Case Report

Intravalvular Implantation Technique for a Modified Bentall's Procedure in Aortitis Syndrome

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Surgical treatments of aortic root involvement in aortitis syndrome are frequently complicated by valve detachment and pseudoaneurysmal formation during active inflammation. A 40-year-old woman with aortitis syndrome complicating the ascending aortic aneurysm, severe aortic regurgitation (AR), and left coronary ostial stenosis was successfully treated by aortic root replacement and concomitant coronary artery bypass grafting (CABG) during acute inflammation. We devised an intravalvular implantation between the fragile aortic annuls and Teflon felt to a modified Bentall's procedure, which prevented anastomotic leakage and pseudoaneurysmal formation in the late period. (Ann Thorac Cardiovasc Surg 2006; 12: 290–2)

Key words: ascending aortic aneurysm, aortic regurgitation, aortitis syndrome, aortic root replacement

A 40-year-old woman was admitted to our hospital for surgical treatment of an aneurysm of the ascending aorta and aortic insufficiency. One year before this admission, an examination had revealed no abnormality.

On admission, her body temperature was 36.5˚C and blood pressure 102/47 mmHg in the right arm and 95/44 mmHg in the left. The heart rate was 105 beats/min. A grade 4/6 diastolic murmur was heard in Erb's area.

A chest X-ray showed an enlarged cardiac silhouette. Computed tomography (CT) showed dilation of the ascending aorta with a maximum size of 5 cm. An angiography revealed localized aneurysmal dilatation of the ascending aorta (Fig. 1). An echocardiogram revealed aortic regurgitation (AR). Increased C-reactive protein concentration of 4.1 mg/dl and a greatly accelerated erythrocyte sedimentation rate of 106 mm/h were noted. Immunological studies demonstrated IgG 2,254 mg/dl, IgA 345 mg/dl, and IgM 185 mg/dl. Other laboratory data was within normal limits. The patient complained of chest pain and dyspnea, with signs of angina pectoris and congestive heart failure due to progressive aortic regurgitation (AR): therefore, an emergency operation was performed despite the acute inflammatory stage.

At a median full-sternotomy, a single dual-staged venous cannula was inserted through the right atrium, and the femoral artery used for arterial cannulation. The patient was cooled systemically to a rectal temperature of 28˚C. The ascending aorta was cross-clamped just below the innominate artery. The aneurysm was incised longitudinally at the center and the coronary ostium carefully cut from the aortic wall in a button shape, which left a 10 mm cut in the aortic wall (the Carrel patch). Small parts of the aortic leaflet near the Alantius body were resected for pathohistological examination. The aortic annuls was found to be extremely fragile. The aortic root was replaced with a composite graft fabricated with a CarboMedics Prosthetic Valve (23 mm) which was placed 5 mm above the proximal end of a woven graft (26 mm). After pathologic confirmation that the inflammation had not spread to aortic leaflets, the flange of the graft was sewn by the modified technique as described below. Mattress sutures were passed through the flange of the composite graft. The needle pierced through the aortic annuls from the ventricular to the aortic side, as with normal everting mattress sutures. Needles passed through the aortic leaflet near its free margin, from the aortic to the ventricular

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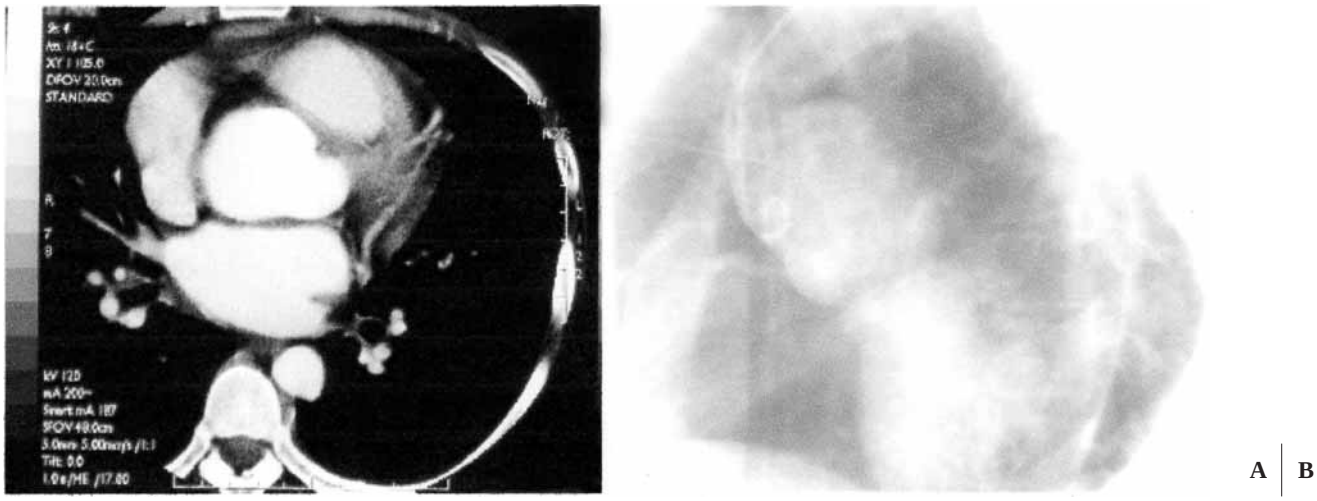

Fig. 1. Contrast enhanced computed tomography (CT) (**A**) and angiography (**B**) reveal aneurysmal dilatation of the ascending aorta.

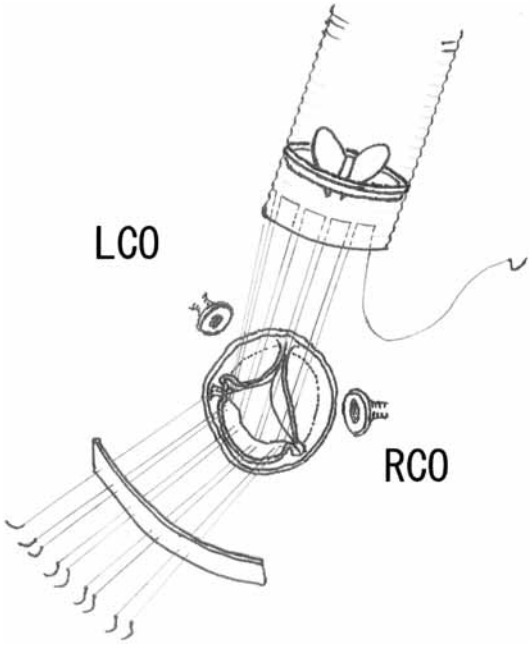

Fig. 2. The modified Bentall's procedure detailing our intravalvular implantation technique.
LCO, left coronary ostium; RCO, right coronary ostium.

side, and finally passed through a belt like Teflon felt (Fig. 2). The right coronary ostium (RCO) was directly anastomosed to the composite graft using the Carrel patch. However, the left coronary ostium (LCO) was extremely fragile, and the left main tract could not be mobilized because of severe adhesions. Thus, the left main tract was ligated and left coronary artery revascularization was accomplished by anastomosing a saphenous vein graft (SVG) between the composite graft above the prosthetic valve and the left anterior descending artery (LAD). Distal anastomosis between the valved conduit and the ascending aorta was performed with 3-0 coated, braided polyester threads using horizontal mattress sutures with a belt like Teflon felt, and then reinforced with a running suture of 3-0 monofilament polypropylene. After the distal anastomosis, the ascending aorta was declamped, and weaning from cardiopulmonary bypass (CPB) went smoothly. Total aortic cross-clamping time was 210 min and CPB time was 291 min.

Histological analysis of the aneurysmal wall revealed intimal proliferation, fragmentation of the elastic fiber in the media, and lymphocytes and plasma cell infiltration into the adventitia, consistent with acute inflammatory phase.

Postoperative course was uneventful; the patient underwent glucocorticoid therapy (prednisone 1 mg/kg per day) for 30 postoperative days, and after the dose had been tapered, she was discharged. At 12 months the patient was doing well on a regime of oral anticoagulants and a maintenance dose of prednisone.

Comment

Aortitis was first reported in 1908 by Takayasu, a Japanese ophthalmologist, as an optic fundi exhibiting peculiar coronary anastomosis.[1] The disease is a chronic vasculitis that predominantly affects the aorta and its main branches in young women. It induces clinically diverse

ischemic symptoms due to stenotic lesions or thrombus formation. More acute progression causes destruction of the media of the arterial wall, provoking the formation of aneurysms or rupture of the involved arteries. The incidences of aneurysmal formation and AR have been reported to be approximately 18 and 24%, respectively;[2] and coronary artery involvement occurs in about 10% of cases.[3] Patients with all these complications are rarely seen, and require treatment involving various surgical techniques.

Surgical treatment of aortic root involvement caused by aortitis syndrome has many difficulties in the timing of the operation, indication of the procedure, materials employed, and postoperative management. When surgery has been performed in the active stage, anastomotic leakage is frequently reported in the late follow-up period.[4] Therefore, surgical interventions are preferably undertaken during a relatively inactive phase of inflammation. However, severely symptomatic patients who show continuing deterioration of angina pectoris or congestive heart failure due to progressive AR need to be operated on irrespective of the inflammatory stage.

The more serious and frequently seen, postoperative complications in patients with aortitis syndrome are paravalvular leakage, valve detachment, and pseudoaneurysmal formation. To prevent these, especially during active inflammation, special surgical techniques are required. We applied an intravalvular implantation technique for replacement of a valved conduit, which prevented bleeding from a proximal anastomosis portion in weaning from CPB, and have not detected an anastomotic false aneurysm after 12 months of follow-up. This method is characterized by its avoidance of direct contact between foreign materials and the inflamed, fragile aortic annulus. Kotsuka et al., using the same method, reported the incidence of paravalvular leakage in aortic valve replacement during active inflammation was 0%.[5]

In our case where, the LCO was extremely fragile, reimplantation of the ostium was impossible, therefore the Bentall's procedure and concomitant coronary artery bypass grafting (CABG) should be employed. We performed CABG using a SVG. The selection of graft materials for CABG in Takayasu's disease is controversial. Arterial grafts revealed good long-term patency rates compared to venous grafts to atherosclerotic coronary artery disease.[6] However, SVGs are preferable for patients in Takayasu's disease because the subclavian artery is usually a major focus of this disease.[7] Thus, we selected the SVG and employed single CABG at LAD. In this procedure, the possible hazard is that the left coronary flow inevitably depends on the SVG. Therefore, long-term monitoring should be required.

Preoperative steroid administration to stabilize inflammation is important in the treatment of aortitis syndrome.[8] However, in the postoperative period steroid therapy is controversial. Steroid administration initiated from the early postoperative period has some potential hazards such as disturbance of the wound healing process and susceptibility to infection. In an active inflammatory stage, however, postoperative steroid therapy is needed to prevent paravalvular leakage, valve detachment, graft occlusion, and pseudoaneurysmal formation.[4,5,8] Therefore, after surgical treatment, we suggest that uninterrupted steroid therapy should be undertaken to prevent late complications in patients.

Our patient with aortitis syndrome successfully underwent a modified Bentall's procedure with a concomitant CABG during an acute inflammatory stage. The use of intravalvular implantation for Bentall's procedure in aortitis syndrome enabled us to prevent bleeding and pseudoaneurysmal formation. Control of inflammation and regular follow-up with enhanced CT are important in such cases.

References

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