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Image of the issue

Transcatheter Closure of Left Ventricular Apical Pseudoaneurysm with an Amplatzer Vascular Plug

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ABSTRACT

We report the case of a 66-year-old man, with a history of previous chest radiation therapy admitted to ED for heart failure. The patient was diagnosed with severe aortic stenosis and multivessel coronary disease and underwent surgical aortic valve replacement and coronary artery by pass grafts.
Cardiac surgery was complicated by a left ventricular perforation by a venting catheter. The laceration was repaired with a Teflon patch apparently successful. Four months later, a CT scan performed for oncological follow-up demonstrated the complete detachment of the Teflon patch and the formation of a left ventricular pseudoaneurysm. The pseudoaneurysm was effectively treated percutaneously using an Amplatzer Vascular Plug 4.

1. Introduction

Cardiac surgery is the second most frequent aetiology of left ventricular pseudoaneurysm, after myocardial infarction [1].

Treatment of apical pseudoaneurysm has typically been surgically, however, in high surgical risk patients,

pseudoaneurysms have been closed percutanously as described in this case [2].

A variety of approaches have been used: antegrade transeptal approach seems to be the best approach to treat apical pseudoaneurysm after transapical transcatheter aortic valve replacement [3] and to treat the uncommon left ventricular outflow tract pseudoaneurysm [4].

We are going to describe a post-surgical pseudoaneurysm close with an Amplatzer Vascular Plug 4 device with a retrograde trans fermoral approach, as below.

2. Case report

A 66-year-old man, hypertensive, smoker with familiar history for ischemic heart disease went to Emergency Department (ED) for heart failure. The clinical history revealed previous thyroid carcinoma with mediastinal lymph node localizations at the age of 32 years. At the age of 62 he was operated for a left breast tumour. An ECG showed sinus rhythm with complete bundle branch block.

Transthoracic echocardiogram showed a severe aortic stenosis. Coronary angiography showed critical stenosis of the left main trunk, of the ramus intermedius and of the right coronary artery.

Heart Team discussion was in favour of Cardiac Surgery. The patient underwent aortic valve replacement with 25 mm Magna bioprosthesis and coronary artery bypass grafts (CABG), left internal mammary artery (LIMA) to the left anterior descending (LAD) and saphenous vein graft (SVG) to the right coronary artery and ramus intermedius. The surgical intervention was complicated by a thin laceration of the left ventricular apex due to the trauma -on a malacia tissue- by the tip of the left ventricular venting catheter.

The laceration was closed applying Teflon strips with sandwich technique and subsequently applying Teflon patches with bioglue.

The patient recovered well and was transferred on the fifth post-operative day to the cardiological rehabilitation center.

Four months after the discharge from hospital, a computed tomography (CT) scan, performed for oncological follow up, showed the presence of an apical pseudoaneurysm of the maximum diameter of 45 mm with a thin neck of 2 mm (Fig. 1 Panels A and B). The Teflon patch was completed detached (Fig. 1 Panel A), surrounding the pseudoaneurysm. The ECG was unchanged. The risk of rupture of the pseudoaneurysm was judged high and a definitive treatment was

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considered mandatory. Redo cardiac surgery seemed to be at very high risk, and percutaneous treatment was preferred. The CT scan was used to defined the size of the pseudoaneurysm neck. The percutaneous access was obtained from the right femoral artery by inserting a six French catheter, unfractioned heparin was administrated, with a target activated clotting time of 300 s.

Under fluoroscopy, a right oblique cranial view (30°/15°) was obtained. This projection resulted as the best view to visualize the neck and the pseudoaneurysm cavity (Fig. 1 Panel C). A six French pigtail catheter was introduced through the Magna 25 mm bioprosthetic aortic valve into the left ventricle (LV).

A left ventriculography was performed, allowing the angiographic visualization of the pseudoaneurysm cavity (Fig. 1 Panel C). The Pigtail catheter was exchanged with a multi-purpose six French coronary guiding catheter. A 0.014 in., balance middle weight (BMW) coronary guidewire was advanced inside the pseudoaneurysm cavity (Fig. 1 Panel D). Subsequently, a Sapphire II coronary dilatation balloon deflated (3.5 × 20 mm) was inserted over the wire into the pseudoaneurysm, in order to reduce the trauma of guiding catheter crossing the neck of the pseudoaneurysm (Fig. 1 Panel E). Supported by the BMW and Sapphire II balloon, the tip of the guiding multipurpose catheter was advanced inside the pseudoaneurysm cavity.

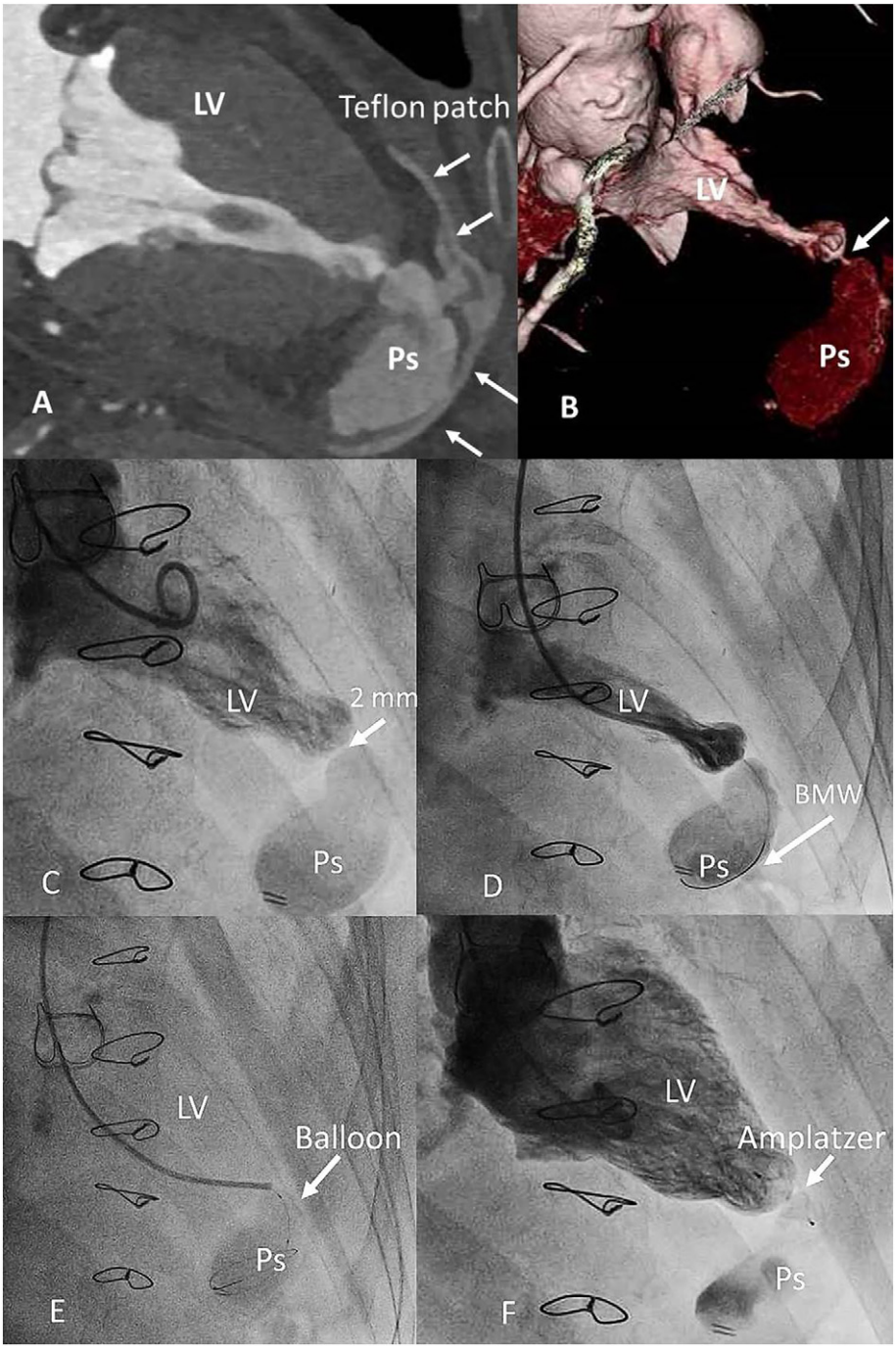

Fig. 1. Panels A and B. Computed tomography (CT) shows left ventricle (LV), the pseudoaneurysm (Ps) surrounded by the Teflon patch completely detached from the LV, (white arrows), the thin neck of the Ps in 3 dimensional volume rendering CT (white arrow). Panel C. Left ventriculogram right oblique cranial view (30°/15°) demonstrated the thin Ps neck (2 mm). Panel D. Introduction of the balance middle weight (BMW) guidewire, curled up, inside the Ps cavity. Panel E. Crossing the Ps neck with the Saffire II coronary dilatation ballon. Panel F. The final left ventriculogram showed the completely occlusion of the Ps sac with Amplatzer Vascular Plug 4 with a device diameter of 8 mm.

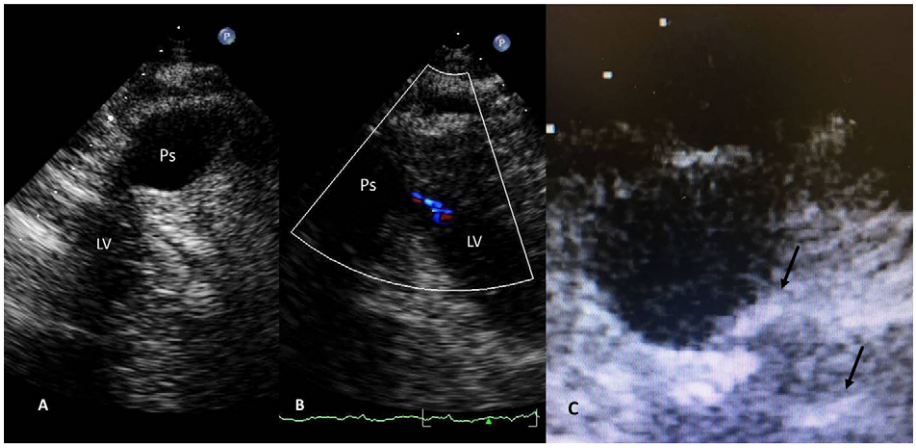

Fig. 2. Transthoracic echocardiography shows in Panels A and B the pseudoaneurysm (Ps) cavity with the forward and back flow at the Colour-Doppler. Panel C. Transthoracic echocardiography at one year follow up from the procedure. The pseudoaneurysm cavity is completely thrombosed. Black arrows shows the Amplatzer Vascular Plug 4 discs.

The guidewire and the Sapphire II ballon were removed and an Amplatzer Vascular Plug 4 was advanced through the guiding catheter and released into the pseudoaneurysm cavity (Fig. 1 Panel F).

Contrast injection demonstrate an immediate effective closure of the pseudoaneurysm (Fig. 1 Panel F).

The cumulative radiation dose was 15 mGy cm^2; the total amount of contrast was 80 ml; the overall duration of the fluoro time was 25 min. The haemostasis of the right femoral artery was obtained using an angioseal six French closure device.

3. Discussion

Chest radiotherapy could favour not only the onset of ischemic heart disease, and structural alterations to the valvular apparatus [5], but can even provoke an abnormal softening of the myocardial tissue.

In the case of the closure of the left ventricular pseudoaneurysm, the correct size of the neck should be evaluated with CT scan. In fact, ballon sizing in this context can have dramatic aftermath.

A coronary angioplasty balloon was utilized to support atraumatic positioning of the multipurpose catheter across the neck of the pseudoaneurysm.

The pseudoaneurysm neck was only 2 mm in diameter, however, we prudentially selected a Amplatzer Vascular Plug 4 (size 8 mm) in order to ensure adequate myocardial grasping between the opposing discs (Fig. 2 Panel C).

4. Conclusion

Previous chest radiation therapy is known to increase the risk [6] of subsequent cardiac surgery due to the formation of dense intra-thoracic adhesions. Awareness of this risk is important relative to the potential need for urgent entry into the chest cavity due to apical LV rupture.

The natural history of untreated ventricular pseudoaneurysms is characterized by possible rupture [7], expansion of the pseudoaneurismatic sac overtime [8], significant loss of anterograde stroke volume [9], and systemic cardioembolic events [7]. Percutaneous closure of left ventricular pseudoaneurysm is a safe and effective procedure in such a high surgical risk patients.

Since there is no device designed for this application, the choice of the device was the operator's preference.

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