

Covered Stent Treatment of an SMA Aneurysm

Endovascular techniques can be the first line of therapy for visceral artery aneurysms.

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CASE REPORT

A 57-year-old man presented to his primary care physician with general abdominal pain in the right upper quadrant, which had been intermittently severe. The patient had a medical history significant for coronary artery disease and a surgical history for cholecystectomy.

The initial CT scan (4-slice from an outside institution) showed a 2.5-cm, dumbbell-shaped aneurysm arising off the first branch of the superior mesenteric artery (SMA). Celiac artery occlusion was noted. Scattered atherosclerotic disease of the abdominal aorta and narrowing of the inferior mesenteric artery (IMA) were also observed.

An initial angiographic study was performed for further evaluation of the aneurysm, as well as to try to reopen the celiac artery. Although the patient had no signs of mesenteric ischemia, his pain may have been due to celiac occlusion. Furthermore, any embolization

of the SMA aneurysm may interfere with celiac flow.

Femoral access revealed that there was near-total occlusion of the celiac artery. An initial attempt with a 7-F, renal double curve guide catheter and a .014-inch wire resulted in a dissection of the celiac trunk. Access was re-established with an 8-F IMA guide catheter, and two .014-inch wires were used to gain access across the high-grade celiac lesion. Predilatation was performed with a 1.5-mm and a 2.5-mm percutaneous transluminal coronary angioplasty, and a 4-mm X 28-mm Herculink (Abbott Vascular, Santa Clara, CA) was placed but could not make the distal bend. After the Herculink was placed, a second stent was deployed (Racer, 4-mm X 8-mm, Medtronic Vascular, Santa Rosa, CA). Postdilatation to 4.5 mm was then achieved (Figure 1A, B). The patient had discomfort due to balloon inflations that was different from his initial presenting pain.

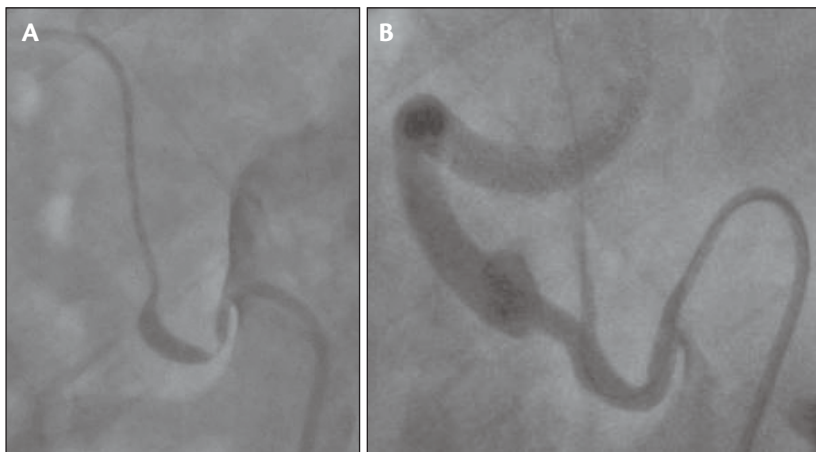


Figure 1. Initial selection of celiac artery reveals a high-grade lesion with difficult access from the femoral approach. After a stiff .014-inch wire was used to cross, the lesion was predilated with a 1.5-mm wire. Predilatation was performed with a 2.5-mm balloon catheter, which finally allowed a balloon-mounted stent to pass (A). A 4-mm X 28-mm Herculink was placed but could not make the distal bend. It was deployed followed by placement of a second stent (4-mm X 8-mm Medtronic Racer). Postdilatation to 4.5 mm was then achieved (B).

Because the aneurysm neck was so small, we decided to perform a CTA of the abdomen to reassess whether endovascular options were possible for the patient instead of surgery. The 64-slice CT showed the aneurysm to arise off one of the inferior pancreaticoduodenal arteries of the SMA (Figure 2). It was a major branch leading to the gastroduodenal artery, which subsequently led to the hepatic and celiac artery. The length before the aneurysm was approximately 4 mm, and the vessel measured approximately 5 mm in diameter. The vessel that exited the aneurysm measured approximately 6 mm in diameter and was markedly tortuous. The scan also revealed extensive calcification of the SMA and in the pancreas.

Because angiograms and CT

demonstrated a short neck, other options aside from covered stents were considered. Embolization of the aneurysm would have been the simplest option, but we were afraid that the collateral flow to the celiac artery would be jeopardized given the impaired celiac artery with a 4-mm to 5-mm stent in place. Also, we were not entirely convinced that this branch vessel did not have communication with loops of small bowel.

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Therefore, the decision was made to try a covered stent graft, which would preserve flow and accomplish the primary mission of occluding the aneurysm.

From the left common femoral access, an 8-F, short IMA guide catheter was placed at the SMA origin (Figure 3). With a Renegade microcatheter (Boston Scientific Corporation, Natick, MA) and a PT2 .014-inch wire (Boston Scientific Corporation), access was achieved through the aneurysm and out to the distal vessel. A second PT2 and Renegade microcatheter were used. Once in place, the two PT2 wires were exchanged for the stiffer Spartacore .014-inch wires (Abbott Vascular). A third wire, a PT2, was placed. Therefore, with the three wires across the aneurysm, the 8-F guide catheter was then coaxially advanced into and past the aneurysm. The Atrium 5-mm X 22-mm covered stent (Atrium Medical Corporation, Hudson, NH) was advanced coaxially over the three .014-inch wires. The normal inner diameter of the Atrium stent is .035-inch, but it was able to go over the three .014-inch wires. Once in position, the guide catheter was pulled back, and the stent was positioned to ensure the aneurysm was covered yet not extending significantly into the SMA. Postdilatation at the distal end was performed with a 6.5-mm percutaneous transluminal coronary angioplasty balloon catheter. Postcontrast injection showed that the aneurysm was covered and sealed and that good flow was

maintained to the celiac artery.

At 1-month follow-up, the patient was doing well with improved abdominal pain relief. A follow-up CT scan showed no leak.

DISCUSSION

Visceral artery aneurysms represent .1% to .2% of all vascular aneurysms. They are mostly asymptomatic, but rupture is associated with a high mortality rate.¹ There appears to be a slight male predominance, and atherosclerotic degeneration is the most common cause.² Although most patients are asymptomatic, some will present with vague abdominal pain, nausea, vomiting, or symptoms of mesenteric ischemia. Rupture is a devastating presentation, with reported mortality rates from 35% to 80%.² Visceral artery aneurysms are classified based upon location: celiac, splenic, hepatic, and superior mesenteric arterial locations. Aneurysms of the SMA are an uncommon but lethal entity that must be treated expeditiously to avoid mortality and high incidence of ischemic small-bowel complications.³

Depending upon the clinical situation—such as location, hemodynamic status, and overall status of the patients—visceral artery aneurysms can be treated by revascularization, ligation, or endovascular techniques. Endovascular techniques include primarily catheter-based embolization with Gelfoam (Pfizer Pharmaceutical, New York, NY), polyvinyl alcohol particles, cyanoacrylate or thrombin, and more permanent coils. Alternatively, catheter-based delivery of

covered stents offers the ability to preserve flow to the organ. Some of the difficulties with covered stents are their delivery and deployment. Self-expandable nitinol-based covered stents are flexible but require large-diameter sheaths and guide catheters; these stents are hindered by a lack of precise deployment. These two reasons necessitated the use of a covered balloon-mounted stent. The balloon-mounted system is stiffer to deploy and requires that the sheath or guide catheter advance past the site to avoid the stent graft becoming dislodged off of the balloon segment. That is why it was crucial for us to deliver the 8-F guide catheter past the exiting artery of the aneurysm.



Figure 2. CTA with 64-slice Philips (Philips Medical Systems, The Netherlands) and TeraRecon (TeraRecon, Inc., San Mateo, CA) shows the 2.5-cm calcified, bilobed aneurysm originating off the first branch of the SMA. Measurements revealed the entrance artery to be 5 mm and the exiting artery to be 6 mm. Scattered calcified walls are seen throughout the SMA and its branches.

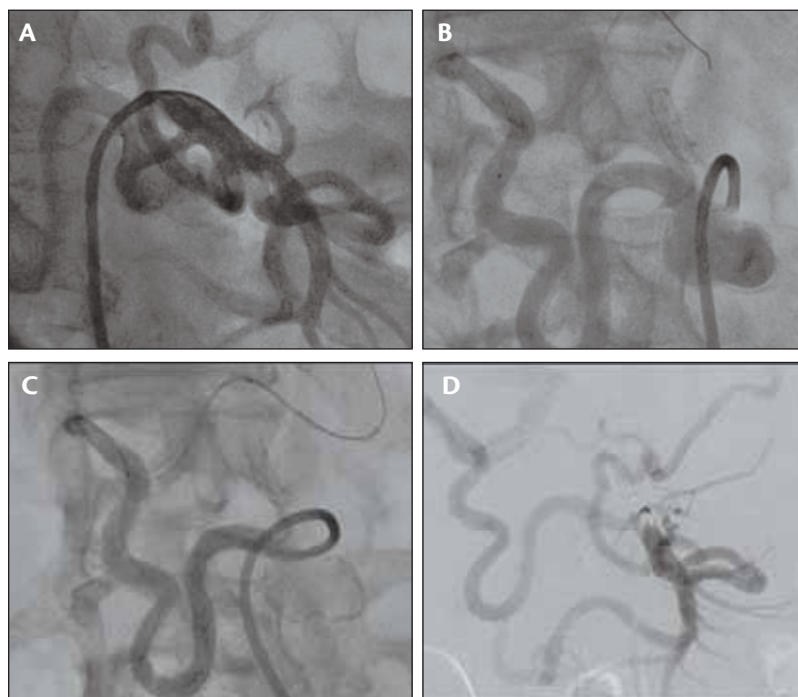


Figure 3. Angiography with the 8-F guide catheter placed in the SMA reveals the complex anatomy of the pancreaticoduodenal arteries, including the bilobed aneurysm originating off the first branch of the inferior pancreaticoduodenal arcade (A). With the guide catheter engaged in the aneurysm, a Renegade microcatheter and a PT2 .014-inch wire were used to gain access across the aneurysm and out to the distal vessel. A second PT2 and Renegade microcatheter were then used and, afterward, the wires were exchanged for stiffer Spartacore .014-inch wires (B). Using the two microcatheters with .014-inch Spartacore guidewires in addition to a third wire (PT2), the 8-F guide was advanced past the aneurysm and into the exiting artery. Once in place, the microcatheters were removed, leaving the three .014-inch wires, which were then used to coaxially deliver the Atrium-covered stent (C). A completion angiogram after postdilatation with a 6.5-mm percutaneous transluminal angioplasty balloon catheter shows the Atrium stent to have excluded the aneurysm with complete flow in the SMA and its branches. The stent in the celiac artery is visible cephalad to the SMA (D).

CONCLUSION

There have been several articles on the management of visceral arterial aneurysms and pseudoaneurysms.¹⁻⁸ There are two articles discussing the use of covered stents for the SMA.^{4,5} Ray et al⁴ recently reported the case of a 30-year-old woman with a posttraumatic pseudoaneurysm of the SMA and associated celiac axis occlusion. The patient was successfully treated with celiac artery recanalization and placement of a covered stent within the SMA.⁴ Gandini et al⁵ reported the use of a covered stent in a patient with gastrointestinal bleeding and in critical clinical condition from a giant SMA pseudoaneurysm who underwent emergency

endovascular treatment.

Fortunately, we could perform the treatment as an elective procedure, first recanalizing the celiac artery and later treating the pancreaticoduodenal artery aneurysm with a covered stent. In our case, we were able to take advantage of three .014-inch wires for support in coaxially advancing the sheath followed by the covered stent. Moreover, we were able to use the 64-slice CT to be able to diagnose the aneurysm and provide key anatomical features that enabled us to proceed with the intervention. It is too early to determine the patency of stent grafts in such vessels long term, but as previous articles have supported, endovascular therapy for visceral aneurysms should be the first line of therapy. ■

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