How-to-do-it

Replacing the diseased aortic valve and the proximal aorta in the elderly patient

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Received 9 August 2006; received in revised form 19 December 2006; accepted 8 January 2007; Available online 12 March 2007

Abstract

Subcoronary implantation of the Medtronic stentless bioprosthesis and an extension using a vascular tube prosthesis provide a safer alternative to the more invasive conventional composite graft replacement or a full root replacement using a homograft or a stentless valve. The advantage lies in eliminating the need for coronary mobilisation and anastomosis which actually lead to the increased risk in those procedures.

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Keywords: Aortic stenosis; Aneurysm; Stentless valve

1. Background

All the conventional methods described so far for treating diseased aortic valve and dilated, dissected, or severely calcified proximal aorta, from composite graft replacement to valve-preserving operations [1], involve deep dissection of the aortic root with mobilisation and direct anastomosis of the coronary buttons to the implanted valve or prosthesis. These anastomoses are unsupported and relatively inaccessible, and bleeding from these suture lines can cause massive problems. Even in the best of hands a certain level of perioperative mortality is unavoidable [2].

We describe an alternative solution which is safer in terms of short-term mortality and the long-term competence of the valve.

2. Surgical technique

The Freestyle bioprosthesis (Medtronic Inc., Minneapolis, MN, USA) is a porcine aortic root specially suitable for replacing the diseased aortic valve and proximal aorta. Over 21,000 of these valves have been implanted during the last 10 years. The vast majority of these implants have been done using the modified subcoronary method which we have already reported and described in detail [3].

High arterial cannulation on the aortic arch enables clamping of the aorta just below the origin of the brachiocephalic trunk. Cardioplegia is usually given retrograde through a catheter in the coronary sinus. In patients requiring bypass grafts, the distal anastomoses are done on the arrested heart. After that the aorta is opened and transected 1.5 cm above the commissures. A suitably sized valve, usually one size larger than the size of the annulus, is chosen, prepared by washing and the coronary sinuses are scalloped leaving the noncoronary sinus intact. Simple interrupted Ethibond sutures are used for the first row. After seating the valve and tying the sutures, the second row of 4-0 Prolene sutures is used to reduce the dilated or dissected aorta to the size of the porcine aorta. Starting at the deepest point between the coronary ostium and the annulus, one arm of each of the double armed sutures is run towards the aortotomy above the commissure between the left and right sinuses. The two sutures meet here. The other ends run around the ostia towards the free edge of the transected aorta. They are brought towards the aortotomy approximating and plicating the diseased human aorta to the nonscalloped noncoronary sinus of the porcine valve (Fig. 1). The two sutures meet above the commissure between the left and the noncoronary sinuses. It is important to avoid a dead space between the two aortae because a haematoma can form here and can lead to infection. The upper end of the diseased aorta is transected 1 cm below the cross clamp and the gap between the two transections is bridged by a vascular prosthesis (example: Vascutek Polyester Gelweave, Terumo Ltd., Renfrewshire, Scotland, Great Britain) one size larger than that of the
valve. Both the anastomoses are done using 4-0 Prolene with a strip of Teflon on the outside (Fig. 2). The combined porcine and human aortae allow a safe anastomosis at the lower end. The aneurysmally dilated aorta may be wrapped around the prosthesis for additional protection.

3. Clinical experience

Since June 2003, 33 patients aged 63–87 years (mean age 73 ± 4 years) have been subjected to the above procedure. Informed consent was obtained from each patient before the operation and at the follow-up study. Apart from aortic valve disease all had diseased proximal aortae, aneurysmal dilatation in 30, severe calcification in 2 and acute dissection in 1. There was no early mortality. Need for blood transfusion was minimal. Thirteen patients did not need any blood replacement. During the follow-up, two patients died due to noncardiac causes. All the surviving patients are clinically doing well. Control echocardiogram after a mean interval of 18 ± 3 months showed that all patients had competent valves and low gradients (mean 7.9 ± 2.7 mmHg).

4. Discussion

All the existing methods for replacement of the diseased aortic root involve coronary mobilisation and anastomosis which undoubtedly increase the risk of bleeding especially in older patients with degenerated and often calcified aortic walls. The available options are replacement using a mechanical valve-bearing conduit or a similar biological substitute made from porcine aortic valve and bovine pericardium [4]. Full root replacement with a homograft or a stentless valve and an extension with a vascular prosthesis is another choice [5]. All these procedures require deep dissection in the aortic root with mobilisation and anastomosis of the coronary ostia and wherein lies the major risk in the older age-group of patients. The above described method, due to its less invasive nature, reduces the risk of bleeding and the need for transfusion and thus reduces mortality and morbidity.

References