



# Surgical Repair of a Pseudoaneurysm of the Ascending Aorta to Pulmonary Artery Fistula after Replacement of the Ascendan Aorta and Aortic Valve

Ilhan Golbasi\*, Cemal Kemalglu, Ozan Erbasan and Ömer Bayezid

Department of Cardiac and Vascular Surgery, Akdeniz University, Turkey

## Abstract

We report the case of a patient with a pseudoaneurysm of the ascending aorta with right pulmonary artery fistula diagnosed after aortic valve and supra-coronary ascending aorta replacement for aortic dissection 4 years previously. He was referred to our hospital because of dyspnea and chest pain. A preoperative diagnostic evaluation revealed a pseudoaneurysm of the ascending aorta (10 cm × 9 cm × 7 cm) close to the proximal anastomotic site of the graft. During surgery, it was determined that the pseudoaneurysm originated from an intimal defect in the aortic wall on the right side of the left coronary artery at the proximal suture line. Pseudoaneurysm of the ascending aorta with pulmonary artery fistula was closed by a 2.5 cm × 4 cm PTFE patch, and aortic defect was repaired with a 1, 5 cm × 2 cm PTFE patch using a femorofemoral bypass. The patient was discharged 9 days later and remained well at a follow-up 6 months thereafter.

Pseudoaneurysm after aortic valve and ascending aorta replacement develops usually due to aortic graft anastomotic dehiscence, infectious, periannular abscess, and perigraft hematoma. Erosion into the pulmonary artery with resultant fistula formation may develop probably due to continuous pulsatile friction between the pseudo-aneurysmatic wall and pulmonary artery. Pseudoaneurysm with aorta-pulmonary fistula is an extremely rare and significant complication following aortic surgery. We report the case of a patient with pseudoaneurysm of the ascending aorta with right pulmonary artery fistula that was successfully repaired surgically.

**Keywords:** Aortic pseudoaneurysm; Aortic root replacement; Ascending aorta aneurysm; Aorta to pulmonary artery fistula

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### \*Correspondence:

Ilhan Golbasi, Department of Cardiac and Vascular Surgery, Akdeniz University, 07070, Turkey,  
E-mail: golbasi@akdeniz.edu.tr

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## Case Presentation

A 62-year-old male was admitted due to progressive exertional dyspnea and peripheral edema, cough, and chest pain for 4 month. Medical history included surgical replacement of the aorta and mechanical aortic valve due to aortic dissection 4 years ago. Physical examination was remarkable for elevated jugular venous pressure and a prominent systolo-diastolic murmur heard in the right second and third intercostal spaces. Chest radiography showed cardiomegaly, enhancement of the right pulmonary vasculature and pulmonary congestion. Computed tomography (CT) also showed the aortic pseudoaneurysm (10 cm × 9 cm × 7 cm) and the communication between the pseudoaneurysm and the right pulmonary artery. The neck of the pseudoaneurysm was small (7 mm), located 3 cm above the level of the prosthetic valve (Figure 1).

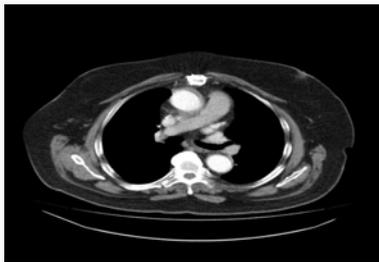
Echocardiography showed an aortic prosthesis functioning normally and a huge mass in the anterior portion of the ascending aorta measuring 9 cm × 11.5 cm in its larger axis and sign of aortopulmonary shunt. Catheterization of the right heart catheter revealed a central venous pressure of 14 mmHg and a pulmonary pressure of 53/22 mmHg. The patient was taking metoprolol and warfarin (Coumadine).

After initial preparation, the common femoral artery and vein were cannulated, with the use of femoro-femoral bypass, extracorporeal circulation was installed and the patient was cooled to 22°C before sternotomy. Later, the venting catheter was inserted directly into the left atrium through the superior right pulmonary vein. The ascenden aorta was cross clamped and retrograde blood cardioplegia was delivered after sternotomy. The retrograde cardioplegia was repeated every 20 min.

Resternotomy was performed and the ascending aorta pseudoaneurysm was directly approached



**Figure 1:** Axial plane of helical tomography depicting a pseudoaneurysm (P) of the aorta (A), the communication between the pseudoaneurysm and the right pulmonary artery.



**Figure 2:** Postoperative one year later, control thoracic tomography showing no problem.

with cardiopulmonary bypass. The pseudoaneurysm originated from an intimal defect in the aortic wall in the proximal aorto-dacron suture line. The pseudoaneurysm appeared to be chronic. It was resected from the surrounding outflow tract and aspirated. Fistula between the pseudoaneurysm and pulmonary artery was closed by a 2.5 cm × 4 cm PTFE patch after right pulmonary artery was clamped from proximal and distally of the defect. Aortic defect was repaired with a 1.5 cm × 2 cm PTFE patch. Mattress stitches of 4/0 polypropylene reinforced with Teflon pledgets are used to approximate the patch.

Rewarming and weaning of bypass followed. The total cardiopulmonary bypass time was 180 min and cross clamp time was 66 min. The postoperative period was uneventful, and the patient was discharged 9 days later and remained well at a follow-up 12 month thereafter. The radiologic assessment by torax CT was normal 12month after the surgery (Figure 2).

## Discussion

Pseudoaneurysm is a pulsating hematoma that develops secondary to anastomotic dehiscence. The differential diagnosis of a perigraft cavity or collection observed after aortic root replacement surgery includes pseudoaneurysm from an aortic graft or coronary artery anastomotic dehiscence, infectious pseudoaneurysm, periannular abscess, and perigraft hematoma. The presence of friable periannular tissue in these patients contributes to anastomotic failure. Surgical management for pseudoaneurysm is always mandatory, because of potentially lethal complications [1-4].

Ascending aortic pseudoaneurysms are usually asymptomatic, unless they compress the adjacent structures. Large pseudoaneurysms may compress an adjacent native vascular structure, cardiac chamber, or aortic graft and may obstruct blood flow. Especially, the superior vena cava is compressed. Thromboembolism or ruptures are other potential complications [5]. Erosion into the pulmonary artery and fistula formation is probably caused by continuous pulsatile friction between pseudo aneurysmatic wall and the right pulmonary artery

[6]. Although symptoms are usually dominated by rather atypical findings of heart failure, the auscultatory presence of a continuous systolo-diastolic murmur should raise suspicion for fistulization. Fistulizing pseudoaneurysm should be differentiated from ruptured sinus of Valsalva aneurysm. Echocardiography, computed tomography, aortography, right heart catheterization and magnetic resonance angiography can differentiate and confirm the diagnosis of pseudoaneurysm with aortopulmonary fistula. During pulmonary artery catheter placement, high oxygen saturation in the pulmonary artery and step-up between the right atrium and the pulmonary artery are useful clues for the diagnosis of aortopulmonary fistulization.

The risk of the rupture of a pseudoaneurysm should be taken into consideration as an indication for emergency surgery, especially in the case of large masses. Pseudoaneurysm formation can generate in a variable period of time, ranging from the early postoperative period to the late postoperative period [6-8].

Rupture during the redo sternotomy or mediastinal dissection due to the reduction in pressure around the formation when opening and sliding the sternum can cause surgical catastrophes so the treatment of ascending aorta pseudoaneurysms remains a challenge. As the pseudoaneurysm is adherent to sternum, sternotomy cannot be performed until profound hypothermia is established using femoral or axillary-femoral bypass [7,9].

In summary, postoperatively pseudoaneurysm should be considered in patients with extensive atherosclerotic disease or dissection in the ascending aorta. Pseudoaneurysm must be investigated in patients with mediastinal enlargement on chest X-ray or systolo-diastolic murmur.

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