

Aortic Root Remodeling for Root Aneurysm with a Uni-commissural Aortic Valve: Report of a Case

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A 23-year-old man was admitted for an aortic root aneurysm with mild aortic valve regurgitation (AR) and a small pressure gradient. At surgery, findings of aortic valve, one normal left posterior commissure and very rudimentary right anterior commissure, was compatible with the uni-commissural aortic valve. Aortic root replacement with valve-sparing technique was performed. Four years later no residual AR was observed. (Ann Thorac Cardiovasc Surg 2005; 11: 132–4)

Key words: aortic valve surgery, aneurysm, aortic root, uni-commissural aortic valve, bicuspid aortic valve

Introduction

Valve-sparing operation for aortic valve lesions has been widely accepted and the long-term result is favorable.^{1,2)} Extended indications for acute dissection,³⁾ Marfan Syndrome,⁴⁾ and bicuspid aortic valve⁵⁾ have recently been reported. In this report the mid-term result of aortic root replacement with sparing uni-commissural aortic valve associated with aortic root aneurysm in a young male was investigated.

Case Report

A 23-year-old man was admitted because of the aortic root aneurysm. He had a history of ventricular septal defect (VSD) and aortic stenosis at 2-year-old, which were repaired by patch closure of VSD and patch aortoplasty under the diagnosis of supra-valvular aortic stenosis at a community hospital. At this time, aortic

valve abnormality was not clearly identified. Systolic murmur was audible at the upper right sternal border and electrocardiography showed sinus rhythm with complete right bundle branch block. The diameter of the aortic root was 58 mm by chest CT. Aortography showed an aortic root aneurysm with mild aortic valve regurgitation (AR) and a mild aortic coarctation. Ankle/radial pressure index was greater than 100%. On echocardiography, the aortic valve was diagnosed to be bicuspid and mild AR and a small pressure gradient (<20 mmHg) was observed.

Under moderate hypothermic extracorporeal circulation and cardioplegic arrest, the aortic valve was exposed by transverse aortotomy. The cusp had a definitely abnormal appearance, one normal commissure was situated at left posterior annulus and a very rudimentary commissure was situated at the right anterior annulus (Fig. 1). The aortic valve annulus was 28 mm in diameter and the valve-opening diameter was 18 mm and no findings of aortic valve stenosis were observed. The height of the posterior commissure was 30 mm from the bottom of the Valsalva sinus but the height of the anterior commissure was 12 mm. The left coronary artery was originated from the posterior and the diminutive right coronary orifice was situated at the left side. As the attachment of the valve was not suitable for the first row stitch of the reimplantation method for aortic valve-sparing, the remodeling method was indicated. The

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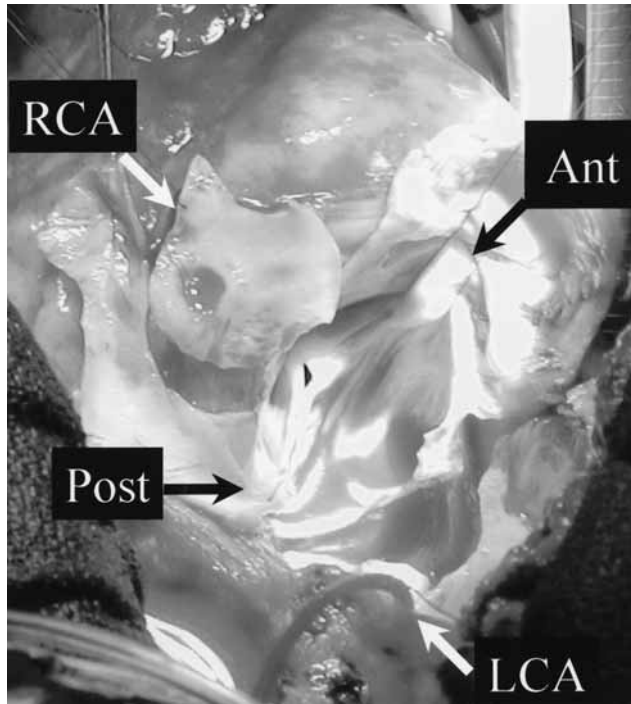


Fig. 1. Intraoperative aortic root finding.

Normal commissure at the left posterior site (Post) and very rudimentary commissure at the right anterior site (Ant) which was retracted by a stay suture. Good coaptation of two leaflets is confirmed. The right coronary orifice button (RCA) was incised and the left coronary orifice button (LCA) was cannulated for cardioplegic solution.

woven Dacron graft (Intergard Woven™, Intervascular, France), 24 mm in diameter, was chosen, to plicate the aortic valve orifice mildly. Two vertical slits and each graft tongue were trimmed according to the heights of the commissure, 30 mm and 12 mm, and appropriate bulging of cusps was confirmed. Trimmed graft tongues were sutured to Valsalva sinuses by continuous suture of 5-0 Prolene® (Ethicon Inc., NJ) with the autologous pericardium buttress. Both coronary buttons were anastomosed to the side holes of the graft and the graft was anastomosed to the ascending aorta.

The postoperative course was uneventful and no AR was confirmed by the aortography (Fig. 2). On echocardiography a small aortic valve pressure gradient (14 mmHg) was demonstrated. Four years after the operation he is active as a full-time worker with no medication and has no symptom of heart failure. The echocardiography showed no AR or aortic stenosis.

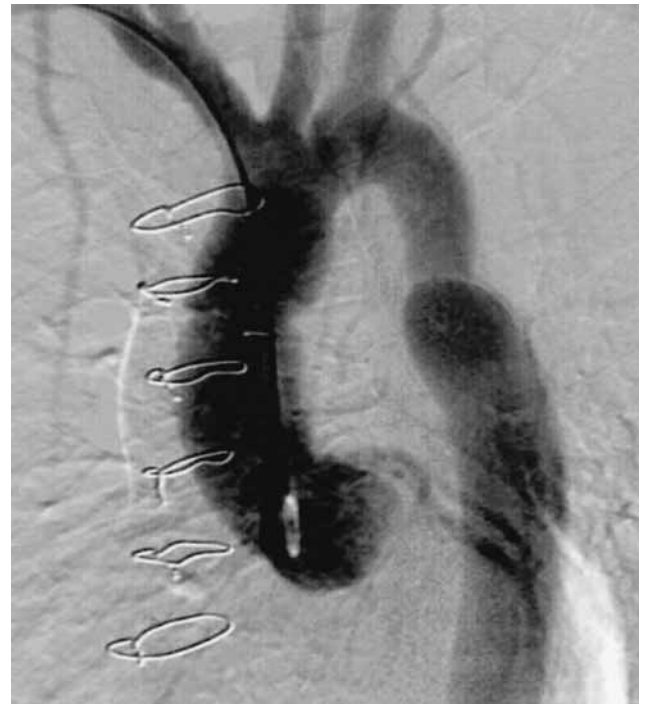


Fig. 2. Postoperative aortography.

There was no aortic valve regurgitation and both reconstructed coronary arteries were confirmed to be patent by the aortography. Mild aortic coarctation of descending aorta is also visualized.

Discussion

The incidence of a uni-commissural aortic valve is rare.^{6,7)} Very few reports were found regarding surgical treatment of this lesion. In the reported case, the aortic valve was diagnosed as bicuspid on echocardiography. However, intraoperative findings such as one commissure being very rudimentary, and the marked difference of the height of commissures, led it to be diagnosed as 'uni-commissural'.⁸⁾ Our surgical strategy for aortic valve replacement in the adult younger than 40-years of age consisted of mechanical valve replacement, valve-sparing operation, and Ross procedure.⁹⁾ On the basis of the patient's refusal of anticoagulation and the relatively higher risk of Ross procedure, the valve-sparing technique with aortic root replacement was indicated.

Recently, Schäfers et al. reported the mid-term (2 to 43 months) result of the remodeling technique of bicuspid aortic valve with mild aortic regurgitation.⁵⁾ Their method to reproduce a competent valve by measuring the relationship of the aortic annulus circumference to the leaflets diameter, height of commissures and depth of si-

nuses, seems to be reasonable. In our case, vertical slits of graft were adjusted to the heights of normal and rudimentary commissures and a uni-commissural valve was reconstructed as a bicuspid valve. As Suematsu et al. stated that only a single coaptation is necessary for the bicuspid valve, contrary to three coaptations for the tricuspid valve,¹⁰⁾ repair of aortic regurgitation in a bicuspid valve may be technically easier if the cusp is not stenotic.

The mid-term result of this case is favorable, but careful follow-up is required for the long-term prognosis.

References

1. Sarsam MA, Yacoub M. Remodeling of the aortic valve annulus. *J Thorac Cardiovasc Surg* 1993; **105**: 435–8.
2. David TE, Ivanov J, Armstrong S, Feindel CM, Webb GD. Aortic Valve-sparing Operations in patients with aneurysms of the aortic root or ascending aorta. *Ann Thorac Surg* 2002; **74**: S1758–61.
3. Kallenbach K, Pethig K, Leyh RG, Baric D, Haverich A, Harringer W. Acute dissection of the ascending aorta: first results of emergency valve sparing aortic root reconstruction. *Eur J Cardiothorac Surg* 2002; **22**: 218–22.
4. Gott VL, Cameron DE, Alejo DE, et al. Aortic root replacement in 271 Marfan patients: a 24-Year experience. *Ann Thorac Surg* 2002; **73**: 438–43.
5. Schäfers HJ, Aicher D, Langer F. Correction of leaflet prolapse in valve-preserving aortic replacement: pushing the limits? *Ann Thorac Surg* 2002; **74**: S1762–4.
6. Falcone MW, Roberts WC, Morrow AG, Perloff JK. Congenital aortic stenosis resulting from a uni-commissural valve: clinical and anatomic features in twenty-one adult patients. *Circulation* 1971; **44**: 272–80.
7. Elkins RC, Knott-Craig CJ, McCue C, Lane MM. Congenital aortic valve disease: improved survival and quality of life. *Ann Surg* 1997; **225**: 503–10.
8. Congenital Aortic Stenosis. In Kirklin JW, Barratt-Boyes BG, ed. *Cardiac Surgery*. New York: Churchill Livingstone, 1993: 1195–1237.
9. Tsukube T, Kawanishi Y, Murakami H, et al. Reconstruction of right ventricular outflow tract with stentless xenografts in ross procedure. *Artif Organs* 2002; **26**: 1055–9.
10. Suematsu Y, Morota T, Kubota H, Ninomiya M, Takamoto S. Valve-sparing operation for aortic root aneurysm in patients with bicuspid aortic valve. *Ann Thorac Surg* 2002; **74**: 907–8.