Bowel necrosis following endovascular revascularization for chronic mesenteric ischemia: report of a case and review of literatures

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Abstract

Background

Endovascular revascularization has recently been established as a less invasive treatment method for chronic mesenteric ischemia. However its complication and the consequence have not been emphasized.

Case presentation

The present report describes a 59-year-old man treated with endovascular revascularization for chronic mesenteric ischemia. However, he was then diagnosed with intestinal necrosis due to distal embolization. Despite undergoing emergent bowel resection, he died on postoperative day 109. Embolic complications following endovascular revascularization has rarely been reported but can cause intestinal infarction, possibly leading to death.

Conclusion

Although endovascular revascularization for chronic mesenteric ischemia is less invasive and may be suitable for high-risk patients, attention should be paid to avoid embolic complications.
1 **Key words**

2 Chronic mesenteric ischemia, endovascular revascularization, embolization, bowel

3 necrosis
Background

Endovascular revascularization (ER) is an emerging treatment alternative for chronic mesenteric ischemia (CMI). Although open surgical revascularization (OR) yields a satisfactory outcome with respect to the relief of symptoms and primary patency, it can be associated with perioperative morbidity and mortality. ER is advantageous in that it is less invasive. However, procedure-related complications following ER occur in about 10% of cases. Of these complications, distal embolization and subsequent bowel necrosis can lead to a fatal condition. The present report describes a case of CMI associated with intestinal infarction after ER, and discusses the procedure-specific complications.

Case presentation

A 59-year-old man was referred to our hospital with postprandial abdominal pain, diarrhea, and vomiting. His body mass index was 18.4. His symptoms improved with total parenteral nutrition but relapsed after he resumed his normal diet. He had a history of multiple abdominal surgical interventions. During the past 20 years, he had undergone open drainage for acute pancreatitis, cholecystectomy and choledochotomy for acute cholangitis, cysto-gastrostomy for pancreatic pseudocyst, and
choledocho-jejunostomy for bile duct stenosis. He had a history of hypertension, diabetes, and cervical spondylosis, as well as a history of smoking. An upper gastrointestinal endoscopy showed no ischemic change, whereas total colonoscopy revealed ischemia in the distal ileum and the ascending colon. Enhanced abdominal computed tomography (CT) showed a stenosis of the superior mesenteric artery (SMA) and occlusion of the celiac and inferior mesenteric arteries with developed collateral vessels from the SMA and left iliac artery (Fig. 1).

The patient was diagnosed with CMI due to splanchnic arterial stenoses and occlusions, and revascularization of the SMA was considered necessary. We chose ER for this treatment, taking into consideration his poor nutritional condition and hostile abdomen. The procedure was performed under local anesthesia via the left brachial route. The stenosis close to the origin of the SMA was traversed with a 0.014-inch guidewire. After systemic administration of 3000 units of unfractionated heparin, the lesion was pre-dilated, and a stent (Palmaz Genesis, 6mm × 16mm, Cordis / Johnson and Johnson, Miami, FL, USA) was placed without apparent difficulty (Fig. 2). He subsequently received a continuous infusion of 15 000 units of unfractionated heparin for the first 24 hours and 100 mg of aspirin per day.
The patient complained of right upper quadrant abdominal pain after the intervention, and his white blood cell count was elevated to 20,000/µL on the next day.

Muscular guarding was present with further elevation of white blood cell count on the second day, and CT revealed small bowel necrosis with intestinal pneumatosis and bloody ascites. Emergency laparotomy was performed, and the necrotic ileum and ischemic ascending colon were resected. The patient suffered an ischemic heart attack and liver abscess postoperatively, which were both treated non-surgically, and he died of massive gastrointestinal bleeding on postoperative day 109.

Discussion

Abdominal angina or CMI is characterized by postprandial abdominal pain and weight loss. Insufficient intestinal blood flow causes these symptoms and is usually produced by the obstruction of 2 or 3 splanchnic vessels. The underlying etiology of this disease is atherosclerosis in more than 90% of cases. Other causes include fibromuscular dysplasia, vasculitis (such as Takayasu arteritis, giant cell arteritis, polyarteritis nodosa, systemic lupus erythematosus, and thromboangiitis obliterans), malignancy, and radiation. Patients are initially treated with conservative therapy including bowel resting, cessation of smoking, and administration of vasodilator drugs.
Revascularization is considered if these conservative treatments fail to relieve the symptoms. Open surgery has been the standard method for revascularization in CMI.

On the other hand, since the first report by Furrer et al. on the effectiveness of percutaneous transluminal angioplasty for CMI, ER has been considered as the treatment of choice in some cases. Previous studies have reported the equivalent technical success of ER and symptom relief rates with lower morbidity compared with OR. However, the primary patency rate is lower in ER, resulting in more secondary interventions. Therefore, ER is currently recommended for high-risk patients. Patients treated with ER can be associated with procedure-specific complications, and sometimes follow catastrophic courses, as in the present case. Distal embolization and arterial dissection are often critical conditions. Eight cases of distal embolization as a complication of ER for CMI have been previously reported. All these patients underwent bowel resection, and 7 out of 8 patients died of postoperative multiple organ failure. Bowel necrosis and subsequent sepsis can easily deteriorate the general condition of those patients considered high risk for OR. Therefore, effort should be made to prevent embolization.

Embolic protection devices may be useful in some cases with CMI. Brown et al. reported that the routine use of an embolic protection device could possibly lead
to lower morbidity and mortality rates. Several reports have suggested the efficacy of embolic protection devices in percutaneous revascularization and stent placement for the treatment of renal artery stenosis.\textsuperscript{12,13} These studies show that embolic particles were observed in 60–90\% of cases treated for atherosclerotic renal arteries. Further studies are necessary to verify the usefulness of embolic protection devices in cases with CMI.

**Conclusion**

In conclusion, although ER for CMI is less invasive and may be suitable for high-risk patients, attention should be paid to avoid embolic complications.

**Consent**

Written informed consent was obtained from the patient’s family for publication of this case report.

**List of abbreviations**

CMI; chronic mesenteric ischemia, CT; computed tomography, ER; Endovascular revascularization, OR; open surgical revascularization, SMA; superior mesenteric artery
Competing interests

We have no conflict of interest to declare.

Author’s contributions

TS, AH, TM designed research, TS collected data. HO, KS, YT, TW analyzed data. TS wrote the paper. AH, TM made a critical revision of the article. All authors read and finally approved the manuscript.

Acknowledgments

None

References


Figure legends

Figure 1; Computed tomography before the intervention.

The arrow indicates occlusion of superior mesenteric artery. The arrowheads indicate obstruction of the celiac and inferior mesenteric arteries. The asterisk shows the development of a collateral vessel from the left iliac artery.

Figure 2; Digital subtraction angiography during percutaneous transluminal angioplasty and stenting.

(a) Stenosis was confirmed near the root of the superior mesenteric artery (arrow). (b) After dilatation, a stent (6mm × 16mm) was inserted.
Table

Review of distal embolization after endovascular revascularization for chronic mesenteric ischemia

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<tr>
<th>Author, year</th>
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Figure 1