

PERCUTANEOUS MECHANICAL THROMBECTOMY: A NEW TOOL IN THE TREATMENT OF ACUTE MESENTERIC ISCHEMIA

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Abstract

Introduction: The diagnosis of acute mesenteric ischemia (AMI) remains challenging due to nonspecific symptoms and signs that lead to a high mortality rate. Common causes include cardiac emboli and thrombosis of a mesenteric plaque.

Objective: To present a clinical case of acute mesenteric ischemia that underwent successful endovascular revascularization.

Case report: 82-year-old female patient with a history of atrioventricular block, hypertension, and dementia. She was admitted to the emergency department for acute abdominal pain with onset 3 days before. Diagnosis of ischemic colitis secondary to acute superior mesenteric artery occlusion was confirmed by angioCT scan. Endovascular treatment was performed: percutaneous mechanical thrombectomy through left brachial access using the Rotarex® system (Straub Medical). She improved from her previous symptoms and was discharged at day 6, with no need of exploratory laparotomy.

Discussion/Conclusion: AMI is a vascular emergency that requires rapid identification and treatment. There are two courses of action for mesenteric revascularization: open or endovascular. Some authors have demonstrated an advantage in the endovascular approach, with reduced morbidity and mortality, especially in an often aging and frail group of patients. The Rotarex® (Straub Medical) system fragments the thrombus and aspirates it at the same time, thus avoiding embolic phenomena at distance. Despite being a new technology, it has shown to be a very promising tool for AMI treatment due to its fast restoration of blood flow with minimal invasiveness.

Keywords: acute mesenteric ischemia, endovascular treatment, mechanical thrombectomy.

INTRODUCTION

Acute mesenteric ischemia (AMI) is a condition caused by an inadequate blood flow to the intestines resulting in ischemia of the bowel wall. It is a rare condition that most commonly affects patients older than 70 years of age and has higher prevalence in women.^{[1][2]}

It has disparate etiologies ranging from arterial to venous and non-occlusive. The primary causes of AMI, representative of 80% of cases are defined as mesenteric arterial embolism and superior mesenteric arterial thrombosis.^{[2][3]}

AMI is a rare cause of acute abdominal pain (accounting only for 1-2% of cases). Despite the technological advances acute abdominal pain still exhibits an overall mortality rate of up to 81%.^{[1][3][4]} The main treatment success factor in an asymptomatic patient or with non-specific symptoms is the speed in diagnosing it. Computed tomography angiography (CTA) is the diagnostic method of choice which can also detect

signs of intestinal suffering such as thickening of the intestinal wall, pneumatosis intestinalis and aeroportia.^[5]

CASE REPORT

82-year-old female patient with a history of atrioventricular block, hypertension, and dementia. The patient was admitted to the emergency department complaining of acute abdominal pain with 3 days onset, associated with nausea, vomiting and diarrhea. On physical examination the patient was found to have severe and diffuse pain on the abdomen without signs of peritonitis. Diagnosis of ischemic colitis secondary to superior mesenteric artery acute occlusion was confirmed with CT scan (Figure 1) without apparent signs of irreversible intestinal ischemia.

Endovascular treatment was performed with the patient being submitted to a percutaneous mechanical thrombectomy by left brachial arterial access using the

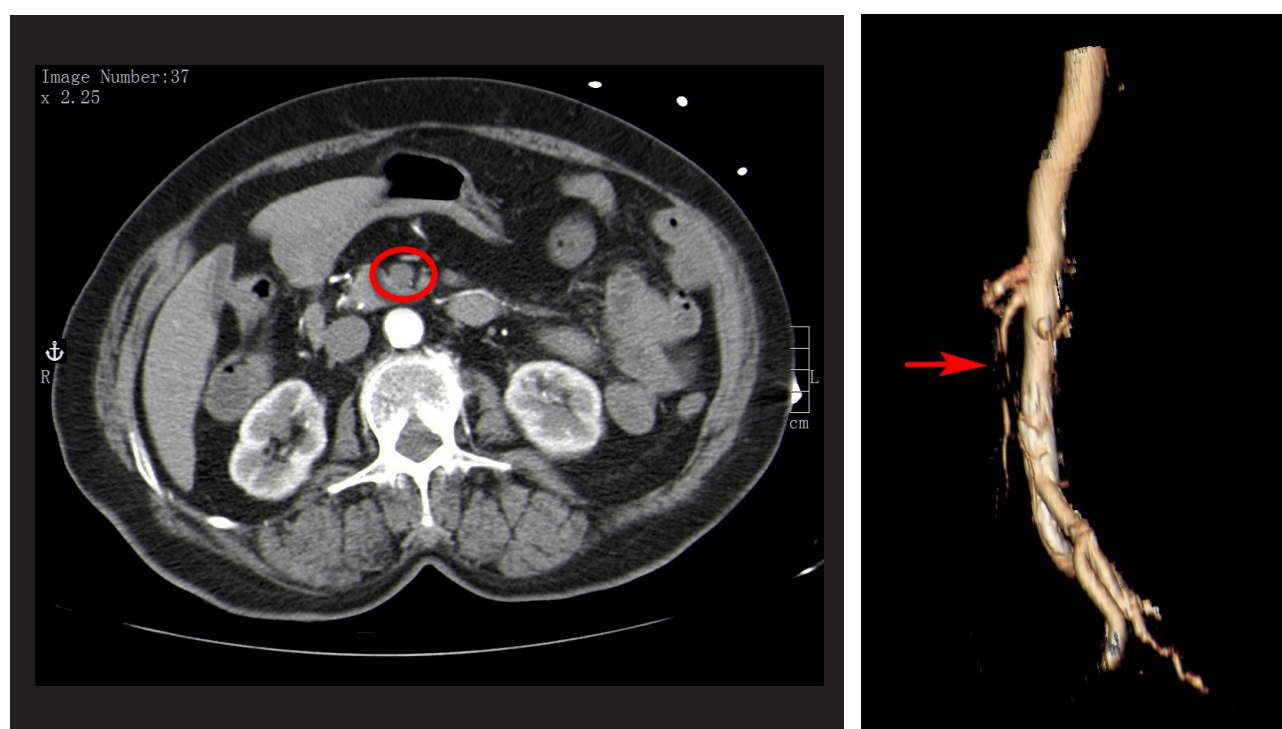


Figure 1

CT scan showing occlusion at the origin of the superior mesenteric artery (circle and arrow).

Rotarex® (Straub Medical) system 6Fr (Figure 2) under local anesthetic and full systemic heparinization (50 UI/Kg, i.v. bolus). During the procedure, complete aspirational thrombectomy was performed without the need for any further endovascular treatments. Post-operative, the patient started a therapeutic dose of enoxaparin (1mg/Kg q12h).

The patient showed symptomatic improvement, no signs of intestinal ischemia, and was discharged at day 6, with no need for exploratory laparotomy. She remains asymptomatic at the 1 year follow-up.

DISCUSSION

The consideration of AMI in the differential diagnosis of acute abdominal pain is paramount for the diagnostic pathway especially among patient over 65 years of age when the physical examination assessment differs from the patient's reported pain levels.

AMI represents a vascular emergency for which treatment must be offered promptly to prevent or reduce the impact of intestinal ischemia. The intestinal wall can hold on without significant injury with a 75% reduction in blood flow for up to 12 hours, however irreversible bowel damage occurs within 6 hours of complete vascular occlusion. [6] Given the patient's cardiac history and the absence of stenotic lesions after full successful thrombectomy embolism seems the most likely etiology.

The clinical management of AMI includes fluid administration, systemic anticoagulant therapy and mesenteric

revascularization. [4] Revascularization can be performed via endovascular or through open surgery. Open surgery is the established treatment for AMI and still is for patients exhibiting peritonitis or with suspected intestinal necrosis. [5] [6]

For early diagnosed patients, the consensus amongst authors is that a less invasive approach should be taken instead, namely endovascular revascularization. The recommended step-up approach starts with the less invasive treatment and progresses to more invasive procedures as the patient needs change. [3]

Several studies have shown the efficacy and reduced morbidity associated with endovascular treatment, namely Branco et al. whose article revealed a 35-56% decrease in the morbidity of open surgery patients to 23-26% with an endovascular technique [5] [7], and Arthur et al. who demonstrated a success rate of 87% using endovascular techniques. [8] In addition to morbidity, mortality was also lower with endovascular treatment, ranging from 9% and 39%. [4] [9] [10] A retrospective European study carried out in Sweden between 1999 and 2006, showed that the mortality rate at 30 days and 12 months was significantly different, favouring endovascular treatment (28% vs 42% [$p=0.03$] and 39% vs 58% [$p=0.02$], respectively), as well as the long-term survival, which was longer with the less invasive treatment. [9] Other benefits of using endovascular treatment have been demonstrated in a small number of studies such as reductions in hospital stays, lower rates of intestinal resection and lower number of patients with short bowel syndrome. [9-11]

The World Society of Emergency Surgery guidelines

support an initial endovascular approach and as noted by Beaulieu et al. patients undergoing this less invasive treatment have lowered the need for exploratory laparotomies by one third. This has also been evidenced by Freitas et al., who justified this result with the early restoration of intestinal perfusion when compared to open surgery, thus decreasing intestinal necrosis.^{[12] [13]} However, despite the decrease in the number of laparotomies, several studies have shown that 14-59% of patients with mesenteric ischemia require intestinal resection.^[3] Although the majority of studies favour endovascular treatment, some such as Beaulieu et al.^[14] and Arya et al.^[15] have failed to prove so. This may be due to lower number of

patients engaged in the studies, both in the group undergoing endovascular treatment and the overall figures.

Since the first publication on endovascular treatment in AMI in 1977 that this procedure has undergone constant evolution and modifications to improve its effectiveness and reduce associated complications.^[13] Currently, there are different endovascular techniques, namely catheter-guided thrombolysis, percutaneous angioplasty or percutaneous mechanical thrombectomy. One of the more recent devices – the Rotarex® aspiration thrombectomy catheter, allows for the destruction of the thrombus by rotational fragmentation and continuous vacuum aspiration. The main advantages of the

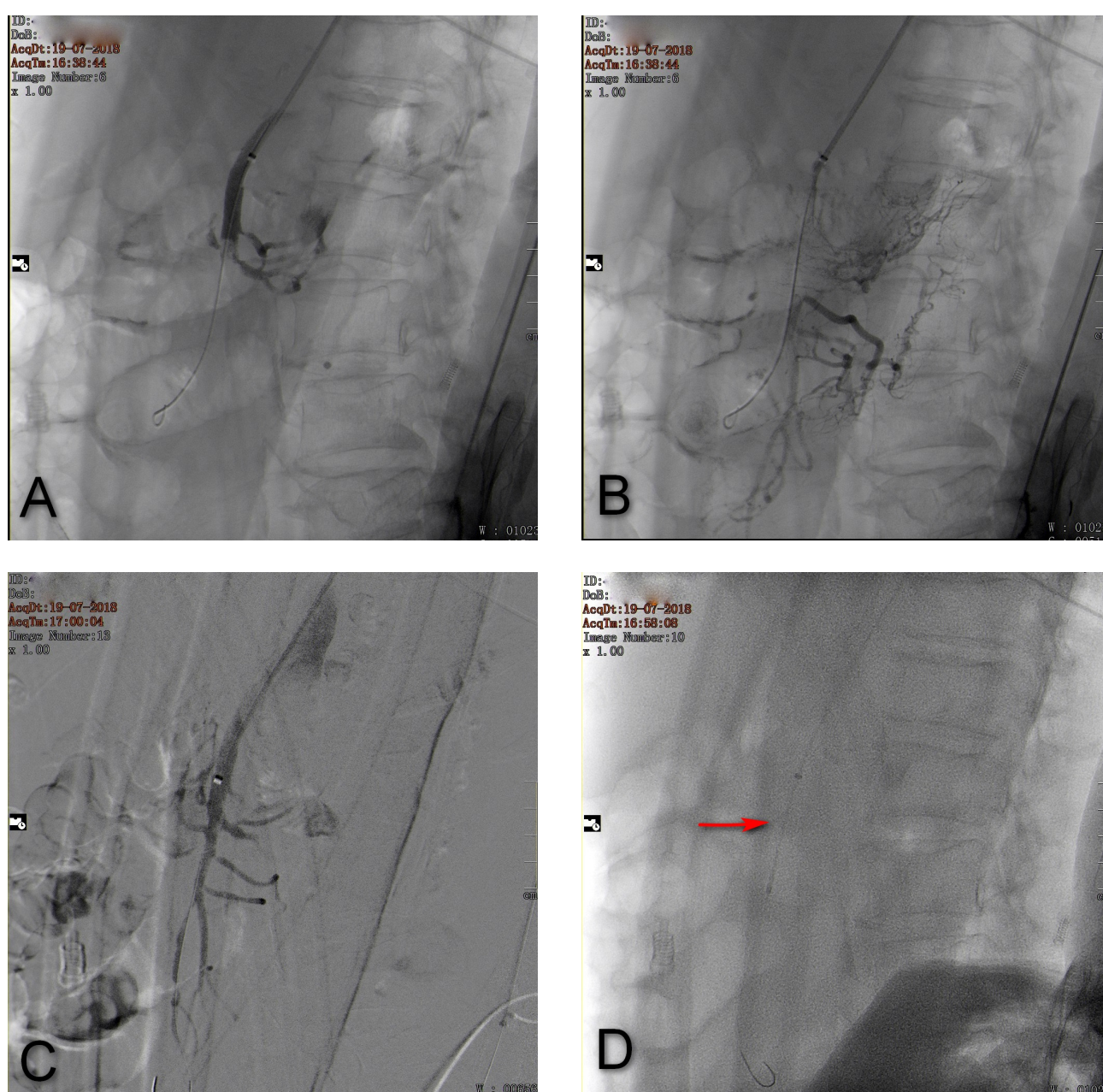


Figure 2

Angiography before (images A and B) and after (image C) mechanical thrombectomy. Image D (arrow) shows the Rotarex® device.

Rotarex® system are the rapid removal of the thrombus and other remnants of older thrombi, and the reduction in the use or time of application of thrombolysis after the procedure.^[16] Vascular rupture or dissection and distal branch embolization are possible complications associated with this technique, though.^[16] Other similar devices such as Angiojet (Boston Scientific) or Indigo (Penumbra) can potentially accomplish the same objective but since there are no comparative studies on the different endovascular techniques in AMI, the approach will depend on the surgical team's expertise and the hospital equipment and resources available.

Despite the advantages demonstrated by this technique, the published literature is mainly composed of case reports and retrospective studies. Multicentric, prospective randomized studies are needed in order to fully scope out the application of endovascular treatment in AMI. Nonetheless, the World Society of Emergency Surgery and the European Society for Trauma and Emergency Surgery guidelines suggest the step-up approach, starting with endovascular treatment, whenever there are available resources and professional expertise, progressing later and only when required to open surgery. In patients with suspected intestinal necrosis or peritonitis, open surgery is indicated, even after endovascular treatment has taken place.

The application of endovascular treatment has implications in the clinical and analytical patient monitoring and follow-up with the view of halting disease progression to intestinal ischemia which would require urgent surgical intervention.^[11]

CONCLUSION

The awareness for AMI when assessing acute abdominal pain in elderly patients is a key factor in the accurate and timely diagnosis and better prognosis. The current guidelines recommend endovascular revascularization as first line treatment, provided the patient does not fit in the criteria for emergent open surgery. The benefits of endovascular techniques include lower morbidity and mortality rates, reduction in length of hospitalisation, reduction of number of laparotomies, reduced intestinal resection and decreased rate of short bowel syndrome. Mechanical thrombectomy is therefore an accepted, efficient and safe treatment option for AMI.

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