

Aortic Root Pseudoaneurysm Following Surgery for Aortic Valve Endocarditis

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Prosthetic aortic valve replacement for aortic valve endocarditis remains a primary practice of most cardiac surgeons. Usually it cures endocarditis and restores cardiac function. However, in advanced aortic valve endocarditis with complex annular destruction, complications following prosthetic aortic valve replacement do occur and present a formidable challenge for reoperation.

Herein, we describe a case of an adult man who was operated on initially for advanced aortic valve endocarditis with a large periannular abscess cavity and who developed congestive heart failure 3 months later. Furthermore, he was diagnosed with a giant pseudoaneurysm around the aortic root without evidence of recurrent infection or aortic prosthetic incompetence. During his reoperation, a cryopreserved aortic homograft as a root replacement that included reimplantation of bilateral coronary artery buttons was used to exteriorize this pseudoaneurysm and reconstruct a left ventricular outflow tract. The postoperative course was unremarkable, and the patient, during a follow-up of 2 years, remained in New York Heart Association functional class I.

Aortic root pseudoaneurysm following prosthetic aortic valve replacement for infective endocarditis is rare in clinical practice and can cause rapid hemodynamic deterioration which requires imminent reoperation. Homograft aortic root replacement has proven to be a versatile treatment option of this complex disease. (*Chang Gung Med J* 2002;25:133-8)

Key words: aortic valve endocarditis, aortic root pseudoaneurysm, homograft aortic root replacement.

Surgical management of complications following prosthetic aortic valve replacement remains a formidable challenge with associated high morbidity and mortality.⁽¹⁾ Usually these complications are due to persistent or recurrent endocarditis with prosthetic incompetence.⁽²⁾ However, aortic root pseudoaneurysm formation in the absence of recurrent infection following prosthetic aortic valve replacement for infective endocarditis is rare. The presentation of this entity and its successful management with

homograft aortic root replacement are described herein.

CASE REPORT

A 45-year-old man with a history of heavy drinking and alcoholic liver disease was operated on initially for infective endocarditis due to persistent fever and congestive heart failure. Although the preoperative blood culture was positive only for strepto-

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coccus viridans, during the operation the aortic leaflets were revealed to be severely damaged by infection with multiple vegetations on the noncoronary and left coronary cusps. In addition, a large abscess cavity measuring 15; 10 mm in diameter near the membranous septum had been excavated below the noncoronary annulus and extended along the aorto-mitral fibrous continuity with consequent downward and lateral displacement of the mitral annulus. The infected leaflets were excised, and the abscess cavity received radical debridement and curettage. A porcine aortic valve (23 mm Carpentier-Edward aortic bioprosthesis) was inserted obliquely along the upper margin of the debrided cavity to avoid distorting the underlying mitral valve integrity and damaging the conduction system. Following the operation, the patient recovered with no major events and was discharged 4 weeks later after completion of an intravenously administered antibiotic course.

Unfortunately, during the outpatient follow-up, he developed progressive dyspnea and chest tightness and was readmitted for further examination. Notably, no fever occurred during this period, and repeated blood cultures were negative for microorganism growth. Transesophageal echocardiography revealed that, although there was adequate prosthetic

valve function, an unusual chamber existed behind the aortic root, which communicated directly with the left ventricle (Fig. 1). Cardiac catheterization confirmed a large protruding pouch (Fig. 2) and indicated a normal coronary angiogram. A magnetic resonance angiogram was further conducted for superior delineation of both the pouch and surrounding structures (Fig. 3). Within days, his condition worsened, deteriorating to acute pulmonary edema. Three months following the previous surgery, reoperation was necessary and a homograft aortic root replacement was planned. To match the size of the implanted aortic bioprosthesis, a valve-conduit aortic homograft with an annular diameter of 23 mm was selected from a tissue-processing laboratory. This cryopreserved homograft was thawed and lengthened with a tubular segment of collagen-impregnated woven graft before conduction of the cardiopulmonary bypass. The aorta was opened following induction of cardioplegia arrest. Removal of the bioprosthesis, which was attached firmly to the aortic base revealed a posteriorly located giant pseudoaneurysm (50; 45 mm in diameter) (Fig. 4). This pseudoaneurysm disrupted the ventricular-aortic continuity and resulted in consequent downward displacement of the anterior mitral annulus. Bilateral coronary artery buttons were then fashioned, and a modified Bentall opera-



Fig. 1 Transesophageal echocardiography showing a large pseudoaneurysm (Ps) between the aorta (Ao) and the left atrium (LA), with direct connection to the left ventricle (LV).

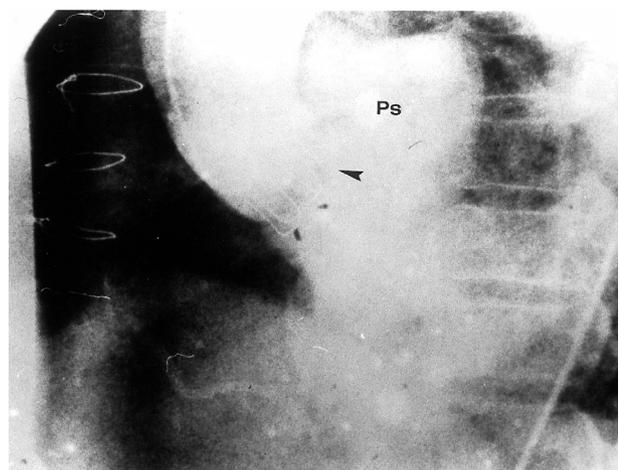


Fig. 2 Left ventriculogram revealing a protruding pseudoaneurysm (Ps) measuring 50; 45 mm in diameter, immediately below the aortic prosthetic valve (arrowhead).



Fig. 3 Magnetic resonance angiogram depicting the relationship of the pseudoaneurysm (Ps) with the surrounding structures (arrowhead: aortic prosthetic valve; Ao: aorta; LV: left ventricle; PA: pulmonary artery).

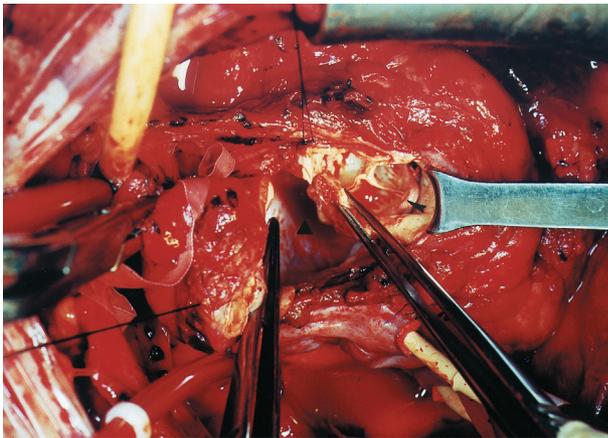


Fig. 4 Intraoperative surgeon's view of the pseudoaneurysm (black triangle) following detachment of the prosthetic valve (arrowhead) from the aortic base.

tion (Carrel patch method) was performed. Due to the irregular shape of the left ventricular outlet and its apparently larger size than the homograft annulus, a substantial homograft subannular muscle cuff was preserved to accommodate this discrepancy. A portion of the proximal anastomosis penetrated the base of the pseudoaneurysm (i.e., anterior to the mitral annulus), which completely exteriorized the pseudoaneurysm from the left ventricular outflow tract. The coronary buttons were then reimplanted, and the distal anastomosis completed. The patient was weaned from the cardiopulmonary bypass with moderate inotropic support and was discharged shortly thereafter without further antibiotic regimen.

In a recent outpatient visit, which was 2 years following his last surgery, the patient was in New York Heart Association functional class I, and his echocardiography demonstrated a smooth left ventricular outflow tract and only mild aortic regurgitation without aortic stenosis.

DISCUSSION

Aortic root pseudoaneurysm formation following advanced aortic valve endocarditis surgery is rare and could be a devastating challenge during reoperation with a lack of adequate surgical ammunition.⁽³⁻⁷⁾ Our experience in the use of homograft aortic root replacement successfully solved this complicated problem. A review of the English literature regarding additional causes and treatments of aortic root pseudoaneurysm revealed few similar reports,^(8,9) and none resembled the scenario we depict herein.

Admittedly, the primary use of true biological tissue such as an aortic homograft or pulmonary autograft in advanced aortic valve endocarditis has several advantages and can possibly avoid a pseudoaneurysm complication.⁽¹⁰⁾ However, there were 2 major factors, which hindered our adoption of this treatment strategy. First, homograft sources are scarce in our region and are limited to only a few tissue-processing laboratories, which in turn prohibits quick accessibility. Second, in most aortic valve endocarditis cases, the infection has not yet spread to the annulus prior to surgery. Therefore, in this instance, a prosthetic aortic valve replacement was adequate.⁽¹¹⁾ Furthermore, when the patient has a life expectancy exceeding 20 years and no contraindica-

tion for anticoagulants, we truly hesitate to insert a homograft valve.⁽¹²⁾ Rather, a mechanical valve, which prevents future reoperation due to biological tissue failure, is preferred. The final question is how to identify advanced cases, which preclude the use of a prosthetic valve before an operation, so that there is enough time to seek and prepare the homograft beforehand. Sophisticated imaging may play a role in those instances.

Alternatively, use of a properly tailored patch of autologous pericardium or glutaraldehyde-preserved bovine pericardium to close the paravalvular abscess cavity was advocated by David et al. to treat advanced aortic valve endocarditis.⁽¹³⁾ The aortic valve prosthesis is then secured to the aortic annulus and to the patch used to reconstruct the left ventricular outflow tract. Although this maneuver may offer another option to avoid such a pseudoaneurysm complication, it is technically demanding and with the probability of patch dehiscence and recurrent prosthetic valve endocarditis.

The hemodynamics of this pseudoaneurysm mimicked that of acute severe mitral regurgitation. Furthermore, his condition deteriorated from the appearance of dyspnea symptoms to frank heart failure in only a few weeks, which made reoperation an imminent necessity. A magnetic resonance angiogram, which aided the operation planning, was a valuable tool in understanding the characteristics of this pseudoaneurysm as well as its relationship with surrounding structures.

Aortic root pseudoaneurysm can cause a wide ventricular-aortic junction separation and consequently a large and irregular ventricular outlet. The rigid sewing ring of a composite graft renders it difficult to compensate for size and shape discrepancies and invariably affects the integrity of the underlying mitral valve apparatus if inserted into the base of the pseudoaneurysm. An aortic valve homograft with an attached subannular muscle cuff proved to be a versatile option in this situation. The bulky muscle cuff was employed to accommodate this geometric discrepancy. The fixation stitches were attached through the homograft fibrous annulus, which strengthened it and prevented further pseudoaneurysm formation due to homograft muscle cuff resolution. Thus, the aortic root pseudoaneurysm with its potentially infective tissue bed was exterior-

ized and completely excluded from the bloodstream, and a smooth left ventricular outflow tract was reconstructed.

Although the durability of an implanted homograft as well as the possible questions it may raise in future operations are of present concern,⁽¹⁴⁾ homograft aortic root replacement is an ideal choice to treat an aortic root pseudoaneurysm following aortic valve endocarditis surgery.

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