Paraprosthetic leak closure 28 years after mitral caged-ball Starr-Edwards implantation

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Abstract

In this case report, we present a patient 28 years after mitral valve replacement with the Starr-Edwards prosthesis complicated by paraprosthetic leak with severe aortic stenosis and moderate tricuspid regurgitation. We successfully repaired the paraprosthetic regurgitation in a patient with extensive mitral annular calcification, without replacement of the valve. No apparent structural deterioration on the caged-ball valve was found. Moreover, aortic valve replacement and tricuspid annuloplasty were performed. One month after reoperation, the patient remained stable with improved clinical status and without any evidence for further paravalvular leak.

Keywords: Valve disease

INTRODUCTION

Since the introduction of the Starr-Edwards ball valve for replacement in the mitral position in 1961, and in the aortic position in 1963, it has gained worldwide clinical acceptance. Many studies have shown the excellent long-term durability of the Starr-Edwards valve for up to 30 years or even longer follow-up periods [1]. However, reoperation after valve replacement with the Starr-Edwards ball valve prosthesis is often unavoidable. Some potentially life-threatening complications have been documented, including paravalvular leakage, ball variance, severe haemolytic anaemia, infective endocarditis, pannus formation, thrombosis and thromboembolic events [2]. Continual improvement in the materials and design used for the prosthetic valves has reduced some of these complications. We report a case of clinically significant complications resulting from paraprosthetic leak of the well-functioning Starr-Edwards mitral ball valve almost three decades after implantation. Paravalvular leaks are not uncommon after surgical mitral valve replacement with incidence reported from 2 to 17% [3]; most of these become apparent in the first half-year after the operation.

CASE REPORT

A 72-year old man with a history of insulin-dependent diabetes mellitus Type 2, atrial fibrillation, pacemaker implantation, coronary artery stenting and a mechanical mitral valve implantation was admitted to our centre. The patient had previously undergone open mitral commissurotomy for severe rheumatic mitral stenosis in 1968. Fourteen years later, he developed severe mitral restenosis, for which he required reoperation. Mitral valve

replacement was performed with a Starr-Edwards ball valve (Edwards Lifesciences, Irvine, CA, USA) in 1982. He reported no serious complaints until the last few years, when the deterioration of his clinical status occurred. At admission, the patient presented increasing dyspnoea with New York Heart Association (NYHA) functional Class III–IV. Clinical examination revealed a systolic murmur over the right second intercostal space and peripheral oedema. Laboratory values were significant for moderate haemolytic anaemia with haemoglobin 9.6 g/dl, reticulocytes 3.2%, lactate dehydrogenase 632 U/l and indirect bilirubin 2.16 mg/dl.

Transthoracic echocardiography revealed severe aortic valve stenosis as well as moderate tricuspid valve regurgitation and demonstrated a well-functioning Starr-Edwards mitral prosthesis with moderate regurgitation, but no obvious evidence for a paravalvular leak. For further evaluation, a transoesophageal echocardiography was performed. This confirmed the presence of regurgitation but, finally, real-time three-dimensional (3D)-echocardiography showed a significant paravalvular leak at the P2-segment of the mitral annulus and visualized the dehiscence segment (Fig. 1).

At operation, via a median sternotomy and a septectomy through a right atriotomy, the mitral prosthesis was visualized. Direct assessment confirmed that the mitral caged-ball prosthesis was intact and was considered to have no dysfunction. An area of dehiscence in the sewing ring was identified (Fig. 2, left panel). The mitral annulus was deeply calcified, which made valve replacement very difficult to perform. We chose the conservative approach. The paravalvular leak was closed with four U-shaped pledgeted mattress sutures (Fig. 2, right panel). Next, aortic valve replacement with a 23-mm St. Jude Medical valve and tricuspid annuloplasty with a 34-mm Edwards MC3 tricuspid ring were performed. Postoperatively, transoesophageal echocardiography documented no residual paravalvular leak.

Figure 1: Preoperative 3D transoesophageal echocardiography imaging of the Starr-Edwards mitral prosthesis. The left panel shows the site of the dehiscence (arrow). The right panel shows the paraprosthesis leak (arrow). See the corresponding intraoperative picture (Fig. 2).

Figure 2: Intraoperative picture of a Starr-Edwards mitral prosthesis showing the site of the paraprosthesis leak (arrow) in the left panel and a Starr-Edwards mitral prosthesis after closure of the paraprosthesis leak (arrow) in the right panel.

The patient's postoperative course was complicated by a small intrapericardial haematoma, but no surgical intervention was required and he was discharged home 17 days following the procedure. The patient's clinical symptoms improved, and the haemolytic anaemia had resolved.

COMMENT

Starr-Edwards caged-ball prostheses were widely used with excellent long-term results for many years; however, these valves showed an impaired haemodynamic profile, especially in the aortic position. An increased rate of thromboembolic complications was also reported. Some authors found structural changes in the prosthesis occurring over time. Since some operative findings such as cloth wear or pannus formation cannot always be detected on routine echocardiographic examination, recommendations to perform prophylactic valve exchange were also presented to prevent valve-related complications [2]. However, in many studies, a Starr-Edwards valve was found to be functioning properly many years after implantation [1]. Valve replacement many years after implantation is often difficult because of extensive calcification of the mitral annulus and is associated with increased mortality [4]. In our case, the primary indication for operation was severe, symptomatic aortic stenosis. Additionally, a paraprosthesis leak with moderate regurgitation and haemolysis was present in our patient. Intraoperatively, we found a

properly functioning prosthetic valve without any morphological signs of dysfunction except for the periprosthetic leak. On the other hand, mitral annulus calcification was so extensive that mitral valve replacement would be very difficult to perform, and the possibility of a recurrent leak was high. Therefore, direct closure of the paravalvular leak was an alternative treatment to valve replacement for this difficult, high-risk case.

Some repair techniques such as transmural stitches, patch curtaining of the leakage area, Teflon felt strips as reinforcement, use of atrial septal tissue or single U-shaped pledgeted sutures (like in our case) have been previously described [3, 5]. A useful technique for a rotatable mechanical prosthesis (bileaflet or tilting disk) was described by Moneta *et al.* [3].

We decided to close the leak using the standard technique of repair with single U-shaped pledgeted sutures because of the small detachment size. If the size of the dehiscence is moderate, an alternative closure method with a patch might provide greater durability. If multiple or large leaks occur, prosthesis replacement might be a suitable approach.

Our case demonstrates the excellent durability of the Starr-Edwards prosthesis and that mandatory valve replacement is not always required. This case also reminds clinicians of the limitations of transthoracic echocardiography in the diagnosis of prosthetic valve function. It emphasizes the importance of transoesophageal echocardiography and the value of real-time 3D echocardiography in addition to traditional two-dimensional methods in assessing valve prosthesis.

Conflict of interest: none declared.

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