

Surgical Outcomes in Acute Right-Sided Colonic Ischemia without Vascular Repair: A Single-Center Experience

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Rezumat

Managementul chirurgical în ischemia acută a colonului drept fără revascularizare: experiența unui singur centru

Introducere: Ischemia acută a colonului drept este o afecțiune care pune viața în pericol și necesită adesea intervenție chirurgicală de urgență. Totuși, rezultatele postoperatorii sunt incerte, în special în absența posibilității de revascularizare. Acest studiu a avut ca scop evaluarea caracteristicilor clinice și a rezultatelor postoperatorii la pacienții care au suferit intervenții chirurgicale fără revascularizare.

Metode: În studiu au fost incluși 73 de pacienți care s-au prezentat cu ischemie acută a colonului drept, fără posibilitate de revascularizare. Pacienții au fost împărțiți în trei grupuri: colectomie dreaptă extinsă cu anastomoză primară, colectomie dreaptă extinsă cu stomă și laparotomie exploratorie. Datele demografice, clinice și perioperatorii au fost analizate și comparate.

Rezultate: Din cei 73 de pacienți cu ischemie acută a colonului drept fără posibilitate de revascularizare, 47 dintre aceștia au beneficiat de colectomie și 26 de intervenții chirurgicale exploratorii. Pacienții cu colectomie au prezentat comorbidități mai reduse (ACCI 4,11 vs. 5,59, $p=0,017$) și rezultate mai bune, cu o mortalitate la 30 de zile de 7,7-11,8%, comparativ cu 80,8% în grupul cu explorare exclusivă. În rândul pacienților cu rezecție, stomia a fost mai frecventă (34 vs. 13 anastomoze), iar complicațiile au fost ușor mai mari (41,2% vs. 30,8%). Mortalitatea la un an a fost cea mai mare în grupul cu stomă (26,5%) și cea mai mică în grupul cu anastomoză (15,4%).

Concluzii: La pacienții cu ischemie acută a colonului drept, fără posibilitate de revascularizare, colectomia dreaptă extinsă este asociată cu rezultate mai bune atunci când este realizată la pacienți atent selecționați. Intervenția chirurgicală ar trebui să fie prioritizată la pacienții cu profil de comorbiditate acceptabil.

Cuvinte cheie: chirurgie de urgență, ischemie mezenterică, complicații, supraviețuire

Received: 01.03.2025
Accepted: 22.04.2025

Abstract

Background: Acute right-sided colonic ischemia is a life-threatening condition often necessitating emergent surgical intervention. However, postoperative results are uncertain, especially in the absence of the possibility of revascularization. This study aimed to evaluate clinical characteristics and surgical outcomes in patients undergoing surgical intervention without vascular reconstruction.

Methods: A retrospective cohort study was conducted on 73 patients presenting with acute right-sided colon ischemia without feasible vascular intervention. Patients were categorized into three groups: extended right-sided colectomy with primary anastomosis, colectomy with ostomy, and exploration only. Demographic, clinical, and perioperative data were analyzed and compared.

Results: From the 73 patients with acute right-sided colonic ischemia without vascular repair, 47 undergoing colectomy and 26 exploratory surgery. Colectomy patients had lower comorbidity (ACCI 4.11 vs. 5.59, $p=0.017$) and better outcomes, with 30-day mortality of 7.7–11.8% compared to 80.8% in the exploration-only group. Among resection patients, ostomy was more common (34 vs. 13 anastomoses), and complications were slightly higher (41.2% vs. 30.8%). One-year mortality was highest in the ostomy group (26.5%) and lowest in the anastomosis group (15.4%).

Conclusions: In acute right-sided colonic ischemia patients without vascular repair, extended right-sided colectomy is associated with improved outcomes when performed in appropriately selected individuals. Surgical intervention should be prioritized in patients with acceptable comorbidity profiles.

Keywords: urgent surgery, mesenteric ischemia, complications, survival

Introduction

Acute colonic ischemia is the most common form of intestinal ischemia, accounting for nearly 60-70% of all cases (1). While the majority involve the left colon and typically follow a benign, self-limiting course, ischemia of the right colon - particularly the cecum and ascending colon - represents a distinct clinical entity with a more aggressive course, higher rates of transmural necrosis, and significantly worse outcomes (2,3). Acute right-sided colonic ischemia (ARCI) is frequently associated with non-occlusive mesenteric ischemia (NOMI), a condition characterized by splanchnic hypoperfusion without a clear arterial or venous thrombus (4). NOMI is most commonly seen in elderly patients with multiple comorbidities and those in states of low cardiac output, septic shock, or following cardiac surgery (5,6).

Due to the anatomical and vascular characteristics of the right colon - particularly its reliance on the superior mesenteric artery and relative lack of collateral circulation - this segment is especially vulnerable to ischemic injury during systemic hypoperfusion (7). Once ischemia progresses to necrosis, surgical intervention becomes imperative to prevent systemic inflammatory response syndrome, sepsis, and multi-organ failure (8).

Surgical management of ARCI is complex and

often performed under emergent conditions; in ideal circumstances, revascularization of the superior mesenteric artery may be attempted; however, in many cases, particularly NOMI, no surgically correctable lesion exists, and management must rely on bowel resection and supportive care (9). The choice between primary anastomosis and ostomy creation remains a matter of ongoing debate, while anastomosis can potentially restore intestinal continuity immediately, it carries the risk of leakage in unstable or immunocompromised patients (10,11). Ostomy, on the other hand, is often safer in the acute setting but may delay definitive management and negatively impact long-term quality of life (7-9).

Existing literature on ARCI is limited, with most studies focusing broadly on mesenteric ischemia or combining left- and right-sided colonic ischemia in pooled analyses (4,9,12). Moreover, very few studies have compared outcomes in patients managed with surgical resection versus those treated with conservative approaches when vascular repair is not an option (1-4). As such, there remains a knowledge gap regarding optimal surgical strategy in this high-risk subset.

The present study aims to evaluate the clinical-pathological features, short- and long-term outcomes, and survival of patients with acute right-sided colonic ischemia managed surgically without vascular repair.

Material and Methods

Study Design and Population

A 5-year retrospective cohort study was conducted between October 2018-2023 involving 73 patients who presented with ARCI and underwent surgical intervention at the Department of General Surgery, Emergency Hospital of Constanța (Constanța, Romania). The inclusion criteria were as follows: 1) patients diagnosed acute right-sided colonic ischemia; 2) patients who underwent surgery; 3) patients unable to undergo vascular repair. The exclusion criteria were as follows: 1) patients with feasible vascular intervention; 2) patients with extensive enteral ischemia. Based on operative strategy, patients were classified into three groups: extended right-sided colectomy with primary anastomosis (n=13), extended right-sided colectomy with ostomy (n=34), and exploratory laparotomy without resection (n=26). The study flow is shown in Fig. 1.

Surgical Intervention

In cases of right-sided colonic ischemia due to non-occlusive mesenteric ischemia (NOMI), the surgical approach was not based solely on hemodynamic status, but rather on a combination of intraoperative findings, comorbidities, age,

systemic dysfunctions, and hemodynamic parameters. The decision to proceed with resection or limit intervention to exploratory laparotomy was made after comprehensive assessment of these factors. Patients with localized ischemia and a more favorable clinical profile - based on imaging, laboratory parameters, and intraoperative findings - underwent resection, which provided definitive source control. In contrast, patients with extensive ischemia, severe comorbidities, or multiorgan failure often underwent only exploratory laparotomy due to the prohibitive surgical risk. Preoperative evaluation included contrast-enhanced CT and, when feasible, angio-CT to assess the extent of ischemia and rule out major vascular occlusion. In selected cases, a second-look laparotomy was considered after stabilization, though this rarely led to resection due to persistent poor prognosis.

Data Collection

Clinical records were reviewed to extract data on demographics (age, gender, residence), comorbid conditions (e.g., hypertension, diabetes, cardiovascular disease), behavioral risk factors (smoking, alcohol), intraoperative findings, and immediate postoperative course. Comorbidity burden was assessed using the Age-Adjusted Charlson Comorbidity Index (ACCI). Post-

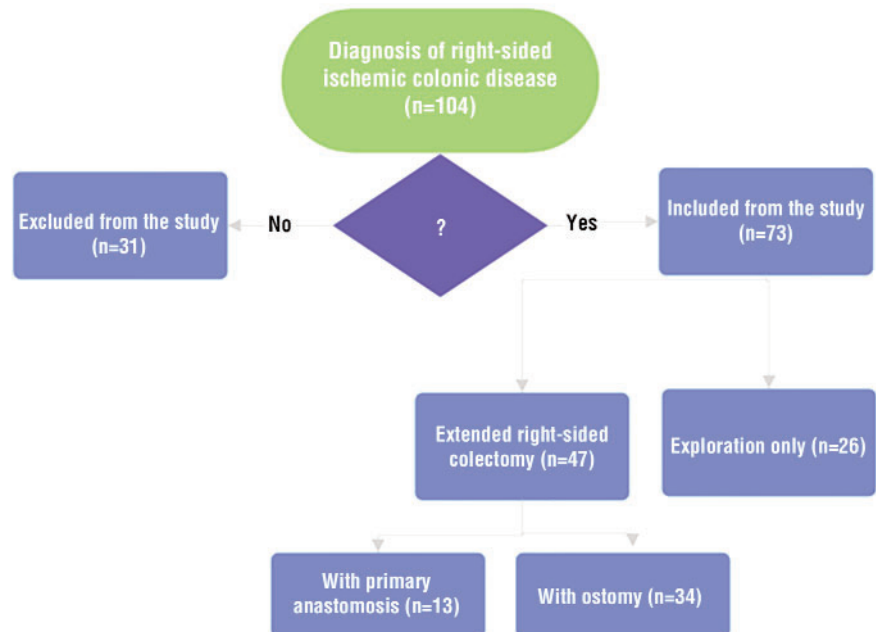


Figure 1. Flowchart visualizing recruitment of participants. Of 104 interested subjects, 73 were eligible for study inclusion.

operative follow-up up to 1 year was performed through clinical visits or by telephone.

Study Endpoints

The primary endpoint was to analyze the post-operative outcomes and to perform a comparison between the resectional and non-resectional approaches in the assessment of one year survival.

The secondary endpoint was to determine the existence of statistical differences regarding the clinical and demographic characteristics between the study groups and subgroups.

Ethical Approval

In compliance with the Declaration of Helsinki on human testing, the study was authorized by the Local Ethics Commission for the Approval of Clinical and Research Developmental Studies. All patients gave their informed consent when they were enrolled (approval no. 43/10.09.2018).

Statistical Analysis

SPSS version 28 was utilized for statistical analysis. Categorical variables are represented as

counts, and the results are displayed as a median with range or mean \pm standard deviation with range. The clinical and pathological parameters were compared using the χ^2 test. Categorical data were evaluated with Chi-square or Fisher's exact test. A statistically significant difference was defined as $p < 0.05$.

Results

Baseline Characteristics

A total of 73 patients with acute right-sided colonic ischemia without possibility of revascularization were included in the study, with 47 undergoing extended right-sided colectomy and 26 receiving exploratory surgery only. Comparative analysis of demographic and clinical characteristics revealed no statistically significant differences in age (67.11 ± 9.31 vs. 71.42 ± 9.02 years, $p = 0.055$) or gender distribution ($p = 0.079$). However, patients in the colectomy group were significantly more likely to reside in urban areas (76.6% vs. 15.4%, $p = 0.041$), suggesting potential referral or access biases (Table 1).

Variables	Extended right-sided colectomy (n=47)	Exploration only (n=26)	p-value
Age (y)*	67.11 \pm 9.31 (52-81)	71.42 \pm 9.02 (57-84)	0.055
Environment			0.041
Urban	36 (76.6)	4 (15.4)	
Rural	11 (23.4)	22 (84.6)	
Gender			0.079
Male	27 (57.4)	17 (65.4)	
Female	20 (42.6)	9 (34.6)	
Behaviour			0.181
Smoker	31 (65.9)	18 (69.2)	
Alcohol abuse	9 (19.1)	6 (23.1)	
Blood pressure*			0.063
Systolic	91.17 \pm 2.5 (69-172)	8.16 \pm 1.7 (57-184)	
Diastolic	4.19 \pm 0.17 (32-89)	4.02 \pm 0.7 (29-67)	
BMI (kg/m ²)*	29.24 \pm 4.15 (18.2-41.44)	24.72 \pm 3.14 (19.62-39.67)	0.475
ACCI*	4.11 \pm 2.21	5.59 \pm 2.17	0.017
0-1	0	0	
2-3	12 (25.5)	3 (11.5)	
4-5	19 (40.4)	8 (30.8)	
≥ 6	16 (34)	15 (57.7)	
Cardiovascular disease	17 (36.2)	12 (46.1)	0.094
Hypertension*	21 (44.7)	5 (17.9)	0.024
DM*2 (4.2)	4 (15.4)	0.094	
Renal disease	3 (6.4)	12 (46.1)	0.058
Pulmonary disease	6 (12.8)	4 (15.4)	0.476
Hepatic disease	1 (2.1)	1 (3.8)	0.801
Neurological disease	5 (10.6)	3 (11.5)	0.129

Table 1. Baseline demographics and comorbidity of the patients

Variables are expressed as number of cases, with percentages in parenthesis, unless indicated otherwise*, *mean \pm SD (Standard Deviation) with range in parentheses. Values in italics indicate statistical significance ($p < 0.050$). y, years; BMI, Body Mass Index; ACCI, Age-Adjusted Charlson Comorbidity Index; DM, Diabetes Mellitus.

The comorbidity burden, assessed by the Age-Adjusted Charlson Comorbidity Index (ACCI), was significantly lower in the colectomy group (mean 4.11 ± 2.21 vs. 5.59 ± 2.17 , $p=0.017$), and this difference was supported by the distribution of patients in higher comorbidity categories (≥ 6 : 34.0% vs. 57.7%). Hypertension was also more prevalent among colectomy patients (44.7% vs. 17.9%, $p=0.024$), while other comorbidities, including cardiovascular, renal, hepatic, pulmonary, and neurological diseases, showed no statistically significant differences between groups.

The Resection Subgroup Analysis: Anastomosis vs. Ostomy

Among patients undergoing extended right-sided colectomy, 13 received a primary anastomosis and 34 received an ostomy (Table 2). The anastomosis subgroup was younger (61.09 ± 10.22 vs. 69.21 ± 11.23 years), although this difference did not reach statistical significance ($p=0.233$). Interestingly,

rural residency was more prevalent among patients receiving anastomosis (61.5% vs. 8.8%, $p=0.044$).

A marked difference was observed in comorbidity profiles. The mean ACCI was significantly lower in the anastomosis group (3.06 ± 1.02 vs. 4.87 ± 2.11 , $p=0.039$), and hypertension was also significantly less common (15.4% vs. 55.2%, $p=0.042$). While other comorbidities such as cardiovascular disease, pulmonary disease, and diabetes were numerically more frequent in the ostomy group, these did not reach statistical significance.

Behavioral risk factors showed trends toward higher smoking prevalence in the ostomy group (85.3% vs. 15.4%, $p=0.071$), while alcohol use was more frequent in the anastomosis subgroup (30.8% vs. 14.8%), although neither was statistically significant.

Postoperative Outcomes

Regarding postoperative outcomes, patients were

Variables	Extended right-sided colectomy (n=47)		p-value
	With primary anastomosis (n=13)	With ostomy (n=34)	
Age (y)*	61.09 ± 10.22 (52-74)	69.21 ± 11.23 (59-81)	0.233
Environment			0.044
Urban	5 (38.5)	31 (91.2)	
Rural	8 (61.5)	3 (8.8)	
Gender			0.712
Male	7 (53.8)	20 (58.8)	
Female	6 (46.2)	14 (41.2)	
Behaviour			0.071
Smoker	2 (15.4)	29 (85.3)	
Alcohol abuse	4 (30.8)	5 (14.8)	
Blood pressure*			
Systolic	11.06 ± 3.8 (81-172)	89.31 ± 1.4 (69-140)	
Diastolic	5.84 ± 0.22 (39-61)	3.28 ± 0.11 (32-89)	
BMI (kg/m ²)*	24.12 ± 3.06 (18.2-33.04)	28.22 ± 4.11 (21.5-41.44)	
ACCI *	3.06 ± 1.02	4.87 ± 2.11	0.039
0-1	0	0	
2-3	8 (61.5)	4 (11.8)	
4-5	4 (30.8)	15 (44.1)	
≥ 6	1 (7.7)	15 (44.1)	
Cardiovascular disease	4 (30.8)	13 (38.2)	0.177
Hypertension*	2 (15.4)	19 (55.19)	0.042
DM*0	2 (5.9)	ns	
Renal disease	1 (7.7)	2 (5.9)	0.219
Pulmonary disease	1 (7.7)	5 (14.8)	0.086
Hepatic disease	0	1 (2.9)	ns
Neurological disease	1 (7.7)	4 (11.8)	0.619

Table 2. Comparison of baseline characteristics and comorbidity between resection with anastomosis or ostomy.

Variables are expressed as number of cases, with percentages in parenthesis, unless indicated otherwise*, *mean \pm SD (Standard Deviation) with range in parentheses. Values in italics indicate statistical significance ($p < 0.050$). y, years; BMI, Body Mass Index; ACCI, Age-Adjusted Charlson Comorbidity Index; DM, Diabetes Mellitus; ns, non-significant.

Table 3. Postoperative outcomes depending on the type of surgical intervention.

Variables	Extended right-sided colectomy with anastomosis (n=13)	Extended right-sided colectomy with ostomy (n=34)	Exploration only (n=26)
Any postoperative complication	4 (30.8)	14 (41.2)	26 (100)
Anastomotic leakage	1 (7.7)	na	na
Ileus	1 (7.7)	1 (2.9)	26 (100)
Systemic complications	1 (7.7)	2 (5.9)	25 (96.1)
Other complications	1 (7.7)	11 (32.3)	17 (65.4)
Postoperative hospital stay*	14.33 (9-21)	19.47 (11-31)	na
Reoperation	1 (7.7)	3 (8.8)	4 (15.4)
Readmission	2 (15.4)	5 (14.8)	0
30-day mortality	1 (7.7)	4 (11.8)	21 (80.8)
1-year mortality	2 (15.4)	9 (26.5)	5 (19.2)
Ostomy reversal	na	5 (14.8)	na

Variables are expressed as number of cases, with percentages in parenthesis, unless indicated otherwise*.

*mean, with range in parentheses. Values in italics indicate statistical significance ($p < 0.050$). na, not applicable.

compared by distribution into the 3 groups of categories: resection with anastomosis, resection with stoma and exploratory laparotomy (Table 3). Postoperative outcomes varied significantly by the type of surgical intervention. All patients were followed up postoperatively clinically, biologically and imaging (abdominal ultrasound, computed tomography), those who underwent only exploratory laparotomy presented various types of immediate postoperative complications; in particular, the rates of ileus and systemic complications were almost universal in the exploration-only cohort (100% and, respectively, 96.1%). For patients who underwent surgical resection, postoperative complications totaled 30.8% and 41.2% in the anastomosis and ostomy groups, respectively.

Patients who underwent resection with stoma had significantly fewer complications such as ileus or systemic complications, but they had numerous complications such as fluid and electrolyte disorders and nutrition disorders, which accounted for almost a third of the total number of patients (32.3%). Postoperative complications such as ileus, systemic complications and anastomotic fistula were identified in only one case each (7.7%). Reoperation and readmission rates were comparable between surgical subgroups (7.7% vs 8.8%), with slightly higher readmissions in patients with anastomosis (15.4%) compared to stoma (14.8%).

Short-term mortality differed significantly between groups. The 30-day mortality rate was dramatically higher in the exploration-only cohort (80.8%) relative to patients undergoing resection (7.7% anastomosis, 11.8% ostomy). One-year mortality was also highest in the ostomy subgroup (26.5%), followed by anastomosis subgroup

(15.4%). Ostomy reversal was documented in 14.8% of ostomy patients.

Discussion

An uncommon but serious surgical emergency, acute right-sided colonic ischemia frequently affects elderly patients with several comorbidities and impaired hemodynamic condition (6). The lack of standardized guidelines for surgical management - particularly when vascular repair is not an option - poses a significant challenge for clinicians (13). Several studies have emphasized the poor prognosis associated with NOMI, a leading cause of ARCI, with reported mortality rates exceeding 70-80% in untreated or conservatively managed cases (2,14). The need for timely surgical intervention is well established; however, the decision between resectional versus damage-control approaches (i.e., exploratory laparotomy without resection) and between anastomosis versus ostomy remains less clearly defined (11-13).

Our study adds to the existing literature by providing a focused analysis of ARCI cases without vascular repair and comparing surgical strategies in terms of both short- and long-term outcomes. The findings demonstrate that patients undergoing resection - either with primary anastomosis or ostomy - had significantly better 30-day and one-year survival compared to those who underwent only exploratory laparotomy. This observation aligns with prior studies showing that definitive resection improves outcomes by removing necrotic bowel, thereby reducing systemic toxicity and risk of multi-organ failure (14-16). In a 10-year review by Clair and Beach (2), mortality in patients

undergoing resection for acute mesenteric ischemia ranged from 30% to 50%, depending on disease severity and timing of surgery. Our study showed markedly lower 30-day mortality in the resection groups (7.7% in anastomosis and 11.8% in ostomy), likely reflecting the benefit of early intervention in a highly selected cohort. Conversely, the exploratory laparotomy group had an 80.8% 30-day mortality, in line with previously reported outcomes in patients managed without resection (4-8,15).

The debate over anastomosis versus ostomy in ischemic bowel disease is ongoing. Bala et al (6) emphasized the importance of patient selection, suggesting that primary anastomosis may be appropriate in stable patients with low comorbidity and without gross peritoneal contamination. Our data support this: patients receiving anastomosis were younger, had a significantly lower ACCI score (3.06 vs. 4.87, $p = 0.039$), and experienced a low complication rate, with only one case of anastomotic leak and no anastomosis-related mortality. This supports the feasibility of primary anastomosis in carefully selected cases. In contrast, the ostomy subgroup, comprising more medically complex patients, showed a higher one-year mortality (26.5% vs. 15.4% in anastomosis). This is consistent with prior findings indicating that the need for an ostomy often reflects poorer baseline status and more extensive disease (17,18). Furthermore, only 14.8% of ostomy patients underwent reversal, highlighting the long-term burden of stoma care, which includes fluid-electrolyte imbalances and reduced quality of life.

Interestingly, our study found a statistically significant association between urban residence and likelihood of undergoing colectomy ($p = 0.041$). While not widely reported in previous literature, this may reflect better access to tertiary care, faster diagnostic workup, or earlier referral in urban settings. Additionally, the high prevalence of smoking and hypertension among ostomy patients raises questions about the role of behavioral and vascular risk factors in surgical decision-making and recovery.

Despite its strengths - including a focused cohort and granular subgroup analysis - our study has several limitations. The retrospective design and single-center scope may limit generalizability. Sample size, particularly in the anastomosis subgroup, was modest, and selection bias cannot be excluded. Nevertheless, these findings have important clinical implications. They support a proactive approach to ARCI,

favoring resection over conservative exploration whenever feasible. Primary anastomosis appears safe in selected low-risk patients, while ostomy remains a valid alternative in the setting of hemodynamic instability or significant comorbid burden. Future studies should incorporate multi-center data, standardized criteria for surgical decision-making, and long-term functional and quality-of-life outcomes, especially for patients living with permanent ostomies.

Conclusion

Surgical resection improves short- and long-term results compared to exploratory laparotomy alone in patients with acute right-sided colonic ischemia when revascularisation is not an option. Primary anastomosis is safe and effective in carefully selected, low-risk patients, while ostomy remains appropriate for those with greater comorbidity or instability.

Conflicts of Interests

The authors declared no potential conflicts of interest.

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