A Case of Inferior Mesenteric Artery Aneurysm with an Occlusive Disease in Superior Mesenteric Artery and the Celiac Artery

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A 72 year-old man was referred to our hospital for treatment of a gradually expanding inferior mesenteric artery (IMA) aneurysm associated with an occluded superior mesenteric artery (SMA) and a severely stenosed celiac artery (CA). Using 64-slice computer tomography (CT), we were able to accurately define a precise collateral visceral circulation from the IMA to the SMA and the CA, greatly clarifying preoperative strategy. The aneurysm was subsequently removed, with revascularization of the SMA and the CA accomplished through grafts from the abdominal aorta using 6 mm polytetrafluoroethylene (PTFE) grafts.

Key words: aneurysm, inferior mesenteric artery, computed tomography

INTRODUCTION

Aneurysm of the inferior mesenteric artery (IMA) is among the rarest of visceral artery aneurysms; there have been only 10 previous reports of IMA aneurysm accompanied by occlusive disease in the superior mesenteric artery (SMA) and the celiac artery (CA).1 We chose therefore in this case to employ 64-slice computer tomography (CT), which is recently proving valuable in the diagnosis of various cardiovascular diseases. CT revealed a precise three-dimensional image of splanic circulation, which greatly facilitated surgical management for the resection of the aneurysm and visceral revascularization.

CASE

The patient was a 72 year-old man who was referred to our hospital with an asymptomatic IMA aneurysm, first discovered in 1996 at another hospital during investigation of renal dysfunction due to polycystic kidney and observed to gradually expand during follow-up. He did not suffer from abdominal angina. He presented with right hemiplegia due to a sequela of cerebral bleeding, and was receiving medication for hypertension and a previous myocardial infarction. Renal dysfunction was estimated at a glomerular filtration rate of 36.6 ml/min/1.73 m.

A physical exam revealed a pulsatile abdominal mass in the left periumbilical region. An aortogram performed at the time of cardiac catheter examination showed no antegrade flow originating from the SMA or the CA. The large left colic artery and the marginal artery of the intestine appeared at the end of the aneurysm and were postulated to be the main supply for the visceral circulation. However, the severity of renal dysfunction in this patient was feared to be contraindicated for the use of further contrast media to provide a sufficiently detailed image of gastrointestinal circulation. Thus, we avoided a conclusive diagnosis and preoperative strategy using this method.

We then performed a 64-slice CT examination, which revealed an aneurysm with a diameter of 31mm in the IMA, and an SMA perfused through the middle colic artery following the left colic artery, which originated at the end of the aneurysm (Fig. 1a). The SMA was occluded (Fig. 1b) and the CA was severely stenosed at each ostium (Fig. 1c). The CA branches were perfused by collateral...
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flow from the pancreatic duodenal artery arcades. Based on the additional details clarified by CT, we were able to determine preoperatively the need for visceral revascularization in addition to resection of the aneurysm.

Upon performing median laparotomy, a pear-shaped aneurysm was confirmed (Fig. 2a). A 6 mm PTFE (polytetrafluoroethylene) graft was first anastomosed to the ileocolic artery, a distal branch of SMA, in an end-to-side manner. This retrograde graft supplied blood flow to the SMA through retroperitoneal pathway. After clamping the abdominal aorta and distal end of the aneurysm, the aneurysm was excised. The wall of the aneurysm was smooth and thin, containing little thrombus. The distal end of the aneurysm, from which the left colic and sigmoid arteries originated, was trimmed and bypassed with the abdominal aorta at the site of the IMA origin using also 6mm PTFE graft. Finally, the graft anastomosed to the ileocolic artery was connected to the bypass in an end-to-side manner (Fig. 2b). There was no sign of bowel ischemia intra or postoperatively and the patient was discharged uneventfully on the 21st POD. A postoperative CT examination confirmed the patency of the grafts and regression of the middle colic artery, which had functioned as the main collateral source of the SMA preoperatively (Fig. 3).

Pathologically, the intima of the aneurysm contained foam cell accumulation and infiltrated inflammatory cells, mainly lymphocytes. These findings are indicative of atherosclerotic disorder in the wall of the aneurysm (Fig. 4).

**Discussion**

Reports of visceral artery aneurysms are increasing as diagnostic facility improves. Although they as yet represent less than five % of all aneurysms, twenty-two percent of these present as emergency cases, with a mortality rate of 8.5% in over 2000 cases. Distribution of aneurysms within the visceral circulation involvement of the splenic (60%), hepatic (20%), superior mesenteric
Fig. 2  a: A pear-shaped aneurysm was confirmed and the dilated left colic artery (open arrow) was seen. b: The primary bypass (open arrow) was constructed between the abdominal aorta and the distal end of the aneurysm, from which the left colic and sigmoid arteries originated. A branched graft was then anastomosed to the ileocolic artery (closed arrow).

Fig. 3  The patency of the graft to the ileocolic (curved arrow) and the left colic arteries, and regression of the middle colic artery (open arrow) were confirmed.

Fig. 4  The intima of the aneurysm contained foam cell accumulation and infiltrated inflammatory cells, mainly lymphocytes. Original magnification × 100.
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In the previous literature, our case was confirmed as one of only ten reported IMA aneurysms involving atherosclerotic change with severe occlusive disease in the SMA and the CA. The cause of these rare aneurysms has been, suggested by Sugrue, to perhaps involve “jet disorder phenomenon”, the greatly increased and possibly turbulent blood flow in the IMA resulting from the severe occlusive lesions in the SMA and the CA.6) This condition exposes localized areas to high arterial pressures and can lead to aneurysm formation.

Here we found the SMA totally occluded near the ostium and obtained its blood supply from the IMA through the middle colic artery following the marginal and left colic arteries. The CA was also severely stenosed at the ostium and perfused by the pancreaticoduodenal arcades. Thus, a simple ablation of the aneurysm would have jeopardized the viability of the splanic organs without revascularization of the IMA branches. We selected a bypass between the IMA and the abdominal aorta instead of direct reimplantation to avoid kinking the IMA branches due to excessive tension. To alleviate concern of fatal intestinal ischemia, if the graft which connected the abdominal aorta to the end of the IMA aneurysm should become occluded, we also intended to construct an additional blood supply to the SMA. We did not bypass to the proximal SMA but to the ileocolic artery, a branch of the SMA, in a retrograde manner through retroperitoneal pathway to reduce length and magnitude of operation for this compromised patient by avoiding a meticulous dissection around duodenum and behind pancreas. Actually, we confirmed a regression of the middle colic artery, which had functioned as the main collateral source of the SMA before the operation. This would indicate that the bypass to the branch of the SMA functions enough. We selected a PTFE graft instead of a saphenous vein graft, because proper graft alignment might be difficult with retrograde grafts and prosthetic grafts were believed to resist kinking better.7) Further, the diameter of the graft button trimmed out from the end of the IMA aneurysm.

REFERENCES