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Bail-out coils embolization for aortic arch isolated lesions: technical insights

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Clinical Vignette

We report the case of a 75-year-old patient with hypertension, type 2 diabetes, chronic obstructive pulmonary disease (COPD) and severe vasculopathy with a history of two cardiac surgeries for aortic arch intramural hematoma (IMH). The patient developed a pseudoaneurysm at the site of the distal anastomosis, which was treated with a percutaneous approach with coil embolization. The aim of our work is to demonstrate the feasibility of a coil strategy even in the aortic arch, which is usually considered a dangerous zone, due to the risk of epi-aortic vessel embolization. In 2015 our patient was treated with total aortic arch replacement (TAR) with the frozen elephant trunk (FET) technique, using an E-vita prosthesis for a distal arch IMH. In 2022, a follow-up CT scan showed a leak from the distal anastomosis, so the patient underwent a second surgery, with repair of the distal anastomosis leak. Although the surgery seemed to have been effective, the radiologic results were not optimal: during follow-up the computed tomography (CT) scan showed a residual pseudoaneurysm of 31x14mm, growing in size on serial imaging. Due to the significant comorbidities and the high surgical risk associated with a third open procedure, the case was discussed in our multidisciplinary team of surgeons and interventional radiologists, and a percutaneous approach with coil embolization was proposed. Our first choice was coiling instead of thoracic endovascular aortic repair (TEVAR) because there was not an ideal proximal landing zone (short length and kinking) and the anatomy was favorable for coil embolization.

Surgical Techniques

The patient was taken into a hybrid operating room and positioned in the supine position. General anesthesia was administered. We inserted a 5 Fr sheath in both the common right femoral artery and the right brachial artery using a percutaneous approach. We inserted a pigtail catheter from the femoral artery for angiography; due to the previous surgery and the position of the reimplanted vessels it was crucial to perform a meticulous angiographic study with several angulations and projections. Before entering the pseudoaneurysm, it is important to take sufficient time to fully understand the anatomy of the defect in relation to the adjacent epiaortic vessels, integrating pre-operative CT scan and angiographic images. To avoid overlapping of the anatomical structures, we identified the entrance of the pseudoaneurysm in a RAO 55° and CRA 20° projection. Considering the anatomy in this patient, performing the procedure through the brachial artery was considered preferable in order to obtain more stability and control. Furthermore, the patient had undergone previous iliac endoprosthesis, making it more difficult to work from femoral access.

After the angiographic evaluation, we placed a 5 Fr Flexor sheath and selectively catheterized the pseudoaneurysm. We aimed to use a stable system for the delivery, with a Flexor sheath, a Simmons catheter and a

microcatheter inside the Simmons catheter. With these devices we obtained a triaxial system, which gives perfect stability to safely deliver the coils inside the defect. After the pseudoaneurysm was catheterized, we proceeded to deliver five standard Ruby coils, four soft Ruby coils and one packing Ruby coil. In these cases, we consider it mandatory to use the controlled-release coils, which allow repositioning in case of unsatisfactory positioning. This resulted in successful exclusion of the pseudoaneurysm from the circulation. Post-operative CT scan showed a good result, without residual defects. The patient had an uneventful post-operative course, with discharge five days after the procedure. A 1 year follow-up CT scan showed a good result with no residual flow in the pseudoaneurysm.

Comments

Aortic arch pseudoaneurysm is a rare and challenging complication to manage after aortic interventions. Besides traditional approaches with open surgery, a percutaneous approach with coil embolization is emerging as a valuable option, especially in high-risk patients. During the last five years, we have successfully treated nine patients with contraindications to open surgery and suitable anatomy using coil embolization. At a median follow-up of 16 months, all patients showed no growth of the pseudoaneurysm on follow-up CT scans, with complete thrombosis in 37% and partial thrombosis in 62%, without severe procedural complications (such as coil migration). Meticulous study of the imaging is crucial in order to achieve good results and avoid epi-aortic vessel embolization. With appropriate experience and a sufficient learning curve this technique can be highly effective and reproducible.

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