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Aortic valve neocuspidization using the Ozaki Technique for bicuspid aortic valve: The first case at Central Military Hospital of Azerbaijan

Abstract

Conventional aortic valve replacement (AVR) remains the standard treatment for aortic valve stenosis or insufficiency, but emerging techniques focus on valve reconstruction rather than replacement. One such method is the Ozaki procedure, which involves replacing each valve leaflet with glutaraldehyde-treated autologous pericardium to restore the natural anatomy of the aortic valve. Although challenging, especially for bicuspid aortic valves, this technique has shown success after a learning period. We report the case of a 54-year-old woman with a history of colorectal cancer, who underwent surgery for severe stenosis of a bicuspid aortic valve using tricuspidization with glutaraldehyde-treated autologous pericardium.

Keywords: Aortic valve reconstruction, bicuspid aortic valve disease, aortic valve neocuspidization

INTRODUCTION

Aortic valve disease is common in Western countries, with aortic valve stenosis being more prevalent than aortic valve insufficiency. For over thirty years, open surgical aortic valve replacement (AVR) has been the preferred treatment for symptomatic severe aortic stenosis (AS) (1,2). Mechanical valves are often used for younger patients due to their durability, while bioprosthetic valves are preferred for older patients to avoid long-term anticoagulants (2). Recently, less invasive techniques like transcatheter aortic valve implantation (TAVI) have emerged, primarily for high-risk patients unsuitable for traditional AVR. Advances in surgical approaches now focus on repairing the aortic valve. In 2011, Ozaki et al. introduced a method using glutaraldehyde-treated autologous pericardium to replace valve leaflets and restore normal aortic valve anatomy (3). The purpose of this case presentation is to highlight the advantages of the Ozaki technique and its applicability to various aortic valve pathologies. When executed with careful attention to technical details, this technique offers significant benefits, including improved hemodynamics in the postoperative period and the absence of vitamin K antagonists (VKAs) that require INR monitoring.

CASE REPORT

We present a 54-year-old woman with a BMI of 35, known bicuspid aortic valve, and moderate stenosis. Her medical history includes colorectal cancer and chemotherapy. Recent echocardiography revealed progression to severe stenosis (mean gradient 52 mmHg). Preoperative Transesophageal echocardiography (TEE) showed a bicuspid, highly calcified aortic valve with a narrow aortic root. Biological valve replacement would likely require root enlargement due to the patient's body mass index (BMI) and narrow aortic annulus. Given the narrow annulus and patient preference to avoid Coumadin, we recommended the Ozaki procedure.

Technical Description

The surgery began with a median full sternotomy. As described in the standard protocol, a 7 × 8 cm section of pericardium was harvested and treated with 0.6% glutaraldehyde. Cardiopulmonary bypass was established through cannulation of the distal ascending aorta and right atrium, and cold blood cardioplegia was used for cardiac protection. The aortic valve was exposed (Figure 1), and the annulus was decalcified. The diseased valve was excised, and the annulus size was measured with the OZAKI AVNeo Sizer System (Figure

2A, B). The treated pericardium was trimmed into three cusps and sewn into the aortic annulus using 4-0 Prolene sutures and a 13 mm HR needle. Tricuspidization was performed to create the new commissures (Figure 3). The procedure lasted 113 minutes on bypass, with the aortic cross-clamp in place for 89 minutes. Intraoperative

and postoperative echocardiograms confirmed the functionality of the new valve with optimal coaptation and gradients (Figure 4A, B). The patient had an uneventful hospital stay and was discharged on the sixth day. Six-month follow-up echocardiography showed peak and mean pressure gradients of 17 mmHg and 9 mmHg, respectively.

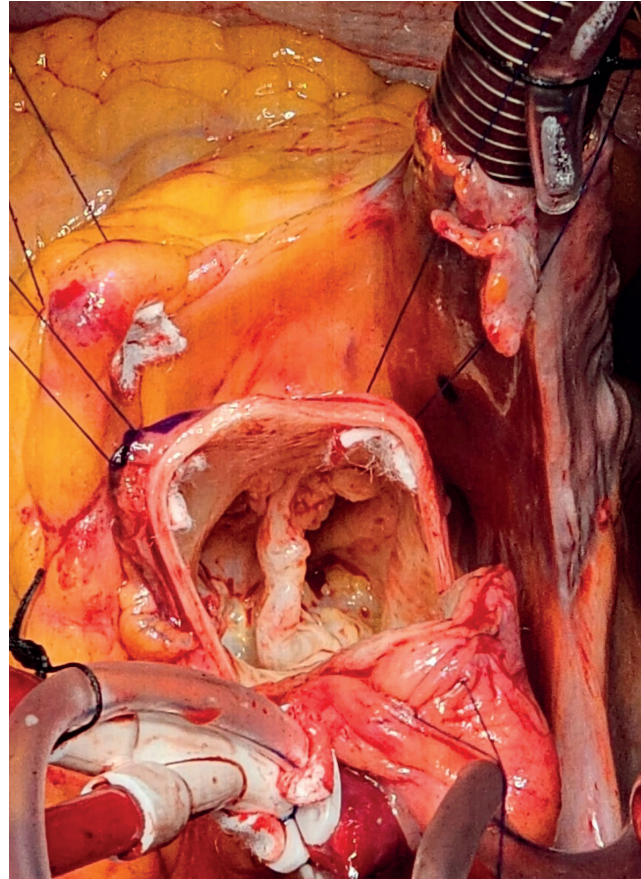


Figure 1. Preoperative view of a degenerated bicuspid aortic valve

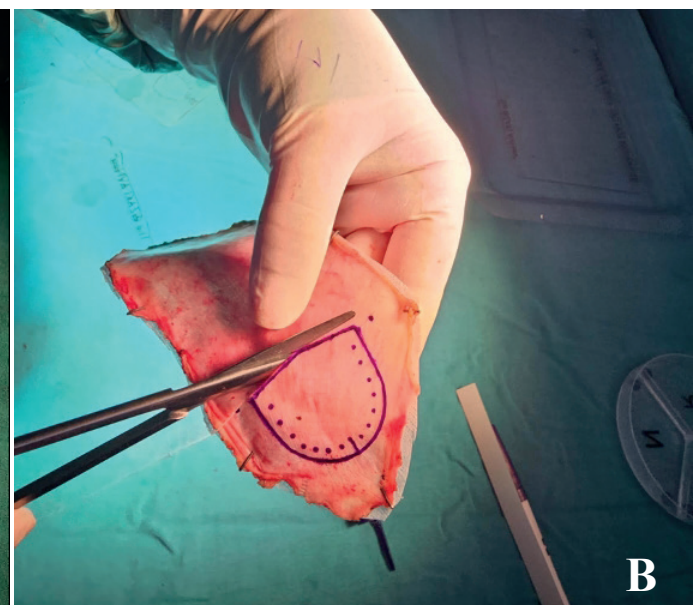
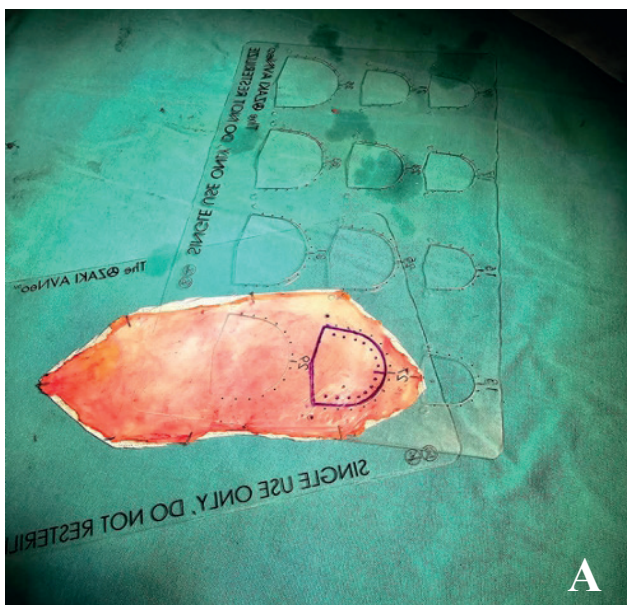


Figure 2. A. Preparation of pericard for AVNeo; B. Preparation of the pericardium for AVNeo

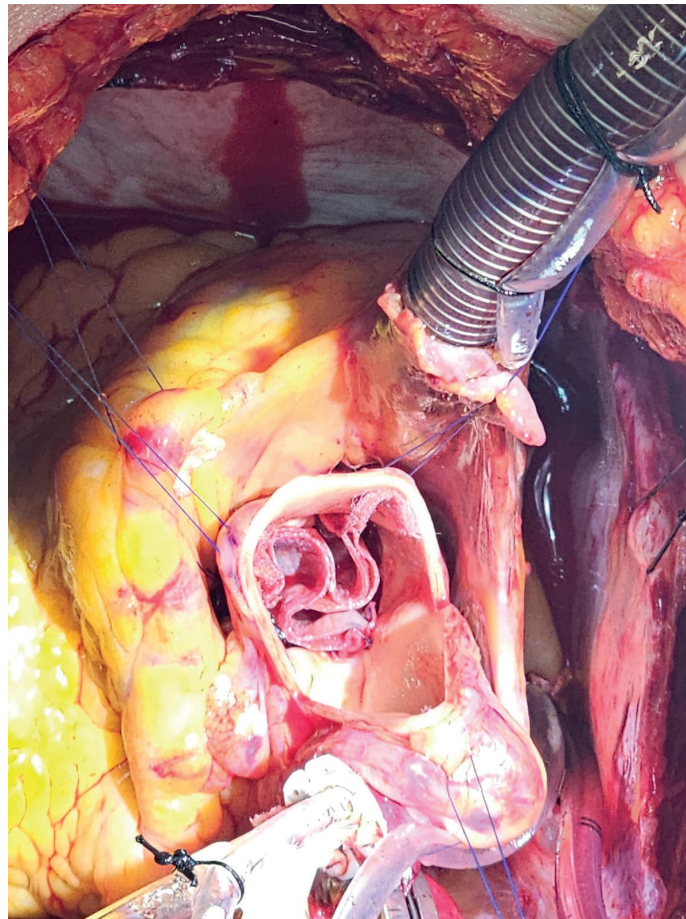


Figure 3. Newly created aortic neovalve using the tricuspidization technique

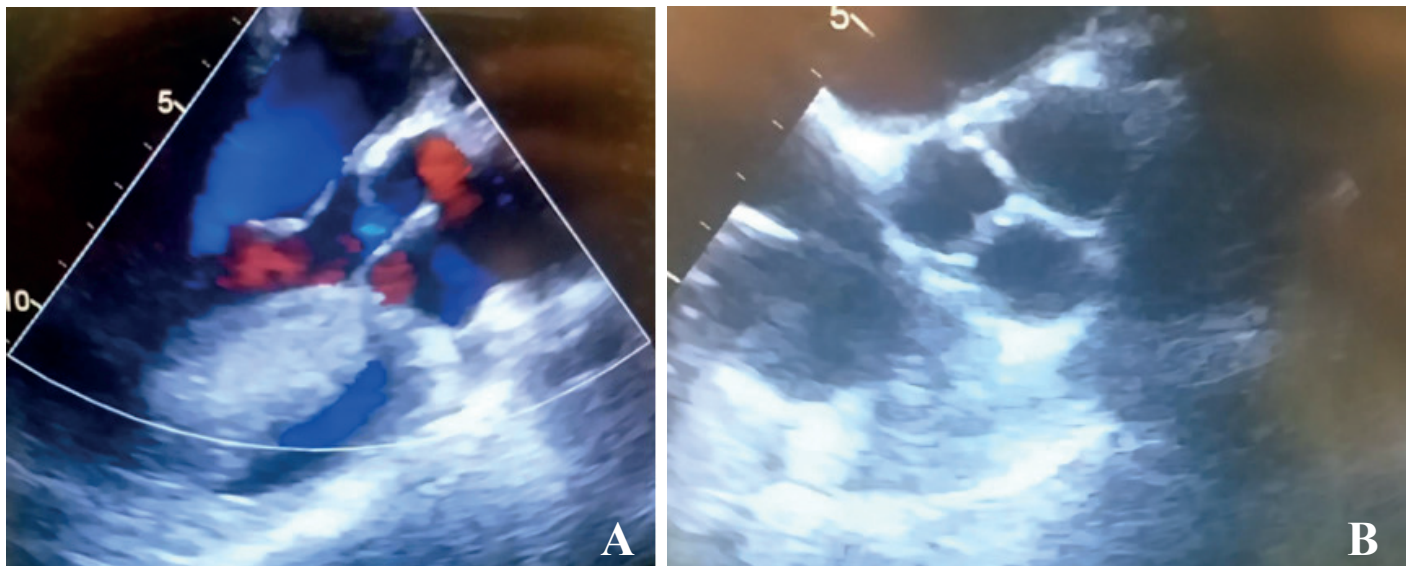


Figure 4. **A.** Intraoperative TEE view of the neovalve (mid-esophageal long-axis view); **B.** Intraoperative TEE view of the neovalve (mid-esophageal short-axis view)

DISCUSSION

Ozaki's technique for reconstructing aortic cusps is notable for its reproducibility and unique benefits (3,4). By sewing pericardium directly to the aortic annulus, the procedure maximizes the

valve orifice area and preserves normal transvalvular gradients. Without a stented frame, the aortic root can expand naturally, maintaining normal coordination between the left ventricle, aortic annulus, sinus of Valsalva, and ascending aorta (5). The

three new cusps positioned up to the sinotubular junction create a large coaptation area during diastole, which is crucial for long-term valve function (6). This method is suitable even for bicuspid or unicuspid aortic valves, allowing transformation into a tricuspid configuration. Additionally, aortic valve reconstruction using this method is ideal for aortic regurgitation and valve stenosis, infective endocarditis, and reoperations following bioprosthesis deterioration.

CONCLUSION

The AVNeo procedure is effective for various aortic pathologies, including aortic stenosis, regurgitation, infective endocarditis, and prosthetic valve endocarditis. It offers excellent hemodynamic outcomes, eliminates the need for anticoagulants, and allows concomitant interventions. Although the procedure requires significant expertise, adhering to the technical steps during the learning curve can achieve results comparable to those reported in the literature, demonstrating its reproducibility and effectiveness.

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Patient Informed Consent: The patient was informed and consent was obtained.

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