



A Rare Location of Pseudoaneurysm in Subaortic Ring after Bentall Operation

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Abstract

Bentall operation is considered a gold standard of surgery in the treatment of ascending aortic aneurysm. This operation with en-bloc resection of ascending aorta and aortic valve requires aortic valve with two coronary buttons re-replacements in a prepared composite graft. The four important locations for the pseudoaneurysm include proximal and distal composite graft anastomosis and two coronary button sites. However, many complications have been reported with this technique but the most serious complication associated with this operation is defined as pseudoaneurysm. We report an exceedingly rare case of subaortic ring pseudoaneurysm in retro composite graft position enclosed by infected surgical that was used to control bleeding in this location. Dehiscence occurred between the aortic ring and the underlying left ventricular muscle. The aortic ring was separated from the underlying muscle by the high tensile strength of sewing ring sutures. The pseudoaneurysm compressing the left atrium without communicating with any cardiac chamber and presenting with high fever (39°C), chills, a few months after Bentall operation. The patient underwent redo operation and repair of the dehiscence's site. The 6-month follow-up revealed no recurrence of a pseudoaneurysm. The uniqueness of this case report is related to the site of pseudoaneurysm between the aortic ring and underlying left ventricular muscle that have not been reported in the medical literature so far.

Keywords

Aortic pseudoaneurysm, Bentall operation, Fever

INTRODUCTION

Pseudoaneurysm of the ascending aorta is a rare and life-threatening complication in Bentall surgery that is usually associated with infectious endocarditis of the prosthetic aortic valve.¹ It could be formed in the aortic and coronary ostial suture lines in a modified Bentall procedure. It also occurs in the aortotomy site, aortic cannulation site, proximal or distal aortic suture lines, aortic vent site, the site of cardioplegic needle puncture, and also in coronary artery button in classic Bentall operation.² The incidence of pseudoaneurysm formation is related to the type of Bentall technique. The most important mechanism of pseudoaneurysm formation in classic Bentall technique

with re-replacement of the coronary button is an infection, and suture line tension but persistent bleeding into the space between the graft, and the wrapped aortic wall seems to play the most important roles in pseudoaneurysm formation in modified Bentall technique.³ In the study by Kouchoukos, the incidence rate of pseudoaneurysm in patients who underwent aortic root replacement with a modified technique ranged from 7 to 25%.⁴ The outbreak time of pseudoaneurysm's signs caused by infection is completely different from noninfected pseudoaneurysm. This difference is related to the long interval of time between the onset of symptoms and the need for reoperation in a non-infected pseudoaneurysm. This issue is opposed to an infected pseudoaneurysm that has an acute or subacute course and

may associate with fatal hemorrhage and mediastinitis in the postoperative period.^{4,5} This case report has a unique characteristic that was not reported in previously reported cases about post Bentall pseudoaneurism. This unique feature is the site of the pseudoaneurism origin lying in the LV muscle under the aortic fibrous ring.

CASE REPORT

A 28-year-old male patient with annuloaortic ectasia and severe aortic valve regurgitation underwent a classic Bentall operation with the insertion of a 25-mm carbomedix composite valve graft (CVG) and re-implantation of the coronary arteries using the 'button technique' in our hospital. After weaning from cardiopulmonary bypass, small bleeding from retro composite graft in aortic ring position was controlled by packing with surgical sheets. The patient had an uneventful recovery and was discharged on warfarin 7 days postoperatively. He was readmitted with fever two weeks after the primary operation. The blood culture was taken and blind treatment with imipenem and vancomycin relieved his fever, chills, and the patient was discharged in good general condition. The echocardiography revealed normal aortic valve function, no vegetation on the prosthetic valve or paravalvular leak, or pseudoaneurism in any location. Two months later, he was re-admitted with fever and chills. He did not complain of dyspnea, orthopnoea, or respiratory distress, lung congestion, distended neck veins, and peripheral edema. Cardiac auscultation revealed no systolic ejection murmur over and aortic area. The chest X-ray showed enlargement of the mediastinum and cardiac silhouette with a prominent right border. The repeated transesophageal echocardiography (Fig. 1) by another cardiologist showed the presence of a small homogenous structure posterior to the Dacron aortic graft extending superiorly and compressing the roof of the left atrium. Communication between the graft and the mass could not be identified and diastolic flow from the mass space in the retro-aortic ring to the left ventricle was not found. Adding up to these data were the findings of the computed tomography – a scan without contrast revealed peri-graft haziness in the back of the Dacron tube suggestive of infection. We supposed that the Surgicel sheets used in the site of Dacron to aortic ring connection in primary operation became a nidus for infection and mediastinitis. Cardiac catheterization to establish the origin of the mass was denied by patient and was not performed. Repeated computed tomography scan confirmed the presence of a small retro composite graft structure extending posteriorly to Dacron graft. Diagnosis of a large pseudoaneurism originating from the implantation site of the composite graft to the native aortic ring was not established until catastrophe bleeding was noted during reentry of the mediastinum in the second operation. The patient was scheduled for urgent surgical treatment. A femoro-femoral cardiopulmonary bypass was instituted and the patient cooled down to about 28°C of esophageal temperature. As soon as the sternum

was opened, and the infected foreign body in peri-graft was removed, the pseudoaneurism lying behind the Dacron graft immediately ruptured (Figs 2, 3). Oxygenated blood coming from the left atrial roof near the aortic ring connection to prosthetic graft was seen; and one-centimeter tear in the left ventricular outflow tract beneath the aortic ring was identified and carefully sewn with 4/0 pledged sutures. It seems that the tension of the suture line separates the fibrous ring from the underlying left ventricle muscle. The dehiscence was not identified in the aortic ring to prosthetic valve sutures lines. Pathology exam of the removed foreign body showed infected clot material with fibrinoid deposition and surgical sheets, the culture of the foreign mass revealed infection with staphylococcus epidermidis. The patient had an uneventful recovery and was discharged after 13 days.

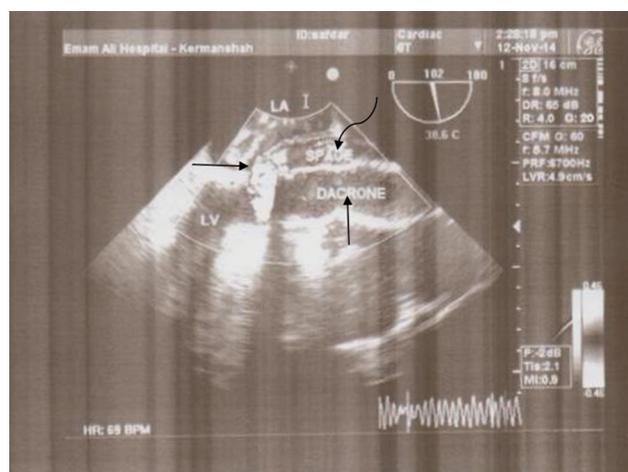


Figure 1. Transesophageal echocardiography revealed the origin of a pseudoaneurism orifice (transverse arrow), pseudoaneurism space (curved arrow), and Dacron tube (vertical arrow).

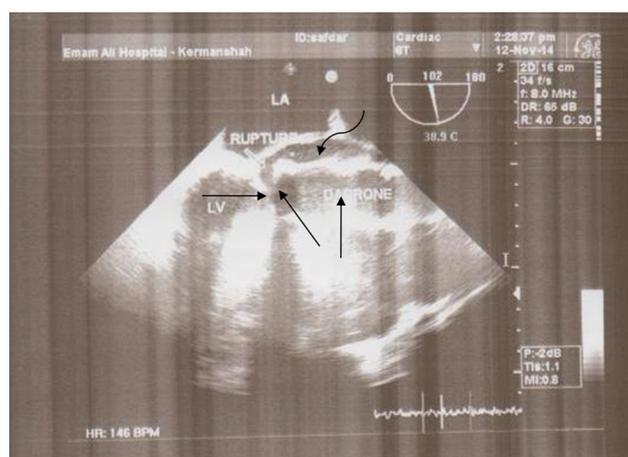


Figure 2. Transesophageal echocardiogram clearly showing Dacron tube (vertical arrow), the orifice of ruptured pseudoaneurism (oblique arrow), and prosthetic aortic valve (transverse arrow), ruptured space (curved arrow), and left ventricle (LV) marked with arrow.

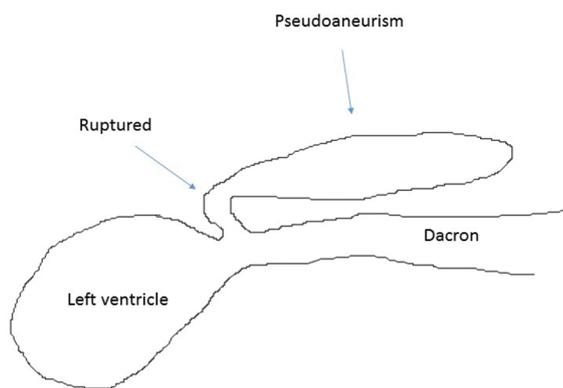


Figure 3. Schematic diagram of pseudoaneurysm.

DISCUSSION

The Bentall technique, invented by Bentall and De Bono, was a revolutionary change in the approach to the surgical repair of annuloaortic ectasia in the ascending aortic aneurysm. The old technique composed of separate aortic valve replacement and separate ascending aorta replacement with Dacron graft and without re-replacement of coronary button. The recent technique was associated with suture line bleeding, recurrent aneurysm, dissection, rupture, prosthetic valve infection, and dysfunction high risk of redo operation for progressive aneurysmal dilatation of native aorta. The use of en-bloc replacement of aorta and ascending aorta with re-replacement of coronary button became the procedure of choice in the treatment of disease of the aortic valve, aortic root, and ascending aorta.⁵ The favourable results of the en bloc technique of Bentall-De Bono were affected by rare and serious complications of the conduit such as a pseudoaneurysm. The early onset pseudoaneurysm usually has an insidious course and its sign and symptoms are left unnoticed by a physician or it presents with non-specific findings such as fever, chills, fatigue. Late onset of this complication causes serious life-threatening conditions such as free rupture to mediastinum, fistula formation to nearby chambers according to the location of pseudoaneurysm, clot formation in a pseudo-sac, emboli to systemic circulation and compression of the cardiac chambers. The incidence of pseudoaneurysms after composite graft implantation in Bentall operation is unknown and careful literature review revealed only a few cases that occurred in four different locations of the composite graft. The proximal anastomosis of a native aortic ring to the prosthetic valve is the most serious site of involvement in pseudoaneurysm formation. The surgical access to this location is complicated by dense adhesion of nearby organs and fibrin to prosthetic graft. The release of this dense adhesion could be associated with injury to other organs such as coronary button, pulmonary artery, and superior vena cava.⁶ Risk factors associated with pseudoaneurysm formation include suture line infection, excessive anticoagulation, and underlying disease with weak aortic wall

tensile strength (Marfan syndrome and aortic dissection), infected foreign body in contact with the Dacron graft such as hemosile or Surgicel, fibrin glove. Transesophageal echocardiography (TEE) Doppler has become the modality of choice in this context, due to its higher accuracy than TTE in identifying the presence of pseudoaneurysms and their sites of origin, by showing an area of flow extending.⁷

CONCLUSIONS

Our case of an aortic pseudoaneurysm complicating a previous Bentall procedure had two unusual and unique findings: the lining of the sac was formed by surgical not by adhesive fibrotic bands. This context caused the free rupture of a sac in reentry into mediastinum with the removal of infected Surgicels around the Dacron tube. The second unique finding was the location of the pseudoaneurysm that was in the retro aortic ring despite the intactness of aortic ring to prosthetic valve. To our knowledge, this complication has not been previously reported in the literature. We were unable either to establish the cause of postoperative fever or retro Dacron tube structure or identify flow from the subaortic ring into it by conventional Doppler TTE. Cardiac catheterization with aortography and TEE was also refused by patients; however, this modality could be important in showing the origin of the pseudoaneurysm from the subaortic ring and confirming the already suspected left-to-right shunt.

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Conflict of Interest

None declared.

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Редкое расположение псевдоаневризмы в субаортальном кольце после операции Бенталла

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Резюме

Процедура Бенталла считается золотым стандартом в хирургии при лечении аневризмы восходящей аорты. Эта операция с блочной резекцией восходящей аорты и аортального клапана требует аортального клапана с повторной имплантацией двух нижних сегментов коронарных артерий в подготовленный композитный трансплантат. Четыре важных участка псевдоаневризмы включают анастомоз проксимального и дистального композитного трансплантата и двух нижних коронарных сегментов. Тем не менее, при использовании этой техники было зарегистрировано много осложнений, но наиболее серьёзным осложнением этой операции является псевдоаневризма. Мы представляем чрезвычайно редкий случай псевдоаневризмы субаортального кольца с низким расположением композитного трансплантата, окружённого инфицированными хирургическими разрезами, которые использовались для остановки кровотечения в этом месте. Расхождение произошло между кольцом аорты и подлежащей мышцей левого желудочка. Мышца аорты была отделена от подлежащей мышцы за счёт высокой прочности на разрыв кольцевых швов. Псевдоаневризма сдавила левое предсердие без контакта с камерой сердца и проявлялась лихорадкой (39° С) и ознобом в течение нескольких месяцев после процедуры Бенталла. Пациент перенёс операцию и выздоровление на месте расхождения. Через шесть месяцев рецидива псевдоаневризмы не выявлено. Уникальность этого клинического случая связана с расположением псевдоаневризмы между кольцом аорты и нижележащим кольцом левого желудочка, данные о котором в медицинской литературе пока отсутствуют.

Ключевые слова

псевдоаневризма аорты, операция Бенталла, лихорадка
