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Case Report

Repair of a Giant Aortic Pseudo-aneurysm in a Patient with Previous Double Mechanical Valve Replacement and Aortic root Enlargement: a Case Report

Chirurgie d'un pseudo-anévrisme aortique géant chez une patiente avec antécédent de double remplacement valvulaire mécanique et élargissement de l'anneau aortique: à propos d'un cas

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ABSTRACT

Aortic pseudo-aneurysm (AP) is a rare complication that can occur after cardiac surgery. We report the case of a 37-year-old woman referred to our unit for a compressive discomfort in the retro-sternum nine month after a double mechanical valve replacement and root enlargement. A giant AP (116 × 55 mm) originating at the level of the proximal aorta was diagnosed and the patient underwent a successful surgical reintervention with patch reconstruction of the aortic root.

RÉSUMÉ

Le pseudo-anévrisme aortique (PA) est une complication rare après une chirurgie cardiaque. Nous rapportons le cas d'une femme âgée de 37 ans, adressée à notre service pour une gêne compressive retro-sternale neuf mois après un double remplacement valvulaire avec prothèses mécaniques et élargissement de l'anneau aortique. Un énorme pseudo-anévrisme aortique de 116 × 55 mm prenant naissance au niveau de l'aorte proximale a été diagnostiqué et la patiente prise en charge avec succès par reconstruction avec patch en péricarde de la racine aortique.

INTRODUCTION

Aortic pseudo-aneurysm (AP) is a rare complication that can occur following heart surgery, with rates ranging between 0.5% and 8.5% in several series [1, 2]. It can occur over a variable period of time, from a few days to several years after surgery [3–5]. AP has been associated with graft and surgical site infections, trauma, degenerative disease, and surgical site leaks [6–8]. Although surgical therapy is associated with high mortality rates ranging between 6.7% and 46% in several studies [6, 9–11], it remains the mainstay of AP therapy. While the percutaneous approach has gained attention in recent years as an alternative to conventional surgery, it is not always technically feasible or available, particularly in developing countries that lack endovascular expertise.
We report the case of a 37-year-old sub-Saharan African female who underwent surgical repair of a giant retro-sternal AP of the ascending aorta nine months after a double mechanical replacement and aortic root enlargement procedure.

CASE PRESENTATION

A 37-year-old female who had undergone a double mechanical replacement and aortic root enlargement nine months earlier was referred to our unit for progressive, pulsatile, and compressive discomfort in the back sternum during the previous two weeks. She also complained of mild fatigue and sporadic episodes of chest pain in the left hemi-thorax with no dyspnea or palpitations.
The postoperative course was characterized by mild fever and superficial sternal wound dehiscence, which were successfully treated with oral antibiotics and wound medication for two weeks. Transthoracic echocardiography at admission showed good function of the previously implanted prosthetic valves with a mild reduction of left ventricular contractility (45%). A huge peri-aortic cavity communicating with the aortic root was found in the antero-right lateral segment of the ascending

aorta (Figure 1). A subsequent computed tomography angiography revealed a giant aortic pseudoaneurysm (11.6 × 55 mm) originating at the level of the aortic root (Figure 2). Considering the potential life-threatening evolution of the lesion, a consensual decision was made with the patient for a surgical repair.

Cardiopulmonary bypass (CPB) was established by direct cannulation of the right axillary artery and the right femoral vein, and the patient was progressively cooled to 22°C (Figure 3a). Two external paddles were placed on the patient's chest to facilitate electrical defibrillation in case of ventricular arrhythmia occurring during the cooling process. After exposure of the sternal bone, the patient was positioned in a deep Trendelenburg position, and CPB was interrupted and sternal re-entry was performed under a short period of deep hypothermic circulatory arrest at 22°C. Fast exposure of the distal ascending aorta was then performed, and cross clamping was applied to permit the restart of CPB and systemic rewarming through the right axillary artery. After removal of the diffused peri-aortic thrombus, an aortic tear was found on the previous suture line for patch enlargement. An aortotomy was done, and cardioplegia was delivered selectively in the coronary ostia. The aortic root and ascending aorta were meticulously inspected to rule out other lesions, and the aortotomy was closed with a new heterologous pericardial patch with continuous sutures that were reinforced with multiple interrupted pledgeted single sutures (Figure 3b).

The patient was transferred to the intensive care unit and weaned from mechanical ventilation five hours after surgery. Postoperative echocardiograms showed no residual AP lesions in the aortic root and good function of both mechanical valves. The global postoperative course was uneventful, and the patient was discharged on postoperative day 7. A control computed tomography angiography performed one month after discharge showed good surgical results with complete restoration of the aortic lumen (Figure 4).

DISCUSSION

AP or false aneurysms have been described in patients with previous heart surgery, especially after aortic procedures [1, 2, 6]. Aortic wall disease, suboptimal anastomotic suture line, and infectious processes ave been identified as factors associated with the onset of AP. When left untreated, AP is associated with a high risk of life-threatening events, including rupture, tamponade, and death [4, 9–11]. Surgical repair remains challenging and requires cautious cardiopulmonary strategies, as chest re-entry carries a high risk of dramatic hemorrhage and mortality [12, 13]. Patients with AP usually also present with comorbidities and complex clinical features, such as residual aortic dissection, poor ventricular function, or underlying infection that could further complicate conventional repair. Thus, less invasive approaches using endovascular techniques (e.g., coil embolization, septal occluders, or endovascular stents) have been described as an alternative to surgery, with satisfactory results reported in several series with high-risk patients [14–17]. The implementation of endovascular repair of AP requires specific expertise, as factors such as the AP neck diameter, the presence of adequate landing zones, and the location of adjacent structures (e.g., the supra-aortic vessels and coronaries arteries) could condition the procedural outcomes.

Patients with AP often present with heterogeneous features with variability in etiologies (e.g., infectious, degenerative, and iatrogenic), clinical presentation, and related comorbidities. A case-by-case approach that considers a patient's characteristics and team expertise are advisable for administering the appropriate therapeutic strategy (e.g., surgical, endovascular, or conservative). In our case, there was no option for percutaneous closure due to the absence of local endovascular expertise and the limited availability of occluding devices. Our decision for conventional repair was motivated by the accumulated aortic surgery experience of the local team [18] and the absence of major morbidities in our patient.

The main challenge associated with the current case was the risk of fatal hemorrhage during chest re-entry, as the anterior thrombosed wall of AP was close to the posterior sternal face. Considering the lower location of the AP's neck, with sufficient distal aortic length (Figure 3a), the clamping of the distal ascending aorta was feasible during a short period of deep hypothermic circulatory arrest (DHCA). Cerebral protection was then achieved with DHCA at 22°C (8 min). A peripheral cannulation through the right axillary artery could have provided an additional option for cerebral perfusion in case of prolonged DHCA. Others have reported similar experiences with DHCA alone as a cerebral protection technique in false aneurysm repair [19]. Dumont et al. performed DHCA at 20°C without antegrade or retrograde cerebral perfusion in 11 patients undergoing AP surgery and reported no neurological injury in the perioperative and follow-up periods [20]. Similar approaches were described by Katsumata et al. and Atik et al. in their cohorts of 11 and 60 patients, respectively, who had DHCA during aortic pseudoaneurysm repair [6, 21]. However, DHCA requires long CPB duration, with the potential for ventricular fibrillation and distension during cooling, especially in the presence of aortic regurgitation. DHCA may also be limited in cases of unexpected extensive repair. To avoid the limitations associated with DHCA, other techniques have been proposed, including a combination of moderate hypothermia and selective cerebral perfusion [12, 22] and the use of an endoclamp with cardioplegia delivery before chest re-entry [23].

In summary, APs are rare but life-threatening lesions that should be suspected in patients presenting with thoracic discomfort after aortic procedures. Careful surgical planning that takes into account a patient's characteristics and the AP anatomy are crucial for a successful reintervention.

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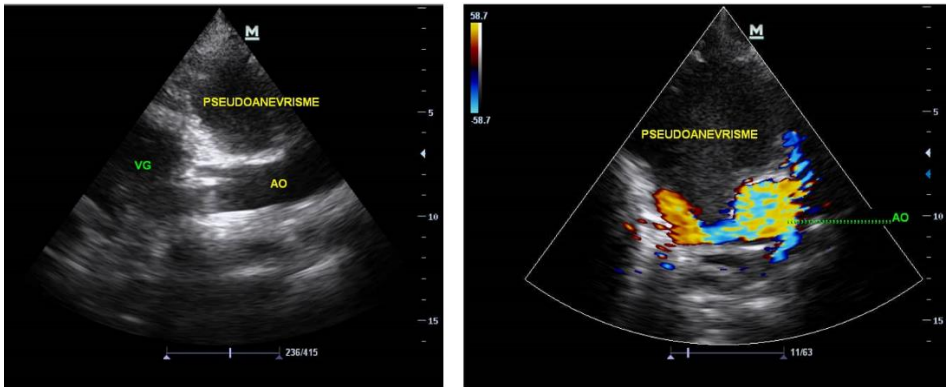

Figure 1. Preoperative transthoracic echocardiogram (left parasternal and short axis views) showing a communication between the aortic root and a huge AP.

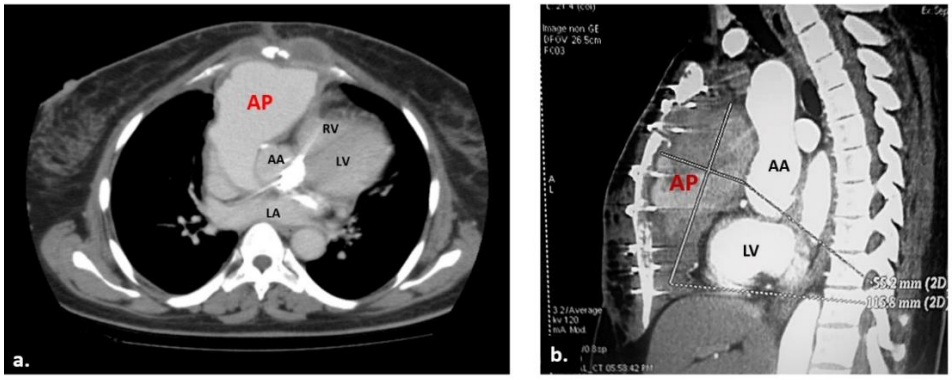

Figure 2. Preoperative Computed Tomography Angiography Scans in axial (a) and sagittal (b) views showing a huge AP extended from the periaortic area to the retro-sternum

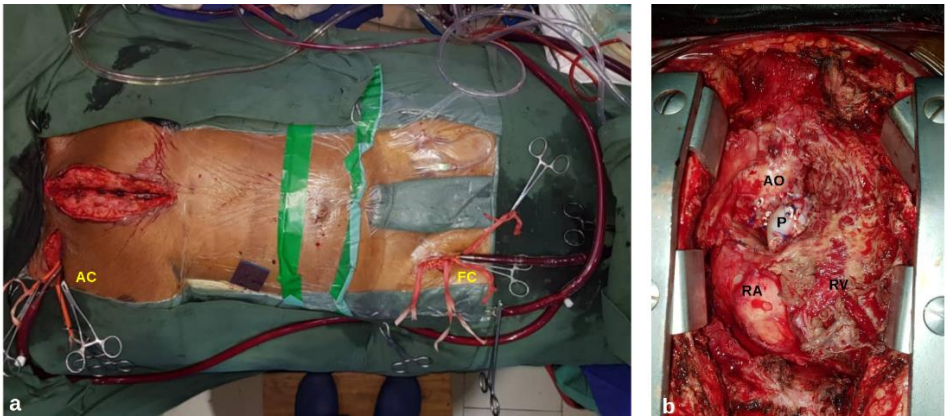

Figure 3. Setting up of cardiopulmonary bypass with peripheral cannulation through the right axillary artery and femoral vein (a); postoperative view with ascending aorta pericardial patch repair (b). [AC=axillary cannulation; FC=femoral cannulation; AO=aorta; RA=right atrium; RV=right ventricle; P=patch).]

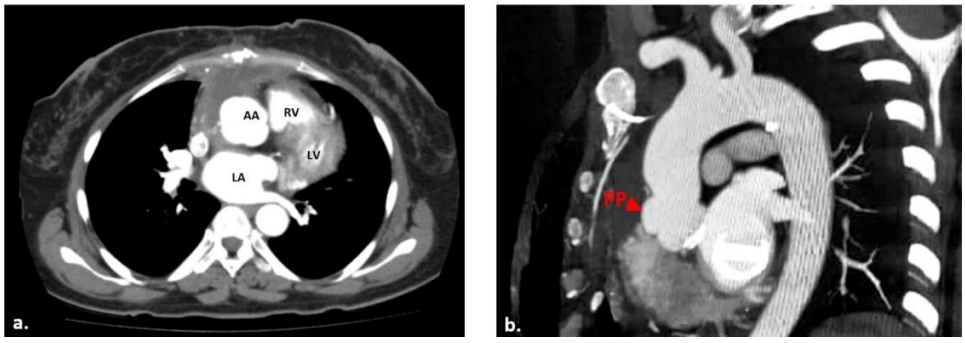

Figure 4. Postoperative Computed Tomography Angiography Scans one month after discharge showing a complete repair of the AP; the red arrow shows the bulging of the pericardial patch used to reconstruct the ascending aorta. (AA=ascending aorta; LA=left atrium; RV=right ventricle; LV=ventricle; PP=pericardial patch)