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Clinical features and outcomes of patients with acute mesenteric ischemia and concomitant colon ischemia: a retrospective cohort study

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ABSTRACT

Background: Early identification of patients with acute mesenteric ischemia (AMI) involving the large bowel may play a decisive role in improving the prognosis of AMI. This study aims to compare the outcomes between patients with isolated AMI and AMI patients with colon involvement (CI) and to identify the predictors of worse outcomes. The different surgical modalities for AMI patients with CI were also evaluated.

Methods: This retrospective cohort study included 199 AMI patients admitted from January 2005 to January 2014. Based on colonoscopy and pathology reports, 39 patients were diagnosed as AMI with CI, and 160 were AMI patients without CI. The clinical outcomes and different surgical modalities were compared. Risk factors of 30-d mortality and short bowel syndrome (SBS) were identified.

Results: The 30-d mortality (10% *versus* 49%, $P < 0.01$) and SBS incidence (19% *versus* 49%, $P < 0.01$) were higher in AMI patients with CI than AMI patients without CI. AMI patients with CI have higher rate of bowel resection (68% *versus* 95%, $P < 0.001$) and second-look laparotomy (25% *versus* 54%, $P < 0.001$) than patients with AMI alone. For AMI patients with CI, emergent laparotomy was associated with shorter hospital stay ($P = 0.04$) and less incidence of SBS (74% *versus* 25%, $P < 0.001$) than initial endovascular therapy. Patients with ostomy had less repeated bowel resection (11% *versus* 63%, $P = 0.001$) and rate of SBS (21% *versus* 79%, $P < 0.001$) than patients with primary bowel anastomosis. Serum procalcitonin level and colon ischemia were risk factors of 30-d mortality and SBS for AMI.

Conclusions: AMI patients with CI represent a special cohort of AMI patients with higher risk of poor outcome. Compared to initial endovascular therapy, emergent laparotomy was associated with shorter length of hospital stay and reduced incidence of SBS.

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Introduction

Acute mesenteric ischemia (AMI) is a catastrophic abdominal vascular emergency with a daunting mortality of over 50% despite more than 50 y of advances in the treatment.[1] The incidence of AMI is estimated at 12.9/100,000 person-years.[2] It carries a high risk of extensive intestinal infarction, complicated by short bowel syndrome (SBS) and permanent intestinal failure requiring long-term total parenteral nutrition (TPN) and/or intestinal transplantation. Currently, endovascular therapy has been increasingly used with favorable clinical outcomes.[3] However, the overall mortality remains unchanged despite increase in utilization of endovascular techniques.[4] Colon ischemia is the most common manifestation of ischemic bowel disease, with an annual incidence of 22.9/100,000.[5] The admission statistics of both AMI and colon ischemia are increasing recently because of the aging population, heightened awareness of diagnosis, and improved survival of patients with cardiac disease.[6]

Based on current literature, it is notable that AMI patients with coexisting small and large bowel involvement had a significantly high mortality rate.[7] For patients with colon ischemia, small bowel involvement was also associated independently with increased mortality.[5] In our clinical practice, we had seen some patients with colon ischemia, who soon developed AMI and died shortly after surgery, or patients with concurrent AMI and colon ischemia requiring extensive resection of bowel and colon with poor outcome. The presentation of colon ischemia could be a heralding sign of AMI and the multiphasic computed tomography (CT) angiography and were considered for assessment of vascular occlusive disease.

The AMI patients with colon involvement (CI) are often difficult to handle for clinicians because they have higher incidence of extensive bowel necrosis as opposed to AMI patients without colonic involvement. Prompt diagnosis and early intervention before bowel infarction are essential to ensure successful treatment. Therefore, we postulated that early identification and proper management of AMI patients with CI may play a decisive role in improving the clinical outcome of AMI patients. However, definitive data of the outcomes of AMI patients with CI are limited. We compared the clinical outcomes of AMI patients with CI and AMI patients without CI to test the hypothesis that this subset of patients had worse prognosis and to identify the potential variables to help clinicians to differentiate this high-risk cohort from the AMI patients with better prognosis. Furthermore, different surgical treatment modalities (e.g., initial endovascular recanalization *versus* emergent laparotomy first, bowel resection with primary anastomosis *versus* ostomy placement) for AMI patients with CI were evaluated.

Methods

Patients and study design

We performed a retrospective cohort study of AMI patients hospitalized from January 2005 to January 2014. The study protocol was approved by the Institutional Review Board. The study was conducted in accordance with the principle of the Declaration of Helsinki. Informed consent was obtained from all the patients. The STROBE criteria were used for structuring the article.[8]

Patients with at least one of the four diagnostic procedures (CT scan, angiography, gastrointestinal endoscopy, and surgical findings) supporting the diagnosis of AMI were identified. The exclusion criteria were 1) age <18 y; 2) patients with secondary causes of mesenteric infarction (e.g., volvulus, adhesions, and strangulated hernia); 3) irreversible acute hepatic or renal failure before admission; 4) pregnancy or lactation; 5) early transfer within first week of admission to other hospitals; 6) incomplete medical records or follow-up data of 1 y. AMI patients with coexisting colon ischemia diagnosed within 1 wk before AMI diagnosis were defined as AMI patients with CI. Colon ischemia was confirmed by colonoscopic or surgical assessment. Each patient had a morphology report that described the signs of ischemia (e.g., subepithelial hemorrhage, edema ulceration, or gangrene), and a pathology report that concluded the findings were consistent with the diagnosis of colon ischemia (Fig. 1).

Data of demographics, medical comorbidities, etiology, serology parameters, length of stay, and treatment outcomes (e.g., surgical intervention, second-look laparotomy, incidence of SBS and long-term TPN, 30-d mortality, and 1-y survival), and complications were retrieved from an institutional medical database system. In addition, anatomic patterns of the intestine and CI were evaluated by CT images, colonoscopy reports, or surgical findings. The clinical outcomes of AMI patients with CI were compared with those of AMI patients without CI. Subgroup analysis of AMI patients with CI requiring emergent open surgery or initial endovascular therapy, primary bowel anastomosis, or diverting stoma was performed. Risk factors of 30-d mortality and SBS of all the AMI patients were analyzed.

Mesenteric recanalization strategy

Mesenteric recanalization was achieved by open embolectomy or thrombectomy, or endovascular (e.g., aspiration, stenting, and catheter-directed thrombolysis) therapy in a hybrid operating room. In this study, all the open revascularization was done at the index operation. During laparotomy, the bowel segments of transmural infarction were removed. Primary anastomosis or temporary staples leaving the creation of stomas until the second-look laparotomy was executed. For patients with high risk of intra-abdominal hypertension, the skin-only closure or temporary closure with an abdominal VAC dressing (Kinetic Concepts, San Antonio, Texas, USA) was used when repeat surgery was planned. All patients were admitted to a surgical intensive care unit after recanalization procedures for expeditious access to aggressive fluid resuscitation, broad-spectrum antibiotic therapy, and nutrition support.

Statistical analysis

Age variable was defined as means ± standard deviation because of normally distributing; other continuous variables were represented as median values and interquartile ranges M