Giant visceral artery pseudoaneurysm treated with endovascular transradial coil embolization

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ABSTRACT

Visceral artery pseudoaneurysms (PSAs) are relatively rare, and cases associated with distal vasculature of the superior mesenteric artery are largely unreported. Visceral artery PSAs, without intervention, can lead to morbidity or mortality from rupture or mesenteric ischemia. Historically, open aneurysmectomy is the gold standard; however, endovascular modalities have emerged as the first-line treatment in patients who are poor surgical candidates and/or have unfavorable anatomy. Herein, we describe a case of a symptomatic PSA of the distal superior mesenteric artery treated via the transradial approach with endovascular coil embolization, showing successful aneurysmal exclusion and preservation of enteric collateral flow. (J Vasc Surg Cases and Innovative Techniques 2020;6:618-21.)

Keywords: Visceral; Pseudoaneurysm; Coil embolization; Transradial; Mesenteric

CASE PRESENTATION

An 83-year-old man with extensive cardiac comorbidities, including multiple myocardial infarctions (in 2005 with bare metal stent placement; in 2012 ST-elevation myocardial infarction requiring a drug-eluting stent to the left anterior descending, and a non-ST-elevation myocardial infarction in 2013), requiring cardiac catheterization via right femoral artery approach, biventricular pacemaker and left ventricular assist device (LVAD) placement (Heartmate II, Abbott Vascular, Chicago, Ill) for ischemic cardiomyopathy necessitating warfarin with multiple driveline infections (on chronic doxycycline), presented with 3 months of diffuse and migratory postprandial abdominal pain with associated significant unintentional weight loss, nausea, and vomiting. Vital signs and laboratory results, including inflammatory markers, were all grossly normal. Abdominal noncontrast computed tomography (CT) scan was performed as patient had chronic kidney disease, showed a 45 × 29 mm mass abutting the distal superior mesenteric artery (SMA) (Fig 1). Initially read as lymphadenopathy and diagnosed with mesenteric panniculitis, the patient was ultimately discharged home before vascular surgery consultation.

One month later, he represented to emergency department with worsening abdominal pain. Once again, vitals, laboratory tests, and initial blood cultures were grossly normal, with the exception of therapeutic international normalized ratio (INR) of 2. Given his abdominal pain and high suspicion for SMA etiology, a CT angiography was performed, demonstrating an enlarging 56 × 36 mm PSA arising from the distal SMA (Fig 2). On further review, previous operative notes did not mention any mesenteric vessel injury or abdominal mass, and a CT scan of the chest, abdomen, and pelvis performed 2 years before presentation, no SMA PSA was visualized. Several CT scans of the chest, abdomen, and pelvis without contrast completed 1 year previously did show a mass near the SMA with a growth rate of 40 mm within 9 months.

The presence of this enlarging SMA PSA in the setting of increasing abdominal pain warranted urgent surgical treatment. Although open aneurysmectomy was contemplated, his history of multiple abdominal surgeries, most recently small bowel resection for intussusception and hernia repair via laparotomy, severe heart failure, and immunosuppressed state from chronic bacteremia, made him a poor operative candidate. Even if the patient is able to overcome the perioperative surgical state, his immunosuppressed status can also affect his increased risk for wound complications, lengthier hospital stay, longer inability to return to regular activities, and escalation of postoperative pain, leading to worsening of his already poor pulmonary status. Endovascular coil embolization was the preferred choice given this poor operative candidate, concern for mycotic PSA for covered stent placement, and the distal nature of the PSA; anticoagulation was not held in this setting.

Left radial artery access was obtained and a 4/5F 10-cm Glidesleender radial sheath (Terumo Medical, Somerset, NJ) was placed. After access, radial artery cocktail containing 3000 U of heparin was given. The activated clotting time was checked throughout the case, and heparin was rebolused to ensure it remained above 250. A 260-cm stiff-angled guidewire and 100-cm angled-glide catheter were used to cannulate the proximal SMA. The angled-glide catheter was exchanged for a 125-cm MPA-catheter to perform our mesenteric angiogram,

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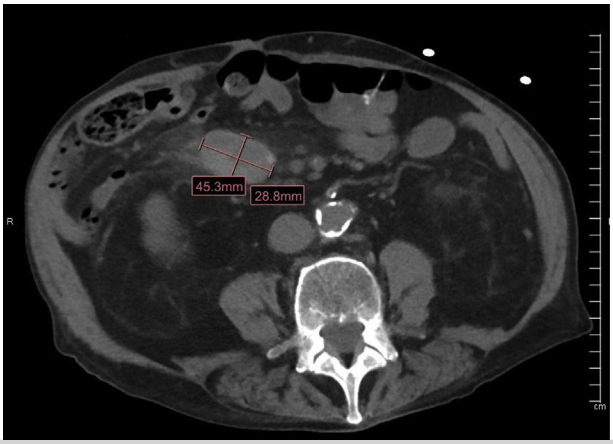

Fig 1. Computed tomography (CT) scan of the abdomen and pelvis demonstrating a 45 × 29 mm mass.

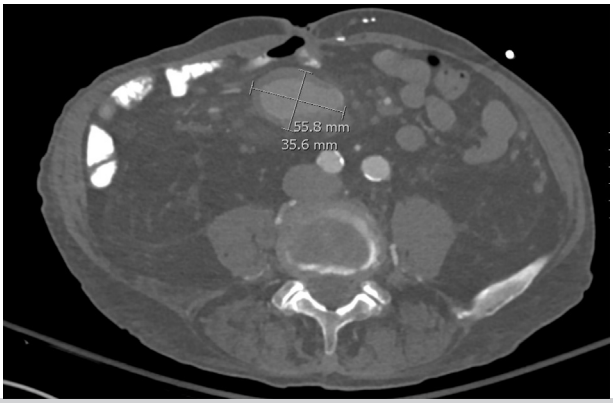

Fig 2. Computed tomography (CT) angiography abdomen pelvis showing 56 × 36 mm superior mesenteric artery (SMA) pseudoaneurysm (PSA).

which confirmed the CT findings and seemed to be amenable to coil embolization (Fig 3). Once cannulation of the SMA was confirmed, a 300-cm 0.014" Fathom wire (Boston Scientific, Marlborough, Mass) through a 155-cm 0.018" Direxion (Alexandria, Va) microcatheter was used to cross distal to the PSA. Angiographic evidence of PSA anatomy was obtained. Using a combination of Interlock (Boston Scientific) and Azur (Terumo Medical) coils, PSA inflow, outflow and sac was embolized using a back-door and front-door technique. Coil embolization required precise coil placement with careful avoidance of collateral vessels in an effort to minimize the risk of mesenteric ischemia; detachable coils were vital for this procedure. A completion angiogram confirmed successful exclusion of the PSA and coil occlusion of distal SMA with brisk flow through the SMA via retrograde filling from collaterals (Fig 4). The procedure was well-tolerated with conscious sedation using low-dose of fentanyl, minimal contrast used (68 mL), and without any perioperative complications. Postoperatively, there was immediate resolution of his abdominal pain. He developed mild acute kidney injury on postoperative day 2 with a creatinine

Fig 3. Intraoperative selective superior mesenteric artery (SMA) angiogram demonstrating distal SMA pseudoaneurysm (PSA).

of 1.5 mg/dL. After an extensive workup to look for any new evidence of infectious etiology without avail, he was discharged home on postoperative day 4 with resolution of acute kidney injury on warfarin and doxycycline, tolerating a normal diet, and without pain.

The 1-month follow-up CT scan showed no enlargement of the PSA with normal-appearing bowel (Fig 5). At the 6-month follow-up, the patient continues to be asymptomatic. Patient consented to publication of this account.

DISCUSSION

Although visceral artery PSAs (VAPAs) of the SMA are extremely uncommon, their high risk of rupture (10%-50%) and subsequent mortality (22%-40%) make their prompt diagnosis and treatment imperative.[1-3] VAPAs occur secondary to arterial wall disruption that can result from infection, vasculitis, fibromuscular dysplasia, trauma, or iatrogenic causes.[1,3,4] The decreased integrity of the arterial wall makes VAPAs more prone to rupture than their true aneurysmal counterparts and can prove fatal. Visceral mycotic PSA, in particular, are most commonly confined to the SMA and in 2.5% to 10.0% of the cases are associated with infective endocarditis.[1] Moreover, this PSA is different than other VAPAs owing to its distal location, large size, and rapid expansion. In this patient with history of LVAD infections, infection was a possible etiology, although no direct evidence could be found. Alternatively, the PSA may have been iatrogenic from inadvertent injury during his previous abdominal surgeries. Although previous operative notes did not expound on mesenteric

Fig 4. Intraoperative completion angiogram showing exclusion of the pseudoaneurysm (PSA) sac and filling of the distal superior mesenteric artery (SMA).

damage, the timing of the surgery in concordance with emergence of SMA PSA makes iatrogenic injury likely.

Treatment modality depends on the location of the PSA, desire to maintain vessel patency, hemodynamic stability, and comorbid conditions.[5] Recently, endovascular treatment has emerged as the preferred choice owing to decreased morbidity, mortality, improved cost effectiveness, and shorter hospital stay.[6,7] Endovascular treatment demonstrates high technical success rates and is useful in poor surgical candidates.[3,7] One method of coiling uses detachable framing coils followed by progressively smaller coil placed inside the framework to achieve tight packing while negating obligation of inflow and outflow embolization with potential distal ischemia.[8] Coil embolization offers a stable treatment for exclusion of the VAPA with good short- and long-term results and complete symptom resolution and no increased risk of continued infection.[9,10-12]

Coil embolization was the preferred choice in this patient owing to the small, distal quality of the vessel with poor collateralization, stent-assisted coil vs pipeline stenting are alternative options. Uncovered flow directing stents such as Pipeline Embolization Device (ev3 Endovascular Inc, Plymouth, Minn) or Multilayer

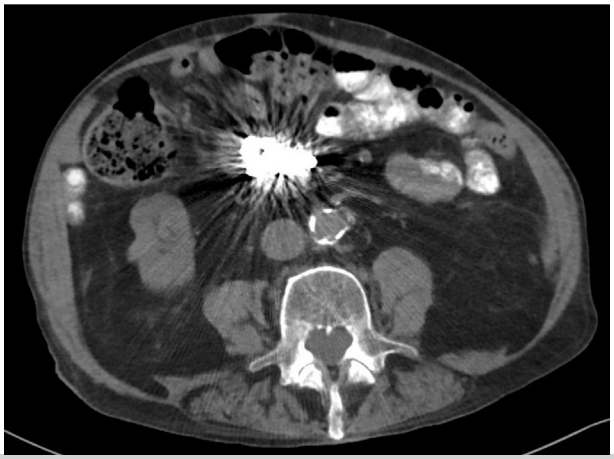

Fig 5. Postoperative follow-up computed tomography (CT) scan showing exclusion of the superior mesenteric artery (SMA) pseudoaneurysm (PSA), presence of coils, and normal appearing bowels.

Aneurysm Repair System (Cardiatis, Isnes, Belgium) have been used. These can decrease flow in a PSA while promoting laminar flow through the primary artery and outflow vessels. They have greater flexibility than stent grafts, making them better suited for peripheral placement and tortuous vessels.[13,14] Flow-directing stents can be especially useful in cases where coil embolization may not be possible, such as aneurysms with wide necks or vessels that need preservation.[15] Nevertheless, coil embolization was the preferred choice in this patient owing to the small, distal quality of the vessel.

Traditionally, a femoral artery approach for SMA PSA treatment is the preferred choice, given the greater familiarity with this access and shorter sheath length needed. To combat the difficulty of cannulating the caudally angulated SMA, steerable or directional sheaths with or without angled or reverse curve catheters can be used.[16] Recently, transradial access (TRA) has gained popularity as access of choice for mesenteric endovascular interventions. TRA provides decreased access site complications, a lesser need for postprocedure transfusion, and improved mortality. Most endovascular practitioners would typically recommend correcting INR to less than 1.5.[14] At times, coagulopathy cannot be corrected, necessitating to perform a case with an elevated INR. TRA is ideal in this setting owing to its low bleeding risk profile with minor grade access site hematomas occurring in only 5.7% of cases with a preprocedural INR of greater than 1.5.[17,18] Transfemoral access site complications in noncoagulopathic patients is quoted at 3% for clinically significant hematoma and 2% risk of thrombotic complication.[19] Moreover, patients with elevated INR (>1.6) undergoing vascular interventions via transfemoral access have demonstrated significant retroperitoneal hematoma, requiring open surgical intervention in 2.4% of such patients.[20] Additionally, TRA provides the

added technical advantage of ease of cannulation into a mesenteric artery owing to their sharp downward angulation. This strategy ultimately leads to decreased procedure time, time to cannulation, and amount of contrast given, resulting in decrease radiation to patient and operator.[21]

Minimally invasive modalities that have been described include stent grafting and embolization with or without coil assistance. Although stent grafting would preserve flow to the intestine, this patient's PSA was not amenable to this technique owing to small vessel diameter in this distal location. Coil embolization has been supported in treatment of VAPAs with good distal collateral flow.[9,22] Coil embolization via TRA without the need to hold necessary anticoagulation was the preferred option.

CONCLUSIONS

Distal VAPAs present a unique challenge for multiple reasons, and there is an absence of strong clinical evidence favoring a specific treatment modality. We report successful transradial endovascular coiling of a symptomatic, rapidly enlarging distal SMA PSA in a patient with extensive cardiac history with multiple LVAD driveline infections and prior abdominal surgeries. Endovascular coiling is an acceptable modality in the treatment of an atypical variation of an SMA PSA with no mesenteric ischemic consequences. In contrast with open surgery, endovascular coil embolization of distal SMA PSA provides a practical, minimally invasive technique with high success rate in selected cases. This case report highlights the advantages of low-profile transradial artery access for treatment of VAPA. This SMA PSA with unusual distal location and rapidly expanding giant size was coil embolized with both angiographic as well as symptomatic success.

Long-term follow-up is vital to monitor the safety and efficacy of endovascular occlusion of this atypical VAPA.

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