Hybrid management approach for superior mesenteric artery and branch aneurysms

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ABSTRACT

Visceral artery aneurysms are rare, with a 25% rupture risk and an associated 70% mortality. A 55-year-old woman with progressive epigastric pain was found to have multiple large superior mesenteric artery (SMA), branch, and gastroduodenal artery aneurysms along with an occluded celiac artery trunk with hepatic flow dependent on the aneurysm branch. Management included antegrade aortohepatic artery bypass with gastroduodenal artery ligation, followed by SMA stenting and aneurysm coiling. This case is novel, given the diffuse pattern and rarity of SMA and branch aneurysms. This hybrid surgical management highlights innovative strategies to minimize morbidity without compromising definitive treatment of complex visceral artery aneurysms. (J Vasc Surg Cases and Innovative Techniques 2019;5:521-4.)

Keywords: Visceral artery aneurysms (VAAs); Superior mesenteric artery aneurysms; Hybrid

Visceral artery aneurysms (VAAs) are defined as aneurysmal dilation >1.5 times the diameter of the celiac artery, superior mesenteric artery (SMA), inferior mesenteric artery, and their branches. Overall incidence is exceeding low at 0.01% to 0.2%. Of all visceral aneurysms, splenic followed by hepatic artery aneurysms represent >80% of these, whereas SMA and SMA branch aneurysms occur in only 5% of cases.[1-3] Historically, upward of 60% of SMA aneurysms were mycotic in nature because of septic emboli; however, the most common etiology today is atherosclerosis.[4] Risk factors for VAAs include atherosclerosis, pregnancy, fibromuscular dysplasia, connective tissue disorders, intravenous drug use, medial degeneration, abdominal trauma, and infectious and inflammatory conditions.[5] Patients are typically asymptomatic and are increasingly diagnosed incidentally on imaging. Another subset may be symptomatic with nonspecific symptoms of abdominal pain.[6] The reported risk of rupture from a VAA is about 25%, which carries a risk of death that approaches 70%; thus, operative intervention is strongly recommended.[5,7]

Although there is no consensus guideline for the treatment of VAAs, there are generally acceptable indications for repair because of the high risk of rupture. These include symptomatic VAAs, VAAs >2 cm, expansion of >0.5 cm/y, woman of childbearing age, and women who are pregnant.[8] There are a number of treatment options, including open excision, revascularization, end-organ resection (ie, splenectomy), laparoscopic or robotic clipping, embolization (endovascular coil, plug, or glue), covered stent placement, and particle injection. Open techniques for repair are generally more accepted in the emergent setting of VAA rupture as there is a lower rate of morbidity and mortality compared with endovascular treatment, although endovascular techniques may be a better option in an elective setting, especially in those with hostile abdomens or who are poor surgical candidates.[8,9]

The patient herein described has agreed to publication of this case along with images, and a written consent has been obtained.

CASE REPORT

A 55-year-old woman without pertinent past medical history presented in a hospital transfer for evaluation of an SMA aneurysm. She had no personal or family history of connective tissue disorders, atherosclerotic risk factors, history of pancreatitis, or abdominal trauma. The patient initially presented with a 1-week history of vague crampy epigastric abdominal pain associated with nausea, emesis, and decreased appetite. On workup, computed tomography angiography revealed one large 3.5-cm SMA branch aneurysm and two smaller 1- to 1.5-cm aneurysms off the inferior pancreatic branches of the SMA as they collateralized to the gastroduodenal artery (GDA; Figs 1 and 2). The proximal celiac trunk was noted to be occluded, with the primary blood supply to the proper hepatic artery through retrograde GDA flow. An open bypass was required to ensure preservation of blood flow to the liver through the hepatic artery as we needed to ligate the GDA to address the GDA aneurysms; the SMA aneurysms originating from the superior pancreatic branches were well embedded within the pancreatic bed and technically nearly impossible to reach from an open approach but easily accessible through an endovascular approach with nearly negligible risks. An endovascular-only repair was not

https://doi.org/10.1016/j.jvscit.2019.10.002

Fig 1. Sagittal computed tomography angiography image of superior mesenteric artery (SMA) and SMA branch aneurysms.
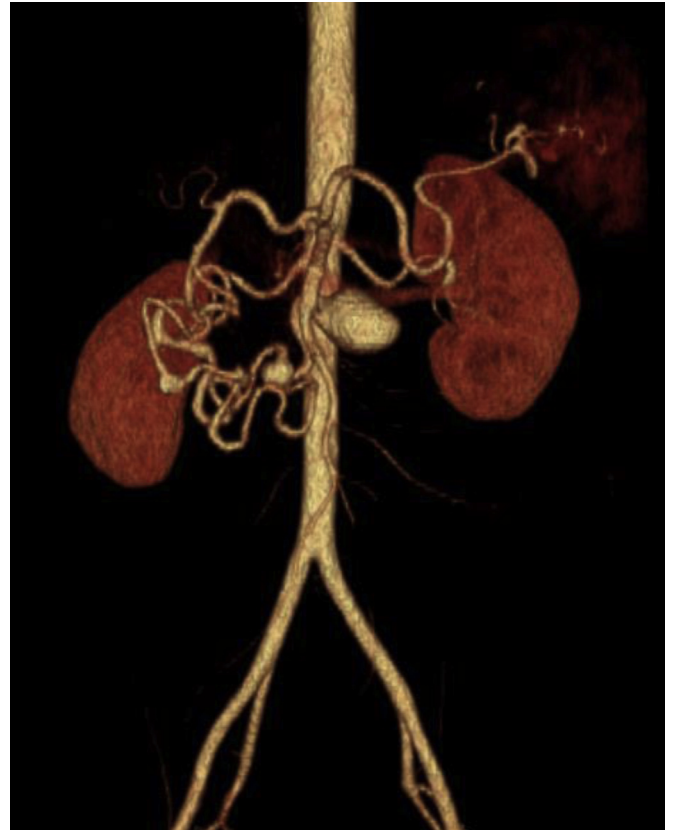

Fig 2. Preoperative three-dimensional reconstruction of computed tomography angiography image of superior mesenteric artery (SMA) and SMA branch aneurysms.

feasible in this case because of the celiac occlusion and dependence of hepatic flow on the GDA. The patient had no history of use of intravenous drugs and no constitutional symptoms suggestive of infection; two separate sets of blood culture specimens were obtained at the outside hospital before transfer and at our institution and noted to be negative, leading us to have a low suspicion of a mycotic etiology. In addition, on imaging, there was no evidence of inflammatory changes surrounding the aneurysms that appeared to have the morphologic features of bland atherosclerotic aneurysms. Thus, we planned a two-stage approach: open antegrade aortohepatic bypass to revascularize the hepatic artery, followed by a second-stage endovascular SMA branch and two GDA aneurysm coil embolizations with placement of an SMA stent for definitive aneurysm repair.

The initial approach was through an upper midline incision; the GDA and common hepatic arteries were identified and ligated, and the supraceliac aorta was dissected. A supraceliac aorta to hepatic artery bypass was performed with a 14- × 7-mm rifampin-soaked Dacron graft with an end-to-side anastomosis to the hepatic artery.

The next day, the patient was taken to our hybrid operating room, and selective catheterization of the SMA was performed. A microcatheter and wire system was used to selectively catheterize the SMA to the origin of the GDA, where multiple coils from 8 to 12 mm were used to coil embolize the two GDA aneurysms, followed by coil embolization of the larger SMA branch aneurysm. The guidewire was then positioned into the ileocolic

artery, and a 6-mm iCAST stent (Maquet, Rastatt, Germany) was deployed and postdilated to 8 mm without aneurysm filling noted on completion angiography (Figs 3 and 4).

The patient recovered well from this, tolerated a regular diet, and was discharged home on postoperative day 5 on antiplatelet therapy. One-month postoperative computed tomography angiography was notable for a patent aorta to hepatic artery bypass with complete thrombosis of the aneurysms (Fig 5). She was seen in clinic 6 and 12 months postoperatively without complaints and with complete resolution of abdominal pain.

DISCUSSION

This case is unique as SMA and SMA branch aneurysms are rare, and the pattern of multiple visceral aneurysms as seen in this patient is even less common. Furthermore, this case is interesting as this patient has no known risk factors for the development of aneurysms, such as trauma, prior surgery, pancreatitis, atherosclerotic risk factors, known connective tissue disorders, or infectious risk factors. Elective VAA repair may be approached through both endovascular and open approaches, depending on the characteristics of the aneurysm. Whereas an endovascular-only repair would be ideal, it was not feasible in this case because of the celiac occlusion and dependence of hepatic flow on the GDA. For

Fig 3. Angiography of superior mesenteric artery (SMA) and SMA branch aneurysms.

Fig 5. Computed tomography angiography demonstrating coiled aneurysms and patent aortohepatic bypass.
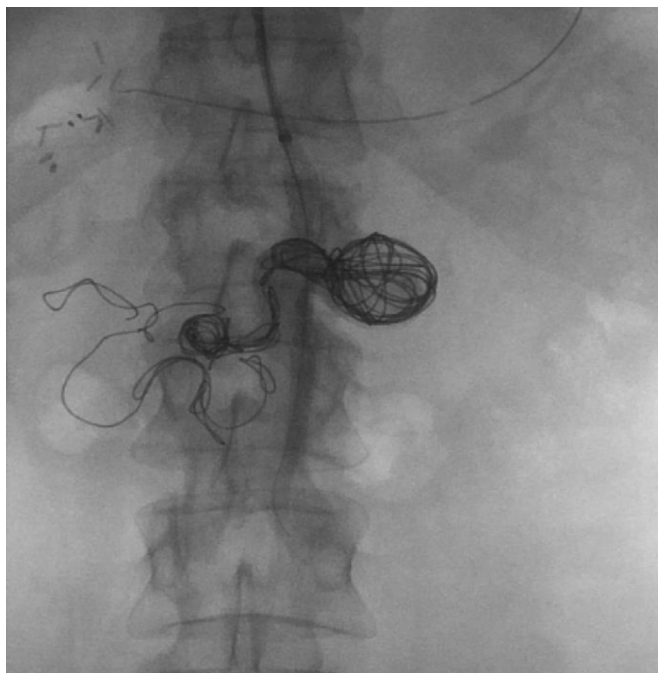

Fig 4. Angiography after coil placement.

conduit choice, it is the surgeon's preference to use rifampin-soaked Dacron whenever possible, even in the absence of a known infectious etiology.

Because of the rarity of VAAs and the lack of controlled studies, management is based on observational studies and various case series. As the rate of rupture and subsequent rate of mortality from a rupture is high, most patients with VAAs with a diameter of 2 cm, rapid growth, or ominous morphologic features should be treated.[8,10] Interestingly, not only did this patient present with multiple aneurysms, but she also had the additional dilemma of an occluded celiac trunk with hepatic flow dependent on the aneurysm branch. This likely was the reason for aneurysmal degeneration of the GDA as a compensatory mechanism in the setting of an occluded celiac artery.[11] The hybrid management strategies of antegrade aortohepatic bypass followed by coil embolization and stent placement in this case are an innovative and unique approach to handle complex visceral aneurysms while maintaining perfusion to the liver and foregut.

CONCLUSIONS

This patient has done very well clinically without any sequelae 6 and 12 months postoperatively, making this case another example of the relatively low morbidity and mortality from elective repair of VAAs.

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