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Percutaneous retrieval of a migrated coil in the left atrium

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Foreign bodies in the left atrium are rare events with potential major complications. We describe the percutaneous retrieval of a coil from the left atrium that migrated there during an embolization procedure for a pulmonary arteriovenous malformation.

Introduction

Pulmonary arteriovenous malformations (PAVM) are abnormal communications between pulmonary artery branches and pulmonary veins, and are seen in 60% of cases with hereditary hemorrhagic telangiectasia (1, 2).

To prevent the complications of PAVM, transcatheter vaso-occlusion is widely accepted as the first-line treatment if the size of the afferent vessel is larger than 3 mm (3). Paradoxical embolization of occlusive material has been described in 2.5 % to 6.3 % of cases (3, 4). Migration of embolic material usually reaches the systemic circulation through the left heart (5). It is only on rare occasions that the occlusive material is trapped in the left cardiac chambers. We report a rare case of successful percutaneous retrieval of a coil that migrated into the left atrium during the embolization procedure of a PAVM.

Case report

A 34-year-old woman with hereditary telangiectasia underwent a helical CT scan to assess the presence of a PAVM that was first visualized on a standard chest X-ray. The malformation was located in the anterior basal segment of the right lower lobe. The aneurysmal sac was 30 x 25 mm. The feeding artery was unique and was 9 mm wide. The venous drainage consisted of one simple vein (Fig. 1). These findings correspond to a simple type PAVM (6), as opposed to a complex type with multiple feeding arteries and draining veins.

Figure 1. 34-year-old woman with a known arteriovenous pulmonary malformation (PAVM). Chest CT demonstrates the large aneurysmal sac of the PAVM in the right inferior lobe.

After obtaining informed consent, we performed an embolization procedure under local anesthesia via a right transfemoral venous approach. A 6-French pigtail catheter was inserted into the right pulmonary artery, and angiography was performed (Fig. 2a). In order to exclude the PAVM, a right coronary Judkins catheter (Cordis Corporation, Miami, FL, USA) was advanced to the distal part of the feeding vessel, and a short Tornado coil MWCE-35 5/10 mm (Cook Medical, Limerick, Ireland) was deployed with the small end first. Immediately after the insertion of

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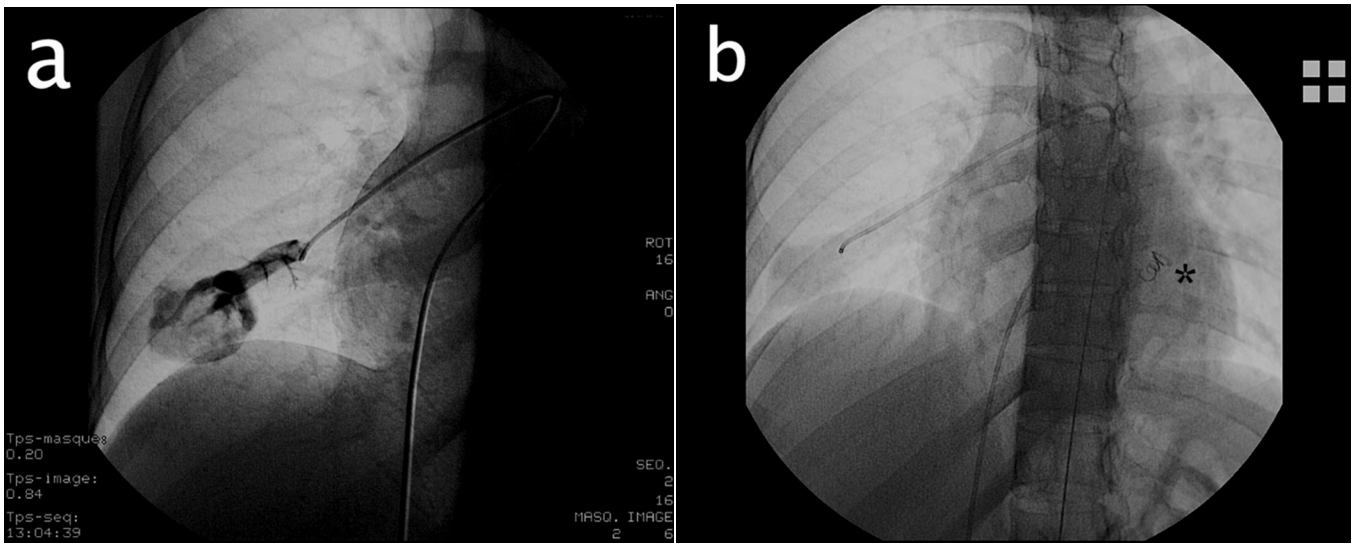

Figure 2. 34-year-old woman with a known arteriovenous pulmonary malformation (PAVM). A. Selective catheterization of the afferent artery in order to exclude the PAVM with coils. B. Distal migration of the coil into the left cardiac chambers (black asterisk).

the coil, it migrated into the aneurysmal sac. A rapid occlusion of the afferent artery was intended to reduce the inflow pressure. The coil, however, moved distally a few seconds later and ended up lodged in the left atrium. The patient remained asymptomatic, and no abnormalities were observed on the electrocardiogram (ECG). The coil seemed unstable on fluoroscopy, with a high mobility for several seconds, and then stabilized by adhering to the leaflets of the mitral valve (Fig. 2b).

After an intravenous injection of 5000 UI of heparin, the decision was taken to try a transvalvular approach through a right arterial femoral access. In order to preserve the mitral apparatus, it was decided not to use a snare directly. The left atrium was catheterized in a retrograde fashion through the aortic valve and then through the mitral valve. A 6F internal mammary guiding catheter (Cordis) was then used to dislodge the coil under fluoroscopic guidance and continuous ECG monitoring. With gentle taps on the proximal end of the coil, the distal end moved up to the aortic valve, where it was suitable for a safe removal with a 25-mm Amplatz Goose Neck snare (EV3, Plymouth, MN, USA), using the same guiding catheter (Fig. 3).

Because of the length of the intervention, it was decided to postpone the embolotherapy of the PAVM for another session. A cardiac MRI performed after the intracardiac procedure showed no lesions or dysfunction of the mitral apparatus. Two weeks later, the procedure was successfully achieved with the insertion of three coils of 0.018-inch MWCE Tornado 10/5 mm and three coils of 0.018-inch MWCE 8/5 mm (Cook Medical). One month after the embolotherapy, computed tomography confirmed occlusion of the PAVM.

Discussion

Until the late 1970s, the only treatment of PAVM was surgical resection (7, 8). Today, transcatheter embolization with microcoils is a standard choice for occlusion of PAVMs, which preserves lung tissue from destructive lobectomy or arterial ligations.

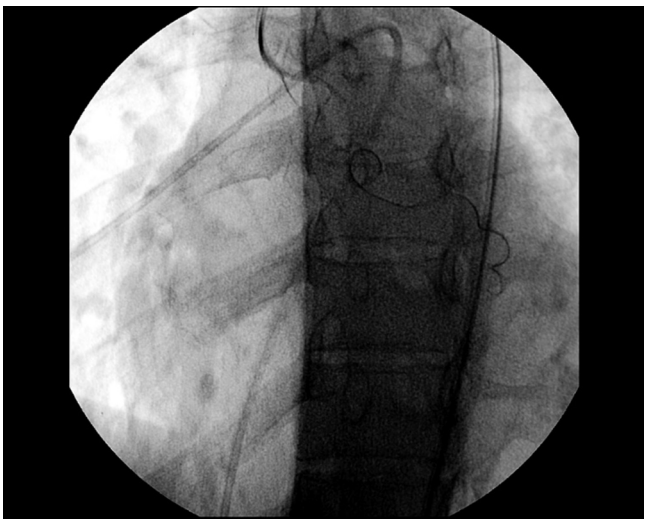

Figure 3. 34-year-old woman with a known arteriovenous pulmonary malformation (PAVM). Snare loop device placed at the level of the aortic valve via a femoral artery approach in order to remove the coil after dislodging it from the mitral apparatus.

Although embolotherapy is a safe procedure, there remains a small risk of coil migration. Several studies have followed migrated foreign bodies that were left in situ within the cardiovascular system (9, 10). Extrapolation from these studies suggests that these complications pose major risks to patients. Hence, every effort should be done to preclude coils from migration in the first place. Embolization must occlude the feeding artery as distally as possible, preserving the normal pulmonary vessels in order to avoid lung infarction. Care must also be taken to avoid underestimation of coil size and to use the large end first when applicable.

For example, in our patient, the choice of a 5/10-mm coil was appropriate. However, the small end of the coil (5mm) was undersized compared to the vessel. With the small end introduced first, there was no possibility to firmly anchor the coil, which was doomed to unwind and to migrate distally. In this case, the choice of a large-end-first (LEF) configuration would have been probably more suitable. With such a type of coil, care should be taken to have a large end sufficiently wide to secure the coil.

Recently, other techniques such as controlled released coils and vascular plugs have been introduced to improve the safety of embolization procedures (11, 12). At the time of our procedure, such devices were not available. Such a vascular plug might have been a more secure embolization agent.

Migration of embolic material in the context of PAVM treatment has been reported in other series (3, 4). Nevertheless, the migration and the entrapment of a coil into the mitral apparatus has never been described. Methods for retrieving a migrated coil from within the cardiac cavities after PAVM embolotherapy have only rarely been reported (13, 14). Both of these cases referred to migration into the ventricles (the left ventricle in the first case and the right ventricle in the second case). These migrated coils were easily snared from these locations without the need for additional maneuvers.

In our case, however, the migrated coil clung to the mitral valve. Attempts to snare it directly from the valve leaflet could not be done safely. Based on previous experience reported in the pediatric cardiology literature (15-17), we know that intracardiac foreign bodies can present serious complications during extraction. As an example, in the case of Haitjema et al. (13), the extraction was followed by a pericardial tamponade due to a ventricular wall perforation. Thus, particular attention should be given to preserving the delicate ventricular endocardium and the integrity of the valvular system. Other authors advocate the administration of heparin immediately after coil migration to prevent thrombus formation (18). Following this, attempts should be made to move the coil into a safer location where it can be more easily retrieved with a lower risk of iatrogenic injury.

It is important to be aware of this complication, which to our knowledge has not been previousl reported, and of the possibility of a two-step retrieval procedure in order to spare the patient from a thoracotomy.

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