Case report

Complex and extensive infective endocarditis: a novel surgical approach


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Abstract

Endocarditis involving the central fibrous body of the heart requires carefully planned surgical intervention. We present a novel approach in a 65-year-old male with extensive endocarditis involving the aortic root, ventricular septum, central fibrous body together with mitral, aortic and tricuspid valves. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

Infective endocarditis presents a surgical challenge which becomes formidable when the process extends beyond the valve leaflets and destroys the annulus and surrounding structures with fistula and abscess formation. We describe a novel surgical approach to repair a complex and extensive endocarditic defect involving the left-sided heart valves, central fibrous body, the ventricular septum and the tricuspid valve.

2. Case report

A 65-year-old male presented with a 10-week history of malaise, weight loss and exertional dyspnoea. He had previously been well and in particular had neither a history of rheumatic fever nor recent dental work. On examination he was pyrexial, cachectic and clubbed, with clinical features of moderate aortic regurgitation. Investigations revealed elevated inflammatory markers and blood cultures isolated streptococcus mitis, sensitive to penicillin. A transesophageal echocardiogram (TEE) demonstrated extensive vegetations involving the aortic valve, anterior mitral valve leaflet and the intervening fibrous tissue (Fig. 1). In addition the infection involved the aortic root leading to abscess formation. Moderate aortic and mitral regurgitation into a dilated left ventricle with impaired systolic function was clearly visible. He was promptly commenced on appropriate intravenous antibiotics, and surgical intervention, which would sacrifice the central fibrous body of the heart, was carefully planned.

Following median sternotomy the external appearance of the heart and ascending aorta was unremarkable. Following the institution of aortobicaval cardiopulmonary bypass (CPB) and cardioplegic arrest further inspection through an aortotomy revealed a large abscess cavity that had completely disrupted aorto-mitral continuity. The infection had tracked in several directions to involve the roof of the left atrium, anterior leaflet of the mitral valve, aortic valve and annulus, ventricular infundibular septum and a portion of the inter-atrial septum through to the tricuspid valve. Radical debridement was undertaken including the entire aorto-mitral curtain producing a picture reminiscent of an atrioventricular septal defect (Fig. 2). Without the availability of a composite mitral/aortic homograft, two aortic homografts were used; the first as an aortic root replacement with coronary reimplantation employing the anterior mitral leaflet of the homograft to close the ventricular septal defect created by debridement. Through a left atriotomy, the second homograft was used in an inverted ‘top-hat’ style and sutured to the remnants of the mitral annulus. The central supporting area of the heart was reconstructed by suturing the adjoining parts of the two homografts together. In addition bovine pericardium was used to close off defects created in the roof of the left atrium, the right ventricular septal attachment, the infundibular fold and the inter-atrial septum. A quadrantic resection and annuloplasty was performed on the infected septal leaflet of the tricuspid valve.

After discontinuing CPB, TOE showed functional obstruction of the mitral homograft caused by excessive posterior displacement of the newly created central fibrous
body. The solution was partial explantation of the inverted homograft and replacement with a 27-mm bileaflet mechanical prosthesis after reinstituting CPB. The anterior portion of the mitral homograft was retained to provide strength and substance to which the mechanical prosthesis could be attached (Fig. 3).

Initial postoperative recovery was uneventful although permanent pacemaker implantation for complete heart block was needed after 10 days. The patient then developed haemodynamically significant haemorrhage from a duodenal ulcer. Emergency endoscopic treatment failed, and in view of the need for long-term systemic anticoagulation partial gastrectomy was performed to avoid any propensity for further bleeding. Small bowel obstruction complicated the partial gastrectomy, which failed to resolve with expectant treatment. A second laparotomy identified small bowel adhesions at the duodenal suture line. These were divided and a duodenal fistula was fashioned, which after prolonged total parenteral nutrition was reversed and oral intake reintroduced. The patient was discharged 2 months following cardiac surgery. During outpatient follow-up at 4 months he was progressing well with good exercise tolerance (New York Heart Association (NYHA) Class I/II) and blood tests revealed normal inflammatory markers. Echocardiography demonstrated moderate ventricular function without any significant valvular dysfunction.

3. Comment

Involvement of the fibrous skeleton of the heart in patients with infective endocarditis is not uncommon and can represent a major surgical challenge. David et al. reported a series of 43 patients (14 with endocarditis) undergoing aortic and mitral prosthetic valve replacements in whom the intervalvular body was replaced with either a patch of Dacron or bovine pericardium [1]. There were seven operative deaths and two patients required reoperation due to early prosthetic valve endocarditis. They concluded that reconstruction of the intervalvular fibrous body during aortic and mitral valve replacement is a satisfactory technique in patients with complex valve annular pathology.

Successful combined aortic and mitral homograft valve replacements for endocarditis have previously been reported [2]. However, the fibrous skeleton of the heart was unaffected in this case. The nature and extent of infective destruction of the intracardiac structures in this case report were indeed among the most spectacular examples in our recent experience. The severe endocarditic destruction in our case involved the entire aorto-mitral curtain with loss of the central fibrous body of the heart and precluded attempts to retain any portion of the anterior mitral valve leaflet for subsequent reconstruction. In less extreme cases, a less radical approach would be feasible with part preservation of the anterior mitral leaflet accompanied by pericardial patch restoration of aorto-mitral continuity. Indeed we have employed this technique on occasions when such a situation existed. However, in the present example the anterior mitral leaflet of the homograft used to reconstruct the aortic root facilitated closure of the large infundibular ventricular septal defect. If we instead
chose to implant the aortic homograft in such a way as to utilise the anterior mitral leaflet as a natural substitute for the native mitral valve, subsequent patch reconstruction of the ventricular septal defect would have been equally complex and time-consuming thus leaving us with no real advantage. The surgical strategy hence adopted was previously unreported and consisted of two aortic homografts, one inverted and sutured to the other: this technique allowed both the aortic and mitral valves to be replaced with concomitant repair of the central fibrous body. The extensive nature of the defects stipulated additional reconstruction of the tricuspid valve, ventricular and inter-atrial septae. The homograft in the mitral position was initially obstructive due to the high wall tension in the anteriorly placed aortic root homograft acting against an undersized mitral homograft. An appropriately sized prosthesis may have averted this particular problem although accurate preoperative radiographic assessment of optimal valvular dimensions in this clinical situation is difficult to obtain in practice. Without the immediate availability of another appropriate homograft, implantation of a non-collapsible mechanical prosthesis underlies the principle of our strategy. Suturing a mechanical valve directly onto the posterior rim of an aortic homograft posed the real danger of the sutures cutting out perioperatively with devastating consequences. The presence of the mitral homograft remnant following partial explantation provided much stronger anchorage for the mechanical prosthesis in addition to its superior haemostatic property.

Fig. 2. (a) Photograph and (b) line-drawing: view through the aortic root into the left ventricular outflow tract after surgical debridement showing extensive destruction of the central fibrous body with aorto-mitral discontinuity. The crest of the interventricular septum (IVS) is visible in the centre of the surgical field. The intercoronary sinus commissures (CC) and coronary buttons (LCB, RCB) can be clearly seen.

Fig. 3. Schematic drawing of a long-axis view of the left heart showing the relations of the two homografts and the eventual implantation of a mitral mechanical prosthesis (inset). LA, left atrium; LV, left ventricle; PMVL, posterior mitral valve leaflet; AMVL, anterior mitral valve leaflet.
In summary, when an ideal composite aorto-mitral homograft is unavailable for repairing such a complex and extensive endocarditic defect, this ‘double homograft’ technique provides an initial solution to reconstruct the decimated left-sided heart valves, restoring the central fibrous body and creating a neo-mitral annulus for the subsequent implantation of a mechanical prosthesis.

References
