Case Report

A Rare Case of Right-Sided Heart Failure after Bentall Procedure

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Received 24 April 2013; Accepted 17 June 2013

Abstract

Pseudoaneurysms of the ascending aorta, which are rare and life-threatening complications in cardiovascular surgeries, can be caused by the Bentall procedure. We describe a 44-year-old woman, who had a medical history of acute aortic dissection (Type A) and the Bentall procedure and was admitted because of exertional dyspnea, edema of the lower extremities, ascites, and holosystolic murmur in the left lower sternal border. Preoperative echocardiography revealed a pseudoaneurysm of the ascending aorta and fistulization of the pseudoaneurysm to the right atrium. Multi-slice computed tomographic scan also showed a large pseudoaneurysm of the ascending aorta around the tube graft. The patient underwent surgery, during which the pseudoaneurysm was resected, the ostium of the right coronary artery was reimplanted, and the orifice of the right atrial fistula was sutured. Intraoperative transesophageal echocardiography revealed the perfect result of the surgery. The patient was discharged uneventfully.

J Teh Univ Heart Ctr 2014;9(4):183-185

This paper should be cited as: Alizadeh Ghavidel A, Shojaeifard M, Mirmesadagh Y. A Rare Case of Right-Sided Heart Failure after Bentall Procedure. J Teh Univ Heart Ctr 2014;9(4):183-185.

Keywords: *Aneurysm, false • Heart failure • Cardiac surgical procedures*

Introduction

Pseudoaneurysms of the thoracic aorta are caused by the transmural disruption of the thoracic wall and the leak contained by the surrounding mediastinal structures.[1] Previous surgical operations still account for the majority of such pseudoaneurysms.[2] One of these surgeries that can lead to the ascending aorta false aneurysms is the Bentall procedure. The pseudoaneurysm of the ascending aorta is an unusual complication in cardiac surgery, with high incidence rates of morbidity and mortality. Other risk factors responsible for the formation of pseudoaneurysms are trauma and infection.[3, 4]

We herein underline the possibility of the formation of the ascending aorta pseudoaneurysm and right atrial (RA) fistula, leading to right-sided heart failure following a previous Bentall procedure.

Case Report

A 44-year-old woman presented with exertional dyspnea, which had increased in the preceding two months, and edema of the lower extremities. She had a medical history of acute aortic dissection (Type A) and the Bentall procedure and aortic arch revision two years before. After the Bentall procedure, she had no early postoperative complications. However, on the 8th postoperative day, she

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developed fever (oral temperature = 39 ˚C). Transesophageal echocardiography (TEE) and chest computed tomographic (CT) scan were performed for the second time in order to work up mediastinitis and endocarditis, both of which were ruled out. There was a wound infection at the site of the axillary cannulation; and due to positive blood culture with pseudomonas and leukocytosis with left shift, antibiotics such as Tazocin, Vancomycin, and Amikacin were started. Nearly after 10 days, she was discharged with no fever or any other complications. During her follow-up, she had no complaints or complications.

During her second admission, the patient's vital signs were stable. Physical examination revealed 4^{+} edema of the lower extremities, ascites, and holosystolic murmur in the left lower sternal border. Chest X-ray demonstrated cardiomegaly, hyperemia in the lungs, right-sided pleural effusion, and enlarged shadow of the ascending aorta. The routine laboratory tests were normal. Preoperative echocardiography revealed a large pulsatile echo-free space (7 cm), surrounding the tube graft of the ascending aorta, and a small connection between this echo-free space and the tube graft just at the site of the right coronary artery implantation with a small orifice (2.5 mm), mostly suggestive of a pseudoaneurysm. Furthermore, there was a continuous flow between this echo-free space and the RA with a small connection (3 mm), indicative of the fistulization of the pseudoaneurysm to the RA (Figures 1 and 2). Contrast study with the injection of agitated saline showed the rapid filling of the RA, followed by the large pseudoaneurysm. The RV was severely enlarged. Other echocardiographic studies illustrated a normal left ventricular size with mild systolic dysfunction (left ventricular ejection fraction = 45%). The RA was moderately enlarged with a moderately reduced systolic function. There was severe pulmonary arterial hypertension (pulmonary artery pressure = 60 mmHg).

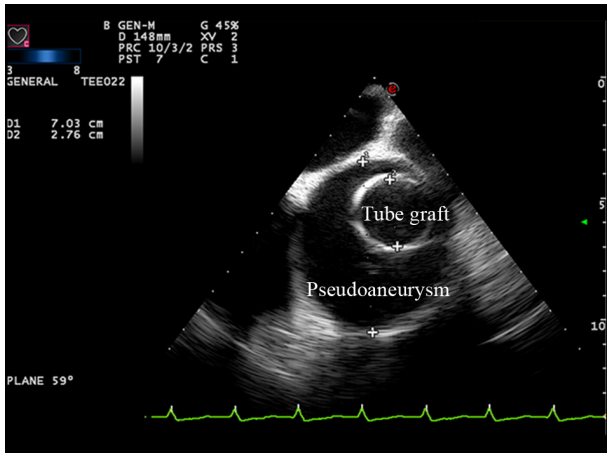

Figure 1. Intraoperative echocardiography before surgical repair: the short-axis view of the aortic tube graft in the ascending aorta with a large pseudoaneurysm surrounding the tube graft. The estimated diameter of the pseudoaneurysm is about 7 cm, compared with the 2.75 cm diameter of the tube graft

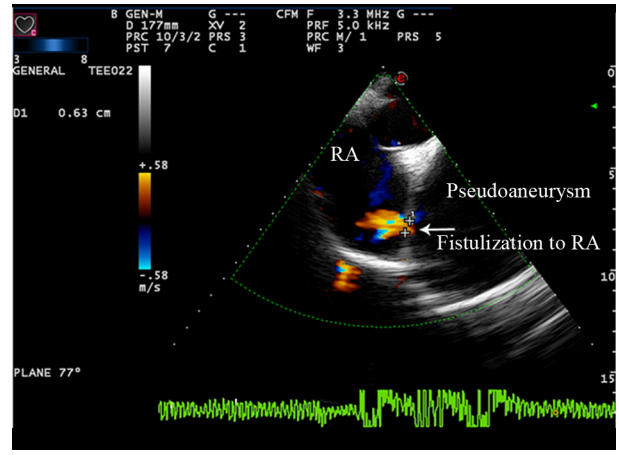

Figure 2. Intraoperative echocardiography before surgical repair: the off-axis view of transesophageal echocardiography demonstrates the color flow of the pseudoaneurysm fistulizing to the right atrium with a continuous flow via a small orifice, estimated to about 6mm in size (arrow)
RA, Right atrium

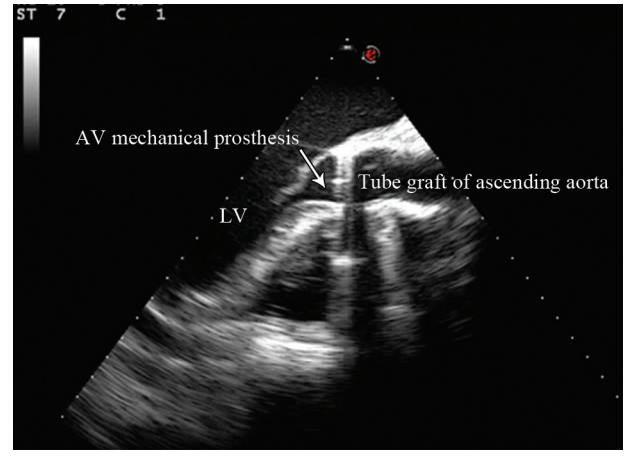

Figure 3. Intraoperative echocardiography after surgical repair: the long-axis view of the aorta (tube graft with a bileaflet mechanical aortic prosthesis) with normal functioning and no evidence of residual pseudoaneurysm or leakage from the tube graft
AV, Aortic valve LV, Left ventricle

Multi-slice CT scan was also conducted, and the results showed a large pseudoaneurysm of the ascending aorta around the tube graft, 105 × 78 mm in diameter, with a compression effect on the superior vena cava (SVC). The most probable origin of the pseudoaneurysm was the right lateral side of the prosthetic valve. An intimal flap from old dissections in the aortic arch extended to the proximal part of the left common carotid artery. The descending aorta was 27mm with no flap. The other branches of the aortic arch were normal. There was moderate abdominal ascites and right pleural effusion (700cc).

Under general anesthesia and after Heparinization (3mg/kg), peripheral cannulation, encompassing the right axillary artery and the femoral vein, was performed and the patient

underwent cardiopulmonary bypass (CPB) with moderate hypothermia. After median sternotomy and decortication, the SVC was cannulated and the ascending aorta, which was surrounded by the large pseudoaneurysm, was relieved. The size of the pseudoaneurysm rendered the clamping of the aorta impossible. Also, there was no access to conduct endoaortic clamping. Therefore, the patient was cooled down to 28 ˚C and the flow of the pump was decreased. The wall of the pseudoaneurysm was opened longitudinally, and the defects related to the right coronary artery anastomosis to the composite of the graft were controlled by the surgeon's finger. The ascending aorta was clamped, and cardiac arrest was performed with the use of a cardioplegic solution via the anterograde and retrograde methods. The pseudoaneurysm was examined more precisely. There was no sign of clot. The wall of the pseudoaneurysm was resected and unroofed completely. A small part of the anastomosis was opened from the peripheral part of the right coronary ostium, and the blood was directed into the pseudoaneurysm through the said defect. The pseudoaneurysm space beside the RA appendage was directed into the RA with a diameter of 5 mm at the orifice and, as a result, one indirect aorta-RA fistula was formed, which resulted in a left-to-right shunt. The ostium of the right coronary artery was reimplanted. The orifice of the RA fistula was sutured with Prolene 4.0 from both sides. The patient was weaned off from CPB easily, and intraoperative TEE revealed the perfect result of the surgery (Figure 3). Postoperative echocardiographic study showed the disappearance of the large echo-free space, normal function of the tube graft of the ascending aorta, no leakage from the proximal or the distal part of the tube graft, and no abnormal space around it. The mechanical aortic prosthesis had a normal function. The patient was discharged uneventfully.

Discussion

The aortic pseudoaneurysm is a rare pathologic condition. Most patients tend to develop pseudoaneurysms in the ascending aorta after previous cardiac and aortic operations. The potential sites for the pseudoaneurysm formation are aortic and coronary ostial suture lines, aortotomy site, aortic cannulation site, proximal or distal aortic suture lines, aortic vent site, and cardioplegic needle puncture site.[2, 5] Suture line tension and persistent bleeding into the space between the graft and the wrapped aortic wall seem to be the most important mechanisms of the pseudoaneurysm formation.[6] In order to assess the complexity of an aortic aneurysm, CT scan and two-dimensional echocardiography are complementary techniques.[7] In our patient, the aortic pseudoaneurysm was formed due to a previous Bentall procedure; and given the location of the pseudoaneurysm, suture line tension was the likely culprit. Our CT scan and echocardiographic studies revealed an aorta-RA fistula. The aneurysm-atrium fistula had led to right-sided heart failure, which is very rare and unusual.

Pseudoaneurysms can be life-threatening, and their concurrence with RA fistulization, although rare, constitutes a very serious complication. Accordingly, we would recommend that pseudoaneurysms and fistulizations be taken into account in patients with right-sided heart failure and a history of the Bentall procedure.

Conclusion

Pseudoaneurysms can be life-threatening, and their combination with right atrial fistulization, albeit rare, constitutes a very serious complication. It is, therefore advisable that pseudoaneurysms and fistulizations be taken into consideration in patients with right-sided heart failure and a history of the Bentall procedure.

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