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CASE REPORT / OLGU SUNUMU

Repair of severe aortic insufficiency and stenosis after Ozaki surgery with Perceval™ aortic valve

Ozaki ameliyatı sonrası ciddi aort yetmezliği ve darlığının Perceval™ aort kapak ile tamiri

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ABSTRACT

The Ozaki technique is a novel technique which involves constructing a new aortic valve with autologous pericardium. The Perceval™ aortic valve is a foldable, stent-inserted aortic valve bioprosthesis that can be placed seamlessly. In a 58-year-old female patient who previously underwent the Ozaki procedure, severe aortic regurgitation and aortic valve stenosis were observed and surgical repair was performed using a Perceval™ valve. Only a trace amount of paravalvular aortic regurgitation was detected in the control echocardiography. The patient was uneventfully discharged five days after the operation. In conclusion, aortic valve replacement with the Perceval™ valve after the Ozaki procedure is an alternative that should be kept in mind in selected cases.

Keywords: Aortic valve, Ozaki procedure, Perceval™ valve.

ÖZ

Ozaki tekniği, otolog perikart ile yeni bir aort kapak yapılmasını içeren yenilikçi bir tekniktir. Perceval™, dikişsiz bir şekilde yerleştirilebilen, katlanabilir, stent takılı bir aort kapak biyoprotezidir. Daha önce Ozaki işlemi uygulanmış 58 yaşındaki kadın hastada ciddi aort yetmezliği ve aort kapak darlığı izlendi ve Perceval™ kapak ile cerrahi onarımı yapıldı. Hastanın kontrol ekokardiyografisinde yalnızca eser miktarda paravalvüler aort yetersizliği saptandı. Hasta ameliyattan beş gün sonra sorunsuz bir şekilde taburcu edildi. Sonuç olarak, Ozaki işlemi sonrası Perceval™ kapak ile aort kapak replasmanı belirli hastalarda akılda tutulması gereken bir seçenektir.

Anahtar sözcükler: Aort kapak, Ozaki işlemi, Perceval™ kapak.

In the field of cardiovascular surgery, the quest for innovative techniques and procedures has led to significant advancements in treating aortic valve diseases. One such ground-breaking procedure is the Ozaki procedure, named after its developer, Dr. Shigeyuki Ozaki.[1] The Ozaki procedure is a valve-sparing aortic root replacement technique that involves the reconstruction of the aortic valve using autologous pericardium. By utilizing the patient's own pericardium, the Ozaki procedure eliminates the need for foreign materials, such as mechanical valves or bioprosthetic substitutes. This preserves the native valve tissue, potentially avoiding complications associated with prosthetic materials and the need for long-term anticoagulation.[2] The Ozaki procedure requires a skilled and experienced cardiovascular surgeon owing to its technical complexity. Early studies have shown promising results, while long-term data regarding the durability and outcomes of the Ozaki procedure are still relatively limited.[3,4] Not all patients are suitable candidates for the Ozaki procedure. Several factors such as severe calcification, extensive tissue damage, or associated comorbidities may preclude the use of this technique.

The Perceval™ (Sorin Group S.p.A., Saluggia, Italy) valve represents a significant leap forward in aortic valve replacement procedures, offering several advantages over traditional surgical techniques. The Perceval™ aortic valve features a collapsible frame made of self-expanding nitinol, a nickel-titanium alloy, covered with bovine pericardium leaflets.

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This unique design eliminates the need for sutures during implantation, making it a sutureless valve. The elimination of sutures simplifies the procedure and reduces cross-clamp and cardiopulmonary bypass (CPB) times, leading to shorter operative durations and potentially decreased complications.[5] While the Perceval™ aortic valve presents numerous advantages, it is essential to acknowledge potential challenges and considerations including the risk of paravalvular leak, the need for appropriate patient selection, potential valve migration or embolization, and the long-term durability of the valve.[6]

If reoperation is required after Ozaki procedure, the Ross procedure (particularly for children), surgical aortic valve replacement and transcatheter aortic valve implantation (TAVI) can be considered. Surgical replacement outcomes are still more favorable than the TAVI procedure.[2,4] In this article, we report the first case of Perceval™ valve implantation for aortic valve failure after Ozaki procedure.

CASE REPORT

A 58-year-old female patient who underwent aortic valve surgery with the Ozaki procedure for severe aortic regurgitation four years ago was applied to our clinic with the complaint of severe dyspnea and palpitation that recently occurred. Her preoperative New York Heart Association (NYHA) score was Class 3. The left ventricular ejection fraction (LVEF) was 35%, and severe aortic insufficiency and aortic valve stenosis were detected. In the preoperative echocardiography, left ventricular dimensions were found to be 50 mm for end-diastolic, 44 mm for end-systolic with a left atrial diameter of 39 mm, an aortic valve velocity of 3.5 m/sec, and an aortic valve area of 0.4 cm^2. Aortic valve peak gradient was measured as 49 mmHg (Figure 1). On the catheter examination, left ventricular pressure was measured as 166/0 (31) mmHg, aortic pressure as 125/70 (91) mmHg, and peak aortic valve gradient as 91 mmHg with severe aortic insufficiency. On the preoperative thoracic computed tomography, the aortic root was measured as 18 mm and severe calcification was detected at the aortic valve level (Figure 2). In the preoperative laboratory tests, creatine was 0.82 mg/dL, C-reactive protein (CRP) was 1.62 mg/L, and leukocyte count was 7,980/mm^3. No abnormal additional value was detected. The patient's EuroSCORE II value was calculated as 4.06. The patient was taken into operation and connected to CPB with femoral arteriovenous catheterization and sternotomy was performed. Cardiac arrest was achieved by selectively administering cold blood cardioplegia after aortotomy. Visual examination of the resected aortic valve revealed degeneration, commissure adhesion and retraction in all three leaflets. There was no vegetation or similar finding suggesting degeneration due to infection. The valves made with the Ozaki procedure were resected and a small size Perceval™ aortic valve was placed. Aortic

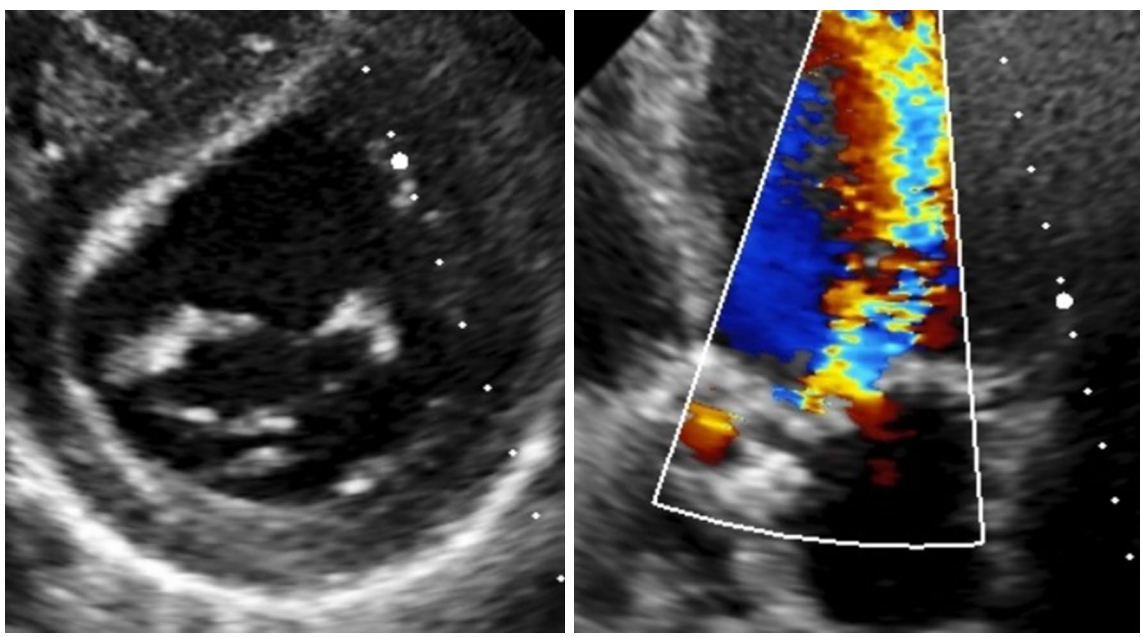

Figure 1. Preoperative aortic valve, aortic valve stenosis and insufficiency, echocardiographic views.

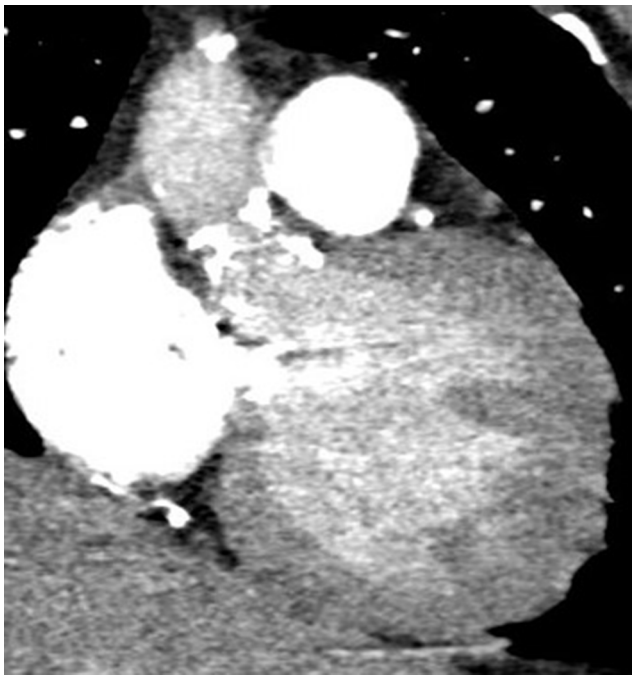

Figure 2. Preoperative aortic root, severe calcification, narrow aortic root, thoracic computed tomography.

cross-clamp time was 37 min and CPB time was 55 min. The patient was weaned from CPB in normal sinus rhythm without positive inotropic support. The patient, who was extubated at the ninth postoperative hour, was discharged from the intensive care unit on the postoperative Day 2. The total amount of drainage was recorded as 670 mL. No blood product replacement was performed during the postoperative intensive care unit stay. Postoperative echocardiography revealed trace aortic insufficiency and a peak gradient of 32 mmHg in the aortic valve. The patient, whose medical treatment was arranged, was discharged from the hospital on postoperative Day 5.

DISCUSSION

The Ozaki procedure has emerged as an alternative to conventional aortic valve replacement, employing meticulous customization and preservation of the native valve apparatus.[1,2] Despite the success of the Ozaki procedure, a subset of patients may require reoperation due to valve dysfunction or disease progression. In a recent study by Ozaki et al.[4] reported that, at 10 years, the rate of freedom from reoperation was 91.2% and the main reasons for reoperation were aortic regurgitation and infective endocarditis, while severe aortic valve stenosis was not considered. The use of nonotologous pericardium to create the valve, small cusp size, small annulus size, and high creatinine levels were associated with a higher mean postoperative gradient. Patients who undergo tricuspidization to match their native aortic valve size have a lower risk of aortic regurgitation after five years, and patients over 70 years of age have a slightly higher risk of long-term aortic valve regurgitation.[4] Traditional sternal re-entry for redo aortic valve replacement carries inherent risks, such as prolonged surgical time, increased bleeding, higher infection rates, and potential damage to surrounding structures. As a result, alternative approaches have been sought to minimize these complications and improve patient outcomes. Mechanical valve replacement was not considered for this patient, due to the narrow aortic root, aortic root calcification and surgical technique that would prolong the operation time, and the TAVI procedure was not considered due to the low EuroSCORE II.

The Perceval™, a sutureless aortic valve prosthesis, has emerged as a valuable option for patients requiring reoperation after the Ozaki procedure. The Perceval™ valve offers numerous benefits, including reduced cross-clamp time, minimized trauma to the myocardium, simplified surgical techniques, and potentially shorter hospital stays.[5] Moreover, available data from several studies investigating the Perceval™ valve and the Ozaki procedure suggest favorable outcomes.[6] These outcomes include improved postoperative hemodynamics, reduced surgical times, and decreased rates of complications. The Perceval™ valve replacement has been considered as a viable option in patients with narrow aortic root and severe aortic root calcification, particularly in redo patients, to reduce operative time and reduce technical risks, including the Ozaki procedure. Further larger-scale clinical trials and comprehensive follow-up studies are warranted to evaluate the clinical outcomes, prosthesis durability, and quality of life of patients.

In conclusion, the Perceval™ sutureless aortic valve replacement holds great promise as a ground-breaking solution for patients requiring reoperation after the Ozaki procedure. Its unique design, simplified implantation, and potential for improved outcomes make it an attractive option in the field of aortic valve surgery. As further evidence emerges from clinical studies, the Perceval™ valve has the potential to revolutionize the management of aortic valve disease, providing patients with a safer, more effective, and successful surgical approach.

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Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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