Endovascular exclusion of aberrant splenic artery aneurysm with covered stent

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ABSTRACT

The splenic artery arising from the superior mesenteric artery is an uncommon anatomical variant. This aberrant origin may rarely be associated with an aneurysm. Previous cases have been managed with surgery and combined surgical/endovascular or endovascular techniques, with the latter involving occlusion of the aneurysm with coils. We report a case of aberrant splenic artery aneurysm that was excluded with a balloon-mounted covered stent, and discuss the technical issues encountered in using this approach. A follow-up computed tomography performed six months after the covered stent placement showed persistent exclusion with marked shrinkage of the aneurysm sac.

Keywords: aberrant splenic artery aneurysm, balloon-mounted covered stent

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INTRODUCTION

An aberrant splenic artery arising from the superior mesenteric artery (SMA), also known as the splenomesenteric trunk, is a rare anatomical variant seen in less than 1% of the population.[1,2] Aneurysms in relation to this variant splenic artery are even rarer, with less than 20 cases described in the literature to date.[3,4] These reported cases have been treated with different techniques, including surgery,[5-7] combined surgery with endovascular methods and endovascular occlusion of the aneurysm with coils.[8] We report a case of this rare anomaly, which was treated with a balloon-mounted covered stent. Follow-up computed tomography (CT) at six months showed marked shrinkage of the aneurysm sac with early onset of dystrophic calcification. Although technical issues were encountered in this approach, it provided the most physiological outcome. More importantly, this method can be extrapolated to treat visceral aneurysms at other complex locations using the endovascular approach.

CASE REPORT

A 34-year-old Chinese man presented with nonspecific upper abdominal pain. Radiological workup, which included a duplex ultrasonography and CT followed by an angiogram, revealed a 2.4-cm saccular aneurysm arising from an aberrant splenic artery and originating from the SMA. The aneurysm was wide-necked and located proximally in the splenic artery, 9 mm from its SMA origin (Fig. 1). The patient had no history of pancreatitis or any other pertinent medical or surgical history. The overall impression after complete clinical work-up of the patient was that the lesion was a true aneurysm arising from an aberrant splenic artery. Treatment was offered to the patient according to the size of the aneurysm, and after considering various options, we decided to attempt to exclude the aneurysm with a balloon-mounted covered stent. This particular stent design was selected in order to enable accurate deployment and control during the procedure.

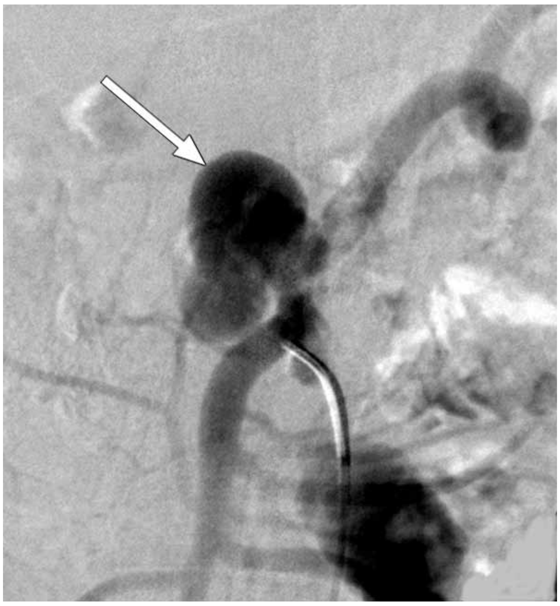

Fig. 1 Angiogram with catheter in the superior mesenteric artery shows the aneurysm (arrow) arising from the proximal aberrant splenic artery.

The procedure was performed in a hybrid CT-angiographic unit (Aquilion, Toshiba, Tokyo, Japan), with the patient under conscious sedation. Right common femoral artery access was obtained. Selective catheterisation of the SMA and splenic artery was performed with a 5F C2 catheter. After preliminary confirmatory angiogram, a 7F, 45-cm Destination guiding sheath (Terumo, Elkton, MD, USA) was placed into the

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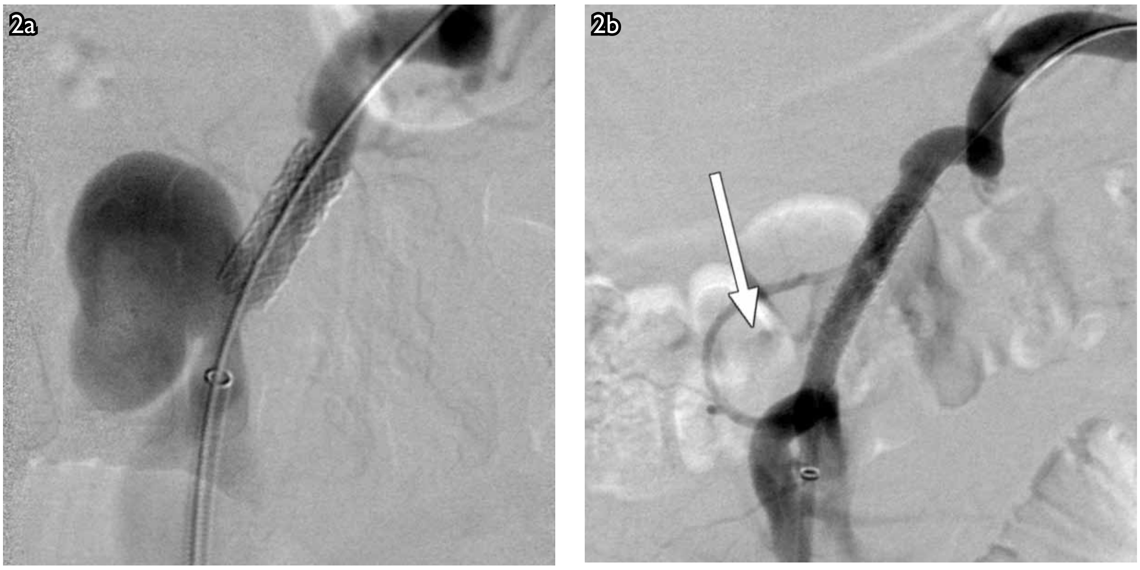

Fig. 2 (a) Magnified view of angiogram with the sheath in the superior mesenteric artery shows migration of the first stent beyond the neck of the aneurysm. (b) Completion angiogram through the sheath shows exclusion of the aneurysm (arrow points to the site of the aneurysm), with preserved supply to the splenic and superior mesenteric arteries.

SMA trunk over a 0.035-inch Rosen wire. Based on the angiographic diameter of the splenic artery (6 mm), a 7 mm × 22 mm Advanta V12 balloon-mounted covered stent was advanced overlying the neck of the aneurysm. The balloon was inflated to deploy the stent. However, the stent migrated distally while the balloon was being inflated, leaving the neck uncovered (Fig. 2a).

Subsequently, a 6 mm × 38 mm Advanta V12 stent was deployed in position across the neck of the aneurysm. There was a type 1A endoleak after the deployment of the second stent, which was treated with post-dilatation of the stent with a 7 mm × 40 mm Sterling balloon over a 0.018-inch V-18 control wire for the final part of the procedure. Final angiogram showed complete exclusion of the aneurysm, with no evidence of endoleak (Fig. 2b). CT angiogram performed the next day showed complete thrombosis of the aneurysm, with preserved blood flow to the spleen (Fig. 3). The patient was discharged from the hospital within two days of the procedure. Follow-up CT angiogram done six months later showed thrombosis, with shrinkage of the excluded aneurysm sac, preserved blood flow to the spleen through the covered stent and onset of early dystrophic calcification within the sac (Fig. 4).

DISCUSSION

Aneurysms arising from an aberrant splenic artery are seen in a proximal position close to its origin.[4] This contrasts with the usual described location of these aneurysms in the mid to distal splenic artery in patients with normal anatomical origin of the artery.[9,10] The proximal anatomical location makes the management of these aneuryms more challenging. The endovascular techniques considered in our case were coil embolisation of the parent artery, bare-stent-assisted coil embolisation of the sac, Amplatzer vascular plugs to trap the aneurysm or covered stent placement.

Our initial consideration was to perform a bare-stent-assisted coil embolisation of the aneurysmal sac. However, we decided against it due to some practical difficulties encountered in the follow-up of visceral aneurysms embolised with coils at other locations. The image quality can be hampered due to artefacts from coils on cross-sectional imaging, making interpretation difficult.[11] As ultrasonographic imaging for follow-up is operator-dependent, there might be difficulty in interrogation of the sac due to overlying bowel gas. Also, there is a risk of the sac increasing in size on follow-up, as the underlying flow dynamics are not changed after coil embolisation of the aneurysm. We eventually opted to use a balloon-mounted stent graft, bearing in mind its most physiological outcome, i.e. preserving native arterial supply to the spleen. We recognised that even if the graft occluded on follow-up, this would be akin to eventual parent artery occlusion.

The procedure was planned on the basis of the diagnostic angiogram. The parameters assessed included the size of the aneurysm and its neck, as well as the distance from the SMA origin. Our initial plan was to exclude the aneurysm with a single stent graft. However, as this could not be achieved, we eventually used two stent grafts instead. Retrospectively, it would have been better to start with either a longer stent graft of the same diameter as the native artery followed by post-dilatation

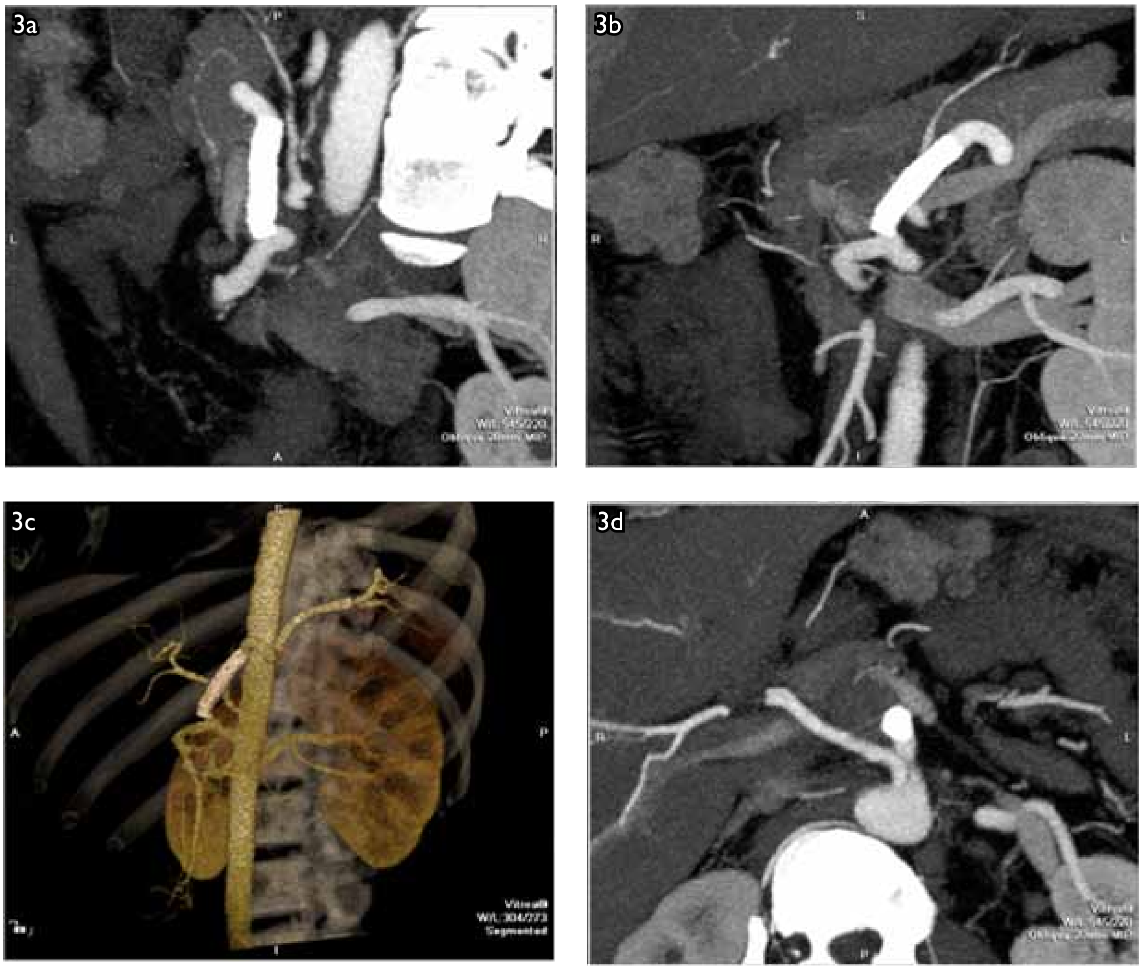

Fig. 3 (a) Sagittal and (b) coronal reconstructed CT angiograms show the covered stent graft in position in the proximal splenomesenteric trunk with blood flow preserved in the artery distally. (c) Reconstructed 3D CT angiogram shows an overview of the covered stent graft in the proximal splenomesenteric trunk. (d) Axial reconstructed CT angiogram shows the covered stent graft in position in the proximal splenomesenteric trunk.

with a larger balloon or to select a longer stent graft that is one size larger than the native artery. A longer stent graft would have provided more support with a lower chance of distal migration and endoleak. Given a similar scenario in future, the latter option will be used.

It is technically challenging to advance stent grafts across tortuous visceral arteries. This stent graft system is stiffer and does not take the curves as well as the bare-stent systems. In our case, we used a stiffer wire, such as 0.035-inch Rosen wire, and found it extremely useful for advancing the more rigid stent graft system past the visceral arteries. The whole procedure lasted 75 minutes, and the patient was fully ambulant within six hours. He was discharged from the hospital within 48 hours. There was a potential risk of inadvertent coverage of the SMA during the procedure. We recognised this as a major potential complication of the procedure. The operating room was kept on stand-by, and pertinent arrangements were made to deal with this possible complication on an emergency basis.

The patient was subsequently placed on an anti-platelet regime, in the form of low-dose aspirin and clopidogrel. However, he stopped the medication after the first month on his own accord. We did not pursue the matter, as even if the stent occluded over a period of time, it would be gradual, eventually enabling good collateral flow to the spleen. In addition, some of the other treatment options initially considered also involve occluding the artery itself. In our patient, the arterial supply to the spleen was preserved after six months, with no evidence of in-stent stenosis with expected sac shrinkage.

Balloon-mounted covered stents can be used for the management of visceral aneurysms at other locations. These stents allow more accurate deployment and control as well as better trackability compared to self-expanding stents. A durable result is achieved once the neck is adequately covered with a stent graft of the correct size. Although it can be challenging to use a stent graft for exclusion of complex visceral aneurysms, it is

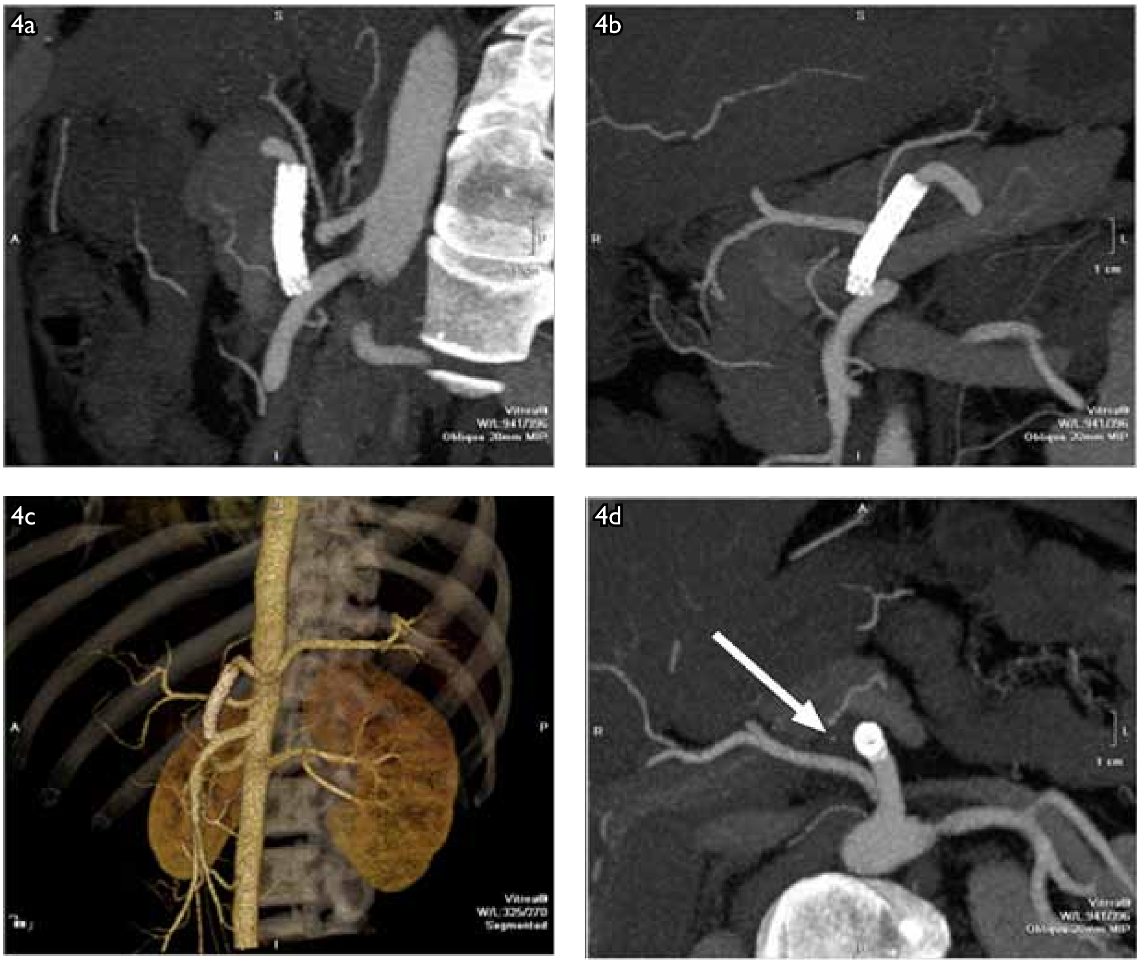

Fig. 4 Six months follow-up. (a) Sagittal and (b) coronal reconstructed CT angiograms show the covered stent graft in position in the proximal splenomesenteric trunk with blood flow preserved in the artery distally. (c) Reconstructed 3D CT image shows an overview of the stent graft in the proximal splenomesenteric trunk. (d) Axial reconstructed CT image shows the covered stent graft in position in the proximal splenomesenteric trunk. Note the early onset of dystrophic calcification within the shrunken, thrombosed sac (arrow).

technically possible to achieve this objective provided proper pre-procedure planning is done and optimal tools are selected.

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