

Repair of Aortic Regurgitation due to Takayasu Arteritis

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ABSTRACT

Background: Prosthetic valve detachment after aortic valve replacement and pseudoaneurysm formation are the most important postoperative complications in patients with Takayasu arteritis with aortic regurgitation. We reviewed our experience of surgical treatment of aortic regurgitation in patients with Takayasu disease.

Methods: Between November 1997 and September 2011, 11 patients (4 women and 7 men) with Takayasu arteritis with aortic regurgitation underwent surgical treatment. The age of the patients ranged from 26 to 56 years (mean, 40 ± 9 years). Primary isolated aortic valve replacement was performed in 1 patient, David procedure in 1 patient, Wheat procedure in 1 patient, Bentall procedure in 2 patients, and Cabrol procedure in 6 patients (including 2 patients who underwent primary aortic valve replacement in other hospitals before being admitted to our surgical team).

Results: There was no in-hospital death. All patients had an uneventful recovery during the postoperative course and were discharged. Prosthetic valve detachment, pseudoaneurysm formation at the suture line, and dilatation of the ascending aorta were not found in patients with composite aortic root replacement during a mean follow-up of 98 ± 45 months. One patient died during follow-up.

Conclusion: Valve detachment after composite aortic root replacement was not observed in patients with Takayasu disease with aortic regurgitation. Satisfactory surgical outcomes were obtained using composite aortic root replacement. However, close follow-up was needed to assess the effectiveness of the Cabrol procedure in patients with Takayasu disease with aortic regurgitation.

INTRODUCTION

Takayasu arteritis is a chronic, non-specific, idiopathic, and inflammatory disease of unknown etiology that primarily affects the aorta and its main branches. In patients with Takayasu arteritis, aortic regurgitation resulting from inflammation of the aortic root and valve is not uncommon, and the prevalence of aortic regurgitation was between 13% and 25% [Matsuura 2005]. Aortic regurgitation was regarded as an important risk factor for mortality in patients with Takayasu arteritis [Matsuura 2005]. Surgical treatment could obtain satisfactory operative outcomes using aortic valve replacement (AVR) [Ando 1998; Matsuura 2005]. However, aortic valve detachment after AVR and pseudoaneurysm formation were observed during follow-up [Suzuki 1989] because of persistent inflammation of the aortic annular. Composite valve graft replacement was recommended for patients with Takayasu arteritis with aortic regurgitation [Adachi 2007]. We retrospectively reviewed our experience of surgical treatment for aortic regurgitation caused by Takayasu disease.

MATERIAL AND METHODS

Patients

In this study, 11 patients with Takayasu disease with aortic regurgitation underwent surgical treatment by Dr. Sun at Fuwai Hospital and Beijing Anzhen Hospital between November 1997 and September 2010. The procedure described below was approved by the institutional review board. Informed consent was obtained from each patient before surgery.

There were 7 men and 4 women. Ages ranged from 26 to 56 years (mean, 40 ± 9 years). Takayasu arteritis was diagnosed based on clinical symptoms, intraoperative findings, and pathologic examinations of the aortic valve and aortic wall. Aortic regurgitation or aortic valve detachment was diagnosed by echocardiography and transesophageal echocardiography. Among the 11 patients, 2 patients with aortic regurgitation underwent primary isolated AVR in other hospitals before being admitted to our surgical team. The clinical profile of patients with Takayasu arteritis with aortic regurgitation is listed in the Table. Immunosuppressive therapies were recommended preoperatively and postoperatively by our surgical team.

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Clinical Profiles of Patients with Aortic Regurgitation with Takayasu Disease*

	Age, y	Sex	Clinical Diagnosis	Steroids	First Operation (hospital)	Morbidity	Second Operation (hospital)	Morbidity	Operative Result
1	49	F	AR/AAD	No	Wheat	No			Alive
2	39	M	AR/ARA	No	Bentall	No			Alive
3	35	F	AR/ARA	No	David	AR (mild to moderate)			Alive
4	56	M	AR/AAD/I° AVB	No	AVR	No			Alive
5	44	M	AR/AAD	Yes	Cabrol	No			Alive
6	46	M	AR/MR/LSCAS	Yes	Cabrol/MVR	No			Alive
7	26	M	AR/ARA	Yes	Cabrol/Ao-A	No			Alive
8	31	M	AR	Yes	AVR (other)	VD	Cabrol	No	Alive
9	40	M	AR/AAD	Yes	Cabrol	No			Alive
10	46	F	AR	No	AVR (other)	VD/I° AVB	Cabrol	No	Alive
11	31	F	AI/AAD	Yes	Bentall	No			Alive

*F indicates female; AR, aortic regurgitation; AAD, ascending aortic dilation; Wheat, Wheat procedure; M, male; ARA, aortic root aneurysm; Bentall, Bentall procedure; David, David procedure; AVB, atrioventricular block; AVR, aortic valve replacement; Cabrol, Cabrol procedure; MR, mitral regurgitation; LSCAS, left subclavian artery stenosis; MVR, mitral valve replacement; VD, valve detachment.

The patients who were discharged from the hospital were followed up by telephone or interviewed in our outpatient clinic. Prosthetic valve function was evaluated by Doppler echocardiography.

Surgical Technique

The patients were operated on under general anesthesia, and the chest was opened through a standard median sternotomy incision. Cardiopulmonary bypass was established by ascending aortic cannulation and single venous cannulation of the right atrium. Intraoperative transesophageal echocardiography was performed to assess valve function. In patients with isolated AVR, the damaged valve was removed and the appropriate prosthetic valve was selected. The surgical technique was adopted largely from Ando et al [Ando 1998]. In patients with aortic root replacement, a second or third operation, the femoral artery and vein were dissected and used for cardiopulmonary bypass. After heparinization, the operation was performed with cardiopulmonary bypass. When the temperature was achieved, the ascending aorta was cross-clamped. The aortic root was opened, and cold cardioplegia was infused into the aortic root to achieve cardiac arrest. In patients undergoing the Bentall procedure, the surgical technique was performed as described by Kouchoukos et al [Kouchoukos 1986]. In patients undergoing the modified Cabrol procedure, the coronary artery ostia were mobilized as buttons. A separate graft was anastomosed to the mobilized ostial buttons in an end-to-end fashion and then the separate graft was anastomosed to the aortic conduit in a side-to-side style.

RESULTS

Surgical Data

Aortic valve replacement was performed in 1 patient, and the Wheat procedure in 1 patient. The remaining patients received composite aortic root replacement in our surgical

team. The David procedure was performed in 1 patient, the Bentall procedure in 2 patients, and the Cabrol procedure in 6 patients (including 2 patients undergoing primary isolated AVR in other hospitals before being admitted to our surgical team). The cardiopulmonary bypass time was 65 to 205 min (mean, 127 ± 44 min), and the aortic cross-clamp time was 42 to 130 min (mean, 86 ± 28 min). Concomitant procedures are summarized in Table 1.

Morbidity and Mortality

There was no in-hospital death. No severe complication occurred, and all patients had an uneventful recovery during postoperative course. Prosthetic valve detachment, pseudoaneurysm formation at the suture line, and late dilatation of the ascending aorta were not found in patients with composite aortic root replacement during a mean follow-up of 98 ± 45 months (range, 3 to 168 months). The patients who underwent aortic root replacement have never had reoperation. One patient was lost to follow-up, and 1 patient died during follow-up. Postoperative computed tomography scanning was performed in 83.3% (5 of 6) patients undergoing the Cabrol procedure, and thrombotic graft occlusion was not observed.

DISCUSSION

In patients with Takayasu disease, aortic regurgitation is regarded as 1 of the major complications related to prognosis. Aortic regurgitation is primarily attributed to annular dilatation resulting from dilatation of the aortic root and/or ascending aorta. In addition, fibrous thickening and retraction of the valve leaflets also contributes to aortic regurgitation. This complication is severe and requires surgical intervention for correction. Due to the need to manipulate fragile and inflamed tissue, it is very difficult to repair aortic regurgitation caused by Takayasu arteritis.

AVR had achieved favorable surgical outcome in patients with Takayasu disease with aortic regurgitation. However, several issues should be emphasized. First, detachment of the prosthetic valve occurred after AVR because of the fragility of the aortic wall along with aortic annular tissue and persistent inflammation of the aortic annulus even with anti-inflammatory therapy [Adachi 2007]. Prosthetic valve detachment occurred in 33% of patients (2 out of 6) [Adachi 2007] and 11.1% of patients (7 out of 63) [Matsuura 2005] after AVR. Second, pseudoaneurysm formation at the suture line was observed in patients with Takayasu disease [Suzuki 1989; Miyata 2003]. This is caused by the fragility of the aortic wall and aortic annular tissue in this disease and active inflammation [Matsuura 2005]. The incidence of anastomotic aneurysm in Takayasu arteritis was 8.5% as reported by Miyata et al [Miyata 1998]. Suture with Teflon felt reinforcement, suppression of active or persisting inflammation with corticosteroids, or the site of the anastomosis without inflammation was recommended to avoid this complication [Ogino 2008]. Late dilatation of the residual ascending aorta after AVR was also reported in patients with Takayasu disease in several centers [Kalangos 1999; Matsuura 2005]. The prevalence of late dilatation of the residual ascending aorta was higher in patients undergoing isolated AVR than in patients who were treated with composite aortic root replacement [Matsuura 2005]. Careful monitoring of the aortic root is mandatory for patients with Takayasu disease with aortic regurgitation undergoing isolated AVR although anti-inflammatory therapy was adopted [Adachi 2007].

To avoid the complications related to AVR mentioned above, composite aortic root replacement was indicated for patients with Takayasu arteritis with aortic regurgitation [Adachi 2007]. Satisfactory operative outcomes and follow-up results were obtained using this technique [Adachi 2007; Tsunekawa 2008]. Neither valve detachment nor pseudoaneurysm formation was observed with aortic root replacement [Adachi 2007]. These were also illustrated by our surgical results. Composite aortic root replacement was preferable because the entire diseased wall was excluded and the stress of the prosthetic valve was not directly applied to the aortic annulus using composite aortic root replacement [Ando 1998; Adachi 2007]. To prevent complications related to AVR, lowering the threshold toward aortic root replacement may be justified in patients with Takayasu arteritis with aortic regurgitation [Okita 2007].

The Cabrol technique for aortic root replacement remains controversial due to thrombotic graft occlusion [Gelsomino 2003]. However, abrasion around the aorta is very difficult in patients with Takayasu arteritis because of the stiff and rigid aortic wall, marked periadventitial and adventitial fibrous thickening, and dense adhesion to the surrounding tissue [Aoyagi 1998]. Furthermore, some patients with Takayasu disease with aortic regurgitation have only mild or mild-to-moderate dilatation of the aortic root, and it is very difficult to perform the button technique. Although early and long-term mortality with the Cabrol procedure appears to be inferior to the Bentall procedure, modified Cabrol procedure

was performed when it was very difficult to perform the Bentall technique. The Cabrol procedure is still considered an invaluable first-line procedure for the few patients with reoperation, low origin of the coronary ostia, and heavily calcified aorta due to the tension-free anastomosis between the coronary arteries and aortic conduit [Kourliouros 2011].

Satisfactory results with low morbidity and mortality were obtained in patients with Takayasu disease with aortic regurgitation using composite aortic root replacement. However, this study documented our limited experience with Takayasu arteritis using the Cabrol procedure. Data were preliminary, and longer follow-up is required to validate the effectiveness of the Cabrol procedure for aortic valve regurgitation due to Takayasu arteritis.

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