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Management of an Intra-Operative Rupture of a Huge Aortic Root and Ascending Aortic Aneurysm: A Case Report

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Abstract | **Case Report**

Introduction: Intraoperative rupture of an aortic root and ascending aortic aneurysm is rare. However rupture of the aneurysm in this group of patients is challenging and associated with fatal outcomes. ***Case Report*:** we report the case of a 31-year-old Marfan syndrome patient with a huge aortic root and ascending aortic aneurysm. Median sternotomy and vertical opening of the pericardium were performed. Aneurysm rupture occurred before cannulation on its anterior surface. Intra-operative and postoperative management were successful. There were no neurological, hemodynamic or hemorrhagic complications. ***Conclusion*:** Intra-operative aneurysm rupture is rare and challenging. However, fast bleeding control and cannulation is compulsory in the management in this situation.

Keywords: Intraoperative rupture, Aneurysm, Marfan Syndrome, ascending aorta, aortic root.

INTRODUCTION

Aortic root and ascending aortic aneurysm and ectopia lentis are considered as the cardinal features of Marfan syndrome [1, 2]. Indeed, the progressive dilation of the aorta leading to aortic rupture or dissection affects the patient's prognosis [2]. Meanwhile, aortic root dilation causes aortic insufficiency resulting in left ventricular volume overload and left ventricular dilation and cardiac function impairment [3]. In order to reduce the risk of aortic dissection, rupture or secondary cardiac dysfunction, replacement of the dilated aortic root with a valved conduit has remained as a reference treatment strategy, although it may be accompanied by complications, mostly related to anticoagulation. Intra-operative rupture of thoracic aortic aneurysm in open heart surgery is a severe complication which may have an adverse effect on the outcome of the surgical procedure.

We report a case of an intra-operative rupture of the aortic root and ascending aortic aneurysm before cannulation during an open-heart surgery.

CASE REPORT

A 31-year-old male presented to our cardiovascular department with progressive chest pain worsen on exertion and bending forward with occasional throbbing for over one year. This patient was followed for ectopic lens. Physical examinations revealed a heart rate of 78 beats/minute with a sinus rhythm, a blood pressure of 126/46 mmHg and the respiration rate was 20 breaths/mn. He had a normal peripheral artery pulses, a diastolic murmur at the aortic valve area and a carotid hyperpulsatility. Chest X-ray had showed a mediastinal widening (Figure1). Trans-thoracic echocardiography (TTE) demonstrated: a huge ascending aortic aneurysm extending to the aortic annulus without intimal flap image, an aortic annulus dilation at 36 mm, a global hypokinesia with severe aortic regurgitation, and a moderate dysfunction of left ventricle with ejection fraction at 45%. There was no mitral or tricuspid regurgitation. Thoracic CT scan confirmed the dilated ascending aortic aneurysm extending to aortic annulus (100 mm*78mm) without any sign of dissection (Figure 2). The biologic report was as follow: leukocyte count: 7830/L; red blood cell count: 5,35 × 10^6/L; hemoglobin: 15.9 g/dL; platelets: 180 × 103/l; C-reactive protein: 0.3 mg/dL; prothrombin: 83.1%.

We have decided to perform an emergency Bentall procedure as an appropriate treatment option, due to the high risk of rupture and the severity of the aortic regurgitation. After informing the patient about the surgery and obtaining the informed surgical consent, he was transferred to the operative room.

Surgical Approach

Median sternotomy and vertical pericardium opening were performed resulting in aneurysm rupture on its anterior surface. A gentle compression on the aneurysmal rupture area was performed (Figure 3), which allowed for rapid cannulation of both vena cava and femoral artery. Cardiopulmonary bypass with normothermia was started, and then aortic clamp was performed just before the brachiocepalic arterial trunk. A cardiac protection with cold blood cardioplegia was achieved via the coronary ostias. Under cardiac arrest, valved tube was implanted to replace both the aortic valve and the ascending aorta at the same time. Prosthesis fenestration was performed and followed by coronary arteries implantation and then distal anastomosis was done in a healthy area of the aorta (Figure 4). The heart activity resumed sinus rhythm after internal cardioversion. CPB time was 136 mn; aortic cross-clamp time was 90 min and heart assistance time was 17 min. Despite the intra-operative aneurysmal rupture, we were able to manage the bleeding.

Post-Operative Care

The patient remained hemodynamically stable under low dose of norepinephrine and dobutamine, which were weaned off at day 1 postoperative. During his stay in the ICU, the patient was hemodynamically stable with no neurological abnormalities. He received six units of fresh frozen plasma and one unit of packed red blood cells. Anticoagulation and antiplaquelet treatment were introduced. Post-operative TTE revealed a good functioning aortic prosthesis, without paraprosthetic leak (Aortic area=1.6 cm2, mean gradient at 10 mm Hg), a global hypokinesia with left ventricular ejection fraction at 31%. After 3 days stay in the ICU, patient was transferred to the cardiac surgery hospitalization unit and the hospital discharge was on day 8 postoperatively.

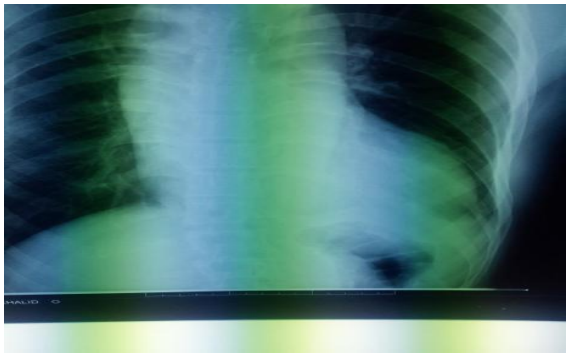

Figure 1: Mediastinal widening and cardiomegaly in the chest radiography

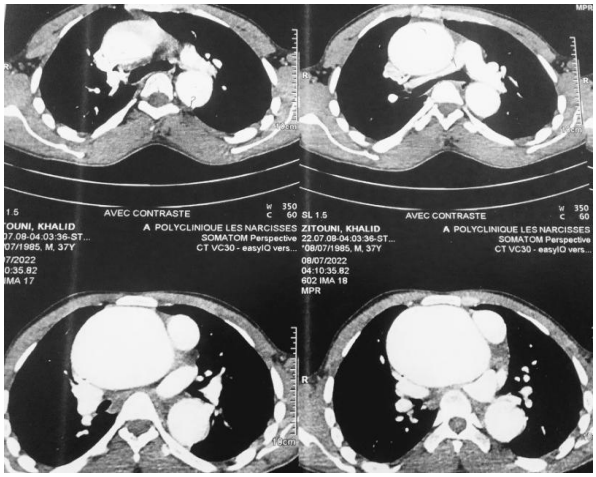

Figure 2: CT scan showing the huge aortic aneurysm

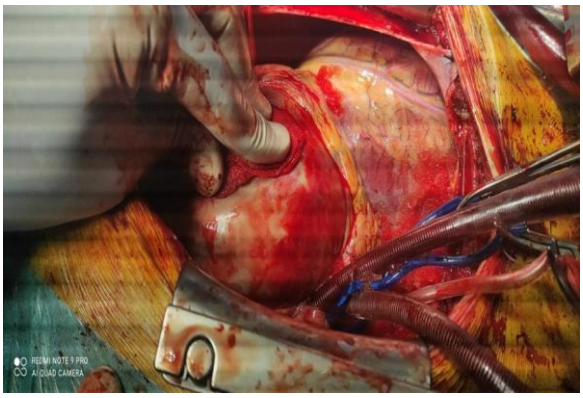

Figure 3: Soft compression on the aneurysmal rupture area

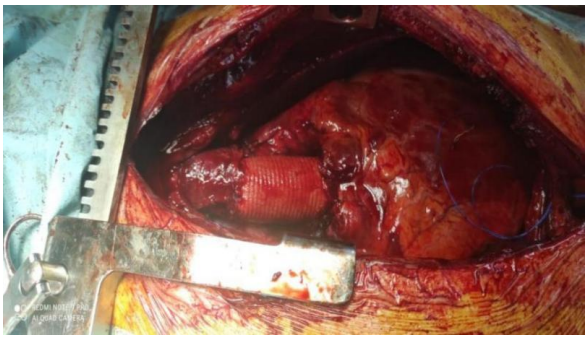

Figure 4: After Bentall procedure

DISCUSSION

Sixty percent (60%) of thoracic aortic aneurysms involve the ascending aorta, aortic arch or aortic root [4]. In younger patients, Marfan syndrome or bicuspid aortic valve is the main etiology. The majority of patients with ascending aortic aneurysm are asymptomatic [5]. However, larger aneurysms can present with symptoms resulting from compression of surrounding structures. They can result in hoarseness from recurrent laryngeal nerve paralysis and chest pain or back pain as it was present in our patient. Superior vena cava syndrome following compression by thoracic aneurysm has also been mentioned [6]. Contrast enhanced CT scan, MR angiogram and echocardiography are the imaging modalities to help in

the diagnosis and management of thoracic aneurysm. Contrast enhanced CT scan and echocardiography were the imaging techniques used in our case. Surgical treatment should be considered in MFS for patients who have aortic root dilatation with a maximal diameter ≥ 50 mm. In case of additional risk factors such as family history of aortic dissection, severe aortic regurgitation, desire for pregnancy, systemic hypertension and/or aortic size increase > 3 mm/year, surgical intervention is indicated when maximal aortic diameter ≥ 45 mm [7]. Our case was urgent because the measures recommended for surgery were doubled (100 mm) and in addition, the patient was symptomatic with a severe aortic regurgitation and moderate left ventricle dysfunction. The survival rates of Bentall procedure in 5- and 10-years are 84% and 75% respectively [8]. Tyron David's procedure shows also excellent outcomes [9]. The aortic annulus dilatation in our patient caused structural damage to the aortic cusps. Moreover, moderate cardiac dysfunction which could worsen postoperatively did not motivate an aortic valve sparing procedure. Then, we ultimately decided to perform a Bentall procedure with a 28 mm conduit composite and a 27 mm mechanical aortic valve. Intra-operative aneurysm rupture is rare and successful result of the surgery requires appropriate intra-operative and post-operative management [10]. Surgeons have to act fast to control blood loss and haemostasis. Rupture of a large aortic root and ascending aortic aneurysm surgical management is a challenge because many complications could occur such as bleeding, stroke and organ ischemia [4]. These complications are more severe when aneurysm rupture occurs before cannulation. We think it could be safer to perform femoral cannulation in patients with very large ascending aorta and/or aortic root aneurysm before sternotomy.

CONCLUSION

Intra-operative ascending aortic aneurysm rupture is rare but associated with major complications. Fast bleeding control and cannulation is compulsory in the management of this situation. We believe that in patient with fragile aorta (eg. Marfan) and a very large aneurysm, femoral cannulation before sternotomy is a better and safer strategy.

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