Aortic valve reconstruction associated to ascending aorta tubular graft replacement in aortic incompetence by annuloaortic ectasia

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Abstract

Objective: Aortic valve incompetence associated with severe aortic ectasia is usually treated by aortic valve and ascending aorta replacement. In cases of isolated aortic ectasia or in Type A aortic dissection the valve is often normal and the incompetence is just due to annular dilatation. Such conditions lead to the application of various valve-sparing surgical techniques, as described by Senning et al., showing the advantages of preservation of the native valve, but the disadvantage of a high technical complexity and a high incidence of recidivation. Methods: We describe a valve-sparing surgical procedure, which has the advantage of a direct and simple approach together with satisfying mid-term results. After the aortic bulb has been fully transected, the excessive wall tissue is resected by two or three triangular excisions just above the valve commissures. Wall excision was indicated in those patients with an aortic diameter exceeding 65 mm at the sino-tubular junction. Tissue excision should not exert tension on to the coronary ostia or excessively reduce aortic diameter. Three external Teflon strips, overriding each other, are placed around the aortic bulb and are included in the direct suture of the edges of the triangular excisions. They are fixed by a running suture over the free border of the bulb. Aortic valve commissures are resuspended when needed. In this way, the aortic bulb, with a competent valve, is wrapped in a prosthetic and inextensible graft. The aortic continuity is then re-established with the interposition of a tubular dacron graft. Results: From April 1990 to December 1995, 21 patients (mean age 48 years, range 32–70) scheduled for surgery for aortic valve incompetence associated with annuloaortic ectasia were treated with this technique. In one patient the procedure failed to achieve a satisfying valve competence and the valve was replaced. In another case a prolapse of the non-coronary cusp required reoperation with aortic valve replacement, without further complications. At follow-up time (mean 42 months, range 18–78), all patients were well and healthy, with control echoes showing no residual valve incompetence and with invariate bulb diameters at every successive examination. Conclusions: Our experience shows that this new valve-sparing approach allows safe and persistent correction of aortic valve incompetence and annuloaortic ectasia although longer term follow up is needed. © 1998 Elsevier Science B.V. All rights reserved

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1. Introduction

Aortic valve incompetence may be due to leaflet damage, as in endocarditis and rheumatic disease, or annular mal-function, as happens in aortic dissection or isolated annuloaortic ectasia.

In the latter cases, aortic cusps are often found to be normal in shape and pliability, whereas anatomical alterations are restricted to the dilated annulus and sino-tubular junction both of which prevent correct leaflet coaptation [1].

Different surgical strategies lead surgeons to choose between combined replacement of valve and ascending aorta, according to the Bentall–De Bono procedure [2,3], or isolated ascending aorta replacement, leaving aortic cusps in situ as described by David et al. [5–7,9,10].

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We describe our experience with a technique of aortic annulus reconstruction and ascending aorta replacement, which shows the advantages of a direct and simple approach together with satisfying mid-term results.

2. Materials and methods

2.1. Patients

From April 1990 to December 1995, 21 patients requiring elective surgery for aortic valve incompetence associated with annuloaortic ectasia were admitted to our center; mean age was 48 years, (min 30, max 70).

Pre-operative conditions were assessed by clinical evaluation, Doppler echocardiogram and emodinamic-cardioangiography (Table 1).

Seven patients were affected with Marfan Syndrome, five patients were affected by aneurysm dilatation of the non-coronary sinus and one had associated coronary disease.

2.2. Surgical technique

Routine CPBP was instituted in every patient with aortic cannulation, single atrial cannula, systemic hypothermia to \(30^\circ\)C, intermittent isothermic antegrade blood cardioplegia and LV venting.

An aortic clamp was positioned just over the distal edge of the aneurysmatic tract, the ascending aorta was transected about 1 cm from the valve plane and the malacic wall was fully resected.

After the aortic bulb had been fully transected, the excessive wall tissue was resected by three triangular excisions just above the valve commissures. Wall excision was indicated in those patients with aortic diameter exceeding 65 mm at the sino-tubular junction. Tissue excision should not exert tension on to the coronary ostia or excessively reduce aortic diameter. Three external Teflon strips, overriding each other, were placed around the aortic bulb and included in the direct suture of the edges of the triangular excisions. If needed, additional double pledgetted 3/0 Prolene sutures were placed through the aortic annulus and the external strips to shrink the annulus when tied (Figs. 1–3).

In the five cases with non-coronary sinus aneurysm, resection and direct suture of the sinus was completed before Teflon strip placement.

When the aortic diameter exceeded 80 mm, an external plicature of the aortic wall was carried out at the level of each commissure.

The space between the strips and the aortic wall was then generously glued and the free border of the reconstructed aortic root was included in a Prolene running suture.

In each case, a tubular Dacron graft of adequate calibre was interposed to replace ascending aorta; aortic valve competence was then tested by flushing cardioplegic solution into the prosthesis, observing eventual left ventricle distension.

3. Results

All patients left the ITU on the 2nd post-operative (p.o.) day and had a normal recovery, free from complications,
except for one patient who required wound revision for bleeding.

In one case a residual moderate valve incompetence was noticed and a successful valve replacement was carried out during the same operative session (this patient will be no longer considered in this study).

Patients were discharged between the 10th and 13th post-operative day, with minimal pharmacologic therapy based on Digoxin, Ca-antagonists and temporary oral anticoagulation.

Each patient was then submitted to a follow-up protocol, including a Doppler echocardiogram and chest X-ray examination before hospital discharge, at 90 days and then every 6 months.

The last data analysis is drawn from a mean follow-up time of 42 months (range 18–78), and the results are reported in Table 2.

At a mean length of time of over 3 years from operation, all but one of the patients are well and healthy, in good cardiocirculatory condition and in 2nd NYHA class, attending to their usual activities. In 19 (95%) of the patients, control echograms showed a good competence of the repaired aortic valve, whose diameter appears invariate at every successive examination when compared with the post-operative examinations.

One patient (5%) developed dyspnoea and acute effort intolerance about 2 months after operation. An echocardiogram displayed massive incompetence and regurgitation of the aortic valve, due to prolapse of the non-coronary cusp; a re-do was performed, with aortic valve replacement, without further complications.

4. Discussion

The usual surgical procedure for aortic incompetence due to annuloaortic ectasia is either separate valve and aortic replacement or, most commonly, the Bentall operation.

Nevertheless, the presence of thin and pliable aortic cusps has led to the development of conservative procedures.

In this direction Cabrol, then Duran et al. obtained good results using a technique of circumferential reduction of the annulus by means of commissural plication, but with a high incidence of late recidivation, as also happened with the technique proposed by Carpentier et al., with commissural transannular stitches [5–8].

Sarsam and Yacoub developed a procedure of excision of the tract of ascending aorta above leaflet insertion, with successive placement of a tubular graft, adequately tailored on the native valve with coronary re-implantation. David and Coll proposed a similar technique describing proximal anastomosis of the tubular graft directly on the outflow tract of the left ventricle, and the successive re-suspension of the native valve cusps inside the tubular graft and coronary re-implantation [9,10].

Our technique leads to a reduction in annular diameter utilising the same principle on which Carpentier’s ring, used in mitral incompetence, is based. The aortic annulus is fixed and enveloped in a tubular structure made up by the three Teflon patches in order to prevent later dilatation of the native aortic tissues left in situ; furthermore sub-annular stitches or coronary anastomosis are not needed [4].

The effectiveness of this procedure, in spite of the small number of cases, is confirmed by the results of short-term follow-up, showing persistence of repaired aortic valve competence and freedom from recurrence of annular and bulbar dilation.

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