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Clinical characteristics, management, and short-term outcomes of acute superior mesenteric artery embolism in a cohort with a high prevalence of cardiogenic risk factors: a single-center retrospective cohort study

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Research Article

Keywords: Acute mesenteric ischemia, Superior mesenteric artery embolism, Atrial fibrillation, Open surgical revascularization, Treatment outcome, Retrospective cohort study

Posted Date: November 12th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11222037/v1

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Additional Declarations: No competing interests reported.

Abstract

Background

Acute superior mesenteric artery embolism (ASMAE) is a rare, life-threatening systemic embolism associated with cardiogenic risk factors. We described its clinical features, management, and outcomes in a single-center cohort.

Methods

This retrospective cohort study included 28 patients with ASMAE treated between March 2023 and March 2026. Isolated mesenteric venous thrombosis, non-occlusive mesenteric ischemia, and superior mesenteric artery dissection were excluded. All patients underwent computed tomography angiography (CTA), and operative patients had surgical or pathological confirmation. Clinical, treatment, complication, discharge, and available post-discharge follow-up data were collected. Continuous variables are reported as mean ± standard deviation and categorical variables as counts and percentages.

Results

We included 17 men and 11 women (mean age, 71.04 ± 9.06 years). Atrial fibrillation was present in 22 patients and valvular heart disease in 12. The proximal, middle, and distal superior mesenteric artery was involved in 7, 12, and 9 patients, respectively; 9 had concurrent infarction and 11 had peritonitis. Four patients received conservative treatment and 24 entered an operative pathway. The mean operative duration was 172.04 ± 63.02 minutes. Operations included Fogarty embolectomy alone (12), embolectomy plus bowel resection (9), bowel resection alone (1), laparotomy alone (1), and AcoStream aspiration followed by open surgery (1). Intestinal ischemia occurred in 21 patients, transmural necrosis in 14, and bowel resection with anastomosis in 10. Eleven patients were discharged against medical advice; 1 survived and 10 died after discharge (post-discharge mortality, 35.7%). Seventeen patients improved before discharge, and 1 later recovered, yielding 18 patients with a favorable short-term outcome. Five of 14 operative patients with a favorable outcome were lost to follow-up; one had residual distal embolism at 1 month.

Conclusions

ASMAE in patients with cardiogenic risk factors was associated with a high burden of intestinal ischemia, bowel necrosis, and post-discharge death. An open revascularization-dominant strategy enabled assessment of bowel viability and resection of nonviable intestine. These findings are descriptive, not comparative; prospective studies with standardized criteria and complete follow-up are needed.

Background

Acute mesenteric ischemia (AMI) is a vascular emergency caused by an abrupt reduction in intestinal perfusion and is associated with mortality approaching or exceeding 50% in contemporary series, particularly when diagnosis and revascularization are delayed [1–5]. AMI accounts for a small but clinically important proportion of acute abdominal emergencies, and its incidence increases with age [1, 3, 20]. ASMAE is a major mechanism of arterial AMI and is frequently associated with a cardiogenic source, including atrial fibrillation (AF), valvular heart disease, and mural thrombus after myocardial infarction [2].

The clinical diagnosis of ASMAE remains challenging. Pain that is disproportionate to abdominal findings may be present early, whereas fever, peritoneal signs, hemodynamic instability, and laboratory abnormalities often appear after irreversible intestinal injury has developed [2, 4]. Previous single-center experience in China also emphasized the non-specific presentation and the need for early surgical readiness [21, 23]. Laboratory tests alone cannot reliably rule in or rule out arterial occlusive AMI [6]. CTA is therefore the preferred initial imaging modality because it can identify the site and extent of occlusion, collateral circulation, bowel-wall changes, pneumatosis, portomesenteric venous gas, and concurrent infarction in other organs [3, 4, 7]. Early multidisciplinary assessment is essential because the diagnostic pathway and the need for immediate revascularization or laparotomy are often determined in parallel [3, 4].

Treatment selection remains debated. Endovascular therapy may be appropriate for selected patients without clinical or imaging evidence of bowel necrosis, and it can restore perfusion while avoiding the physiological burden of open surgery [4, 5, 7]. AcoStream thrombus aspiration and guiding-catheter aspiration are established endovascular options in selected patients [15, 16], whereas open emergency surgery remains essential when bowel viability cannot be assessed or preserved [13]. However, endovascular treatment does not directly assess bowel viability and may be insufficient when peritonitis or transmural necrosis is already present [4, 7]. In a 2025 analysis of the prospective AMESI cohort, the unadjusted mortality advantage associated with endovascular treatment was largely explained by baseline selection, and the treatment method was not an independent predictor of in-hospital mortality [8]. This finding highlights the need for real-world data describing how patients are actually selected and treated outside highly standardized trials.

The present study therefore describes the clinical characteristics, diagnostic pathways, treatment strategies, operative findings, complications, discharge status, and short-term follow-up of 28 patients with ASMAE at a single tertiary-care center. The study does not aim to compare the causal effectiveness of open and endovascular treatment. Its principal contribution is to document an open revascularization-dominant pathway in a high-risk cohort and to identify the clinical and methodological uncertainties that should be addressed in future prospective studies.

Methods

Study design and setting

This was a single-center, retrospective cohort study performed in the Department of Vascular Surgery at Suining Central Hospital, Suining, Sichuan, China. The study period was March 2023 to March 2026. The study used routinely collected, de-identified clinical data and was reported according to the STROBE recommendations for observational studies.

Participants

Adult patients were eligible if they had a primary diagnosis of ASMAE, underwent CTA at our hospital or a referring hospital, and received initial or definitive treatment at our center during the study period. The diagnosis was established by CTA showing an intraluminal filling defect, abrupt contrast-column cutoff, or occlusion involving the SMA trunk or its branches. In patients who underwent surgery, the diagnosis was additionally confirmed by operative findings or pathological examination of the retrieved thrombus or resected bowel. Patients with isolated superior mesenteric venous thrombosis, non-occlusive mesenteric ischemia, SMA dissection, insufficient CTA evidence, incomplete clinical records, or primary treatment completed at another hospital were not included.

Data collection

The following variables were extracted from the electronic medical record: sex, age, admission and discharge departments, total hospital stay, smoking status, hypertension, diabetes mellitus, coronary artery disease, atrial fibrillation (AF), valvular heart disease, cardiac insufficiency, prior cerebral infarction, renal insufficiency at admission, hypoalbuminemia, SMA occlusion location, concomitant infarction, abdominal pain and its duration, peritonitis, abdominal distension, CT evidence of bowel obstruction, treatment modality, operative duration, intraoperative bowel ischemia or necrosis, bowel resection, treatment abandonment, postoperative complications, postoperative hospital stay, time to pain relief, time to resumption of oral intake, discharge status, and available post-discharge follow-up findings.

Definitions

The SMA was divided into three anatomical segments according to the CTA-based classification described by Tual et al. [19]. The proximal segment (S1) extended from the SMA ostium to the inferior pancreaticoduodenal artery, the middle segment (S2) extended from the inferior pancreaticoduodenal artery to the ileocolic artery, and the distal segment (S3) was located downstream of the ileocolic artery.

Intestinal ischemia was defined as intraoperative dusky or cyanotic bowel with impaired peristalsis or reduced arterial pulsation. Transmural intestinal necrosis was defined as full-thickness necrosis confirmed by pathological examination in resected specimens or as unequivocally nonviable bowel

judged by the operating surgeon. Peritonitis was defined as rebound tenderness and/or involuntary abdominal muscle guarding. Renal insufficiency at admission was defined as an estimated glomerular filtration rate < 60 mL/min/1.73 m² or a serum creatinine concentration above the age- and sex-specific laboratory upper reference limit, consistent with the KDIGO framework [24]. Hypoalbuminemia was defined as a serum albumin concentration < 30 g/L. Cardiac insufficiency was defined as a documented clinical diagnosis of heart failure, including symptomatic heart failure or objective cardiac dysfunction consistent with the 2021 ESC criteria [25]. CT evidence of bowel obstruction was defined as dilated proximal bowel with a transition zone and/or air-fluid levels reported by the attending radiologist. Clinical improvement was defined as resolution or substantial reduction of abdominal pain, improvement or resolution of peritoneal signs, ability to resume oral intake, and discharge without immediate plans for further emergency intervention.

Imaging assessment

All patients underwent CTA at either a referring hospital or Suining Central Hospital, and the images or reports were reviewed by the treating vascular surgery team. The CTA criteria for ASMAE were an intraluminal filling defect, abrupt vessel cutoff, or occlusion of the SMA trunk or branches. For patients who underwent surgery, imaging findings were correlated with operative findings and, when available, pathological examination. Detailed scanner, slice-thickness, contrast-dose, and scan-phase information was not uniformly available and is therefore not reported.

Treatment strategy

Conservative treatment was considered for patients without peritonitis, hemodynamic instability, or imaging evidence of transmural necrosis, particularly those with distal or chronic occlusion and preserved bowel viability. Conservative treatment included anti-infective therapy, anticoagulation, improvement of the mesenteric circulation, plaque stabilization, acid suppression, and nutritional support. Mild infections were treated with piperacillin-tazobactam, and severe infections were treated with imipenem-cilastatin. Weight-adjusted enoxaparin was used for anticoagulation. Alprostadil injection was used to improve the mesenteric circulation, a statin was used for plaque stabilization, omeprazole was used for acid suppression, and albumin, lipid emulsion, and glucose were used for nutritional support.

Endovascular treatment was considered for selected patients without peritonitis or established transmural necrosis when the vascular anatomy was suitable and treatment could be performed without unacceptable delay. Access was obtained through the common femoral artery. Aspiration thrombectomy was performed with the AcoStream system or a guiding catheter, and catheter-directed thrombolysis was added when residual thrombus was present at the operator's discretion.

Open surgery was selected when peritonitis, suspected transmural necrosis, hemodynamic instability, CT signs of irreversible bowel injury, failed endovascular treatment, or uncertainty regarding bowel viability

was present. Surgical treatment included SMA incision with Fogarty catheter embolectomy, necrotic bowel resection, intestinal anastomosis, exploratory laparotomy, or a combination of these procedures. A second-look laparotomy or conversion from endovascular treatment to open surgery was considered when abdominal pain or peritoneal signs persisted, lactate concentrations increased, hemodynamic instability developed, or residual intestinal ischemia could not be excluded. The final decision was made by the multidisciplinary team in consultation with the patient and family.

Outcomes and follow-up

The primary outcomes were intraoperative intestinal ischemia, transmural intestinal necrosis, bowel resection, and post-discharge death. Secondary outcomes included complications, postoperative hospital stay, time to pain relief, time to resumption of oral intake, CTA findings, and post-discharge survival status based on available follow-up. The follow-up protocol allowed outpatient and telephone follow-up for up to 1 year after discharge. However, for this retrospective analysis, only follow-up information documented up to the last recorded contact was analyzed; the analysis did not assume that every patient had completed a full year of follow-up. Loss to follow-up was defined as the absence of outpatient follow-up and failure to reach the patient or family by telephone. Follow-up CTA was reviewed for main-trunk patency, stenosis, and distal or branch embolism.

Statistical analysis

The study was descriptive. Continuous variables are reported as mean ± standard deviation and categorical variables as counts and percentages. No inferential comparisons were performed.

Results

Baseline characteristics and clinical presentation

A total of 28 patients with ASMAE were included: 17 men and 11 women. The mean age was 71.04 ± 9.06 years. Mean age was 67.88 ± 9.90 years in men and 75.91 ± 4.66 years in women. The mean hospital stay was 13.07 ± 10.40 days. Sixteen patients (57.1%) were initially admitted to the vascular surgery department, whereas 12 were initially admitted to other services. At discharge, 17 patients were recorded as being discharged from vascular surgery, 8 from the intensive care unit, and 3 from the gastroenterology or gastrointestinal surgery service. Seventeen patients showed clinical improvement before discharge, and 11 were discharged against medical advice or at the request of the patient or family.

Cardiovascular and metabolic comorbidities were common. Twelve patients had a smoking history, 16 had hypertension, 2 had diabetes mellitus, 13 had coronary artery disease, 22 had AF, 12 had valvular heart disease (12 did not and 4 had unknown status), 13 had cardiac insufficiency, 9 had a history of

cerebral infarction, 7 had renal insufficiency at admission, and 4 had hypoalbuminemia at admission (Table 1).

Table 1
Baseline characteristics and clinical presentation

Characteristic	n (%) or mean ± SD
Age, years	71.04 ± 9.06
Male age, years	67.88 ± 9.90
Female age, years	75.91 ± 4.66
Male sex	17 (60.7)
Female sex	11 (39.3)
Hospital stay, days	13.07 ± 10.40
Initial admission to vascular surgery	16 (57.1)
Smoking history	12 (42.9)
Hypertension	16 (57.1)
Diabetes mellitus	2 (7.1)
Coronary artery disease	13 (46.4)
Atrial fibrillation	22 (78.6)
Valvular heart disease	12 (42.9)
Cardiac insufficiency	13 (46.4)
Prior cerebral infarction	9 (32.1)
Renal insufficiency at admission	7 (25.0)
Hypoalbuminemia at admission	4 (14.3)
SMA occlusion location	
Proximal	7 (25.0)
Middle	12 (42.9)
Distal	9 (32.1)
Concurrent infarction at another site	9 (32.1)
Renal infarction	4 (14.3)
Splenic infarction	3 (10.7)
Lower-limb arterial ischemia	1 (3.6)

Values are mean ± standard deviation or n (%). CT, computed tomography; SMA, superior mesenteric artery.

Characteristic	n (%) or mean ± SD
Concurrent splenic and renal infarction	1 (3.6)
Abdominal pain	28 (100)
Duration of abdominal pain, hours	25.93 ± 27.37
Signs of peritonitis	11 (39.3)
Abdominal distension	5 (17.9)
CT evidence of bowel obstruction	6 (21.4)

Values are mean ± standard deviation or n (%). CT, computed tomography; SMA, superior mesenteric artery.

Vascular and abdominal findings

All 28 patients had abdominal pain. The mean interval from symptom onset to presentation was 25.93 ± 27.37 hours. Eleven patients had signs of peritonitis, 5 had abdominal distension, and 6 had CT evidence of bowel obstruction. The embolus involved the proximal, middle, and distal SMA in 7, 12, and 9 patients, respectively. Nine patients had concurrent infarction at another anatomic site: renal infarction in 4, splenic infarction in 3, lower-limb arterial ischemia in 1, and concurrent splenic and renal infarction in 1.

Treatment

Four patients received conservative treatment. Of these, 3 had distal SMA embolism and 1 had chronic occlusion with acute exacerbation. All 4 received anti-infective therapy, improvement of the mesenteric circulation, anticoagulation, plaque stabilization, acid suppression, and nutritional support.

Twenty-four patients entered an operative treatment pathway. The mean operative duration was 172.04 ± 63.02 minutes. Twelve patients underwent SMA incision with Fogarty catheter embolectomy alone, 9 underwent Fogarty embolectomy plus necrotic bowel resection, 1 underwent necrotic bowel resection alone, 1 underwent exploratory laparotomy alone, and 1 underwent initial AcoStream aspiration followed by open Fogarty embolectomy, necrotic bowel resection, and intestinal anastomosis (Table 2).

Table 2
Treatment and short-term outcomes

Variable	n (%) or mean ± SD
Initial treatment strategy	
Conservative treatment	4 (14.3)
Operative treatment pathway	24 (85.7)
Surgical procedure	
Fogarty embolectomy alone	12/24 (50.0)
Fogarty embolectomy plus necrotic bowel resection	9/24 (37.5)
Necrotic bowel resection alone	1/24 (4.2)
Exploratory laparotomy alone	1/24 (4.2)
AcoStream followed by open surgery	1/24 (4.2)
Intraoperative findings among 24 operative patients	
Intestinal ischemia	21 (87.5)
Transmural intestinal necrosis	14 (58.3)
Necrotic bowel resection with anastomosis	10 (41.7)
Family declined resection or continued surgery	4 (16.7)
Discharge against medical advice or patient-requested discharge	11/28 (39.3)
Confirmed alive after discharge	1
Died after discharge	10/28 (35.7)
Discontinued during surgery	5
Postoperative acute stroke	3
Postoperative gastrointestinal perforation	1
Anastomotic leakage with active intra-abdominal bleeding	1
Improved before discharge	17/28 (60.7)
Favorable short-term outcome after operative treatment	14/28 (50.0)
Favorable short-term outcome after conservative treatment	4/28 (14.3)

Values are n or mean ± standard deviation. Denominators are specified when they differ from the total cohort. The 14 operative patients with a favorable short-term outcome comprised 13 patients who improved before discharge and 1 patient who was initially discharged against advice and later recovered.

Variable	n (%) or mean ± SD
Postoperative hospital stay among 13 improved operative patients, days	18.85 ± 9.81
Time to relief of abdominal pain, days	3.08 ± 2.18
Time to resumption of oral intake, days	5.00 ± 1.96

Values are n or mean ± standard deviation. Denominators are specified when they differ from the total cohort. The 14 operative patients with a favorable short-term outcome comprised 13 patients who improved before discharge and 1 patient who was initially discharged against advice and later recovered.

Operative findings, short-term outcomes, and post-discharge mortality

Among the 24 operative patients, intraoperative intestinal ischemia was observed in 21 patients (87.5%). Transmural intestinal necrosis was present in 14 patients (58.3%). Ten patients (41.7%) underwent necrotic bowel resection with intestinal anastomosis, whereas the families of 4 patients declined further bowel resection or continuation of surgery.

Eleven patients were discharged against medical advice or at the request of the patient or family. One patient was subsequently confirmed alive and recovered after treatment at another hospital. The remaining 10 patients died during the follow-up period after discharge; this group included 5 patients who discontinued treatment during surgery, 3 who developed acute stroke after surgery, 1 with gastrointestinal perforation, and 1 with anastomotic leakage and active intra-abdominal bleeding. Thus, the confirmed post-discharge mortality was 10 of 28 patients (35.7%).

Seventeen patients improved before discharge, including 13 operative patients and all 4 conservatively treated patients. The patient who was discharged against advice and later recovered was added to the operative group, giving 14 operative patients with a favorable short-term outcome and 18 patients (64.3%) overall with a favorable short-term outcome. Among the 14 operative patients with a favorable outcome, the mean postoperative hospital stay was 18.85 ± 9.81 days, the mean time to relief of abdominal pain was 3.08 ± 2.18 days, and the mean time to resumption of oral intake was 5.00 ± 1.96 days.

Follow-up

Among the 14 operative patients with a favorable short-term outcome, 5 were lost to follow-up. Eight patients had no main-trunk embolism or stenosis on follow-up CTA, and 1 had distal superior mesenteric arteriovenous and partial branch embolism at 1 month. No patient had a documented recurrent main-trunk occlusion during the available follow-up period.

Discussion

Principal findings

This single-center cohort of 28 patients with ASMAE illustrates the clinical profile and treatment burden of a vascular emergency that often presents after the optimal window for intervention has narrowed. The cohort was elderly and had a high prevalence of AF, valvular heart disease, and prior cerebral infarction, consistent with a predominantly cardiogenic embolic mechanism [2]. More than one-third of patients had signs of peritonitis, 21 of 24 operative patients had intraoperative intestinal ischemia, and 14 had transmural necrosis. Most patients were therefore treated with an open strategy that allowed direct assessment of bowel viability and resection of nonviable intestine. At the same time, 11 patients were discharged against medical advice or at the request of the patient or family; 10 died after discharge, and 5 of the 14 operative patients with a favorable short-term outcome were lost to follow-up. These findings support the clinical importance of early diagnosis and multidisciplinary treatment while also exposing the limitations of a retrospective single-center design for comparing treatment strategies.

Diagnosis and time-dependent risk

ASMAE remains difficult to diagnose because early symptoms may be nonspecific and laboratory tests do not reliably identify or exclude arterial occlusive AMI [2, 6]. In the present cohort, 16 of 28 patients were initially admitted to vascular surgery, whereas 12 entered through other services. This pattern may reflect the nonspecific presentation of mesenteric ischemia and the need for physicians outside vascular surgery to maintain a high index of suspicion. A recent systematic review of diagnostic biomarkers found substantial heterogeneity and low-quality evidence and concluded that no biomarker or combination of biomarkers can currently be used alone to rule in or rule out arterial occlusive AMI [6]. The diagnostic pathway should therefore integrate clinical probability, laboratory findings, and early CTA rather than relying on a single biomarker.

CTA is central to the contemporary diagnostic pathway because it identifies the occlusion site, assesses collateral circulation, and detects bowel-wall and mesenteric changes associated with irreversible injury [3, 4, 7]. The 2022 World Society of Emergency Surgery guidelines and the 2025 CIRSE standards of practice both emphasize prompt imaging and multidisciplinary decision-making [3, 7]. The present cohort had a mean symptom duration of 25.93 hours, and 11 patients already had peritoneal signs. The clinical importance of these findings is not that a specific time threshold should be universally applied, but that diagnostic and treatment delay can shift the clinical problem from selective revascularization in a patient without necrosis to damage-control surgery in a patient with established bowel infarction [5, 8].

Treatment strategy in the context of current evidence

The optimal initial strategy for acute SMA occlusion remains debated. Endovascular therapy is attractive in patients without peritonitis or imaging evidence of transmural necrosis because it may restore flow with less physiological stress and may reduce early complications [4, 5, 7]. A 2022 retrospective study of 41 patients with SMA embolism found that endovascular treatment was feasible in selected patients without clinical evidence of bowel necrosis, with a technical success rate of 93%, but it did not eliminate

the need for close monitoring because bowel necrosis can progress despite successful revascularization [9]. A 2025 substudy of the prospective AMESI cohort included 158 patients and found a mortality rate of 2.9% in effective endovascular treatment, 41.2% in insufficient endovascular treatment, and 45.8% in the surgical group [8]. However, patients in the surgical group had higher baseline illness severity, higher C-reactive protein, and higher lactate levels. After multivariable adjustment, surgery was not an independent risk factor for mortality, and the apparent benefit of endovascular treatment was largely explained by selection [8]. This is directly relevant to the present study, in which treatment was chosen by the clinical team rather than randomly and in which the open group included patients with a high burden of peritonitis and necrosis.

The present cohort therefore supports a selective rather than an ideological treatment strategy. Open surgery remains necessary when the clinical question is not only whether the artery can be reopened, but also whether the intestine is viable and must be resected [4, 7]. In contrast, endovascular therapy may be considered for patients without peritoneal signs or established necrosis, provided that the patient can be monitored closely and that the threshold for laparotomy remains low when symptoms persist or peritoneal signs develop [5, 7]. AcoStream and guiding-catheter aspiration are established endovascular options in selected patients [15, 16]. The single patient in this cohort who initially underwent AcoStream aspiration and then required open surgery because symptoms did not improve illustrates the limitation of treating the vascular occlusion without directly resolving the question of bowel viability. Historical studies established open emergency surgery as the mainstay of AMI treatment [13], whereas contemporary studies emphasize that outcomes after endovascular or open treatment are strongly influenced by disease stage and patient selection [14].

Bowel necrosis, operative findings, and risk stratification

The high rate of transmural necrosis in this cohort is clinically important. Fourteen of 24 operative patients had intestinal necrosis, and 10 underwent necrotic bowel resection with anastomosis. Nuzzo et al. prospectively identified organ failure, serum lactate > 2 mmol/L, and bowel-loop dilation on CT as independent predictors of irreversible transmural intestinal necrosis; the rate of necrosis increased from 3% with no risk factors to 38%, 89%, and 100% with one, two, and three risk factors, respectively [10]. Those findings suggest that a structured preoperative risk assessment could help identify patients who require immediate laparotomy rather than a trial of endovascular therapy. The present dataset did not systematically report all components needed to calculate this score, which limits retrospective application. Other systematic reviews have likewise identified clinical, biochemical, and radiological predictors of bowel necrosis, although the available evidence is heterogeneous [18]. Nevertheless, the high rate of necrosis observed here is consistent with the possibility that many patients had already passed the pre-necrotic phase when treatment was initiated.

CT features can also inform the decision to operate. A meta-analysis of 11 studies and 1,037 patients found that bowel-wall thinning, decreased or absent bowel-wall enhancement, bowel dilation, pneumatosis intestinalis, portomesenteric venous gas, and arterial occlusive AMI were associated with transmural intestinal necrosis [11]. These findings should not be used as a substitute for surgical

judgment, but they can help prioritize patients for urgent laparotomy when the clinical picture is consistent with irreversible injury. Standardized anatomical reporting of SMA occlusion using the proximal, middle, and distal classification would also improve comparability across studies [19]. In the present study, 6 patients had CT evidence of bowel obstruction and 11 had peritoneal signs, indicating that a substantial proportion of patients presented with advanced disease.

Kapalla et al. reported that pneumatosis intestinalis, increased lactate concentration, and ischemic intestinal sections were independent risk factors for in-hospital mortality among patients with AMI requiring laparotomy; age, congestive heart failure, and AF were associated with higher mortality in univariate analysis [17]. The present cohort was elderly and had a high prevalence of AF and a high burden of necrosis, supporting the need for intensive postoperative monitoring and repeated risk reassessment.

Postoperative complications and recovery

The postoperative course in this cohort was characterized by both recovery and severe complications. Fourteen operative patients ultimately had a favorable short-term outcome, with a mean time to abdominal pain relief of 3.08 ± 2.18 days and a mean time to resumption of oral intake of 5.00 ± 1.96 days among those who improved before discharge. These observations suggest that effective revascularization and resection of nonviable bowel can be followed by meaningful short-term recovery in selected patients. However, among the 10 patients who died after discharge, 3 developed acute stroke, 1 developed gastrointestinal perforation, and 1 developed anastomotic leakage with active intra-abdominal bleeding. These complications reflect the high comorbidity burden of the cohort and the physiological consequences of advanced intestinal ischemia. They also reinforce the need for critical-care support, neurological surveillance, and early recognition of anastomotic or gastrointestinal complications after surgery.

Clinical implications

The main contribution of this study is not a claim of therapeutic superiority. It is a detailed description of an open revascularization-dominant clinical pathway in a real-world cohort with a high prevalence of AF, peritonitis, intestinal ischemia, and necrosis. The findings support four practical principles. First, ASMAE should be considered early in older patients with severe abdominal pain that is disproportionate to physical findings, particularly when AF or valvular heart disease is present. Second, CTA should be obtained promptly when the diagnosis is suspected because it can identify the occlusion and provide information relevant to bowel viability [3, 4, 7]. Third, endovascular and open treatment should be understood as complementary strategies rather than mutually exclusive options, consistent with the 2020 Chinese expert consensus and contemporary international guidance [7, 22]. Fourth, the decision to continue or escalate treatment should account for the patient's baseline condition, the presence of peritonitis or necrosis, the patient's goals of care, and the family's informed preferences. The high post-discharge mortality observed here also indicates that structured follow-up and early management of recurrent vascular events are integral components of care.

Limitations

Several limitations should be considered. First, this was a single-center retrospective study with a small sample size, which limits precision and generalizability. Second, treatment allocation was not randomized and was strongly influenced by baseline severity, the presence of peritonitis, imaging findings, and patient or family preferences. The observed differences in outcomes between treatment approaches therefore cannot be interpreted as causal effects. Third, the source dataset did not systematically report several variables that are important for contemporary risk stratification, including organ failure, serum lactate, bowel-wall enhancement, bowel-loop diameter, and complete time-to-intervention data. Fourth, 5 of the 14 operative patients with a favorable short-term outcome were lost to follow-up, and follow-up duration and completeness varied; not all patients had complete 1-year follow-up, so no complete 1-year outcome estimate was derived. Fifth, all reported post-discharge deaths were based on follow-up information provided by family members, and the exact timing and cause of death were not independently adjudicated. Sixth, no adjusted or subgroup analyses were performed; therefore, all reported associations are descriptive and cannot support causal inference. Finally, the study period, treatment definitions, and variable thresholds were harmonized using the available clinical records, but residual misclassification remains possible.

Future directions

Future studies should use a prospective, multicenter design with standardized inclusion criteria, CTA protocols, treatment-selection criteria, and follow-up intervals. A practical minimum dataset should include symptom onset, first medical contact, time to CTA, time to revascularization, organ failure, serum lactate, bowel-wall enhancement, bowel-loop dilation, peritonitis, intraoperative bowel viability, and 30-day mortality. Follow-up should extend beyond the immediate postoperative period and include 6-month gastrointestinal disability-free survival, which has been shown to differ between complete and incomplete SMA occlusion despite similar short-term mortality [12]. Finally, studies should predefine how treatment escalation from endovascular therapy to laparotomy is triggered, because this decision, rather than the initial modality alone, may determine whether nonviable intestine is removed in time.

Conclusions

In this single-center retrospective cohort of 28 patients with ASMAE, the disease predominantly affected older adults with cardiogenic risk factors and presented with a high burden of peritonitis, intestinal ischemia, and necrosis. An open revascularization-dominant strategy enabled direct assessment of bowel viability and resection of nonviable intestine in most operative patients. Eleven patients left against medical advice or requested discharge; one survived, and ten died after discharge, corresponding to a confirmed post-discharge mortality of 35.7%. Early clinical suspicion, prompt CTA, multidisciplinary assessment, and a low threshold for laparotomy remain central to management, particularly when peritonitis or imaging features of transmural necrosis are present. These findings are descriptive and do not establish the superiority of open or endovascular treatment. Prospective

multicenter studies with standardized selection criteria, complete follow-up, and formal ethical approval are needed.

Abbreviations

AF: atrial fibrillation; AMI: acute mesenteric ischemia; ASMAE: acute superior mesenteric artery embolism; CTA: computed tomography angiography; SMA: superior mesenteric artery; STROBE: Strengthening the Reporting of Observational Studies in Epidemiology.

Declarations

Ethics approval and consent to participate

This retrospective cohort study was approved by the Medical Research Ethics Committee of Suining Central Hospital (approval no. KYLLKS20260234; approval date 30 September 2026). The committee reviewed Research Protocol V1.0/20260921 and approved the waiver of informed consent because the study used existing de-identified clinical data without additional patient contact or intervention.

Clinical trial number

Clinical trial number: not applicable.

Consent for publication

Not applicable. Only de-identified aggregate data are reported.

Availability of data and materials

The de-identified datasets generated and/or analyzed during the current study are not publicly available because of patient privacy and institutional restrictions. They are available from the corresponding author, Gangzhi Li (yj529303563@qq.com), on reasonable request and subject to approval by the Medical Research Ethics Committee of Suining Central Hospital.

Competing interests

The authors declare that they have no competing interests.

Funding

This study received no specific funding.

Authors' contributions

JY conceived and designed the study, collected and analyzed the data, interpreted the results, and drafted the manuscript. JJZ contributed to data collection, validation, and manuscript revision. GZL

supervised the study, contributed to its design, and critically revised the manuscript. All authors read and approved the final manuscript.

Acknowledgements

Not applicable.

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