29 What Is the Most Sensitive and Specific Imaging Study for the Detection of Acute Mesenteric Ischemia? Is MDCT the Gold Standard?

Courtney H. McKee and Sarah Ronan-Bentle

Pearls and Pitfalls

- Angiography was the previous gold standard for diagnosis of AMI, allowing immediate therapeutic intervention as well.
- CT angiography (CTA) is fast, accurate, sensitive, and specific for the diagnosis of AMI and should be considered the first-line test for AMI.
- Because of the significant morbidity and mortality associated with AMI, it is important to obtain a CTA, even in patients with renal insufficiency.

Rapid and accurate diagnosis of acute mesenteric ischemia (AMI) is crucial to minimize morbidity and mortality [1, 2]. The gold standard test for diagnosis of acute mesenteric ischemia (AMI) was previously formal angiography [3, 4]. Angiography is an attractive option because it provides the opportunity for diagnosis and immediate treatment of AMI [4–6].

Advances in multidetector computed tomography (MDCT) technology have allowed CTA to replace formal angiography as a first-line diagnostic test for AMI. There is a large and growing body of literature that strongly supports CTA as the first-line diagnostic test for AMI. CTA is a rapid, noninvasive, and accurate means of diagnosing AMI and is readily available to emergency department (ED) physicians. CTA has been found to have a 96% accuracy rate, with a pooled specificity of 93% and a pooled sensitivity of 96%, as well as excellent negative and positive predictive values [7–10]. Given the high morbidity and mortality associated with delayed diagnosis of AMI and CTA's excellent performance in detecting AMI, it is important to perform this test early, regardless of renal insufficiency [8, 10]. CTA is also able to detect irreversible bowel wall ischemia, which is useful in discussion with surgical colleagues [11].

Notably, the World Society of Emergency Surgery guidelines, published in 2017, made a 1A recommendation that any patient with suspicion for AMI undergoes a CTA as soon as possible [12]. Radiologists use a number of different criteria for diagnosis including evidence of arterial occlusion, bowel wall thickening, bowel dilatation, pneumatosis or portal air, fat stranding, perforation, and organ infarction [8].

Magnetic resonance angiography (MRA) with intravenous contrast is an alternate diagnostic tool for clinicians when suspicious for acute mesenteric ischemia. MRA is particularly strong when diagnosing proximal arterial occlusions and quantifying stenosis, though it may overestimate the degree of stenosis [13–16]. There is also no radiation or iodinated contrast exposure to the patient. However, MRI technology, while increasingly common, is still not ubiquitous among hospitals. Even if available, the increased time to perform the study confers a potential delay in both diagnosis and treatment of AMI. Furthermore, MRA does not reliably demonstrate bowel necrosis [17]. The American College of Radiology 2018 Appropriateness Criteria continues to recommend CTA over MRA. There may be situations where MRA is preferred: for improved vessel mapping or if CTA is absolutely contraindicated or unavailable and the time delay is not prohibitive [7].

Summary

Angiography will remain a relevant diagnostic and therapeutic tool in the management of AMI in specific patient populations. MRA is an additional diagnostic modality that should be used only in the appropriate clinical setting if there is a high concern for AMI. CTA is reliable, fast, and accurate, and provides critical information that assists clinicians in the diagnosis and management of AMI. CTA should be considered the first-line test for evaluation of AMI.

C. H. McKee · S. Ronan-Bentle (✉)
University of Cincinnati College of Medicine, Department of Emergency Medicine, Cincinnati, OH, USA
e-mail: mckeech@ucmail.uc.edu; ronanse@uc.edu

A. Graham, D. J. Carlberg (eds.), *Gastrointestinal Emergencies*, https://doi.org/10.1007/978-3-319-98343-1_29

Suggested Resource

- Lotterman S. Mesenteric ishcemia: a power review. Nov 2014; http://www.emdocs.net/mesenteric-ischemia-power-review/

References

1. Bradbury AW, Brittenden J, McBride K, Ruckley CV. Mesenteric ischaemia: a multidisciplinary approach. Br J Surg. 1995;82(11):1446–59.
2. Kassahun W, Schulz T, Richter O, Hauss J. Unchanged high mortality rates from acute occlusive intestinal ischemia: six year review. Langenbeck's Arch Surg. 2008;393(2):163–71.
3. Lock G. Acute intestinal ischaemia. Best Pract Res Clin Gastroenterol. 2001;15(1):83–98.
4. Cangemi JR. Intestinal ischemia in the elderly. Gastroenterol Clin N Am. 2009;38(3):527–40.
5. Acosta S, Wadman M, Syk I, Elmståhl S, Ekberg O. Epidemiology and prognostic factors in acute superior mesenteric artery occlusion. J Gastrointest Surg. 2010;14(4):628–35.
6. Wyers MC. Acute mesenteric ischemia: diagnostic approach and surgical treatment. Semin Vasc Surg. 2010;23(1):9–20.
7. Oliva I, Davarpanah A, Rybicki F, Desjardins B, Flamm S, Francois C, et al. ACR appropriateness criteria® imaging of mesenteric ischemia. Abdom Imaging. 2013;38(4):714–9.
8. Aschoff A, Stuber G, Becker B, Hoffmann M, Schmitz B, Schelzig H, et al. Evaluation of acute mesenteric ischemia: accuracy of biphasic mesenteric multi-detector CT angiography. Abdom Imaging. 2009;34(3):345–57.
9. Hagspiel K, Flors L, Hanley M, Norton P. Computed tomography angiography and magnetic resonance angiography imaging of the mesenteric vasculature. Tech Vasc Interv Radiol. 2015;18(1):2–13.
10. Menke J. Diagnostic accuracy of multidetector CT in acute mesenteric ischemia: systematic review and meta-analysis. Radiology. 2010;256(1):93–101.
11. Kirkpatrick I, Kroeker M, Greenberg H. Biphasic CT with mesenteric CT angiography in the evaluation of acute mesenteric ischemia: initial experience. Radiology. 2003;229(1):91–8.
12. Bala M, Kashuk J, Moore E, Kluger Y, Biffl W, Gomes C, et al. Acute mesenteric ischemia: guidelines of the World Society of Emergency Surgery. World J Emerg Surg. 2017;12(38). https://doi.org/10.1186/s13017-017-0150-5
13. Gaa J, Laub G, Edelman RR, Georgi M. First clinical results of ultrafast, contrast-enhanced 2-phase 3D-angiography of the abdomen. Röfo. 1998;169(2):135–9.
14. Gilfeather M, Holland GA, Siegelman ES, et al. Gadolinium-enhanced ultrafast three-dimensional spoiled gradient-echo MR imaging of the abdominal aorta and visceral and iliac vessels. Radiographics. 1997;17(2):423–32.
15. Holland GA, Dougherty L, Carpenter JP, et al. Breath-hold ultrafast three-dimensional gadolinium-enhanced MR angiography of the aorta and the renal and other visceral abdominal arteries. AJR Am J Roentgenol. 1996;166(4):971–81.
16. Meaney JF, Prince MR, Nostrant TT, Stanley JC. Gadolinium-enhanced MR angiography of visceral arteries in patients with suspected chronic mesenteric ischemia. J Magn Reson Imaging. 1997;7(1):171–6.
17. Shetty AS, Mellnick VM, Raptis C, Loch R, Owen J, Bhalla S. Limited utility of MRA for acute bowel ischemia after portal venous phase CT. Abdom Imaging. 2015;40(8):3020–8.