces, and the absence of complications.[14] The timing and selection of rescue therapy for patients who were refractory to IV steroids were primarily determined by the physician in charge mostly as the standard practice in real-life as well as the drug availability. We analyzed the risk factors for surgery in ASUC and the efficacy of IV steroids in ASUC and compared the colectomy rates in the pre-biologics era versus the post-biologics era.

4. Statistical Analysis

Descriptive statistics for continuous variables are reported as the mean±standard deviation. Categorical variables are described using frequency distributions and reported as number (%). We used the chi-square or Fisher exact test for categorical data and the independent *t* test or Wilcoxon rank-sum test for continuous data comparisons of the study groups. Logistic regression analysis was carried out to determine the factors that influence the outcome between the pre-biologics and post-biologics era. Colectomy-free survival was defined as the interval between the onset of ASUC and surgery or the last follow-up and was estimated using the Kaplan-Meier method. Recurrence-free survival was defined as the interval between ASUC onset and recurrence or last follow-up. Statistical analyses were performed using SPSS version 20.0 (IBM Corp., Armonk, NY, USA). All *P*-values were 2-sided, and $P<0.05$ indicated significance.

RESULTS

1. Baseline Characteristics of Study Cohort

We enrolled 98 patients meeting the ASUC criteria; 66.3% of

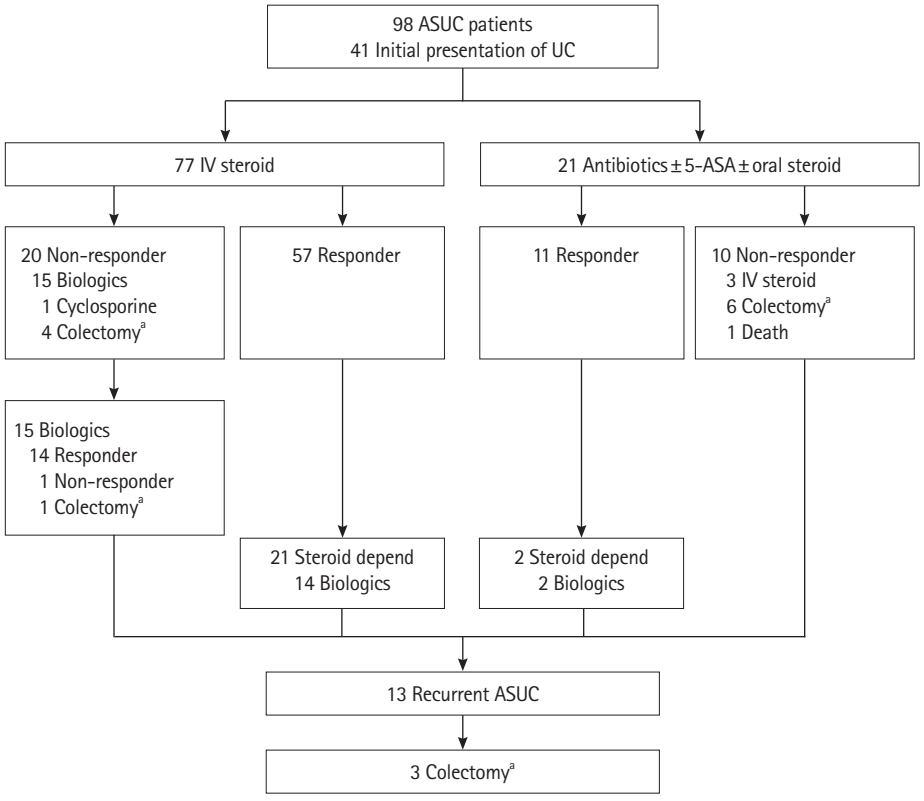

Fig. 1. Study patient flowchart. [a]Colectomy rate for index ASUC (11.2%) and colectomy rate during entire follow-up (14.3%). ASUC, acute severe ulcerative colitis; UC, ulcerative colitis; IV, intravenous.

the patients were men (Table 1). The mean age upon UC diagnosis was 46.7±14.1 years, and the age upon ASUC onset was 54.4±14.0 years. Regarding drug exposure history, 21 patients (21.4%) had received oral steroids, 5 (5.1%) had received immunosuppressant agents, and 6 (6.1%) had received previous biologics therapy. Of the 98 patients, 46 (46.9%) had comorbidity, and 76.1% had a CCI of <2 points. The mean Ulcerative Colitis Endoscopic Index of Severity was 6.6, and the mean Mayo endoscopic subscore was 2.7. Seven patients (7.1%) had concomitant *Clostridium difficile* infection (CDI), and 6 patients (6.1%) had cytomegalovirus infection upon their index ASUC admission. All patients who had concomitant CDI received therapy, while 5 (83.3%) of those with cytomegalovirus infection were treated. One patient (16.7%) did not receive antiviral treatment due to clinical improvement with IV steroids. Among the 7 patients with toxic megacolon, medically, 4 (57.1%) received IV steroids, 1 (14.3%) received oral steroids, and the remaining 2 (28.6%) were treated with mesalamine. Eventually, 6 patients (85.7%) underwent colectomy, while 1 patient (14.3%) with concomitant CDI recovered with IV steroids and oral vancomycin. Eleven patients (11.2%) received colectomy for the index ASUC, the time between ASUC onset and surgery was 11.9±10.0 days. There was only one 56-year-old male patient with valvular heart disease received prophylactic therapy for venous thromboembolism. One 77-year-old female patient with multiple comorbidities and ASUC as initial presentation expired due to sepsis.

2. Treatment Flow

Of the 98 patients with ASUC who were enrolled, 41 (41.8%) had ASUC as their initial UC presentation (Fig. 1). In total, 77 patients (78.5%) initially received IV steroid therapy for ASUC, whereas the other 21 patients (21.4%) received antibiotics, 5-aminosalicylate, and/or oral steroids. Among the patients who did not initially receive IV steroid therapy, all were treated with antibiotics for suspected infectious colitis. Four patients (19.0%) received a combination of oral steroids, and 5-aminosalicylate was prescribed to 11 patients (52.3%). The IV steroid therapy group had a response rate of 74.0%. Of the 20 patients who did not respond to IV steroids, 15 (75%) received biologics therapy, 4 (20%) underwent surgery, and 1 (5%) received cyclosporine therapy. The 21 patients (21.5%) who received conservative therapy had a response rate of 52.4%. Of the 10 patients (47.6%) who did not respond to conservative therapy for ASUC, 6 underwent surgery, 3 received IV steroids, and one patient died due to septic shock.

3. Response to Medical Therapy

Of the 77 patients receiving IV steroid therapy, 57 (74.0%) responded (Table 2). The response time after initiation of IV steroids was 3.5±1.9 days. The response group had a higher white blood cell count (P=0.031) and a shorter admission period (P=0.004). Of the steroid non-responders, 15 (19.5%) received rescue therapy with biologics (6 received IFX, 5 for ADA, 3 for GOL, and 1 for VED). Non-IFX drugs were prescribed because of drug availability. The average response time after initiated biologic therapy was 11.4±7.8 days. Among the biologics rescue group, only 1 patient (6.7%) received colectomy after not responding to 2 doses of IFX, and histology revealed concomitant cytomegalovirus infection. However, the initial biopsy specimen obtained prior to IV steroid therapy exhibited no evidence of cytomegalovirus infection. There-

Table 2. Efficacy of IV Steroids in 77 Patients with ASUC

Variable	Responded (n=57)	Non-responded (n=20)	*P*-value
Male sex	39 (68.4)	12 (60.0)	0.745
Age of UC diagnosis (yr)	42.9±14.1	45.7±15.6	0.527
Age of ASUC onset (yr)	45.9±13.9	52.4±13.3	0.060
ASUC as initial presentation	28 (49.1)	5 (25.0)	0.093
Smokers	9 (15.8)	4 (20.0)	0.494
Comorbidity (>2)	4 (7.0)	1 (5.0)	0.802
UC location (E1/E2/E3)	3/17/37	1/2/17	0.178
Hospitalization duration (day)	16.9±10.3	26.4±13.8	0.004
Mayo endoscopic subscore	2.6 ±0.6	2.8±0.2	0.130
UCEIS	6.5±1.8	7.2±0.9	0.408
Initial laboratory at admission			
CRP (mg/dL)	9.9±7.1	9.3±6.1	0.913
Albumin (g/dL)	3.3±0.6	3.2±0.4	0.730
Albumin/CRP	0.7±0.8	0.9±1.5	0.919
Hemoglobin (g/dL)	10.9±2.4	10.5±1.8	0.519
White blood cell (10^3/μL)	13.2±7.2	9.7±3.6	0.031
Platelet (10^3/μL)	379±152	388±166	0.658
Clostridium difficile infection	5 (8.8)	1 (5.0)	0.611
Cytomegalovirus infection	2 (3.5)	3 (15.0)	0.058
Concomitant medication			
5-Aminosalicylic acid	52 (91.2)	18 (90.0)	0.504
Azathioprine	10 (17.5)	5 (25.0)	0.386

Values are presented as number (%) or mean±standard deviation.
IV, intravenous; ASUC, acute severe ulcerative colitis; UC, ulcerative colitis; E1, proctitis; E2, left side colitis; E3, pancolitis; UCEIS, Ulcerative Colitis Endoscopic Index of Severity; CRP, C-reactive protein.

https://doi.org/10.5217/ir.2024.00112 • Intest Res 2026;24(1):117-128

fore, the overall biologics rescue therapy success rate was 14 out of 15 (93.3%).

4. Predictors of Colectomy for ASUC upon Index Admission

During their index admission for ASUC, 11 patients (11.2%) received colectomy because of failure of medical treatment. The colectomy was performed an average of 14.7 days (range, 6–20 days) after non-response to IV steroids. One patient underwent colectomy 10 days after not responding to biologic therapy.

We compared the clinical characteristics of the colectomy and non-colectomy groups. As shown in Table 3, in comparison with the non-colectomy group (n=87), the colectomy during index admission group (n=11) had significantly higher percentage of men (100.0% vs. 62.1%, $P=0.012$) and had ASUC onset at older age (59.8 years vs. 48.1 years, $P=0.016$). Lower hemoglobin (9.4 g/dL vs. 10.9 g/dL, $P=0.023$), higher CRP (18.5 mg/L vs. 9.2 mg/L, $P=0.035$), and lower albumin (2.7 g/dL vs. 3.3 g/dL, $P=0.017$) levels were associated with colectomy. The albumin/CRP ratio was significantly lower in the colectomy

Table 3. Clinical Characteristics of ASUC in Colectomy versus Non-Colectomy Groups

Characteristic	Colectomy (n=11)	Non-colectomy (n=87)	*P*-value
Male sex	11 (100)	54 (62.1)	0.012
Age of UC diagnosis (yr)	52.7±11.4	44.7±14.5	0.089
Age of ASUC onset (yr)	59.8±10.0	48.1±14.1	0.016
ASUC as initial presentation	3 (27.3)	38 (43.7)	0.299
Smokers	4 (36.4)	13 (14.9)	0.156
Comorbidity (>2)	1 (9.1)	10 (11.5)	0.812
UC location (E1/E2/E3)	1/0/10	8/21/58	0.175
Previous drug exposure			
Steroid	3 (27.2)	18 (20.7)	0.620
Azathioprine	0	4 (4.6)	0.420
Biologics	1 (9.1)	5 (5.7)	0.793
Hospitalization duration (day)	34.8±14.6	17.0±11.3	<0.001
Mayo endoscopic subscore	2.8±0.4	2.6±0.5	0.574
UCEIS	7.0±0.7	7.0±0.6	0.905
Initial laboratory at admission			
CRP (mg/dL)	18.5±15.6	9.2±7.1	0.035
Albumin (g/dL)	2.7±0.6	3.3±0.5	0.017
Albumin/CRP	0.3±0.4	1.1±1.6	0.016
Hemoglobin (g/dL)	9.4±1.8	10.9±2.3	0.023
White blood cell (10^3/μL)	11.6±5.4	12.5±6.9	0.978
Platelet (10^3/μL)	309.1±144.6	384.2±154.2	0.147
Toxin megacolon	6 (54.5)	1 (1.1)	<0.001
Clostridium difficile infection	0	7 (8.0)	0.343
Cytomegalovirus infection	2 (18.2)	4 (4.6)	0.204
Concomitant medication			
IV steroid	5 (45.5)	72 (82.8)	0.004
5-Aminosalicylic acid	8 (72.7)	77 (88.5)	0.146
Azathioprine	1 (9.1)	16 (18.4)	0.443
Biologics	1 (9.1)	7 (8.0)	0.915

Values are presented as number (%) or mean±standard deviation.
ASUC, acute severe ulcerative colitis; UC, ulcerative colitis; E1, proctitis; E2, left side colitis; E3, pancolitis; UCEIS, Ulcerative Colitis Endoscopic Index of Severity; CRP, C-reactive protein; IV, intravenous.

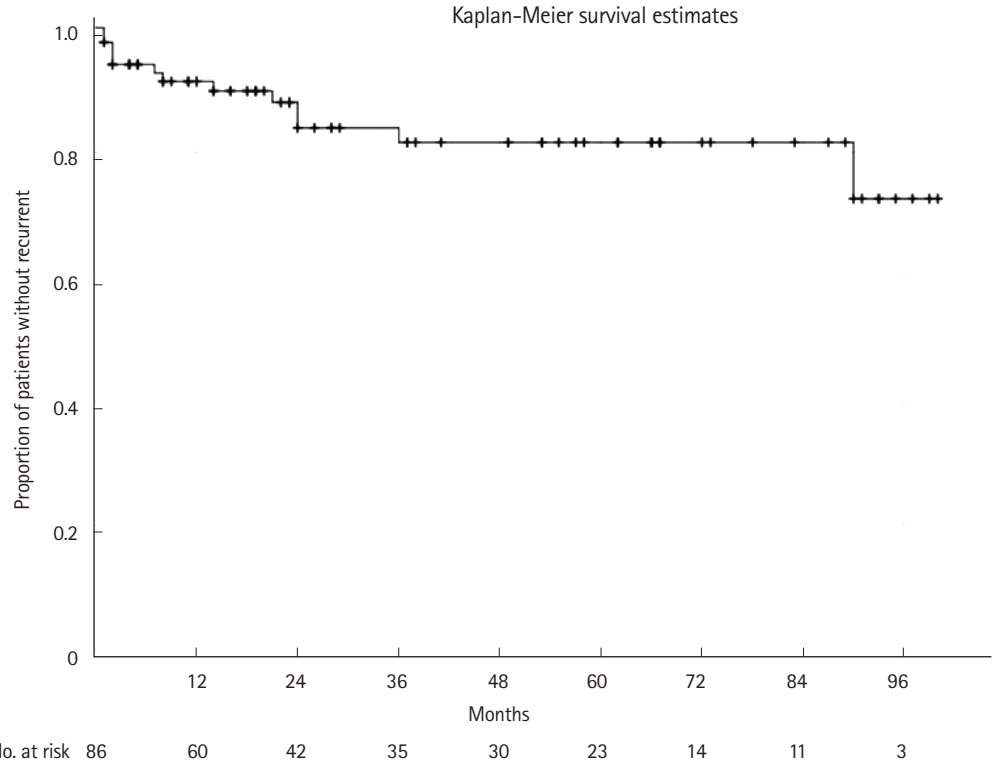

Fig. 2. Kaplan-Meier time-to-relapse curve for 86 patients with acute severe ulcerative colitis. Thirteen patients had confirmed relapse after a median follow-up of 24 months (interquartile range, 11–66 months). Cumulative incidence of relapse-free survival at 1, 2, and 3 years was 89.9%, 83.9%, and 81.6%, respectively.

group (0.3 vs. 1.1, $P=0.016$). Patients with toxic megacolon was for sure more often received colectomy and cytomegalovirus infection was numerically more often seen in the colectomy group. Since more colectomy cases were from the conservative treatment group, there was a lower IV steroid concomitant usage noted in the colectomy group (45.5% vs. 82.5%, $P=0.004$).

5. Recurrent ASUC

After exclusion of 11 patients receiving surgical therapy and 1 who died at the index ASUC admission, the remaining 86 patients (87.8%) with ASUC were enrolled for ASUC recurrence analysis (Fig. 2). In total, 13 patients (15.1%) experienced recurrent ASUC after a median follow-up of 24 months (interquartile range, 11–66 months). The cumulative incidence of relapse-free survival at 1, 2, and 3 years was 89.9%, 83.9%, and 81.6%, respectively. Twelve patients (92.3%) received IV steroids, while 1 patient (7.7%) received oral steroids. Seven patients (53.8%) subsequently required rescue therapy (3 received IFX, 1 for ADA, 1 for GOL, 1 for VED, and 1 for Tofacitinib). Three patients (23.1%) received colectomy for recurrent ASUC. The recurrence group had a longer average follow-up duration than did the nonrecurrence group (74.2 months vs. 40.9 months, $P=0.002$), the greater number of events observed might be a bit related to the longer follow-up period (Table 4). Given that most recurrences happened within 3 years after the index ASUC, we believe that variations in the follow-up period have a minimal impact on recurrence observations. The recurrence of ASUC was not related to previous biologics treatment or not (biologics 14.3%, non-biologics 15.2%). However, previous cytomegalovirus infection was a risk factor for recurrent ASUC (23.1% vs. 2.7%, $P=0.004$), whereas CDI was not. Of the 5 patients with previous cytomegalovirus infection, 2 were steroid-dependent and both had recurrent ASUC.

6. Colectomy Rates between Pre- and Post-Biologics Eras

We defined 2013 to 2015 and 2016 to 2022 as the pre-biologics and post-biologics eras, respectively, on the basis of biologics availability in Taiwan. In total, 67 patients (68.4%) had ASUC in the post-biologics era, more than the number in the pre-biologics era, which may have been related to the difference in observation duration and/or increasing disease prevalence and awareness. Biologics were prescribed to 15 patients

https://doi.org/10.5217/ir.2024.00112 • Intest Res 2026;24(1):117-128

Table 4. Recurrent and Nonrecurrent ASUC in 86 Patients

Characteristic	Recurrent (n = 13)	Nonrecurrent (n = 73)	*P*-value
Male sex	9 (69.2)	45 (61.6)	0.607
Smokers	4 (30.8)	9 (12.3)	0.089
Age of UC diagnosis (yr)	45.3 ± 11.1	44.2 ± 14.7	0.809
Age of ASUC onset (yr)	48.4 ± 9.3	47.4 ± 14.4	0.995
Follow-up duration (mo)	74.2 ± 26.3	40.9 ± 31.8	0.002
Comorbidity (> 2)	1 (7.7)	8 (10.9)	0.723
UC location (E1/E2/E3)	3/2/8	5/19/49	0.158
Previous drug exposure			
5-Aminosalicylic acid	13 (100)	65 (89.0)	0.215
Azathioprine	5 (38.5)	12 (16.4)	0.068
Steroid	11 (84.6)	59 (80.8)	0.750
Steroid depend	4 (30.8)	23 (31.5)	0.959
Biologics	3 (23.1)	20 (27.4)	0.749
Biologics for initial ASUC	2 (14.3)	11 (15.2)	0.977
Previous infection			
Clostridium difficile infection	2 (15.3)	5 (6.8)	0.300
Cytomegalovirus infection	3 (23.1)	2 (2.7)	0.004

Values are presented as number (%) or mean ± standard deviation.
ASUC, acute severe ulcerative colitis; UC, ulcerative colitis; E1, proctitis; E2, left side colitis; E3, pancolitis.

(22.4%) in the post-biologics era. ASUC as initial presentation was more common in the pre-biologics era than in the post-biologics era ($P = 0.027$) (Table 5). The IV steroid prescription rate significantly increased from 45.2% in the pre-biologics era to 94.0% in the post-biologics era ($P < 0.001$). In the multivariable analysis, no significant factors were found to influence short-term colectomy rates in both the pre-biologics and post-biologics era. The cumulative incidence of short-term colectomy-free survival at 3, 10, and 20 days was 93.5%, 83.9%, and 83.9%, respectively, in the pre-biologics era and 100%, 97.0%, and 92.5% in the post-biologics era, respectively (Fig. 3A). The cumulative incidence of long-term colectomy-free survival at 1, 12, and 36 months was 83.9%, 83.9%, and 83.9%, respectively, in the pre-biologics era and 92.5%, 89.4%, and 86.6%, respectively, in the post-biologics era (Fig. 3B). According to this, colectomy was delayed and the colectomy rate was slightly lower after the availability of biologics, but colectomy-free survival did not differ significantly between the 2 eras ($P = 0.270$).

DISCUSSION

This multicenter study analyzed the data of 98 patients with ASUC with the median follow-up as 2 years, rendering it the first Asian cohort study to assess the impact of biologics in the short-term (30 days) and long-term (median as 2 years) outcomes of ASUC. The rate of colectomy during index admission for ASUC was 11.2%, and the colectomy rate was not significantly lower in the post-biologics era, although colectomy appeared to occur later and at an insignificantly lower rate in the short-term follow-up. The colectomy rate was 23.1% for recurrent ASUC, and the long-term colectomy-free survival was not significantly decreased even in the biologics era. Long-term disease duration and steroid dependency during previous cytomegalovirus infection were related to recurrence episodes. In this cohort study, male sex and older onset age were risk factors for colectomy. Initial hemoglobin, CRP, and albumin levels and the albumin/CRP ratio were effective predictors of failure of medical therapy.

Despite the increasing incidence and prevalence of UC in Asia, no research has compared colectomy rates associated with ASUC between the pre-biologics and post-biologics eras. Most studies have focused on post-biologics outcomes for ASUC. A Korean multicenter study revealed that IFX was prescribed in 49 of 295 (16.6%) patients with ASUC. The colectomy rate was 6.1% and 18.8% at the 3-month and 12-month follow-up, respectively.[8] However, IFX responders had shorter

Table 5. Univariate and Multivariate Analyses for the Characteristics of ASUC Patients in Pre-biologics and Post-biologics Eras

Characteristic	Pre-biologic era (n = 31)	Post-biologic era (n = 67)	Univariate *P*-value	Multivariate *P*-value
Male sex	24 (77.4)	41 (61.2)	0.114	0.140
Age of UC diagnosis (yr)	49.1 ± 14.9	44.1 ± 14.0	0.123	0.429
Age of index ASUC onset (yr)	59.5 ± 14.9	46.0 ± 13.3	0.077	0.920
ASUC as initial presentation	18 (58.1)	23 (34.3)	0.027	0.078
Smokers	5 (16.1)	12 (17.9)	0.829	0.859
Comorbidity (> 2)	6 (19.3)	5 (7.4)	0.083	0.848
UC location (E1/E2/E3)	3/7/21	6/14/47	0.972	0.589
Previous drug exposure				
Steroid	6 (19.4)	15 (22.4)	0.734	0.244
Azathioprine	1 (3.2)	4 (6.0)	0.566	0.345
Hospitalization duration (day)	20.0 ± 14.0	19.7 ± 14.1	0.927	0.945
Mayo endoscopic subscore	2.6 ± 0.9	2.8 ± 0.4	0.104	0.338
UCEIS	6.2 ± 2.1	6.9 ± 1.5	0.212	0.780
Initial laboratory at admission				
C-reactive protein (mg/dL)	11.9 ± 8.3	9.6 ± 9.1	0.251	0.290
Albumin (g/dL)	3.1 ± 0.6	3.3 ± 0.6	0.174	0.421
Hemoglobin (g/dL)	10.5 ± 2.0	10.8 ± 2.4	0.314	0.397
White blood cell (10^3/μL)	12.1 ± 6.8	12.5 ± 6.8	0.691	0.782
Platelet (10^3/μL)	354.9 ± 165.1	385.0 ± 149.5	0.535	0.421
IV steroid treatment	14 (45.2)	63 (94.0)	< 0.001	0.823

Values are presented as number (%) or mean ± standard deviation.
ASUC, acute severe ulcerative colitis; UC, ulcerative colitis; E1, proctitis; E2, left side colitis; E3, pancolitis; UCEIS, Ulcerative Colitis Endoscopic Index of Severity; IV, intravenous.

colectomy-free survival than did IV steroid responders.[8] The rates of biologics prescription and colectomy were consistent with our data from the post-biologics era. A Japanese study identified that at 8 weeks, the colectomy rate was 28.6% in 7 patients with ASUC treated with IFX.[9] The IFX response rate in 10 patients with ASUC at week 2 in a Chinese study was 90%, and the colectomy rate was 20% at a median follow-up of 9.6 months.[10] Our study is the firstly conducted in Asia to compare colectomy rates for ASUC in the pre-biologics era versus the post-biologics era, also with the longest follow-up period which could demonstrate the recurrent ASUC situation. According to our results, recurrent ASUC has even higher colectomy rate, which implies that we have to monitor aggressively even patients passed the first episode of ASUC.

Mainstream management of ASUC is based on day 3 scores to predict outcomes in patients treated with IV steroids.[15-17] The Oxford criteria indicate an 85% risk of colectomy if the CRP level > 45 mg/L or bowel movements occur more than 8 times in 24 hours after 3 days of IV steroid therapy.[17] Since the introduction of IFX or cyclosporine as second-line medical therapy, the Oxford criteria have been unsuitable for colectomy prediction.[18] Advances in biologic therapies have improved control of UC disease activity, but struggles in medical management may be associated with delays in surgical intervention, which could result in higher rates of morbidity and mortality.[19] Therefore, clinicians must recognize predictors of steroid therapy ineffectiveness and the necessity of rescue therapy based on information from the time of admission.

Simple laboratory predictors of steroid responsiveness facilitate earlier use of rescue therapy, and CRP, albumin, and hemoglobin levels are useful predictors of surgery for ASUC.[19,20] The CRP/albumin ratio is an early predictor and practical marker of the severity of ASUC and, for this purpose, is superior to CRP or albumin level alone.[21] Our results are consistent with findings that albumin, CRP, and hemoglobin levels and the CRP/albumin ratio upon admission predict colectomy in ASUC.

https://doi.org/10.5217/ir.2024.00112 • Intest Res 2026;24(1):117-128

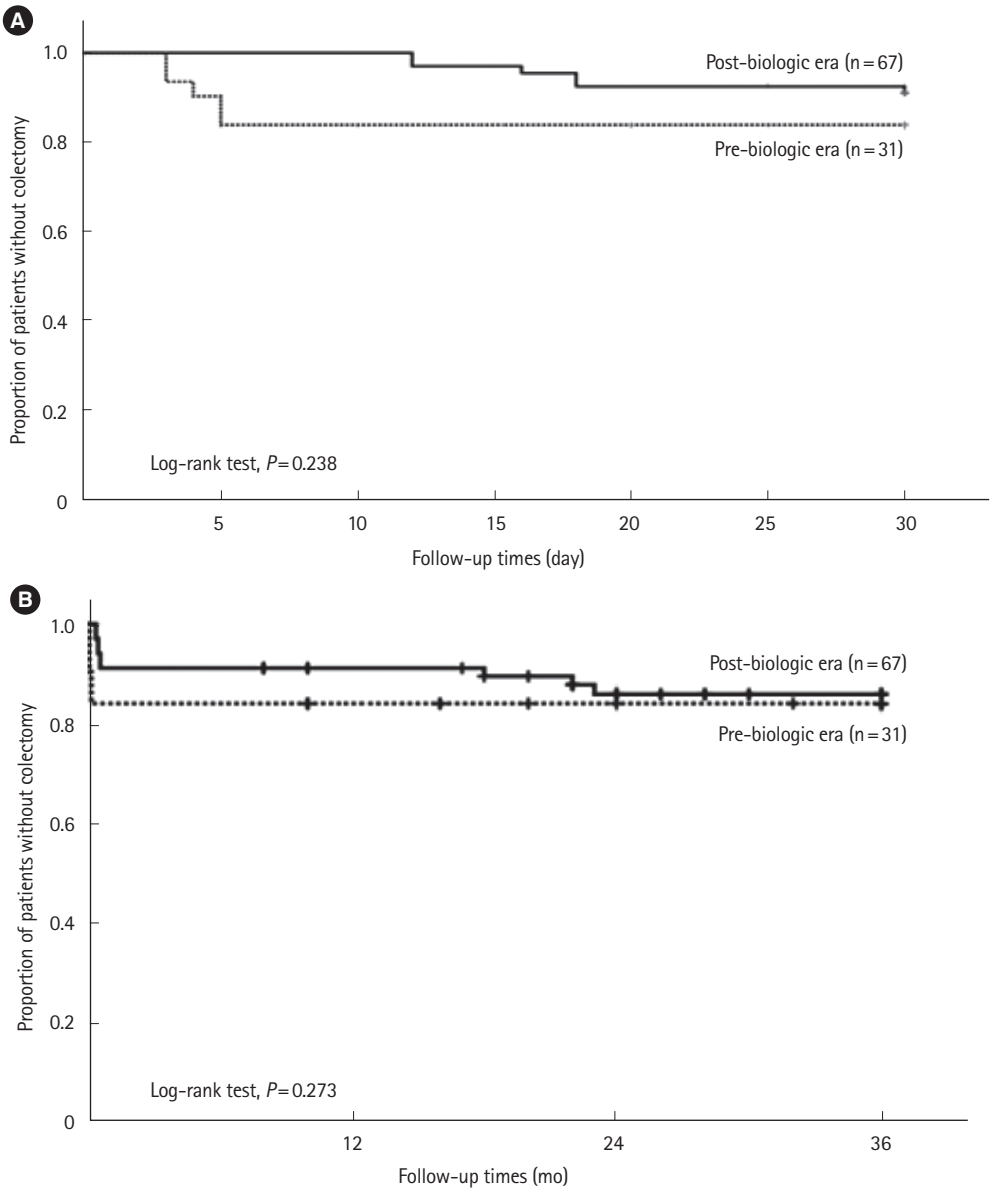

Fig. 3. Kaplan-Meier time-to-colectomy curve for 98 patients with acute severe ulcerative colitis for (A) short-term and (B) long-term follow-up.

A meta-analysis identified a lower risk of colectomy in women (odds ratio [OR], 0.78) and patients who smoke (OR, 0.55) and higher risk in patients with extensive disease (OR, 3.68) or who have ever used steroids (OR, 2.10).[22] Onset of UC at an older age was a risk factor for surgery in our study; this may have been related to greater reluctance to use IV steroids in older patients. Regarding the sex difference, one study showed that men are more likely to undergo surgery to achieve long-term remission or cure, whereas women favor short-term symptom control through medical therapy.[23] In Taiwan, UC is more common in men (male to female ratio, 1.6),[24] which may also have contributed to more male patients receiving colectomy in this study. The previous study, from Asia and including Taiwan, showed a lower incidence of venous thromboembolism in East Asian UC patients compared to those in Western countries,[25] which was consistent with the deep vein thrombosis prophylaxis was lower in our study (1%). Even without prophylaxis, no venous thromboembolization event was recorded in this cohort.

In this study, IV steroids were prescribed in 78.5% of patients with ASUC. In 41 patients (41.8%) with ASUC as initial presentation, the IV steroid prescription rate was lower at

63.4% (26/41). IV steroids should be as the first-line treatment for ASUC and should not be delayed for the exclusion of infection in ASUC, as suggested by guidelines.[26] Our real-world data highlighted the clinical dilemma of prescribing IV steroids in patients with ASUC as the initial presentation, due to the challenge of the waiting period required to exclude infectious colitis. Especially in the past, stool cultures for bacteria, particularly *C. difficile*, often took several days to yield results. Our inclusion period covered a time when rapid tests for CDI were not available. Fortunately, this issue has significantly decreased in recent years with the introduction of rapid tests and polymerase chain reaction methods for CDI. Another issue is that doctors might have less experience in managing ASUC as the initial UC presentation. We strongly believe that our experience can demonstrate the importance of early recognition of ASUC and provide the appropriate treatment for those countries where the inflammatory bowel disease incidence and prevalence are in emerging stages. Our study demonstrated that IV steroid administration shortened admission durations and related to higher white blood cell levels. In the era of biologics, the overall necessity of colectomy for ASUC is relatively unchanged, and mortality rates have decreased significantly because fewer emergency colectomies occur.[27] A population-based study identified no differences in colectomy rate in patients with incident UC over 40 years despite increasing use of biologic therapies.[28] In our cohort study, the colectomy rate was not significantly different after the availability of biologics than it was before, but the rate of IV steroid prescription was higher. This may have been related to recognition of the role of IV steroids in ASUC and insurance reimbursement criteria.

A systematic review of long-term outcomes of ASUC showed that more colectomies occurred in ASUC recurrence cases than in initial ASUC cases (OR, 2.35; 95% confidence interval, 1.33–4.14; $P=0.003$) and that the risk of colectomy was related to biological disease severity on admission.[2] The same trend was found in our study; the colectomy rate was 11.2% for initial ASUC and 23.1% for the recurrent ASUC. Long-term disease duration was related to the risk of ASUC relapse. A study conducted in Korea showed that patients with active UC responded favorably to the first course of steroid treatment but that many patients were eventually refractory to steroids.[29] The study from Taiwan found that more than two-thirds of Crohn's disease patients needed biologic retreatment for acute exacerbations within 1 year after a median of 57 weeks following forced discontinuation.[30] In another study from Taiwan showed that relapsed rate was 42.9% at 6 months after mean duration of 11.1 months of reimbursement restriction for VED usage for UC.[31] Our study found that 5 patients (38.5%) experienced recurrent ASUC after a mean forced biologic discontinuation period of 9.6 months (range, 6–14 months). Therefore, treat-to-target strategies and maintaining steroid-free clinical remission are vital to preventing higher risk of surgery during ASUC recurrence in patients with UC.

Our study has several limitations. First, the lower rate of IV steroid administration, shorter duration and overlap follow-up period in the pre-biologics era affected the ASUC outcomes. Using ASUC as an initial presentation and waiting for culture results might both contribute to the lower use of IV steroids, which can present challenges in real-world practice. Second, due to the reimbursement criteria for biologics, which require a 5-day non-response to IV steroids, and the delayed availability of IFX, only 40% of patients received IFX as rescue therapy. IFX was not available until 2017 and reimbursed until 2018 for UC in Taiwan; therefore, its availability might have affected the outcomes. Additionally, in Taiwan, biologics were reimbursed for a limited period, meaning patients might not achieve mucosal healing, potentially contributing to recurrent ASUC. Finally, this was a retrospective study, and as such, predictive factors such as periodic laboratory collection, follow-up endoscopic healing status, and bowel ultrasound data were lacking. With the timing of IV steroids, rescue therapy, and multidisciplinary team care, physicians may develop an efficient therapy in the future.

So far, we did not observe the short-term and long-term colectomy rate for ASUC has been changed after the introduction of biologics. Recurrent ASUC was associated with a higher colectomy rate, therefore, close monitoring and treat-to-target approach with achieving steroid-free remission are extremely important after the first episode of ASUC.

ADDITIONAL INFORMATION

Funding Source

This work was supported by a grant from the National Taiwan University Hospital (MS507).

Conflict of Interest

Wei SC has consultancy and advisory role for Bristol Myers Squibb, Celltrion, Ferring Pharmaceuticals Inc., Janssen, and Pfizer; honoraria from AbbVie, Bristol Myers Squibb, Celltrion, Cornerstone, Ferring Pharmaceuticals Inc., Janssen, Pfizer,

Takeda, and Tanabe; and grant/research funding from Takeda. All other authors disclose no relevant relationships.

Wei SC is an editorial board member of the journal but was not involved in the peer reviewer selection, evaluation, or decision process of this article. No other potential conflicts of interest relevant to this article were reported.

Data Availability Statement

The anonymized data can be obtained from the corresponding author on a reasonable request.

Author Contributions

Conceptualization; Methodology; Resources; Funding acquisition: Wei SC. Project administration: Lin CC, Hsu WH, Chiang FF, Lin WC, Wei SC. Data curation: Lin CC, Hsu WH, Chiang FF, Lin WC, Wei SC, Hsu TC. Software: Chang CW. Formal analysis: Wu DC, Wang HY, Chang CW, Wong JM, Hsu TC. Visualization: Lin CC, Hsu WH, Chiang FF, Lin WC, Chang CW. Supervision: Wu DC, Wang HY, Chang CW, Wong JM, Hsu TC. Writing original draft: Lin CC, Hsu WH, Chiang FF, Lin WC, Wei SC. Writing - review & editing: Wu DC, Hsu TC, Wang HY, Chang CW, Wong JM, Wei SC. Approval of final manuscript: all authors.

ORCID

Lin WC	https://orcid.org/0000-0002-8142-538X
Lin CC	https://orcid.org/0000-0001-7262-4101
Hsu WH	https://orcid.org/0000-0002-9539-5281
Chiang FF	https://orcid.org/0000-0002-5071-3370
Chang CW	https://orcid.org/0000-0002-7858-3854
Hsu TC	https://orcid.org/0000-0002-0462-1037
Wu DC	https://orcid.org/0000-0003-3742-0634
Wang HY	https://orcid.org/0000-0003-3313-5879
Wong JM	https://orcid.org/0000-0002-8971-3001
Wei SC	https://orcid.org/0000-0002-5017-5840

REFERENCES

1. Solberg IC, Lygren I, Jahnsen J, et al. Clinical course during the first 10 years of ulcerative colitis: results from a population-based inception cohort (IBSEN Study). Scand J Gastroenterol 2009;44:431-440.
2. Dinesen LC, Walsh AJ, Protic MN, et al. The pattern and outcome of acute severe colitis. J Crohns Colitis 2010;4:431-437.
3. Jain S, Kedia S, Sethi T, et al. Predictors of long-term outcomes in patients with acute severe colitis: a northern Indian cohort study. J Gastroenterol Hepatol 2018;33:615-622.
4. Narula N, Marshall JK, Colombel JF, et al. Systematic review and meta-analysis: infliximab or cyclosporine as rescue therapy in patients with severe ulcerative colitis refractory to steroids. Am J Gastroenterol 2016;111:477-491.
5. Jakobovits SL, Travis SP. Management of acute severe colitis. Br Med Bull 2006;75-76:131-144.
6. Aratari A, Papi C, Clemente V, et al. Colectomy rate in acute severe ulcerative colitis in the infliximab era. Dig Liver Dis 2008;40:821-826.
7. Ouyang Q, Tandon R, Goh KL, et al. Management consensus of inflammatory bowel disease for the Asia-Pacific region. J Gastroenterol Hepatol 2006;21:1772-1782.
8. Oh SJ, Shin GY, Soh H, et al. Long-term outcomes of infliximab in a real-world multicenter cohort of patients with acute severe ulcerative colitis. Intest Res 2021;19:323-331.
9. Minami N, Yoshino T, Matsuura M, et al. Tacrolimus or infliximab for severe ulcerative colitis: short-term and long-term data from a retrospective observational study. BMJ Open Gastroenterol 2015;2:e000021.
10. Liu A, Lü H, Yang H, LI Y, Qian J. Efficacy of infliximab as rescue therapy in acute severe ulcerative colitis. Chin J Gastroenterol 2017;(12):604-609.
11. Bernstein CN, Nugent Z, Shaffer S, Singh H, Marrie RA. Comorbidity before and after a diagnosis of inflammatory bowel disease. Aliment Pharmacol Ther 2021;54:637-651.
12. Pabla BS, Schwartz DA. Assessing severity of disease in patients with ulcerative colitis. Gastroenterol Clin North Am 2020;49:671-688.
13. Ikeya K, Hanai H, Sugimoto K, et al. The ulcerative colitis endoscopic index of severity more accurately reflects clinical outcomes and long-term prognosis than the Mayo endoscopic score. J Crohns Colitis 2016;10:286-295.
14. Daperno M, Sostegni R, Scaglione N, et al. Outcome of a conservative approach in severe ulcerative colitis. Dig Liver Dis 2004;36:21-28.
15. Ho GT, Mowat C, Goddard CJ, et al. Predicting the outcome of severe ulcerative colitis: development of a novel risk score to aid early selection of patients for second-line medical therapy or surgery. Aliment Pharmacol Ther 2004;19:1079-1087.
16. Truelove SC, Witts LJ. Cortisone in ulcerative colitis; final report on a therapeutic trial. Br Med J 1955;2:1041-1048.
17. Travis SP, Farrant JM, Ricketts C, et al. Predicting outcome in severe ulcerative colitis. Gut 1996;38:905-910.
18. Moore AC, Bressler B. Acute severe ulcerative colitis: the Oxford criteria no longer predict in-hospital colectomy rates. Dig

Dis Sci 2020;65:576-580.
19. Matson J, Ramamoorthy S, Lopez NE. The role of biomarkers in surgery for ulcerative colitis: a review. J Clin Med 2021;10:3362.
20. Shiga H, Takagi S, Inoue R, et al. What determines the later clinical course of patients who do not undergo colectomy at the first attack? A Japanese cohort study on ulcerative colitis. Digestion 2010;81:104-112.
21. Sayar S, Kurbuz K, Kahraman R, et al. A practical marker to determining acute severe ulcerative colitis: CRP/albumin ratio. North Clin Istanb 2019;7:49-55.
22. Dias CC, Rodrigues PP, da Costa-Pereira A, Magro F. Clinical predictors of colectomy in patients with ulcerative colitis: systematic review and meta-analysis of cohort studies. J Crohns Colitis 2015;9:156-163.
23. Sceats LA, Morris AM, Bundorf MK, Park KT, Kin C. Sex differences in treatment strategies among patients with ulcerative colitis: a retrospective cohort analysis of privately insured patients. Dis Colon Rectum 2019;62:586-594.
24. Yen HH, Weng MT, Tung CC, et al. Epidemiological trend in inflammatory bowel disease in Taiwan from 2001 to 2015: a nationwide population-based study. Intest Res 2019;17:54-62.
25. Weng MT, Park SH, Matsuoka K, et al. Incidence and risk factor analysis of thromboembolic events in east Asian patients with inflammatory bowel disease, a multinational collaborative study. Inflamm Bowel Dis 2018;24:1791-1800.
26. Yen HH, Wu JF, Wang HY, et al. Management of ulcerative colitis in Taiwan: consensus guideline of the Taiwan Society of Inflammatory Bowel Disease updated in 2023. Intest Res 2024;22:213-249.
27. Holvoet T, Lobaton T, Hindryckx P. Optimal management of acute severe ulcerative colitis (ASUC): challenges and solutions. Clin Exp Gastroenterol 2021;14:71-81.
28. Wetwittayakhlang P, Gonczi L, Lakatos L, et al. Long-term colectomy rates of ulcerative colitis over 40 years of different therapeutic eras: results from a Western Hungarian population-based inception cohort between 1977 and 2020. J Crohns Colitis 2023;17:712-721.
29. Yoon JY, Cheon JH, Park JJ, Hong SP, Kim TI, Kim WH. Clinical outcomes and factors for response prediction after the first course of corticosteroid therapy in patients with active ulcerative colitis. J Gastroenterol Hepatol 2011;26:1114-1122.
30. Chen NY, Chuang CH, Chang YC, et al. Suboptimal outcomes and retreatment rate of patients with Crohn's disease after forced discontinuation of biologics: a nationwide population-based study. Clin Pharmacol Ther 2023;114:914-921.
31. Lin WC, Tai WC, Chang CH, et al. Real-world evidence of effectiveness and safety of vedolizumab for inflammatory bowel disease in Taiwan: a prospective nationwide registry (VIOLET) Study. Inflamm Bowel Dis 2023;29:1730-1740.