



Acute mesenteric ischemia: diagnostic and therapeutic challenges

Demetrios Demetriades¹

Published online: 12 September 2023

© The Author(s), under exclusive licence to Springer-Verlag GmbH Germany 2023

Acute mesenteric ischemia is diagnostically and therapeutically the most challenging abdominal surgical emergency. It may occur as a result of acute thrombosis or embolism of either the superior mesenteric artery or vein or from nonocclusive ischemia, usually secondary to severe hypotension and high doses of vasopressors. The clinical presentation during the early stages of the disease is usually nonspecific, the appropriate radiological investigation is often delayed because of low index of suspicion and the early CT scan findings are often not diagnostic, especially in no occlusive mesenteric ischemia, which is the most common type of ischemia encountered in critically ill patients in the intensive care unit. CT angiography is reliable in the diagnosis of acute mesenteric ischemia due to occlusion of the superior mesenteric vessels. However, its role in nonocclusive mesenteric ischemia is usually limited, especially during the early stage of the disease, where CT angiography usually shows little or nondiagnostic findings of mesenteric ischemia.

Straarup et al. in a recent study identified subtle CT radiological changes within the intestinal wall, luminal diameter and gastrointestinal vessels as independent predictors of acute mesenteric ischemia, which could improve the early recognition and treatment of the problem. Pneumatosis intestinalis, increased contrast enhancement in the bowel wall, inferior mesenteric artery arteriosclerosis and colonic contraction were predictors of acute mesenteric ischemia [1].

Delayed diagnosis of acute mesenteric ischemia is the most common diagnostic error in acute care surgery, in both the emergency department and the intensive care unit. The consequences of delayed diagnosis are often catastrophic, resulting in bowel necrosis, sepsis, organ failure and death. The overall reported mortality rate is as high as 60–90%. Extensive bowel resection often results in short bowel

syndrome, with devastating effects on the quality of life, including debilitating diarrhea, malnutrition, and the need of parenteral nutrition. For these reasons, early diagnosis and restoration of the intestinal oxygenation remain the cornerstone for reducing adverse outcomes.

The absence of significant abdominal signs is the most common reason for the delayed diagnosis. The diagnosis becomes even more challenging in unevaluable patients, such as in sedated and mechanically ventilated patients or patients with severe associated comorbidities. Martin et al. in a recent study of 119 patients with acute mesenteric ischemia, reported delayed diagnosis in 33%. After multivariate analysis, the absence of significant abdominal pain was the only independent predictive factor of delayed diagnosis. The study concluded that the history of patient, physical exam, and biological data are not sufficient for early diagnosis and emphasized the need of increased awareness and new biomarkers, to improve early diagnosis [2].

The risks of nontherapeutic exploratory laparotomy for acute mesenteric venous ischemia with viable bowel were highlighted in a study by Emile et al. who reported that patients who had nontherapeutic laparotomy had significantly higher complication and readmission rates and longer hospital stay than those treated conservatively. The authors emphasized the importance of careful and informed decision-making process to reduce nontherapeutic laparotomies [3].

The diagnostic challenges of clinical examination and CT scan evaluation in the early diagnosis of ischemia, were highlighted recently by Bergamini et al. [4]. The authors explored new approaches in an effort to reduce nontherapeutic laparotomies. In a study which included patients admitted to ICU after cardiac surgery, with suspected acute mesenteric ischemia of recent onset and nonconclusive CT scan. One group of patients underwent bed-side diagnostic laparoscopy and a second group underwent laparotomy. The study concluded that bed-side diagnostic laparoscopy is a useful and safe diagnostic tool for early diagnosis and can help to avoid potentially a risky transport to the radiology suite or an unnecessary laparotomy.

✉ Demetrios Demetriades
Demetrios.Demetriades@med.usc.edu

¹ USC School of Medicine, Los Angeles General Medical Center, Los Angeles, USA

The open abdomen technique which involves temporary abdominal wall closure and relook laparotomy for ischemic bowel has been a widespread practice in many centers. Proaño-Zamudio et al. [5] evaluated the effect of delayed abdominal closure on postoperative morbidity and mortality in patients with acute mesenteric ischemia. In a large ACS-NSQIP study of 1520 patients who underwent emergency laparotomy. Patients were divided into two groups: delayed fascial closure and immediate fascial closure. Propensity score matching was performed based on comorbidities, pre-operative, and operative characteristics. The study concluded that delayed fascial closure technique was associated with increased risk of respiratory failure and mortality as compared to immediate fascial closure. The authors cautioned against a liberal policy of delayed abdominal closure in patients with mesenteric ischemia.

The most important serious consequence for survivors of acute superior mesenteric artery occlusion is the short bowel syndrome requiring long-term total parenteral nutrition (TPN), a condition which reduces quality of life and may cause life-threatening septicemia and liver dysfunction. Nakao et al. [6] in a very recent study reported that the time from onset to intervention > 6 h, pneumatosis intestinalis, ascites, and a positive smaller superior mesenteric vein sign were associated with an increased risk for long-term TPN. Multivariate analysis identified the presence of ascites as an independent risk factor for needing long-term TPN. Age, gender, underlying disease, presence of shock requiring vasopressors, site of obstruction (proximal vs. distal), and initial treatment (surgery vs. interventional radiology vs. thrombolytic therapy) were not significantly different between the two groups.

In summary, despite the advances made in the care of abdominal emergencies, acute mesenteric ischemia remains a major diagnostic and therapeutic challenge. No single diagnostic approach is sensitive enough for early diagnosis of this condition. The combination of high index of clinical suspicion, CT angio, biomarkers, and laparoscopic

evaluation is critical for early diagnosis and optimal outcomes. Some common therapeutic approaches, such as delayed abdominal closure have been challenged and more studies are needed to evaluate their role in the management of these patients.

Declarations

Conflict of interest None.

References

1. Straarup D, Gotschalck KA, Mikalone R, Thorlacius-Ussing O. Preoperative findings on non-specific CT in patients with primary acute intestinal ischemia: a case-control study. *Eur J Trauma Emerg Surg.* 2022;48(4):3025–32. <https://doi.org/10.1007/s00068-021-01741-w>.
2. Martin J, Depietro R, Bartoli A, Markarian T, De Maria L, Di Bisceglie M, Persico N, Michelet P, Mege D. Acute mesenteric ischemia: which predictive factors of delayed diagnosis at emergency unit? *Eur J Trauma Emerg Surg.* 2022. <https://doi.org/10.1007/s00068-022-02112-9>.
3. Emile SH, Elmetwally AM, AbdelMawla A. Outcome of laparotomy and conservative treatment of patients with acute mesenteric venous ischemia with viable bowel. *Eur J Trauma Emerg Surg.* 2022. <https://doi.org/10.1007/s00068-022-01924-z>.
4. Bergamini C, Alemanno G, Giordano A, Pantalone D, Fontani G, Di Bella AM, Iacopini V, Prosperi P, Martellucci J. The role of bed-side laparoscopy in the management of acute mesenteric ischemia of recent onset in post-cardiac surgery patients admitted to ICU. *Eur J Trauma Emerg Surg.* 2022;48(1):87–96. <https://doi.org/10.1007/s00068-020-01500-3>.
5. Proaño-Zamudio JA, Argandykov D, Renne A, Gebran A, Dorken-Gallastegi A, Paranjape CN, et al. Revisiting abdominal closure in mesenteric ischemia: is there an association with outcome? *Eur J Trauma Emerg Surg.* 2022. <https://doi.org/10.1007/s00068-022-02199-0>.
6. Nakao Y, Sasanuma H, Sata N, Tagaya N, Matsumoto K, Mizobuchi T, Koga F, Thompson E, Lefor A. Factors associated with the need for long-term total parenteral nutrition in survivors of acute superior mesenteric artery occlusion. *Eur J Trauma Emerg Surg.* 2023. <https://doi.org/10.1007/s00068-023-02281-1>.