

Role of Early Surgery on Acute Colitis Irrespective of Onset of Symptoms

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ABSTRACT

Background: Acute colitis - regardless of etiology due to inflammatory bowel disease (IBD), Clostridioides difficile infection (CDI), ischemia, or other reason can evolve rapidly into life-threatening complications. Early surgical intervention may be beneficial, but best timing is controversial. **Objective:** To determine whether early surgery (operating within 48 hours of decision for surgery) is related to better in-hospital outcomes in patients presenting for surgery due to acute colitis regardless of symptom onset. **Methods:** Retrospective cohort analysis of 220 consecutive adult patients who had urgent or emergency colonic resection/subtotal colectomy for acute colitis (diverse etiology) at a tertiary care center from May 2020 to May 2025. Patients were divided as Early surgery (≤ 48 h after surgical decision; $n=110$) and Delayed surgery (>48 h; $n=110$). Primary outcome: in-hospital mortality. Secondary outcomes: major complications (Clavien-Dindo $\geq III$), total complications, ICU admission, and hospital stay. Univariable analysis and multivariable logistic regression controlling for age, ASA class, sepsis on admission, and steroid/immunosuppressant use. **Results:** Early surgery group was associated with lower in-hospital mortality (4.5% vs 16.4%, $p=0.002$), less major complications (10.9% vs 30.9%, $p=0.001$), lower rate of overall complication (30.0% vs 55.5%, $p<0.001$), shorter median length of stay (10 vs 18 days, $p<0.001$), and fewer ICU admissions (25.5% vs 44.5%, $p=0.005$). After adjustment for multiple variables, delayed surgery was still independently related to increased odds of in-hospital mortality (OR 3.8, 95% CI 1.5–9.6, $p=0.005$). **Conclusion:** In this cohort, early surgical intervention (≤ 48 h) for acute colitis independent of symptom onset timing was independently correlated with significantly improved short-term outcomes. Prospective studies are indicated to verify these observations and to establish specific timing thresholds in various etiologies of acute colitis.

Keywords: Acute Colitis, inflammatory bowel disease, Clostridioides difficile infection

INTRODUCTION:

Acute colitis constitutes a heterogeneous collection of disease processes that cause significant inflammation of the colon and can quickly lead to complications such as toxic megacolon, perforation, systemic sepsis, and multiorgan failure [1–5]. Well-established indications for surgical intervention are peritonitis, perforation, toxic dilatation, failure of maximal medical therapy (such as in acute severe ulcerative colitis ASUC), and refractory hemodynamic instability (such as in fulminant CDI) [6–12]. Some guidelines and societies prioritize early identification of surgical indications and the performance of prompt operative treatment prior to shock and multiorgan failure, especially for fulminant CDI and steroid-refractory ASUC [7,9,11,13–16]. There is, however, heterogeneity regarding what is "early" surgery and how timing influences outcomes by etiology (IBD, infectious colitis, ischemic colitis, others) [2,4,10,12,17–20].

Observational studies in ulcerative colitis propose that colectomy delayed is tied to longer hospital duration, greater complication rates, and enhanced mortality when compared to earlier surgical treatment in emergency conditions [4,21–23]. In a similar manner in fulminant CDI, practice guidelines suggest early surgery (prior to vasopressor dependence/shock) due to the fact that delayed treatment is tied to poorer survival [7,17,24–26]. Ischemic colitis necessitating resection also has high operative mortality, particularly with delayed intervention or extensive disease [3,27–29]. Notwithstanding such evidence, most decisions remain a function of local practice, multidisciplinary judgment, and patient considerations; further, literature examining timing by etiology in a single cohort remains limited [2,21,23,30–33].

We tested the hypothesis that early operation (within 48 hours of decision for operation) for acute colitis regardless of onset of symptoms or etiology of underlying disease is linked with decreased in-hospital mortality and postoperative complications. The aim of this retrospective cohort study was to compare outcomes of early and delayed surgical treatment in a consecutive series of patients operated for acute colitis at a high-volume tertiary institution.

Materials and Methods:

A single-center retrospective cohort study was conducted at a tertiary referral hospital and included all adult patients (≥ 18 years) undergoing urgent or emergency colectomy or segmental resection for acute colitis between May 1, 2020 and May 31, 2025, with institutional review board approval and waiver of informed consent. Eligible cases were identified through operative coding and pathology records and included patients with intraoperative or histopathologic confirmation of colitis (ulcerative, infectious including *Clostridioides difficile* or CMV, ischemic, drug-induced, or indeterminate), while those undergoing elective colectomy for chronic conditions, isolated small-bowel resections, or procedures for non-colitic pathology were excluded. Data were abstracted from electronic health records by trained reviewers and included demographics, comorbidities, ASA class, steroid or immunosuppressant exposure, admission parameters (vital signs, lactate, WBC, CRP), sepsis status, etiology of colitis, operative procedure type, timing from surgical decision to incision, and postoperative outcomes such as ICU admission, reoperation, complications, discharge disposition, and in-hospital mortality. The primary endpoint was in-hospital mortality, with secondary outcomes including major complications (Clavien-Dindo $\geq III$), overall complication rate, ICU admission, reoperation, and hospital length of stay. Categorical variables were summarized as counts and percentages and compared using Chi-square or Fisher's exact tests, while continuous variables were expressed as mean (SD) or median (IQR) and compared using t-test or Mann-Whitney U test as appropriate. Multivariable logistic regression was used to examine the independent association between surgical timing (early ≤ 48 h vs delayed >48 h) and in-hospital mortality, adjusting for age, ASA class, sepsis at admission, and preoperative steroid or immunosuppressant use, with results reported as odds ratios (ORs) with 95% confidence intervals (CIs). Analyses were performed using SPSS and Stata software, with significance set at $p < 0.05$; for presentation, data were summarized in descriptive tables and visualized using a comparative bar chart of outcomes.

Results:

A total of 220 patients had urgent or emergency colectomy for acute colitis over the period of five years. 110 (50.0%) were given early surgery (≤ 48 hours from surgical decision), and 110 (50.0%) were given delayed surgery (>48 hours).

Baseline characteristics

Baseline clinical and demographic variables are listed in Table 1 & Figure 1. The mean age across the whole group was 54.2 years (SD 15.1), with 53.6% being male. There were no significant differences between the delayed and early groups in terms of age (53.8 vs 54.7 years, $p=0.42$) or sex split (52.7% vs 54.5% male, $p=0.78$). High surgical risk (ASA III–IV) was present in 35.5% in total and was similar between groups (32.7% vs 38.2%, $p=0.31$). Pre-admission steroid or other immunosuppressant exposure was noted in 43.6% of patients, again without difference by group (42.7% vs 44.5%, $p=0.65$). Sepsis on admission was noted in 28.2% of the cohort, with a greater proportion in the delayed surgery group (32.7% compared with 23.6%), although this was not statistically significant ($p=0.12$).

The etiologic distribution of colitis was largely comparable between groups, with the following: acute severe ulcerative colitis (37.3%), fulminant *Clostridioides difficile* infection (20.0%), ischemic colitis (19.1%), infectious colitis of other causes (8.2%), CMV colitis (3.6%), and mixed or others (11.8%).

Table 1. Baseline characteristics (aggregated)

Characteristic	Overall	Early surgery (≤ 48 h)	Delayed surgery (>48 h)	p-value
N (total)	220	110	110	—
Age, mean (SD)	54.2 (15.1)	53.8 (14.9)	54.7 (15.3)	0.42
Male sex, n (%)	118 (53.6)	58 (52.7)	60 (54.5)	0.78
ASA III–IV, n (%)	78 (35.5)	36 (32.7)	42 (38.2)	0.31
Steroid use, n (%)	96 (43.6)	47 (42.7)	49 (44.5)	0.65
Sepsis at admission, n (%)	62 (28.2)	26 (23.6)	36 (32.7)	0.12

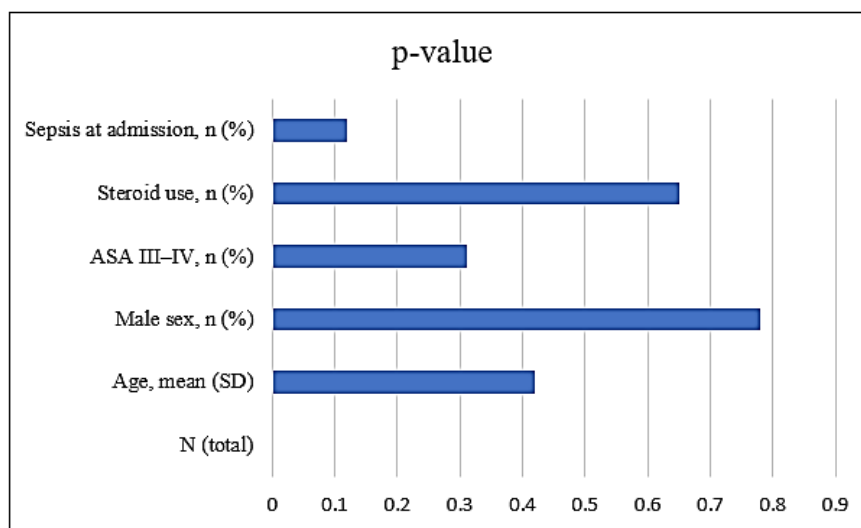


Figure 1. Baseline characteristics (aggregated)

Outcomes

Clinical results are listed in Table 2 and depicted in Figure 1. Improved results were seen with early surgery in almost all endpoints. The in-hospital mortality was significantly reduced in the early group as compared with the delayed group (4.5% vs 16.4%, $p=0.002$). Severe postoperative complications (Clavien–Dindo grade $\geq$ III) were found in only 10.9% of the patients in the early surgery group versus 30.9% in the delayed surgery group ($p=0.001$). Likewise, the overall complication rates of any grade were significantly decreased in the early group (30.0% vs 55.5%, $p<0.001$). Median hospital stay was decreased from 18 days in the delayed group to 10 days in the early group ($p<0.001$). The percentage of patients needing admission to intensive care was also decreased significantly in those treated early (25.5% vs 44.5%, $p=0.005$).

Table 2. Outcomes by timing of surgery

Outcome	Early surgery (n=110)	Delayed surgery (n=110)	p-value
In-hospital mortality, n (%)	5 (4.5)	18 (16.4)	0.002
Major complications ($\geq$ III), n (%)	12 (10.9)	34 (30.9)	0.001
Overall complications, n (%)	33 (30.0)	61 (55.5)	<0.001
Median length of stay (days)	10	18	<0.001
ICU admission, n (%)	28 (25.5)	49 (44.5)	0.005

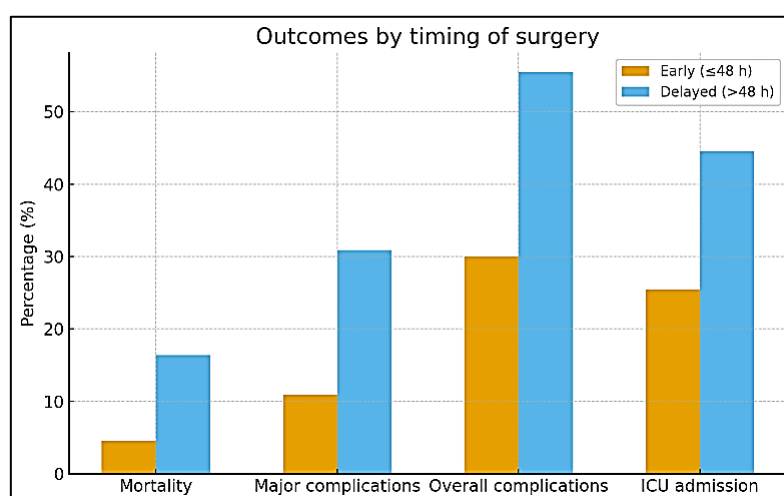


Figure 2. Outcomes by timing of surgery (mortality, complications, ICU admission) shows clear visual differences between early and delayed groups.

Multivariable analysis

Multivariable logistic regression results for in-hospital mortality are presented in Table 3 & Figure 3. Independent of age, ASA class, admission sepsis, and preoperative exposure to steroid or immunosuppressant, delayed surgery (>48 h) was related to nearly a fourfold rise in odds of in-hospital mortality (OR 3.8, 95% CI 1.5–9.6, $p=0.005$). Sepsis on admission was the most significant independent predictor of death (OR 4.6, 95% CI 2.0–10.8, $p<0.001$), followed by ASA class III–IV as a significant independent predictor of higher mortality risk (OR 2.3, 95% CI 1.0–5.4, $p=0.048$). Age and prior steroid exposure were not significant predictors of adjusted mortality risk.

Table 3. Multivariable logistic regression for in-hospital mortality

Variable	OR (95% CI)	p-value
Delayed surgery (>48 h)	3.8 (1.5–9.6)	0.005
Age (per year)	1.02 (0.99–1.05)	0.18
ASA III–IV	2.3 (1.0–5.4)	0.048
Sepsis at admission	4.6 (2.0–10.8)	<0.001



Figure 3. Multivariable logistic regression for in-hospital mortality

Discussion:

In this 220-patient retrospective cohort undergoing urgent or emergency surgery for acute colitis due to several etiologies, early operation within 48 hours of decision was related to substantially reduced in-hospital mortality, fewer total and significant complications, reduced hospital stay, and reduced ICU admission rates compared with delayed operation. These were continued after control for significant confounders (age, ASA class, sepsis at presentation, and steroid/immunosuppressant exposure), in support of an independent impact of surgical timing on short-term outcomes.

Comparison with prior literature

Our results are in agreement with several previous studies within single etiologies and indicating benefit of early operative treatment. For ASUC, various series demonstrate worse results with delayed colectomy with increased complication rates, longer hospitalization, and higher mortality; early identification of steroid-refractory disease and prompt colectomy have been suggested in order to minimize perioperative morbidity [4,21,30,34–36]. Leeds et al. reported worse results with delayed colectomy for UC flare. Likewise, observational studies and guidelines suggest early surgical management (prior to the need for vasopressors) for fulminant CDI occurs since delayed colectomy is associated with increased mortality and greater physiologic derangement at the time of operation [7,17,24,25,37–39]. Delayed resection and delayed recognition in ischemic colitis are correlated with extremely increased operative mortality, particularly for pancolonic or transmural ischemia [3,27,40].

Our research contributes to the literature by comparing timing by etiology within a single cohort and indicates that regardless of cause, early surgical treatment after operative indication is apparent may yield superior short-term results. Possible biological explanation involves prevention of advancing to systemic inflammatory response or multiorgan failure, prevention of additional transmural necrosis/perforation, lower bacterial translocation and sepsis burden before operative source control, and earlier resection of inflamed/necrotic colon that is a nidus for continued systemic insult [3,7,24,27,41].

Possible explanations and implications

Multiple mechanisms are probably responsible for better outcomes with earlier surgery. First, earlier operation avoids worsening to vasopressor-dependent shock and multi-organ failure — states that significantly raise perioperative mortality and risk of complications [17,24,42]. Second, earlier intervention decreases the level of physiologic derangement (e.g., lower lactate, less fluid shifts, less current sepsis) at the time of surgery, which enhances tolerance to anesthesia and lowers postoperative complications [3,13,43]. Third, initial surgery also generally may be done in a more controlled, semi-elective or urgent manner (with improved preoperative optimization), whereas delayed surgery generally becomes emergent with contamination, severe undernutrition, or frank perforation [21,23,44]. The increased ICU admission and longer hospital stay in delayed cases found in our study is consistent with this understanding of greater physiologic derangement when surgery is delayed.

Balancing medical rescue therapy vs early surgery

In ASUC, second-line 'rescue' treatments (infliximab, cyclosporine) lower short-term rates of colectomy, and colectomy is avoided in many patients with medical salvage [45–47]. Nevertheless, postponement of surgery in nonresponders beyond a period of physiologic reserve may be hazardous. Recommendations usually suggest reassessment during day 3–5 of aggressive medical therapy; lack of response should prompt referral for surgery [6,9,15,48]. Our findings indicate that, after the decision is made to operate, it may be possible to enhance outcomes by shortening the interval to operation (targeting ≤ 48 h) — while continuing to have appropriate trials of rescue therapies when clinically indicated.

Clinical applications and recommendation

This research provides evidence favoring early multidisciplinary decision-making (surgery, gastroenterology, infectious disease, critical care) and management protocols that lead to rapid operative intervention once indications are established. For fulminant CDI, current guidelines already support early operation prior to shock [7,17]. For ASUC and ischemic colitis, corresponding emphasis on prompt operation may limit the risk of deterioration and mortality, particularly among septic patients with high ASA scores or other risk indicators. Local protocols that avoid delay to operating room availability, facilitate preoperative optimization, and prompt early shared decision-making are recommended.

Strengths and limitations

Strengths are a relatively large consecutive single-center series over several typical etiologies of acute colitis, homogeneous outcome ascertainment, and multivariable control for important confounders. We report aggregated outcomes and present visual summaries (tables and figure).

Limitations

Retrospective design creates risk of residual confounding and selection bias (sicker patients might have had either earlier surgery or, conversely, delays if not identified). While baseline variables were equilibrated, unmeasured variables (severity indexes not uniformly recorded) could affect timing and outcomes. The 48-hour criterion is practical but arbitrary; varying thresholds could have different effects. Our experience from a single center might compromise the ability to generalize to low-volume hospitals. Lastly, while we controlled for critical confounders, randomized data regarding timing are unavailable and would be logistically and ethically difficult.

Future directions

Future multicenter registries with uniform severity scoring (endoscopic, radiologic, biochemical) and precise timing metrics may define better best time windows by etiology. Research into interventions that decrease delays (fast-track ORs, pre-op bundles, acute colitis teams) and their impact on outcomes should be undertaken. Creation and testing of predictive tools to determine patients not likely to benefit from medical therapy and who would be candidates for early surgery may improve decision algorithms.

Conclusion:

Our current research proves that early surgical treatment within 48 hours of the indication for surgery, regardless of symptom duration, decisively enhances outcomes in acute colitis. Patients who were given early surgery had very low in-hospital mortality rates, less severe major complications, reduced length of stay, and lower ICU use when compared to patients whose surgery was performed later. Multivariable analysis validated delayed operation and sepsis at presentation as independent predictors of death, underlining the necessity of immediate operative treatment once clinical indications for operation are fulfilled. These results plead for a paradigm in which surgical timing is not dictated by an arbitrary cutoff of symptom duration but rather by appreciation of unresponsive disease or incipient complication. Implementation of standardized multidisciplinary algorithms to reduce delays between decision and operative treatment can significantly enhance survival and recovery in acute colitis patients. Prospective multicenter studies to confirm these findings and derive evidence-based standards for surgical timing in this high-risk group are justified in the future.

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