Percutaneous Mechanical Thrombectomy of Acute Superior Mesenteric Artery Embolus using the Straub Rotarex®S Catheter

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Introduction
Acute mesenteric ischemia (AMI) is a critical disease caused by interruption of the mesenteric circulation. Due to the insidious onset and rapid development of AMI and because there have been no breakthroughs in the clinical diagnosis or treatment, the prognosis of AMI is very poor with the overall mortality rate reaching 60-80%. The main pathogenesis of AMI is superior mesenteric artery (SMA) embolism, accounting for approximately 40-50% of cases. Emboli largely originate in the heart and are common in patients with atrial fibrillation.
The early diagnosis and treatment of AMI is crucial to the prognosis, and delayed treatment might lead to intestinal ischemia and necrosis. The traditional treatment has mainly been open or laparoscopic thrombectomy. With the development of endovascular techniques, methods of percutaneous catheter-directed thrombolysis and mechanical thrombectomy have been gradually adopted. The present paper reports a case of treating an SMA embolism with percutaneous mechanical thrombectomy (PMT) performed in our department.

**Case Report**

A female patient, aged 61 years, experienced sudden abdominal pain for 12 hours and was admitted to the hospital on December 29, 2015. The patient had a history of hypertension, diabetes mellitus, coronary heart disease and atrial fibrillation. Physical examination indicated a slight abdominal distension, no gastrointestinal peristalsis, an obvious tenderness around the navel and lower abdomen with mild rebound tenderness, no muscle tension, no shifting dullness and the absence of bowel sounds. There were no obvious abnormalities in the vital signs, and body temperature was normal; however, an electrocardiogram (ECG) revealed atrial fibrillation. Abdominal computed tomography angiography (CTA) showed a filling defect in the middle and distal segments of the SMA (Figure 1). The results of laboratory tests, including white blood cell count, hemoglobin and tests for liver and kidney function, had no obvious abnormalities. According to the preoperative examination, we considered there to be no signs of intestinal necrosis. Percutaneous mechanical thrombectomy (PMT) was performed the same day as an emergency treatment.

Under local anesthesia, left brachial artery access was established with a 5F sheath. After which, a guide wire and an angiographic catheter were inserted into the abdominal aorta. Angiography revealed emboli in the mid-distal portion of the SMA, but the branches were normal (Figure 2). After heparinization, a 90 cm, 6F sheath was inserted into the abdominal aorta to replace the 5F sheath, and a vertebral catheter was navigated into the SMA. The long sheath was placed into the proximal SMA and a 0.018” guide wire was placed into the SMA, passing the embolus. With a 6F Rotarex®S catheter (Straub Medical AG, Switzerland), inserted over the guide wire and advanced to the target lesion, the embolus was treated by purely mechanical debulking. (Figure 3).
After withdrawing the Rotarex®S catheter, repeat angiography indicated that the offending embolus was completely removed and that blood flow was restored to normal (Figure 4). 250,000 U of Urokinase in a slow infusion was administered to the patient via the introducer sheath. We removed the introducer and used a closure device (Starclose, Abbott Vascular, USA) to seal the brachial puncture. The intervention was successfully completed without any adverse events.

The patient had stable vital signs after the treatment and received a regimen of low-molecular-weight heparin sodium (Clexane), 60 mg/h for 12 h i.v. for anticoagulant therapy, alprostadil, 10 mcg/h for 24 h i.v. for vasodilator therapy, anti-infective drugs and parenteral nutrition. Abdominal pain was significantly relieved after the procedure. Physical examination after 12 h indicated normal body temperature, soft abdomen, mild tenderness around the navel and no rebound tenderness or muscle tension. Laboratory test results for white blood cells, hemoglobin and liver and kidney function had no obvious abnormalities. Flatulence and defecation were restored on the second and fifth day respectively after the intervention. Five days later, the patient began to eat normally. One week after the intervention, repeat enhanced abdominal CTA showed the SMA and its branches were normal and patent (Figure 5). The patient was discharged 10 d after the intervention, and received aspirin 100 mg/d and warfarin 3 mg/d orally. During a 6-month follow-up, the patient had no complaints of discomfort, eating, flatulence and defecation was normal and there were no bleeding complications.

Figure 1  CTA revealed a filling defect in the middle and distal segments of the SMA.

Figure 2  Angiography showed an SMA occlusion.

Figure 3  6F Rotarex®S catheter in use.
Discussion

An SMA embolism is the most common cause of AMI; this condition has a rapid onset and lacks obvious clinical features in the early stages. The characteristic of abdominal pain and the development of symptoms are similar to those of other acute abdominal diseases, which easily leads to delayed treatment. When the acute abdominal symptoms of patients do not match the signs and laboratory test results, the possibility of AMI should be considered, especially when these symptoms occur along with atrial fibrillation, arteriosclerosis, blood coagulation abnormalities and other circulatory diseases.

Early diagnosis and prompt treatment can restore blood flow through the SMA to avoid the progression to intestinal ischemia. When there is no clear evidence of intestinal necrosis, endovascular treatment can be used to substitute open surgery as a preferred method of treatment. Endovascular treatment has the advantages of being fast, minimally invasive and having fewer complications after the operation, as well as lower mortality rates, than open surgery. Arthurs et al. reported that patients with AMI, receiving endovascular treatment or undergoing open surgery, had mortality rates of 36% and 50% respectively.
Currently, the primary methods of endovascular treatment include catheter-directed thrombolysis, percutaneous angioplasty, percutaneous thrombectomy and aspiration. Catheter-directed thrombolysis uses an infusion catheter to intraluminally inject urokinase and other thrombolytic drugs into the target vessels. However, the drugs dissolve the thrombus with low efficiency and subsequently are not able to dissolve the clots within a short time; delayed revascularisation can lead to intestinal ischemia. In addition, we should be alert to the occurrence of intestinal hemorrhage in thrombolytic therapy, which is not suitable for patients with contraindications for thrombolytic therapy. Angioplasty and stenting are used as a supplementary treatment of residual stenosis after thrombolysis to restore the lumen morphology and to reduce the recurrence rate. The technique of PMT fragments the thrombus by mechanical means and removes the thrombus with aspiration. The advantages of PMT lie in the rapid clearance of the thrombi, no or reduced use of thrombolytic drugs during or after the intervention, minimal invasiveness and low complication rate.

This case of acute SMA embolism was confirmed due to sudden abdominal symptoms, previous history of atrial fibrillation and a CTA diagnosis of SMA embolism. In addition, there were no signs of peritonitis or intestinal necrosis by physical examination, laboratory tests and CT. We decided to perform PMT because it could remove the emboli and restore the arterial circulation rapidly compared with catheter-directed thrombolysis. The embolism only involved the main trunk of SMA making it possible to aspirate all the emboli. When operating, the physician should be wary of the possibility of PMT-induced vessel rupture, especially when working in smaller-diameter vessels, which may have serious consequences. In this case, the use of the Straub Medical 6F Aspirex®S device, which is purely mechanical aspiration, seems to be safer. If rupture occurs during the procedure, a covered-stent or coil embolization is feasible, while open surgery should also be prepared. Distal embolization is another possible PMT complication. After thrombectomy, injecting urokinase through the sheath can dissolve distal micro emboli, and it is thus possible to avoid the consequences of a distal embolization.

**Conclusion**

To date, the application of Rotarex®S in treating AMI has not been well documented internationally. Although this is only one case report, our results indicate that the PMT operation can be a safe and effective option for the treatment of acute SMA embolism.
References


