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Surgical Therapy of Pulmonary Artery Aneurysms: A Report of 2 Cases

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ABSTRACT

Pulmonary artery aneurysm is a rare condition that may be acquired rather than congenital. The natural history of pulmonary artery aneurysms is not defined yet, and management is still controversial. We present 2 cases of adult patients with pulmonary artery aneurysms who were treated surgically. We suggest replacement as the surgical strategy.

INTRODUCTION

Pulmonary artery aneurysm (PAA) is a rare condition that may be congenital or acquired [Tsui 2001]. In contrast to aneurysms in the vessels of systemic circulation, true PAA are rare [Caralps 1978]. These aneurysms can grow to immense sizes prior to diagnosis. PAA, which are associated with congenital lesions, are often treated concomitantly with the underlying anomaly. The management of idiopathic PAA is still controversial. It can be assumed that the same hemodynamic force that creates aortic aneurysms, which is based on Laplace's law, promotes growth of the PAA. Even though a PAA is under lower pulmonary circuit pressure [Veldtman 2003], the risk of rupture or dissection increases due to weak elastic layers in media of the arterial wall. We review our cases of idiopathic PAA and present our experience with this uncommon entity.

CASE REPORTS

The first patient was a 55-year-old man who was admitted to the hospital with chest pain and shortness of breath. On chest x-ray, a pulmonary shadow was prominent. Thorax magnetic resonance imaging (MRI), which had already been taken in a peripheral hospital, demonstrated a dilated main pulmonary artery that was measured 7 × 5 cm in diameter (Figure 1). Coronary angiography revealed significant stenoses in the left anterior descending and right coronary arteries.

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The second patient was a 70-year-old man. In clinical examination for chronic cough, a prominent expansion in the pulmonary artery shadow was detected in chest radiography. Thorax MRI documented a main PAA 5.5 × 3 cm in diameter. Pulmonic valves were normal in echocardiography, and estimated pulmonary artery pressure was in normal range. Primary valvular inflammation, infectious reasons, and traumatic causes were ruled out.

In both cases surgery was performed through a median sternotomy using 28°C systemic hypothermia, cardiopulmonary bypass, and cardioplegic arrest. The aneurysm of the main pulmonary artery (Figure 2) and dilated bifurcation of the pulmonary artery were removed and reconstructed by using a 26-mm Dacron graft. Concomitant coronary bypass surgery was performed in the first patient (Figure 3). In the second case, reduction arterioplasty was added to the protocol to trim the expanded right pulmonary artery.

The patients' postoperative courses were uneventful. The first and second patient were discharged from hospital on the sixth and the fifth postoperative days, respectively. The patients were followed-up by echocardiography and computed tomography (CT). In the sixth month, echocardiography revealed that the pulmonary valves were competent and there was no pulmonary hypertension. At the end of the first year, we performed a CT scan to detect reconstructed segments of the pulmonary arteries. Scan photographs were completely normal. Patients are still under yearly follow-up with transthoracic echocardiography.

DISCUSSION

Idiopathic pulmonary aneurysm is a rare clinical entity. Only 8 cases were detected in a series of more than 100,000 necropsies reported in 1947 [Deterling 1947]. The majority were noted in the main pulmonary artery. The causal and associated factors of PAA have been previously reported [Arom 1998]. In the pre-antibiotic era, the majority of cases were caused by tuberculosis or syphilis. PAA are frequently associated with congenital cardiac defects, which occur in 47% of cases, with a patent ductus arteriosus being the most common defect. Atherosclerotic, degenerative, and traumatic factors complete the list. Consequently, authors have reported degenerative changes of the arterial media, specifically fragmentation of the elastic media in 3% of their cases [Arom 1998].

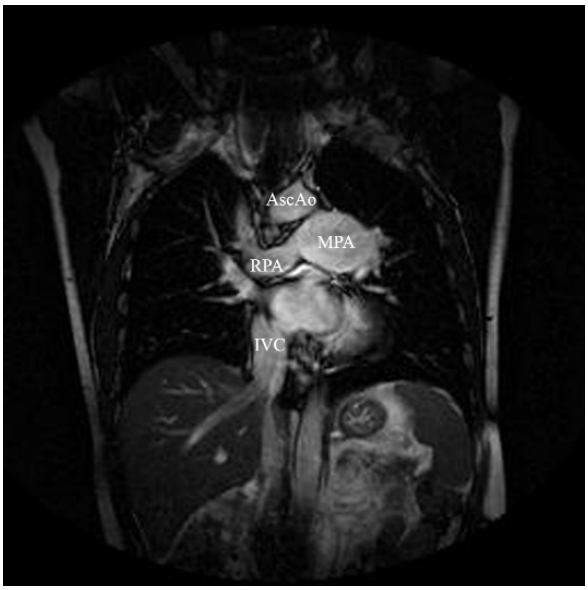

Figure 1. Preoperative thorax magnetic resonance imaging showing the pulmonary artery aneurysm in the first patient. AscAo indicates ascending aorta; MPA, main pulmonary artery; RPA, right pulmonary artery; IVC, inferior vena cava.

In diagnosis of pulmonary aneurysms, a CT scan is very useful. However, our first patient had been admitted to the hospital already with a prediagnosis of pulmonary aneurysm detected by MRI, and MRI was preferred for our second patient because of his acute renal insufficiency (blood creatinine level, 2.3 mg/dL).

Echocardiography may be useful for the validation of pulmonary valves and estimated pulmonary pressure. An echocardiogram is important for ruling out pulmonary hypertension, as it indicates the risk of rupture or dissection. Testing pulmonary valve insufficiency is important for determining progressive right ventricle dysfunction and estimating what surgical strategy has been used before.

The management of PAA has largely been surgical, but the unanswered questions are when and how surgery is best performed. Aggressive surgical approaches have been based on the risk of dissection or rupture. Evidence of progression to arterial wall dissection or rupture have been documented in patients with connective tissue disorders [Senbaklavaci 2001]. PAA, even those large in size and under low pulmonary pressures, may not pose a risk in contrast to those with pulmonary hypertension or Eisenmenger syndrome [Daliento 1998].

Progression to dissection or rupture has been documented in the setting of severe pulmonary arterial hypertension, and patients often had associated congenital left to right shunts, such as patent ductus arteriosus [Deterling 1947; Senbaklavaci 2001]. If surgery is necessary, the main recommendation would be correction of the primary anomaly accompanying aneurysm repair.

Our indication for the first case was the symptomatic state accompanying coronary artery disease, and we performed coronary artery bypasses concomitant to the PAA removal and graft implanting. The second case was also symptomatic due to aneurysmal compression.

Reported surgical procedures have included Dacron graft placement and autologous pericardial replacement of the main pulmonary artery and proximal branches [Casselman 1995; Kuwaki 2000]. In both cases we used Dacron graft interposition. We believe that single aneurysmorrhaphy without graft enforcement may cause late ruptures or aneurysm formation since the arterial wall is mostly affected with cystic medial degeneration. Veldtman mentioned correcting the pulmonary valve insufficiency by pulmonary valve replacement, thereby relieving not only right ventricular volume overload but also the associated hemodynamic burden on the vessel wall [Veldtman 2003]. We believe that pulmonary insufficiency can be well tolerated in patients without severe right ventricular dysfunction due to annular dilatation. Replacement of the valve is a secondary burden, and repair may be considered.

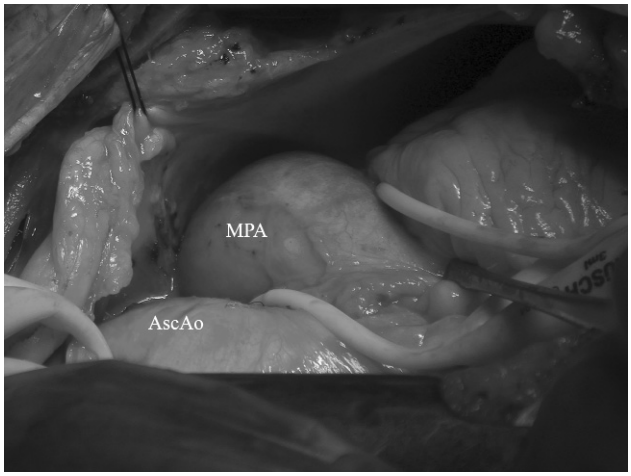

Figure 2. Operative photograph showing the dilated main pulmonary artery in the second patient. AscAo indicates ascending aorta; MPA, main pulmonary artery.

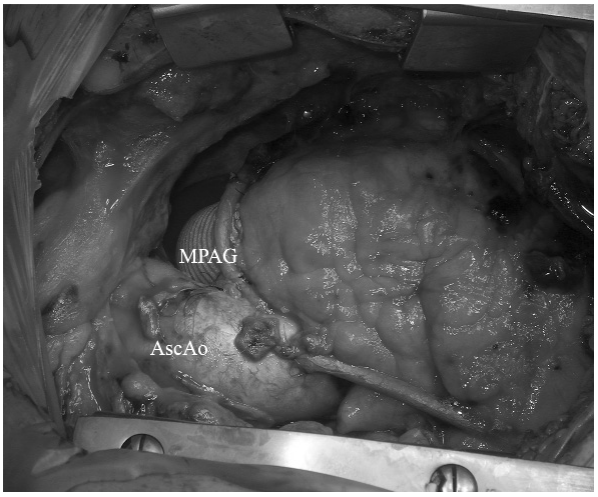

Figure 3. Operative photograph showing the reconstructed pulmonary artery and saphenous vein bypass grafts. AscAo indicates ascending aorta; MPAG, main pulmonary artery graft.

We recommend surgery for repair of PAA in cases with high risk for rupture and dissection and for patients in a symptomatic state, our patients, who had compression symptoms. We believe graft replacement is the best procedural choice for PAA. In long-term follow-up, transthoracic echocardiography and CT scanning or thorax MRI are useful for determining the risk of recurrence.

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