

Surgical exclusion of postsurgical pseudoaneurysm of the ascending aorta

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ABSTRACT

Pseudoaneurysm of ascending aorta after cardiac surgery is rare in children. We report a case of successful surgical exclusion of ascending aortic pseudoaneurysm in a 15-year-old boy. The neck of the aneurysm was in close proximity to the right coronary artery (RCA).

Keywords: Aortic pseudoaneurysm, aortic valve replacement, ascending aorta, cannulation site, device, exclusion, hypothermia, pseudoaneurysm, transcatheter, ventricular septal defect closure

INTRODUCTION

Prior cardiac surgery is the most frequent cause of ascending aorta pseudoaneurysm (PsA)^[1] irrespective of age; even though, PsA occurs in less than 0.5% of all cardiac surgical cases.^[2] The surgery of this condition is always a challenge. The mortality rate ranges from 29 to 46%, exsanguination resulting from rupture of the PsA during sternal reentry or surgical maneuvers being the most frequent cause of death.^[1] The key to successful exclusion is to prevent accidental exsanguination and to protect brain from ischemic injury.^[3] Transcatheter exclusion is an alternative approach to surgery and is considered safer by some.^[4-7] Notwithstanding the approach, timely exclusion is the key. The goal is to prevent hemodynamic stress in the form of aortic pressure and flow transmission to the vulnerable sac.

CASE REPORT

A 16-year-old boy presented with an eye-catching precordial bulge, breathlessness at rest, palpitation, and atypical chest pain for 3 months. A year back he was operated for ventricular septal defect (VSD) closure

by Yacoub's technique and aortic valve replacement using a 25-mm St Jude's rotatable mechanical valve. His physical findings include significant protrusion of sternum with stretched out suture line, moderate pallor, rocking precordium, raised Jugular venous pressure, and short systolic murmur at higher left parasternal border. Liver enzymes, prothrombin time (PT), and international normalized ratio (INR) values were raised. Twelve-lead electrocardiogram showed sinus tachycardia and left ventricular hypertrophy with strain pattern. His cardiothoracic ratio was 0.7. Two-dimensional echocardiograph showed left ventricular enlargement, moderate to severe left ventricular dysfunction, a large PsA originating from anterolateral aspect of ascending aorta, protruding retrosternally just anterior to right ventricle, causing significant compression of the right ventricle. The neck of PsA and the flow across were not seen clearly. The tricuspid valve regurgitation was significant.

Cardiac catheterization was omitted to avoid accidental rupture.

Cardiac computerized tomography with contrast enhancement (CECT) showed a large PsA (10.5×5.9×11.2 cm) arising from the anterolateral aspect of the ascending aorta with neck size of 10 mm. The neck of the PsA was in close proximity to the ostium and proximal right coronary artery (RCA). The proximal RCA was compressed between the expanding aneurysm and ascending aorta [Figure 1]. The right ventricle and its infundibulum were compressed to a slit-like space just because of large retrosternal aneurysm, quite consistent with echocardiographic findings [Figure 2]. There was erosion of body of the sternum with anterior

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Figure 1: A 64-slice computerized tomography (CT) with three-dimensional reconstructions shows a large ascending aorta pseudoaneurysm of size 12 × 10 × 8 cm

cortical break. The extension of the aneurysm into the parasternal soft tissues suggested the likelihood of impending rupture.

Anemia was corrected by blood transfusion. The surgical exclusion method was opted because of close proximity of PsA neck to RCA origin. Warfarin was replaced with unfractionated heparin 3 days prior to surgery. A midline sternal incision was made after femorofemoral bypass and moderate hypothermia. There was immediate blood loss of 500-600 ml. Two to three hundred grams of clotted blood was removed from aneurysmal recesses. Cardioplegia was introduced through ascending aorta cannula. The neck was located on the anterior wall of aorta with firm rims and devoid of vegetation. The defect was closed by double layer pledgeted suture (intra-aortic layer is poly-tetrafluoro-ethylene (PTFE) and external layer is of bovine pericardium). De-airing was smooth. Sternal suturing was done after a gap of 6 h to ensure hemostasis. Milrinone infusion was used in the postoperative period in view of significant left ventricular dysfunction. Warfarin was restarted on day 3. His 4 days intensive care unit (ICU) and 7 days step-down care unit observation was uneventful. Patient was discharged on the 10th postop day. The pre-discharge echocardiograph showed complete relief of right ventricular compression, no residual leakage, and minimal tricuspid valve regurgitation. There was mild retrosternal collection. His blood cultures were negative for microbial growth. Histopathology of excised redundant sac wall showed mild inflammation and was negative for microbial evidence followed-up till 2 weeks. Follow-up echo at the end of 3rd month showed no collection with improved ventricular function.

COMMENT

The most vulnerable sites for acquired aneurysm are suture lines, cannulation, needle puncture sites

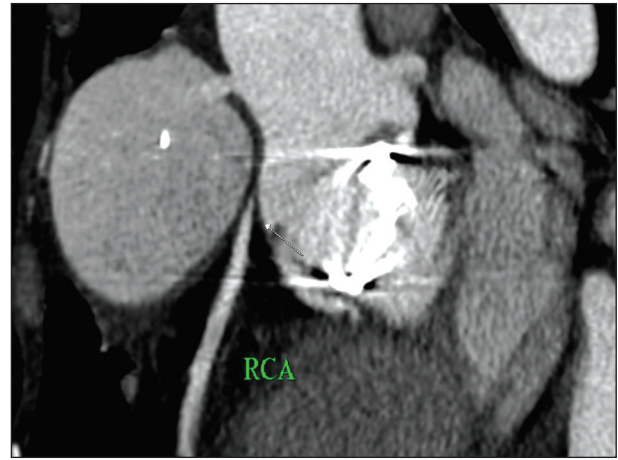


Figure 2: A 64-slice CT with contrast enhancement (CECT) shows the diameter of neck of aneurysm is 1 cm, significantly compressing the origin and proximal part of right coronary artery (RCA). The distance between RCA and neck of pseudoaneurysm is 5 mm suggesting a possible contraindication to percutaneous closure of pseudoaneurysm

for pressure recording, cross-clamp, and the site of bypass graft.^[1-3] Perioperative infection, poor intraoperative suture technique, and preexisting aortic wall disease, alone or in combination are contributing factors.^[1-3] Most of the PsA are located on the anterior aspect of aorta; grows retrosternally; and compresses right atrium, right ventricle, and RCA. Rarely PsA is seen posteriorly, the kissing spot for tip of cardioplegia tube.^[8] Almost 80% of affected patients had the operation performed within 2 weeks of diagnosis of PsA.^[3] Sometime PsA has been reported 35 years after cardiac surgery^[9] as a signature or stigma of previous intraoperative events. Infection was found to be the predominant cause with almost half of the patients having a history of native or prosthetic valve endocarditis or mediastinitis.^[3] Newer imaging techniques allows real perception of the three-dimensional profile with regards to location, extension, neck size, and proximity to coronaries. Repair without bypass,^[10] hypothermia, and alternative pump techniques are some of the attempts to reduce morbidities. The first successful percutaneous exclusion dates back to 2005.^[6]

Recently, catheter-based approaches have been used to treat PsA. The device use is off label, based on experience from small series or anecdotes.^[4,11,12] Catheter-based exclusion also takes care of some of the most complicated cases such as double fistula^[13] and repeated fistula at the neck sites.^[14] Device embolization^[15] is extremely rare.

However, in our case we used surgical method because of close proximity of neck of aneurysm to RCA, financial reasons, and consent in favor of surgery.

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