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Bicuspid reconstruction surgery in a patient suffering from aortic valve infective endocarditis with annular abscess using Ozaki's procedure: A case report

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ABSTRACT

INTRODUCTION: Aortic valve infective endocarditis with annular abscess is associated with high mortality rate and surgery is usually the choice of treatment. Plasty or reconstruction of aortic valve is being performed more widely.
PRESENTATION OF CASE: We report a case study of a 56-year-old male who was diagnosed with congenital bicuspid aortic valve, severe aortic stenosis and regurgitation, and annular abscess. This patient underwent operation in december 2019 and Ozaki's procedure was used to measure the distance between two commissures to reconstruct new leaflets and close the abscess using autologous pericardium. A bicuspid valve was reconstructed based on the anatomical feature of the patient. 6 months after surgery, aortic valve function was good with no residual insufficiency, maximum gradient was 8 mmHg.
DISCUSSION: Reconstruction of aortic valve by Ozaki's procedure has been reported with many advantages for the patient. In case of infectious endocarditis, this technique helps avoid the use of artificial materials. Bicuspid aortic valve reconstruction surgery following the novel methods of reconstructing three leaflets or maintaining the bicuspid morphology could both be performed with good results.
CONCLUSION: Reconstruction of aortic valve by Ozaki's procedure in infectious endocarditis has good results. In case of true bicuspid aortic valve, reconstruction bi-leaflets can be performed.

1. Introduction

Bicuspid aortic valve is the most prevalent congenital valvular malformation which accounts for 1–2% of the general population with a male to female ratio of 3/1 [1]. The common complication of bicuspid aortic valve is aortic stenosis which usually occurs at the age of 60 or older while aortic regurgitation often occurs earlier at the third decades of life [2,3]. Ascending aortic aneurysm is also common with a frequency of 50–60% among patients with bicuspid aortic valve [4]. Endocarditis occurs with a rate of 0.3%–2% per patient-year in this population [5]. For patients with severe aortic valve disease, regardless of symptoms, surgical valve replacement is the widely used therapy with well-established long-term outcomes [6]. Nevertheless, there are inherent concerns related to the long-term use of anticoagulant with mechanical valve [7] and the rapid degeneration of bio-prosthesis valve [8]. Aortic valve reconstruction surgery using autologous pericardium treated with Glutaraldehyde solution following Ozaki's procedure was first performed at Toho hospital, Tokyo in 2007 [9]. Since then, more than 4000 patients had undergone this surgery worldwide with excellent medium-term results [10,11]. This method does not utilize prosthetic material and therefore, may provide better outcomes for patients with infective endocarditis. Ozaki et al. have reported favorable outcomes of tricuspid aortic valve reconstruction surgery in patients with bicuspid aortic valve [12]. However, good long-term outcomes have also been reported with bicuspid aortic valve reconstruction in this group of patients [4]. In our center, Ozaki's procedure is routinely performed by surgeons with

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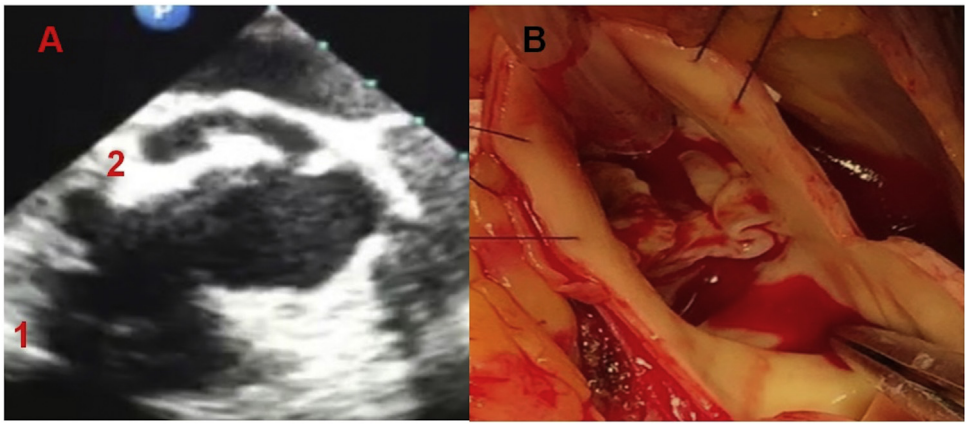

Fig. 1. A: Intraoperative trans-esophageal echocardiography (1 – aortic annular abscess; 2 – Bicuspid aortic valve). B: Aortic valve during surgery.

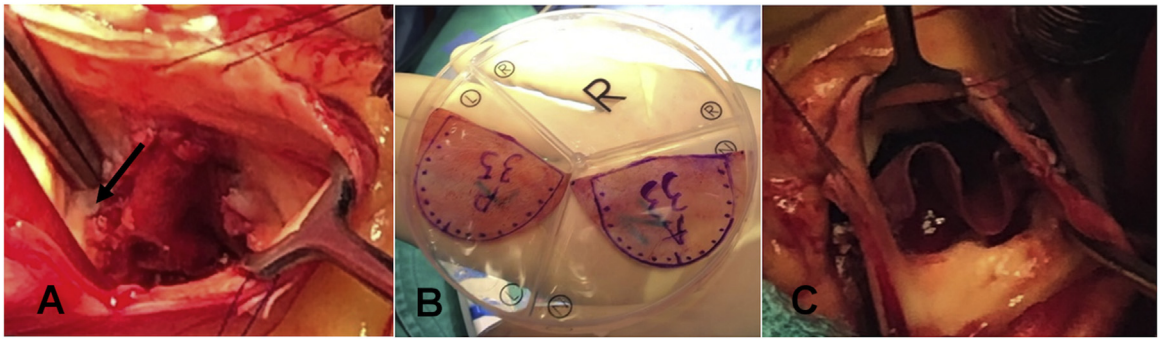

Fig. 2. A: Closure of aortic annular abscess using autologous pericardium. B: Two leaflets trimmed from pericardium. C: The reconstructed aortic valve.

certified qualification issued by Professor Ozaki. In patients with bicuspid aortic valve, based on the type of lesion, either bicuspid or tricuspid reconstruction can be performed at the discretion of the surgeon. We realized the advantages of this method in patients with endocarditis in Vietnam and we report a clinical case of successful bicuspid aortic valve reconstruction and aortic root abscess closure using autologous pericardium treated with Glutaraldehyde by Ozaki's procedure. This work has been reported in line with the SCARE criteria [13].

2. Case report

A 56-year-old male patient presented with dyspnea and left-sided chest pain. On admission, his heart rate was 80 beats per minute and regular. There was a 3/6-degree systolic ejection murmur at the aortic valve location. Transthoracic echocardiography revealed a bicuspid aortic valve with severe calcification and maximum gradient was 70 mmHg, Vmax 5.1 m/s, and valvular orifice area of 0.5 cm^2. Trans-esophageal echocardiography showed an aortic annular abscess near the commissure between anterior and posterior leaflets (Fig. 1).

Surgical procedure took place in December 2019: the surgery was performed by complete sternotomy. After sternotomy, the pericardium was harvested with a size of 8 × 8 cm. The pericardium was then dissected, cleaned and treated with 0.6% Glutaraldehyde solution in 6 min and rinsed for 3 times in normal saline. Extracorporeal circulation was established with one arterial line placed in the ascending aorta; one venous line placed in the right atrium. Myocardial protection was performed by using crystalloid fluid and hypothermia (to 32 °C) during surgery. The ascending aorta was opened 1.5 cm above the right coronary artery ostium. The bicuspid aortic valve was classified as type 0 (anterior-posterior), both leaflets were severely calcified, and there was an annular abscess at the posterior leaflet with a diameter of 1 cm, the surrounding tissue was disintegrated. The leaflets were trimmed, the annular calcifications were removed, and the abscess was cleaned and closed with pericardium (Fig. 2A). The sizes of two leaflets were measured (the distance between two commissures) using the sizer tool designed by Ozaki and the results were 35 mm for both leaflets (Fig. 2B).

New leaflets were cut from pericardium and then sewn to the aortic annulus, starting from the middle of the annulus towards two commissures. The commissures were reinforced using pledgets. Intraoperative trans-esophageal echocardiography showed good functioning of the reconstructed valve with very mild regurgitation, valve orifice area was 4.06 cm^2 and maximum gradient was 11 mmHg.

3. Discussion

Autologous pericardium treated by Glutaraldehyde has been used as a biological material for aortic valve repair and replacement with good long-term (>16 years) outcomes as reported by Al Halees et al. [14]. To date, with the development of antibiotics, outcomes after endocarditis have been improved. Nevertheless, more than 1/3 of cases still require surgical intervention with a 12.2% mortality rate depending on the type of surgery [15,16]. Surgical replacement of aortic valve with a prosthetic valve is still widely performed but there are limitations due to the need of anticoagulation with mechanical valves as well as the risk of degeneration and immune response to bio-prosthesis materials [7,8]. In particular,

in patients with high risk of re-operation after infective endocarditis, reoperation may be more difficult with a prior mechanical valve replacement surgery compared with a reconstruction surgery in which the valve natural properties was preserved [17]. Ozaki et al. proposed the reconstruction of three leaflets of the aortic valve using autologous pericardium treated with glutaraldehyde and this procedure was first performed in 2007. Medium-term results have shown a reoperation rate of 4.2% and 10-year survival rate of 85.9% [11]. The advantage of this method is that the authors created a sizer tool to measure leaflet sizes, how to cut new leaflets, as well as location to sew, all of which make this procedure being widely performed worldwide with high success rate [10]. In cases of infective endocarditis with aortic annular abscess, Ozaki's procedure is chosen to limit the use of prosthetic material or homo-graft [17]. In patients with abnormal bicuspid aortic valve, Ozaki et al. [12], MG Song et al. [18] both showed the hemodynamic advantages of reconstructing a tricuspid pattern compared with bicuspid reconstruction. We chose to perform bicuspid reconstruction in cases with bicuspid aortic valve without raphe by using Ozaki's sizer tool and suturing technique to create two balanced leaflets. In this clinical case, this patient had high risk of re-infection due to large annular abscess which would cause difficulties in case of reoperation if this patient underwent prosthetic valve replacement. Therefore, reconstruction surgery using autologous pericardium was preferred. The use of pericardium for abscess closure and valve reconstruction allowed us to avoid using prosthetic material in the infected area. Though the reduced infection rate of using pericardium reconstruct has not been validated, the absence of prosthetic annulus may make antibiotics treatment more effective [17]. The bicuspid instead of tricuspid reconstruction in patients with bicuspid aortic valve with no raphe is easier to perform technically, no annular re-separation or new commissure construction were required. Particularly, in patients with annular abscess, the separation of the annulus from bicuspid to tricuspid may be more difficult. With other anatomical types of bicuspid aortic valve, where there is a large middle line in a big leaflet (bicuspid functionally but tricuspid anatomically), tricuspid valve reconstruction is preferred.

4. Conclusion

Aortic valve reconstruction surgery using autologous pericardium by Ozaki's procedure is a good option for patients with infective endocarditis. For those with aortic annular abscess, the use of pericardium treated with Glutaraldehyde to close the abscess is a way to avoid the use of foreign material. In patients with congenital bicuspid aortic valve, the choice between bicuspid and tricuspid reconstruction depends on the valvular anatomy, type of lesion as well as the operator's experience. In this particular case, reconstructing two leaflets was technically easier than re-dividing the annulus for tricuspid reconstruction.

Declaration of Competing Interest

The authors report no declarations of interest.

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None.

Ethical approval

The study was approved by our research committee, E Hospital, Hanoi, Vietnam.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Surgery: Hung T Ngo; Huu C Nguyen; Tran-Thuy Nguyen; Le Ngoc Thanh.
Data collection: Hung Q Doan.
Data interpretation: Hung Q Doan; Lionel Camilleri.
Writing the paper: Hung T Ngo; Tran-Thuy Nguyen.

Registration of research studies

N/A.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at https://doi.org/10.1016/j.ijscr.2020.09.197.

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