Surgical treatment of large aortic pseudoaneurysm in a 17-year-old patient: a case report

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SÚHRN

Pseudoaneuryzmy (nepravé aneuryzmy) aorty predstavujú zriedkavé, avšak život ohrozujúce stavy, ktoré sa vyskytujú najčastejšie po predchádzajúcich kardiochirurgických výkonoch. Príčiny ich vzniku sú multifaktoriálneho charakteru, ako je trauma hrudníka alebo infekcia. Klinický obraz môže byť variabilný. Manifestácia ochorenia môže byť asymptomatická, alebo na druhej strane až s katastrofickým priebehom. V našej kazuistike prezentujeme úspešnú chirurgickú liečbu veľkej pseudoaneuryzmy vzostupnej aorty u asymptomatického 17-ročného pacienta, ktorý pred 10 mesiacmi podstúpil náhradu aortálnej chlopne.

ABSTRACT

Aortic pseudoaneurysms are rare, but life threatening conditions, that occur most commonly after previous cardiac surgery. The causes could be multifactorial such as chest trauma or infection. Clinical presentation can vary from asymptomatic to catastrophic outcomes. We report the successful surgical repair of a large ascending aortic pseudoaneurysm in an asymptomatic 17-year-old patient who had undergone aortic valve replacement 10 months ago.

Introduction

Ascending aortic pseudoaneurysms are rare, but life threatening conditions, that occur most commonly after previous cardiac surgery with a reported incidence of less than 0.5%.[1] Also pseudoaneurysms of ascending aorta could be secondary to blunt thoracic trauma, aortic infection or iatrogenic aetiologies: catheter-based interventions.[2] Ascending aortic pseudoaneurysms are typically asymptomatic and found incidentally. The gold standard for treatment remains surgical, but novel treatments have been proposed including Amplatzer plugs.[3] Without intervention, they progressively expand, rupture, compress, and erode surrounding structures or become a nidus for infection and systemic embolism.[4]

We report the successful surgical repair of a large ascending aortic pseudoaneurysm in an asymptomatic patient who had undergone aortic valve replacement 10 months ago. Informed consent was obtained from the patient's legal guardian for using the patient's clinical information for submission and publication.

Case report

Our patient is a 17-year-old boy, weighing 52 kg, who was born with double outlet right ventricle (DORV), subaortic ventricular septal defect (VSD), bicuspid aortic valve (BAV) and subaortic membrane. He underwent a complete repair: intraventricular tunnel, VSD closure, with excision of the subaortic membrane at 2 months of life. After that, he was on regular follow-up at our centre and because of severe aortic stenosis at age of 16 years, he underwent Nicks procedure using Matrix patch™ (Auto Tissue GmbH Berlin, Berlin, Germany), and aortic valve replacement with a 19mm St. Jude bileaflet mechanical valve.

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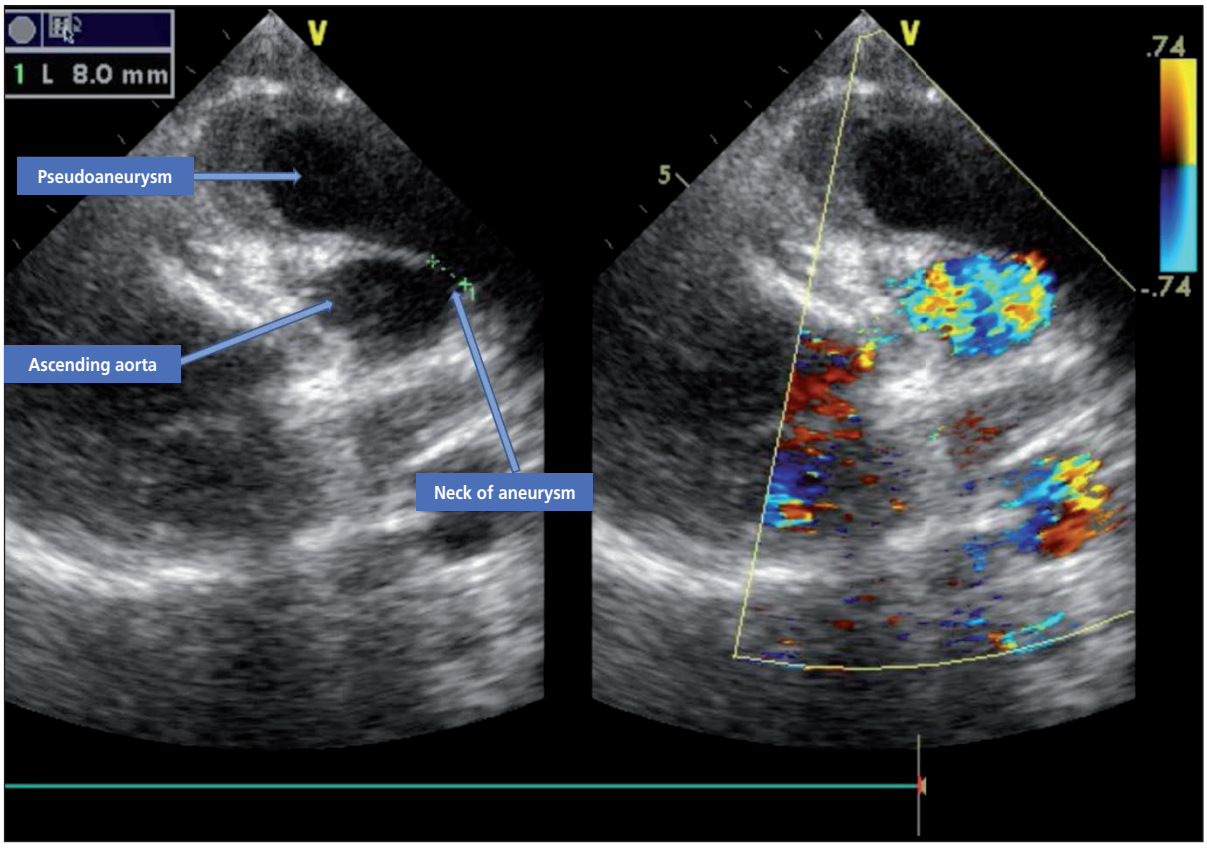
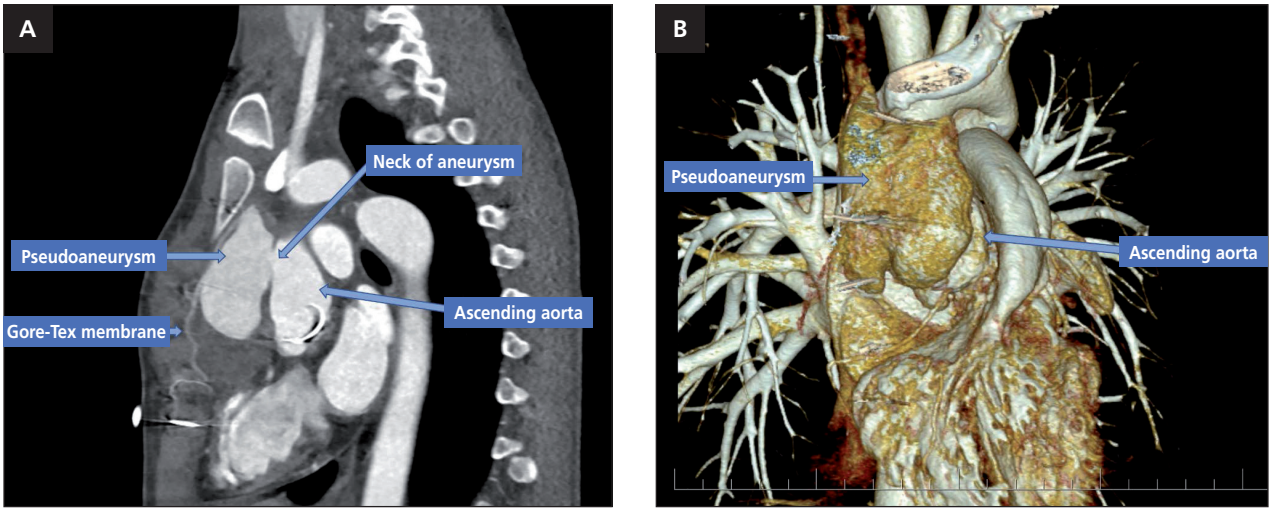


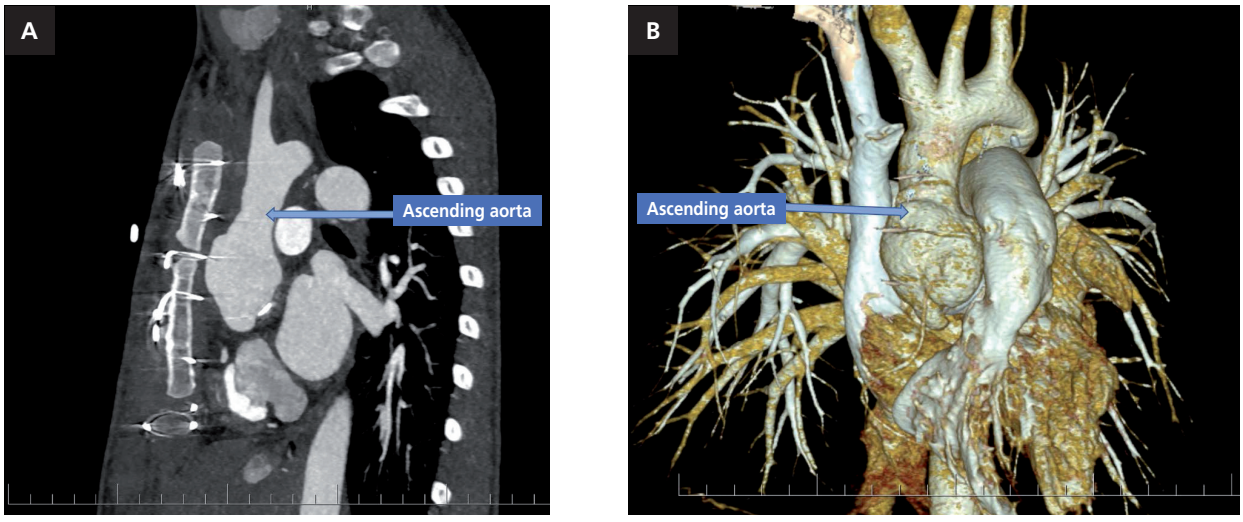
Fig. 1 – Transthoracic echocardiography, revealing a large pseudoaneurysm arising from anterior wall of the ascending aorta.

The postoperative period had been uneventful except pleural effusion requiring drainage, and the patient was discharged at postoperative day 21 under oral anticoagulation. Transthoracic echocardiography (TTE) after the operation and chest X-ray at discharge showed no abnormalities.

Ten months later he was transferred from the outpatient clinic to our institution for tertiary care. At the referring clinic, the echocardiography revealed a large and atypical echo-free space in front of his ascending aorta. Upon hospital readmission, the physical examination revealed normal vital signs, normal clicking heart sounds consistent with a mechanical valve, and no clinical signs of infection. Electrocardiogram and blood tests were normal. His echocardiography (Fig. 1), showed normal systolic function, normal functioning aortic mechanical valve, and no evidence of vegetation, and revealed a large echo-free space 46 × 20 mm which arose from the anterior wall of his ascending aorta and connected to the aorta with an 8 mm narrow neck. These findings were confirmed on



Figs 2A and 2B – Preoperative computed tomography angiograms demonstrating a pseudoaneurysm arising from the anterior wall of the ascending aorta. Dimensions were 70 × 47 × 26 mm with a 13 mm neck.



Figs 3A and 3B – Computed tomography angiogram 2 months after surgery showed no evidence of recurrence.

computed tomography (CT) angiogram, which showed a pseudoaneurysm arising from the anterior wall of the ascending aorta. The lesion was 70 × 47 × 26mm in size and had a 13 mm neck (Figs 2A and 2B). The patient was discussed with the Heart team and surgical repair was indicated using deep hypothermia and circulatory arrest.

Before sternotomy, cardiopulmonary bypass (CPB) was instituted by means of right common femoral artery perfusion and right common femoral, right internal jugular venous drainage. The patient was cooled to 24 °C and once the desired temperature was reached, re-sternotomy was performed. The pseudoaneurysm was entered after removing the Gore-Tex membrane, which was placed to cover the heart, and the circulatory arrest was initiated. The innominate artery was identified and mobilized then the antegrade cerebral perfusion was begun with a flow rate of 30–40 ml/kg/min, the cardioplegic solution was infused directly via the coronary ostia. A 12 × 8 mm hole in the ascending aorta was found, along the aortotomy suture lines from the previous operation. The edges of the hole and the surrounding tissue appeared infected and friable. A thrombus was removed from the pseudoaneurysm and swab cultures were taken. A local debridement was done and the defect in ascending aorta wall was closed using a patch from Contegra conduit (Medtronic Inc, Minneapolis, MN, USA). After rewarming the cardiopulmonary bypass was weaned off without incident. Circulatory arrest time was 23 min, selective antegrade cerebral perfusion time was 41 min, and total CBP duration was 188 min. The patient made an uneventful postoperative recovery without neurologic sequelae.

Microbiological analysis of the pseudoaneurysm isolated *Staphylococcus epidermidis* from one sample, but all blood cultures before and after the surgical intervention were negative. Intravenous antibiotic therapy was initiated and continued for 16 days, then oral antibiotics were administered.

The patient was discharged uneventfully on the 17th postoperative day. We repeated a cardiac CT scan (Figs 3A and B) at 2 months following surgery which showed no pseudoaneurysm and the patient is well at a 2.5-year follow-up.

Discussion

Aortic pseudoaneurysm is caused by the rupture of at least one layer of the aortic wall, which is surrounded and contained by the remaining aortic walls and adjacent mediastinal structures.[5] Most commonly, it can occur after previous cardiac surgery, and may even develop many years later (up to ten years) after aortic surgery, as recently reported in one case by Rečičárová et al.[6] However, the causes could be multifactorial such as chest trauma, infection, connective tissue disorders, technical problems with anastomosis, or aortic wall degeneration.

Many different forms of clinical presentation have been described, with a significant proportion of patients (53%) being asymptomatic,[7] as initially found in our case. As the pseudoaneurysm gradually increases in size, symptoms may appear, mainly due to compression of adjacent structures; including chest pain, dyspnea, superior vena cava syndrome or acute coronary syndrome, or right-side heart failure signs. It can also manifest as a pulsatile mass or peripheral embolism, aortic regurgitation, mediastinitis, or sepsis.[4,7]

Various treatments of aortic pseudoaneurysm are advocated in the literature, including percutaneous and surgical repairs, however, percutaneous repair was mainly reported in the adult population.[3,5] Surgical repair still remains the gold standard, especially because of the infected nature of the lesion in some cases that precludes the use of percutaneous devices. Surgical treatment, with cardiopulmonary bypass via the femoral artery and femoral vein or a combination of the subclavian artery and the femoral vein, followed by deep hypothermia with low cardiac output or circulatory arrest prior to sternotomy, is considered the best approach in most cases.[7] In our case we used the right common femoral artery perfusion and right common femoral, right internal jugular venous drainage followed by deep hypothermic circulatory arrest with selective cerebral antegrade perfusion.

Many surgical techniques have been described in the literature to repair pseudoaneurysms and reconstruct the ascending aorta.[4,7] In general, the repair technique

depends on the size, location, and presence of infection of the pseudoaneurysm. It varies from primary closure using simple sutures, insertion of patch graft, or aortic graft replacement. We used a patch from the Contgera conduit to reconstruct the defect in ascending aorta. We tried to avoid using prosthetic materials because of the infected appearance and the friability of the surrounding tissues. Also, we believe that the Contegra patch in this position is more hemostatic than prosthetic materials.

Careful follow-up and prophylaxis for infective endocarditis (IE) are essential in these patients. However, since transthoracic echocardiography is often inadequate to examine the ascending aorta, especially in adolescents and adults, transesophageal echocardiography (TEE), CT or cardiac magnetic resonance imaging (CMR) should be considered. After aortic surgery, the literature on CT scan follow-up ranges; some authors suggest annual follow-up with contrast-enhanced chest CT.[7] In addition, several centres use the CT surveillance protocol recommended by the European Society of Cardiology guidelines for the diagnosis and treatment of aortic diseases.[8]

Conclusion

Early diagnosis, careful preoperative planning, and appropriate treatment of such a rare complication can be lifesaving.

Conflict of interest

The authors report no financial relationships or conflicts of interest regarding the content herein.

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Ethical statement

Authors state that the research was conducted according to ethical standards.

Informed consent

Informed consent was obtained from the patient's legal guardian for using the patient's clinical information for submission and publication.

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