CASE REPORT

Aortic Root Re-replacement with Cryopreserved Aortic Homograft in a Patient with Active Composite Valve-graft Endocarditis

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Abstract: We describe a repeat aortic root replacement using a cryopreserved aortic homograft in a patient with active composite valve-graft endocarditis and an aortic root abscess. At the second surgery, infected prosthetic material was removed and surrounding tissue was radically debrided. The cryopreserved aortic homograft was positioned using the full root technique with a concomitant coronary bypass graft. The postoperative course was uneventful and the patient continues to thrive 2 years after the repeat operation. (Keio J Med 57 (2) : 111-114, June 2008)

Key words: Allograft, Infective endocarditis, prosthetic valve endocarditis, Bentall operation, S. epidermidis

Introduction

Prosthetic valve endocarditis and re-operative aortic root replacement are associated with high postoperative mortality.¹ Once an infected prosthesis becomes medically uncontrollable after aortic root replacement, the composite valve-graft must be removed and the aortic root should be replaced once again. Operative mortality under such conditions can be extremely high. Homografts are considered to be the best graft for aortic valve reoperation to treat infected mechanical and bioprosthetic valves, because the reported risk of developing early or late postoperative recurrent infection is low and constant. This apparently also applies to composite valve-graft endocarditis.

Case

A 56-year-old man developed palpitation for the first time after a cold in February 2005. He was diagnosed with annulo-aortic ectasia with severe aortic regurgitation after a medical examination and referred to our hospital for surgery. The modified Bentall operation com-

prising an implant of a composite woven Dacron prosthetic graft (28 mm in diameter) and a mechanical valve (23 mm in diameter) into the aortic root, re-anastomosing the coronary ostia to the graft, and concomitantly placing a saphenous vein graft from the aorta to the left anterior descending (LAD) branch on May 16, 2005 was successful. The patient was discharged from hospital 25 days later, but was soon readmitted with a high fever, body temperature, > 40.3 °C, white blood cell (WBC) count, 16,400/mm³ and C-reactive protein (CRP), 8.39 mg/dl. The body temperature and inflammatory reaction (C-reactive protein) promptly improved after starting empiric antibiotic therapy with teicoplanin (TEIC) and meropenem trihydrate (MEPM). Six days later when methicillinresistant Staphylococcus aureus was defined as the pathogen of sepsis (Table 1), MEPM, which was administered mainly to combat gram-negative organisms, was stopped. Therapy with TEIC was continued, the concentration of which was monitored once or twice each week and the dose was adjusted to keep the trough between 10 to 20 µg/ml. However, the infection was not completely controlled and worsened. We repeatedly detected S. epidermidis in blood specimens. Computed tomography

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Antibiotics	Sensitivity	Antibiotics	Sensitivity	Antibiotics	Sensitivity
PCG	R	CFPM	R	GM	R
MPIPC	R	CDTR-PI	R	CAM	R
ABPC	R	FMOX	R	LVFX	R
SBT/ABPC	R	IPM/CS	R	LZD	S
CVA/AMPC	R	MEPM	R	QPR/DPR	S
CEZ	R	VCM	S	β -lactamase +	
CTX	R	TEIC	S		
CPR	R	ABK	S		

 Table 1
 Antibiotic susceptibility of pathogens obtained from patient's blood
 R, resistant; S, sensitive.



Fig. 1 Whole body CT shows abnormal fluid collection around composite valve-graft.

(CT) showed abnormal fluid collection around the graft (Figure 1). Transesophageal echocardiography (TEE) revealed a 15×5 mm mass at the aortic valve annulus and a soft tissue mass (abscess) around the graft. These findings indicated active infective endocarditis with a perigraft abscess. Coronary angiography showed excellent patency of the saphenous vein graft to the LAD branch, which was achieved at the previous operation. The left circumflex system was small. Gallium scintigraphy detected isotope accumulation at the site of fluid collection around the graft and we determined periannular extension of the infection. The patient was scheduled for repeated surgery on July 16, 2005. The calculated logistic EuroSCORE,² or the calculated predicted operative mortality for patients undergoing cardiac surgery, was 28.55%.

Operative Procedures

The patient was placed in the supine position and the sternum was carefully entered through the midline using an oscillating saw. The radial artery was harvested from the left forearm. Cardiopulmonary bypass was established using the superior and inferior vena cava for venous drainage and the femoral artery for arterial return. The right upper pulmonary vein was cannulated for venting. A free radial arterial graft was anastomosed to right coronary artery #2 under beating. The previous graft to the LAD was preserved. A purulent discharge was evident around the prosthetic graft. After aortic crossclamping, the ascending aorta was transected distal to the felt strip which had previously been used for distal anastomosis. Carrel patches, or left and right coronary ostia, were removed and the infected prosthetic material was completely removed. Perivascular malgranulation and surrounding soft tissue were radically debrided. The operative field was washed with electrolytically-generated water, then with saline, and the homograft was positioned. The fragile coronary buttons were ligated and the proximal end of the radial artery graft was sutured to the homograft.

The patient was extubated on the 4th postoperative day and TEIC was continued for 6 weeks postoperatively under therapeutic drug monitoring (TDM). During the first 3 days after the operation, cefazolin sodium (CEZ) and amikacin sulfate (AMK), which were routinely used during the cardiovascular surgery, were concomitantly administered. From postoperative days 10 to 31, biapenam was added to TEIC because of a transiently re-elevated WBC count. The postoperative course was uneventful and the patient was discharged from hospital on September 10. At discharge, the WBC count was 6200/mm³ and CRP was 0.17 mg/dl. The volume-rendered image generated by multidetector row CT showed that the aortic root was replaced by the homograft and that the coronary bypass grafts were patent (Figure 2). The patient has been regularly followed up as an out-patient for > 2 years during which he has remained free of infection.

Discussion

Prosthetic valve endocarditis is an incremental risk factor for operative mortality in patients with all types of infective endocarditis. Among them, composite valve-graft endocarditis after aortic root replacement is supposed to be the most lethal, because re-operative aortic root replacement itself is associated with high mortality, and periannular tissue destruction, annular abscess or pseu-



Fig. 2 Volume rendered image generated by multidetector row CT. Image shows aortic root replacement with homograft and patent coronary bypass grafts.

doaneurysms are almost always present. Proper selection of antibiotics is very important, but this alone is not always sufficient. These difficulties can be overcome by debriding all infected and necrotic tissues and replacing the aortic root in addition to prolonged antibiotic therapy.3 According to the guidelines,4 VCM and aminoglycosides comprise the recommended antibiotic combination for treating prosthetic valve endocarditis when the targeted pathogen is undetectable or undetermined, because staphylococcus is the most likely culprit. However, gram-negative organisms are also major (>10%) pathogens in this setting. Obviously, targeted antibiotic therapy should be started as soon as the responsible microorganism is detected. We used TEIC for the entire period of both empiric and targeted antibiotic therapy according to policy guidelines. Uncontrolled infection is a major indication for surgical intervention as well as congestive heart failure and thrombotic events. However, to judge whether an infection could be controlled with antibiotic therapy alone, or if surgical intervention is necessary, is difficult to judge, especially during the early phase. The timing of surgery tends to be delayed, although early surgical intervention can improve the overall prognosis of active infective endocarditis. Surgery is recommended when infection is uncontrolled despite antibiotic administration for 3 to 10 days. Annular abscesses and pseudoaneurysm formation are also strong indications for surgical intervention. From these viewpoints, earlier surgery might be a viable choice if a homograft is readily available. Possible graft materials for re-replacement include composites containing mechanical valves,³ freestyle stentless valves⁵ and homografts.⁶ Some authors have found that prosthetic root replacement as well as homografts result in an excellent long-term outcome⁷ and that composite graft replacement might be superior to homografts.⁸ However, homografts are generally believed to be the optimal material for prosthetic valve endocarditis because the risks of residual/recurrent infection and of paravalvular leakage are lower.⁹⁻¹¹ Although we also believe that homografts are optimal for aortic root re-replacement to treat composite valve-graft endocarditis, drawbacks include short supply, early calcification in some patients and progressive deterioration. We had access to an appropriately-sized cryopreserved homograft. During repeat aortic root replacement, unplanned coronary artery bypass grafting constitutes a major risk factor for hospital mortality. Coronary ostia reimplantation (Carrel patch method) or a second smaller tube graft interposition^{12, 13} were not options for coronary reconstruction in our patient because debridement completely destroyed the coronary ostia. Conventional coronary artery bypass grafting with proximal coronary artery ligation was considered to be the most expedient and safest route under these circumstances. The patient remains under close observation for late graft atherosclerosis, coronary ischemia and recurrent infection.

The homograft for this patient was provided thanks to the timely action of the staff of Sapporo Medical College, to whom we are extremely grateful. A network should be established to acquire and distribute homografts as soon as possible.

Conclusions

Repeat aortic root replacement using a cryopreserved aortic homograft was successful in a patient with active composite valve-graft endocarditis.

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