Embolization of a Large Pulmonary Arteriovenous Malformation

BY SACHIN MODI, MD, AND ARUL GANESHAN, MD

Pulmonary arteriovenous malformations (PAVMs) are abnormal communications between pulmonary arteries and pulmonary veins, leading to the formation of an extracardiac right-to-left shunt. These rare lesions are most commonly congenital in nature, but the exact pathogenesis is uncertain. Although it is assumed that the vascular defects are present at birth, they seldom manifest clinically until adulthood, when the vessels have been subject to pressure over several decades. Complications of PAVMs include cyanosis, high-output congestive cardiac failure, hemorrhage, polycythemia, and cerebral embolism/abscess.

Hereditary hemorrhagic telangiectasia (HHT), or Osler-Weber-Rendu disease, is a rare genetic condition in which patients have abnormalities in blood vessel formation in the skin, mucous membranes, and organs such as the lungs. Approximately 50% of patients with the condition will have PAVMs. Current treatment of PAVMs includes endovascular embolization or surgical resection.

Figure 1. A CT scan of the thorax showing a large, right lower lobe PAVM with a large draining vein.

CASE PRESENTATION

A 50-year-old man with known HHT and multiple PAVMs was referred to our center from a regional hospital. Aside from regular minor nosebleeds, he was otherwise fit and well. He had presented to his local hospital with debilitating shortness of breath, which had developed over the last few months. He was unable to ascend stairs or walk for long periods without feeling short of breath. He underwent contrast-enhanced CT of the thorax, which revealed multiple bilateral PAVMs (four in the left lung and three in the right lung). One of the AVMs in the right lower lobe was extremely large, with the artery measuring 7 mm and the draining vein 10 mm (Figure 1).

The patient was seen in the interventional radiology clinic, and embolization of the AVMs was discussed in detail; the patient was subsequently scheduled for the procedure.

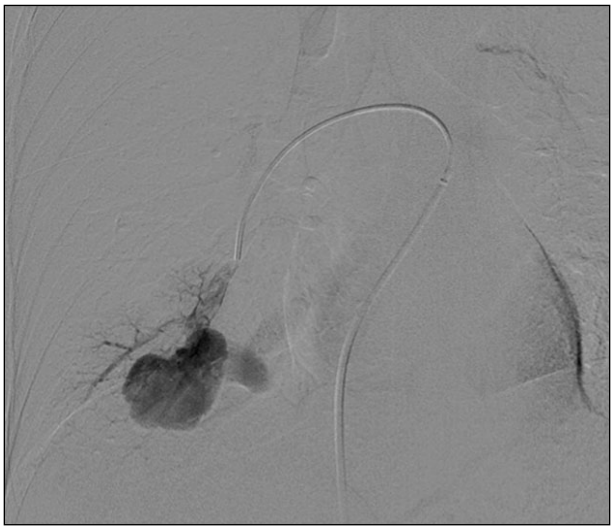

Figure 2. An angiogram of the right lower lobe pulmonary artery confirming the presence of the AVM with a large draining vein.

Results from case studies are not necessarily predictive of results in other cases. Results in other cases may vary.

Figure 3. After embolization with three Interlock™ Coils, there was complete occlusion of the draining vein.

PROCEDURE DESCRIPTION

Using ultrasound guidance, the right common femoral vein was accessed. A wire and catheter were negotiated into the right main pulmonary artery, and a diagnostic angiogram confirmed the presence of a large, right lower lobe PAVM with a large, rapidly draining vein (Figure 2).

A branch of the right lower lobe pulmonary artery was catheterized using an 0.021-inch inner diameter, two-RO marker, 130-cm length Direxion™ Microcatheter and an 0.016-inch Fathom® Steerable Guidewire, followed by selective catheterization of the PAVM distal arterial limb and venous nidus. Embolization was carried out using three 0.018-inch Interlock™ Detachable Coils (two 22-mm X 60-cm coils and one 20-mm X 60-cm coil). The AVM was successfully embolized with no flow seen in the draining vein (Figure 3). There were no procedural complications, and the patient was discharged to home the next day after an uneventful recovery. He is due to be recalled over the next few months for similar embolizations of the remaining PAVMs.

DISCUSSION

Large PAVMs such as in this case are challenging to treat, mainly due to the size of the artery and vein, as well as the high-flow shunt with a significant risk of coil migration through the vein into the heart. Traditionally, plugs have been used for embolizing large high-flow PAVMs; however, use of the Interlock™ Detachable Coils in PAVM embolization is becoming a popular choice due to the availability of large-diameter coils (up to 22 mm).

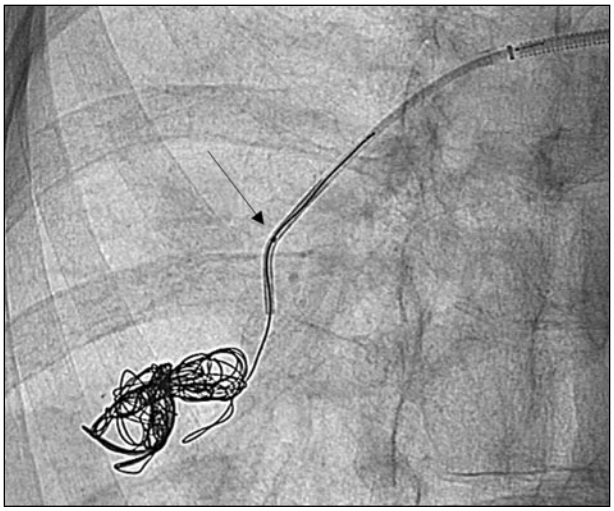

Figure 4. The Direxion™ Microcatheter with proximal marker (arrow) allowing accurate judgment of the microcatheter position.

The 0.018-inch Interlock™ Detachable Coils also enable a complex embolization procedure to be performed through a small catheter/sheath combination (4 F) with the option to retract the partially deployed coil should an unfavorable coil position be noted or evidence of peri-procedure coil migration be apparent. This combination of catheters provides the additional option of performing diagnostic angiography in order to appreciate the change the partially deployed coils make to the flow dynamic of the shunt before the coils' full deployment. Because these coils are available in up to 60-cm total length, their use can facilitate cost-effective completion of the procedure with reduced radiation exposure.

The Direxion™ Microcatheter was particularly useful in this case due to the two markers on the catheter. The proximal marker gave an accurate estimate of where the distal end of the catheter was placed before deploying the coils, as it is often difficult to see due to the already deployed coils (Figure 4).

Overall, in this case of a large PAVM, we found the Direxion™ Microcatheter and Interlock™ Coils very useful aids in performing this embolization in a safe, efficient, and controlled manner. ■

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