



# Open thrombectomy and retrograde mesenteric stenting as a treatment for acute in chronic occlusive mesenteric ischemia: A case report

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## Abstract

In this case report, we outline a tailored approach for a complex patient with acute in chronic proximal occlusive mesenteric disease complicated with fresh thrombosis and a heavily calcified aorta, where the standard treatment proved suboptimal. We outline the surgical considerations that ultimately led to performing a hybrid procedure of open thrombectomy combined with retrograde open mesenteric stenting of the superior mesenteric artery. The patient was a 75-year-old male, with a history of severe arteriosclerosis presenting with abdominal pain over 48 h. An initial diagnostic laparoscopy was performed at a local hospital showing signs of mesenteric ischemia. The patient was transferred to a major trauma hospital, where the patient underwent an open thrombectomy combined with retrograde open mesenteric stenting. The patient's intestines showed no signs of necrosis after surgery, and the patient was discharged nine days after surgery. The patient has experienced no complications and was alive at the 90-day follow-up. This case report outlines the clinical information available to the surgeons, leading to their decision of an infrequently used approach in emergency surgery. We believe that hybrid procedures utilizing the strengths of both open and endovascular surgery should be considered in complex patients where standard treatment options are suboptimal. European guidelines state that retrograde open mesenteric stenting should be performed when antegrade stenting fails, utilizing a through-and-through procedure. We believe that in some cases it is beneficial to the patient to use a hybrid approach including retrograde open mesenteric stenting as first line treatment.

## Keywords

Acute mesenteric ischemia, interventional radiology, thrombectomy, endovascular procedures, diagnostic imaging

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## Introduction

This case report demonstrates a tailored approach for a complex patient with acute in chronic occlusive mesenteric ischemia, where the standard treatment proved suboptimal. The procedure performed was an open thrombectomy combined with retrograde open mesenteric stenting (ROMS) of the superior mesenteric artery (SMA).

Acute mesenteric ischemia has an incidence of 0.09–0.2% of all acute surgical admissions and a mortality of 50% if untreated.<sup>1</sup> This case is important to report as it illustrates

certain predicaments that surgeons face when planning the optimal approach in emergency surgery. Further, we believe that the chosen hybrid procedure ultimately shortened the

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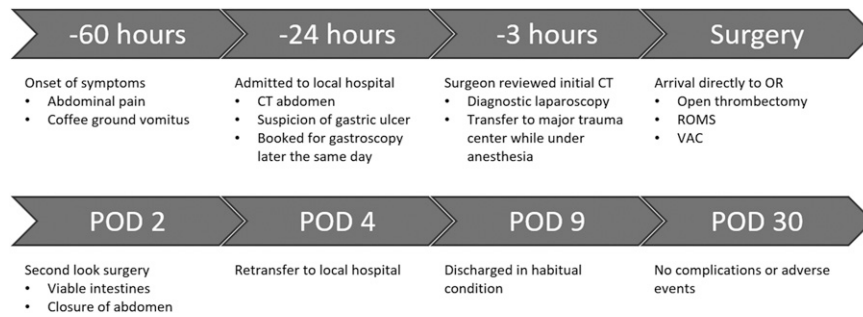
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**Figure 1.** Timeline of the case. POD, post-op day; OR, operating room; ROMS, retrograde open mesenteric stenting; VAC, vacuum assisted closure.

surgery and benefited the patient. Performing ROMS is not novel in itself, but due to the extensive thrombosis of this patient, it had to be combined with open thrombectomy. We have not seen previously published case reports on this approach previously in the literature.<sup>2-6</sup>

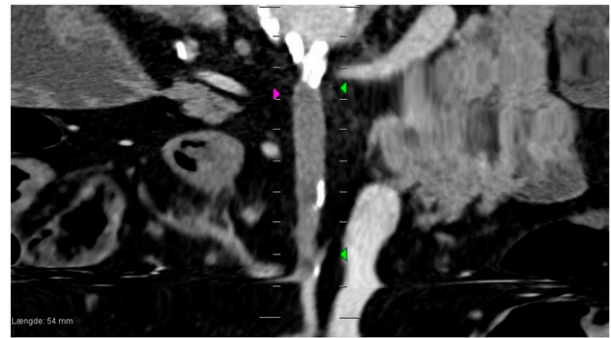
The current European guidelines state that ROMS can be used if antegrade recanalization of the SMA fails. It is recommended as a through-and-through procedure. Ultimately, it is recommended using an antegrade rather than retrograde stenting due to operator radiation exposure.<sup>7</sup>

In this case report, we aim to outline the timeline of the case, the available clinical information, the reasoning behind choosing a hybrid approach, and the outcomes of the case. This case was reported according to the surgical case report (SCARE) criteria.<sup>8</sup> The patient has given oral and written consent to publication of this case report.

## Case history

The patient was a 75-year-old Caucasian male admitted via ambulance to a rural hospital. The patient had experienced abdominal pain and vomiting for 48 h. The patient had a history of smoking for 60 years, severe arteriosclerosis, hypertension, hypercholesterolemia, type 2 diabetes, and previous acute myocardial infarctions. The patient had previously undergone a transfemoral amputation on one leg, a toe amputation on the other leg, and five coronary artery bypass grafts. [Figure 1](#) shows a timeline of the case.

In hospital, the patient presented with direct pain in the epigastric and hypogastric regions and coffee ground vomitus, but no peritoneal reaction. Symptoms were initially mistaken for a gastric ulcer, but due to his history of severe arteriosclerosis, the receiving surgeon suspected bowel ischemia and decided against gastroscopy. An abdominal CT with a mixed arterial and venous phase showed no definitive signs of bowel ischemia, but with a suspicion of possible occlusion of the SMA. The surgeon consulted a vascular surgeon at a major trauma center, who was in surgery at the time. They agreed on the surgeon performing a diagnostic laparoscopy at the local hospital followed by



**Figure 2.** Curved planar reconstructed abdominal CT showing a short proximal occlusion of the superior mesenteric artery with fresh thrombus throughout the first three branching points.

another consultation. The diagnostic laparoscopy revealed 70 cm of edematous small intestine with petechiae and decreased motility, leading to the diagnosis of intestinal ischemia.

Immediately after surgery, with the patient still under anesthesia, the patient's case was again discussed with the vascular surgeon. The CT was reviewed by the vascular surgeon as well as an interventional radiologist: it showed a short proximal chronic occlusion of the SMA with thrombus throughout the first three branching points of the SMA ([Figure 2](#)). The combination of radiological and clinical findings suggested a fresh thrombosis. Furthermore, the aorta and iliac arteries were severely calcified ([Figure 3](#)).

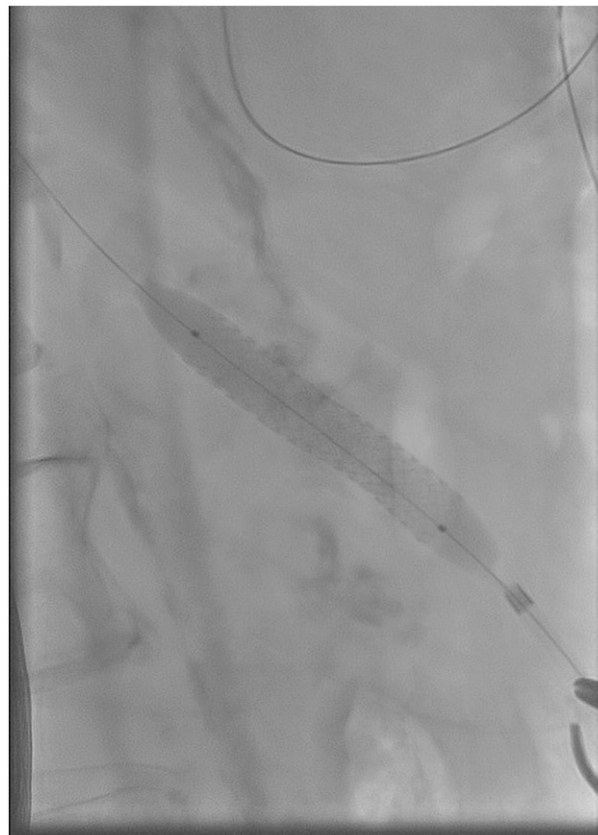
Due to the proximal occlusion and extensive fresh thrombus, the team decided against primary endovascular treatment. Usually, open thrombectomy with SMA bypass surgery would then be performed, but due to the extensive calcification of the aorta, it would likely prove difficult to perform an aortic anastomosis. Therefore, the approach chosen was a hybrid procedure with open thrombectomy followed by ROMS. The patient was prepared for groin puncture and antegrade approach with through-and-through wire in case of difficulties with ROMS.



**Figure 3.** 3D reconstruction of the initial CT of the abdomen, showing a heavily calcified aorta and iliac arteries.

### Intervention

The patient was transferred while intubated directly to the operating room in a major trauma center. An explorative laparotomy via a transverse incision was performed. The infracolic SMA was exposed including the first three branching points, with selective control of all branches. Open thrombectomy of fresh thrombus was performed via a transverse arteriotomy immediately proximal to SMA's second branching point approximately 6 cm distal to the SMA origin. After thrombectomy, sufficient retrograde backflow was noted, but no antegrade inflow. Using the arteriotomy as access, a long 5F-sheath was inserted and secured with a surgical band. A 0.035" Glidewire Advantage (Terumo, Somerset, NJ) supported by a 5 F Lindh catheter (Cordis, Santa Clara, CA) was used to recanalize the proximal occlusion and a Propos 7/36 balloon expandable uncovered stent (QualiMed, Winsen, Germany) was placed guided by calcifications visible under fluoroscopy (Figure 4). The final retrograde angiography showed no remaining stenosis. Sufficient antegrade inflow was confirmed and any residual thrombus was flushed out prior to arteriotomy closure with Prolene 6-0 sutures. The abdominal organs were reviewed by an abdominal surgeon,



**Figure 4.** Image obtained during the endovascular procedure showing deployment of the balloon expandable stent in superior mesenteric artery guided by the heavy calcifications. The tip of the sheath in retrograde position is visible.

and besides several small intestine petechiae, the organs were found to be clinically viable with palpable pulse distal to the closed arteriotomy. The abdomen was closed with a vacuum assisted closure (VAC) system to prevent abdominal compartment syndrome and to serve as access for a second look after 48 h.

The procedure lasted 164 min. During surgery, the patient was fully heparinized with 4000 IU heparin and received prophylactic antibiotics (piperacillin/tazobactam and metronidazole). The patient had a total blood loss of 190 mL. The procedure was performed by a board certified vascular surgeon, a board certified interventional radiologist, and a vascular surgery resident.

### Follow-up and Outcomes

On post-operative day (POD) 2, the second look laparotomy revealed viable intestines with no areas of necrosis. The VAC was removed, and the abdomen was closed. While in-hospital, the patient received epidural analgesia, thromboprophylaxis, and prophylactic antibiotics. The patient had

no dietary restrictions after surgery due to viable intestines. On POD 4, the patient was retransferred to a local hospital. The patient experienced no complications or adverse outcomes and was discharged at POD 9 in habitual condition. The patient was prescribed life-long clopidogrel 75 mg daily and acetylsalicylic acid 75 mg daily for six months post-surgery.

This patient had a good outcome compared with previous studies. A meta-analysis of similar cases shows a 30-day mortality rate following ROMS of 32%, endovascular therapy of 26%, and open surgery of 40%.<sup>9</sup> The patient was discharged after just 9 days, where other studies show a mean hospital stay of 20 days after ROMS.<sup>5</sup> The patient was still alive at 90 days follow-up and has another follow-up consultation one year after surgery.

## Discussion

This case report demonstrates an infrequently used surgical approach. It describes in not previously reported detail the clinical and diagnostic considerations relevant to aid the surgical team's decision-making in order to apply this approach when suitable. Further, this case underlines the value of cross-specialty therapy, including surgeons from vascular surgery, radiology, and abdominal surgery.

The ROMS technique in itself is not novel.<sup>2-6</sup> However, to our knowledge, no previous case reports or case series have described ROMS combined with open thrombectomy, nor underlined the preoperative considerations in choosing this procedure. A limitation to this report is the short 90-day follow-up.

Hybrid procedures utilizing the strengths of both open and endovascular surgery should be considered in complex patients where standard treatment options are suboptimal. In patients with proximal SMA occlusion, extensive fresh thrombus, and a very calcified aorta, we believe that ROMS should be considered as a first line treatment, rather than primarily being used when an antegrade approach fails. If recanalization by ROMS should fail, an antegrade approach with through-and-through wire technique can then be considered. As operator radiation exposure is inherently increased with the ROMS technique, we recommend the use of a long sheath while performing ROMS. However, arguably, with proper shielding the shorter procedural time of ROMS will only minimally increase the exposure compared with a through-and-through procedure.

In conclusion, we believe that a thorough preoperative discussion of the possible approaches with other specialties can lead to better outcomes, and we hope that the surgical considerations listed in this case report can assist other

surgeons in preoperative decision-making for complex patients.

## Declaration of Conflicting Interests

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