CASE REPORT

Solo Smart Stentless Bioprosthesis for Infective Valve Endocarditis with Aortic Annular Abscess

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Summary

So far, there is still controversy regarding the optimal prosthetic valve for patients with active infective valve endocarditis with annular abscess. Here, we report the case of a 65-year-old woman who was diagnosed with infective endocarditis associated with extensive annular abscess. The patient underwent debridement of the abscess cavity followed by aortic valve replacement using a Solo Smart (SS) stentless bioprosthesis. Postoperative recovery was uneventful, with no signs of recurrent infection. Since the SS valve is designed for supra-annular and subcoronary implantation, it is considered to be an alternative to conventional prosthetic valves in patients with infective endocarditis with aortic annular abscess.

Key words: Infective endocarditis

The Solo Smart (SS) valve (Sorin Group, Saluggia, Italy) is a bovine pericardial stentless bioprosthesis with a hemodynamic performance superior to that of stented valves.1,2 This bioprosthesis is specially designed for supra-annular and subcoronary implantation. Here, we report its use for the successful surgical treatment of active infective endocarditis with extensive annular abscess. Our patient underwent aortic valve replacement (AVR) using the SS stentless valve via its specific implantation technique. Written informed consent was obtained from the patient for the publication of this report.

Case Report

A 65-year-old woman with a high fever was previously treated with antibiotics for pyogenic spondylitis by an orthopedist at a local hospital. Her blood culture was positive for alpha-Streptococcus. Ceftriaxone (4 g/24 hours, intravenous, in two equally divided doses) was started as antibiotic therapy. Her fever did not subside one week after admission, and she developed progressive severe respiratory failure requiring mechanical ventilation with endotracheal intubation. Echocardiography revealed both aortic and mitral destruction and the presence of a large mass, resulting in severe valvular insufficiency, as well as a left ventricular ejection fraction of 79% (Figure 1). Furthermore, markedly thickened and distorted aortic valve leaflets with an 8 × 6 mm mobile mass on the left ventricular aspect of the aortic valve, which was consistent with vegetation, were observed (Figure 1). Active infective endocarditis was diagnosed as the cause of severe congestive heart failure. She was referred to our institution and emergent surgery for infective endocarditis was performed.

After the median sternotomy, cardiopulmonary bypass was established with ascending aortic and bicaval cannulation. After aortic cross-clamping, cardiac arrest was induced by infusion of retrograde cold blood cardioplegic solution. The ascending aorta was opened transversely. The right and noncoronary cusps were severely damaged by the infection, which extended beyond the valvular leaflets. The diseased aortic valve with vegetation was resected, followed by antegrade selective cardioplegia (Figure 2A). A para-annular abscess was noted in the aortic valve annulus, encompassing more than one-third of its circumference (Figure 2B). After debridement of the abscess cavity, it was left open. Although no pseudoaneurysmal formation was observed, the radical debridement resulted in a large annular defect, which included the areas of the right and noncoronary cusps. Therefore, the standard annular implantation of a conventional prosthetic valve was considered to be difficult. We decided to use the SS stentless valve, which allows supra-annular implantation. The aortic annular diameter was measured and, according to the manufacturer’s instructions, a 23 mm SS stentless valve was implanted supra-annularly in the sinuses of Valsalva using three continuous 4-0 polypropylene sutures (Figures 3, 4). After completion, the sutures were tied extra-aortically and the aortotomy was closed. The mitral valve was inspected through the transseptal approach. The diseased segment of the posterior leaflet was resected triangularly and resutured with interrupted 5-0...
polypropylene stitches, followed by annuloplasty using a 28 mm Carpentier-Edwards Physio II ring (Edwards Lifesciences, Irvine, CA, USA). After the completion of mitral valve plasty, the interatrial septum was closed. The duration of cardiopulmonary bypass was 199 minutes, and the aortic cross-clamping time was 150 minutes. Postoperative recovery was uneventful, and no arrhythmia was observed. Sulbactam/ampicillin (12 g/24 hours, intravenous, in four equally divided doses) and gentamicin (150 mg/24 hours, intravenous, in three equally divided doses) were administered for six weeks after the operation. The patient showed no signs of recurrent infection during the follow-up. Echocardiographic examination at one-year follow-up demonstrated good valvular function of the SS stentless valve and no regurgitation of the mitral valve (Figure 5). The mean transvalvular gradient of the prosthesis was 9.6 mmHg.

Discussion

To date, there is still controversy regarding the optimal type of valve replacement and specific prosthesis in patients with aortic valve endocarditis with annular ab-
Figure 4. Operative procedure. **A:** The SS bovine pericardial stentless bioprosthesis. **B:** Schematic drawing of the aortic root. The large annular defect after the radical debridement of the aortic annular abscess (black arrows). **C:** Supra-annular implantation of the SS valve without annular stitches. The external pericardial cuff of the SS valve was sutured to the wall of the sinus of Valsalva.

Figure 5. Postoperative transthoracic echocardiography. **A:** Long axis view of the SS valve. **B:** Short axis view of the SS valve. LV indicates left ventricle; and Ao, aorta.

The standard surgical approach to annular abscesses is (1) debridement of the abscess followed by (2) patch closure using autologous pericardium. Subsequently, standard annular implantation of a prosthetic valve is performed. However, if a large annular defect is present after debridement, standard AVR techniques requiring annular stitches are considered to be difficult. In patients with extensive infective endocarditis, aortic root replacement is sometimes inevitable instead of a standard AVR because of the large annular tissue defect after radical debridement. A composite graft bearing a mechanical or stented bioprosthetic valve, the Freestyle valve (Medtronic Inc., Minneapolis, MN, USA), and a homograft is considered for aortic root reconstruction. Aortic root replacement for extensive infective endocarditis is still a challenging operation associated with high periprocedural mortality and morbidity. Furthermore, a homograft is not always available, which is considered to be an ideal aortic root conduit for extensive infective endocarditis.

Aortic valve reconstruction using autologous pericardium, called the Ozaki procedure, was recently introduced as an attractive alternative to conventional prosthetic valve replacement in patients with infective endocarditis. However, the pericardial cusps have to be sutured to the aortic annulus even in the Ozaki procedure. Therefore, this procedure is not appropriate in patients with a large annular defect.

The SS valve is a bovine pericardial stentless bioprosthesis with excellent hemodynamic performance. According to the report of a large, multicenter, European study, the Freedom Solo (FS) bovine pericardial stentless valve, which is the same as the SS stentless valve, showed excellent long-term durability and hemodynamic performance. Freedom from structural valve deterioration and re-
operation was 90.8% and 87.3%, respectively, at 10 years of follow-up. It was concluded that the FS bovine pericardial stentless valve was expected to be a reliable bioprosthesis in the aortic position as a valid alternative to stented bioprostheses and associated with simple implantability.

The SS stentless valve is sutured using three running sutures above the aortic annulus according to the standard reported technique. A peculiar characteristic of the SS valve is its supra-annular implantation within the sinus of Valsalva, which does not require annular sutures. The supra-annular fixation spares the impaired and inflamed subannular tissue and abscess. Recently, the FS bovine pericardial stentless valve has been used for the surgical treatment of infective endocarditis.

A recent multicenter study showed the surgical results of 59 patients with extensive infective endocarditis who underwent AVR with the FS bovine pericardial stentless valve. All patients in this study presented with annular tissue infection, and 54.3% of them had annular abscess. Although early mortality was considerably high (15.2%) because of the complexity of the cases, survival freedom from reoperation and endocarditis at 10-year follow-up was 88.0% and 86.7%, respectively. In spite of the complex nature of the patients’ characteristics, late survival outcomes were comparable to the more technically demanding aortic root replacement using a homograft and the Freestyle valve, with low rates of endocarditis recurrence. Furthermore, stentless bioprostheses have demonstrated low reinfection rates and excellent hemodynamic performance, comparable with those of homografts.

Conversely, Schaefer et al. reported that the survival of patients who underwent AVR using the FS bovine pericardial stentless valve for native valve endocarditis and the clinical outcomes in terms of structural valve deterioration and prosthetic valve endocarditis rates were inferior compared with the stented pericardial valve. Although patients with extensive annular damage may benefit from the supra-annular implantation technique, the authors were reluctant to recommend its utilization for the treatment of native valve endocarditis.

Needless to say, AVR in extensive infective endocarditis should follow a tailored approach for each individual patient. Moreover, we consider the SS stentless valve as a useful alternative to conventional prosthetic valves in patients with active infective endocarditis and annular abscess. The SS stentless valve is also expected to be a simple, less invasive, technically less demanding alternative to aortic root replacement. Furthermore, it is considered as an ideal prosthesis for redo AVR patients who sometimes lack a normal annular structure.

In patients with infective endocarditis of the aortic valve, mitral valve involvement is frequently observed, and a simultaneous mitral procedure is required. Recently, mitral valve plasty replaced prosthetic valve replacement as the first-line surgery, even in patients with infective endocarditis. In order to perform mitral valve plasty, good surgical exposure is necessary. In patients undergoing AVR with mechanical or stented bioprostheses, surgical exposure of the anterolateral area of the mitral valve is sometimes inadequate owing to the interference of the aortic prosthesis. The prosthesis may distort the mitral valve, making accurate plasty and its evaluation difficult. However, stentless bioprostheses do not influence the natural mitral annular geometry. The use of the SS stentless valve is expected to maintain an accurate mitral annular shape suitable for performing valve plasty. It also allows for simultaneous valve surgery without posing any technical difficulties.

In contrast to conventional prosthetic valves that necessitate annular stitches, the approach to implantation of the SS stentless valve is simple, but it has not been standardized yet and is more surgeon-dependent. Special attention should be paid to the patient’s root anatomy, correct sizing, and symmetric implantation, since any malpositioning can lead to tissue fatigue over time, leading to structural valve deterioration. Therefore, better outcomes with the SS stentless valve depend on optimal patient selection and on recognizing its limitations.

In conclusion, high-risk patients with infective endocarditis accompanied by annular abscess, a small aortic annulus, and those who require concomitant mitral valve surgery and redo AVR may profit from SS stentless valve implantation.

Disclosures

Conflicts of interest: None.

References