

Surgical treatment of the ascending aorta aneurysm associated to bicuspid aortic valve

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Surgical treatment of patients affected by bicuspid aortic valve (BAV) and ascending aorta aneurysm still represents a challenge for cardiac surgeons. The best surgical management and the timing of operation remain unclear and many studies report different results. Replacement of the valve and/or the aorta can be performed with very low mortality and morbidity, and in the last 20 years, valve repair has become an additional available option in presence of mild-to-moderate insufficiency of BAV. Patients with BAV disease are usually younger than patients with degenerative disease affecting a tricuspid aortic valve, and for this reason the optimal treatment is aimed to reach the goal of optimal long-term results in terms of freedom from valve reoperation and complications.

Indication for surgical treatment of aortic root and ascending aorta in patients with BAV is more aggressive respect to tricuspid aortic valve patients mainly due to a greater incidence of acute aortic complications observed during the follow-up of these patients. Isolated replacement of the aortic root or ascending aorta is recommended for diameters of the aorta at 45–50 mm. According with the general opinion regarding the intrinsic predisposition to dilation of the aortic wall in BAV patients, the cut-off beyond which there is surgical indication is shifted down by 50 mm as compared to patients with tricuspid valve. Need for aortic valve replacement, changes further the cut-off for surgery. If the patients undergoes aortic valve replacement ascending aorta should be treated when diameter is >45 mm. It should be take into account also the opportunity

to index the aortic dimensions to the body surface area preoperatively. An aortic ratio >1.4 represents the cut-off above which surgical replacement of the aorta is strongly recommended.

The treatment of dilated ascending aorta with a normally functioning BAV, depends on the anatomy of the aneurysm and the involvement of the aortic root. In particular, if the latter is not interested, it is possible a supracoronary ascending aorta replacement only, using a vascular tubular Dacron prosthesis, anastomosing the proximal part of the prosthesis to the sinotubular junction and distally to the proximal portion of the aortic arch. The reconstruction of the sinotubular junction can restore the competence of the aortic valve in the presence of a moderate insufficiency secondarily determined by an excessive commissural stretching.

When both aorta and aortic valve are diseased surgical approach depends on the anatomy of the aortic root. If the aortic root is preserved, we can replace the valve and ascending aorta separately. If the aortic root is dilated (diameter >45 mm) and BAV is affected by a primary disease (insufficiency or mixed pathology), Bentall–De Bono operation guarantees results. The operation consists on the entire replacement of the aortic root and ascending aorta using a composite valve conduit graft with the re-implantation of the coronary ostia on the tubular graft.

In our experience, BAV disease represents 15–20% of patients operated on for isolated aortic valve replacement, but this incidence raises up to 35% in the presence of ascending aorta dilation requiring surgery.

Different surgical operations have been performed for patient with BAV-related ascending aorta dilatation: in a 7-year-period 150 consecutive elective patients (mean age 57.6 ± 13.7 years, 116 males) were treated: 46 patients underwent Bentall operation (Group 1; 31%), 77 (51%) separate aortic valve and ascending aorta replacement and 27 (18%) ascending aorta replacement only with or without BAV repair.

Operative mortality was 2.1% (n=1) in Group 1, 1.3% (n=1) in Group 2, absent in Group 3. The incidence of in-hospital major complications was 4% in Group 1 (n=2), 2.6% in Group 2 (n=2), absent in Group 3; pacemaker

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implantation was 4% (n=2), 1.3% (n=1), and absent, respectively ($p =$ not significant, for all comparisons).

Five-year survival was 94%±4% for Group 1, 92%±3.4% for Group 2, and 100% for Group 3 ($p =$ not significant).

Predictor of late death was the advanced age at operation (69±9 years versus 58±15 years; $p<0.05$). No late complications in any Group related to proximal aorta surgical procedure were recorded during the follow-up period, so no patient required a reoperation on the proximal ascending aorta.

Follow-up echocardiography showed a statistically significant improvement of the left ventricular ejection fraction in patients subjected to Bentall procedure (from 0.56 ± 0.09 preoperatively to 0.60 ± 0.09 during follow-up, $p<0.05$). In Group 2 and Group 3 was observed no increase in the dimensions of the native aortic root. Moreover, in these two groups of patients, the aortic root diameters were significantly smaller than the preoperative diameters. In Group 2, the size of the root remained stable in all examined patients and an increase of the root diameter greater than 2 mm was not observed in any case. In 1 patient of Group 3 (3.8%), the size of the root increased during follow-up. The mean value of aortic regurgitation grade in patients in which the BAV was repaired or spared did not increase during follow-up (0.5±0.8 /4+) in comparison with the preoperative value (0.8±0.9 /4+).

Our study seems to confirm that BAV pathology includes a heterogeneous group of patients in which three different surgical strategies may confer satisfactory early and follow-up results when the indication of each type of procedure is carefully done.

In younger patients with aggressive BAV pathology (i.e. aortic root dilation >45 mm and significant aortic valve regurgitation or dysfunction) Bentall operation confirms as the gold standard therapy, and improving of left ventricular function has been showed by means of this surgical technique, even in presence of preoperative advanced aortic insufficiency and left ventricular dysfunction.

In presence of a less pronounced dilation of the root, separate aortic valve and ascending aorta replacement represents a simpler procedure that can be more appropriate especially in presence of older patients.

Isolated ascending aorta replacement represents a safe alternative in presence of normal or near to normal functioning BAV at the time of operation, and the risk of valve dysfunction, at least in a mid-term follow-up period, seems to be negligible.

Keywords: Bicuspid Aortic Valve, Aortic Root Surgery, Ascending Aorta Surgery

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Conflict of Interest

Authors declare no conflict of interest.

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