Case Report

Bioprosthetic aortic valve replacement 12 years after percutaneous aortic valvuloplasty in a young female adult with hope of pregnancy

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Case: A 26-year-old woman who had congenital aortic valve stenosis presented with exertional dyspnea. She had undergone percutaneous balloon aortic valvuloplasty 12 years previously at the age of 14. When she was 20 years old, she delivered a neonate by elective cesarean section at the 31st week of gestation because the mean pressure between the left ventricle and the ascending aorta was 52 mmHg.

Outcome: She successfully underwent aortic valve replacement with a bioprosthetic valve combined with replacement of the ascending aorta in order to make the next pregnancy possible.

Conclusion: The long-term prognosis of percutaneous balloon aortic valvuloplasty might be acceptable for some patients, even though this procedure is associated with the possibility of secondary interventions.

Key words: Aortic valve replacement, balloon aortic valvuloplasty, bicuspid aortic valve, congenital aortic valve stenosis, prosthetic valve

INTRODUCTION

PERCUTANEOUS BALLOON AORTIC valvuloplasty (P-BAV) was introduced for palliative treatment of critical aortic valve stenosis. This treatment was designed as a bridge to radical valve surgery, such as valve replacement and trans-arterial aortic valve implantation. The early clinical usefulness of P-BAV is apparent, but its long-term effect is limited. We report a patient who underwent aortic valve replacement 12 years after P-BAV.

CASE REPORT

A 26 -YEAR-OLD WOMAN PRESENTED with exertional dyspnea. She had been followed for congenital aortic valve stenosis since several months after birth. When she was 14 years old, the mean pressure gradient between the left ventricle and the ascending aorta (V-A PG) exceeded 40 mmHg. She underwent P-BAV. A balloon catheter of 18 mm × 30 mm (TRYTECH, Tokyo, Japan) through the right femoral artery was progressed to the left ventricle. The balloon was inflated twice with standard atmospheres, resulting in V-A PG of 27 mmHg by echocardiogram (Fig. 1). Five years later, she unexpectedly became pregnant. She delivered a neonate by elective cesarean section at the 31st week of gestation because the V-A PG was 52 mmHg with left ventricular ejection fraction (EF) of 74% and aortic valve area (AVA) of 0.48 cm^2. The V-A PG was decreased to 40 mmHg with similar EF and AVA after delivery, but it gradually increased year by year. Five years after delivery, V-A PG exceeded 80 mmHg with EF of 78% and AVA of 0.40 cm^2, but the patient refused surgical intervention because the condition was asymptomatic. She gradually experienced exertional dyspnea, and V-A PG was increased to 110 mmHg by echocardiogram with EF of 76% and AVA of 0.36 cm^2 at 25 years old. Serial changes of echocardiographic findings of the aortic valve are shown in Figures 2 and 3. The fibrotic thickness of the aortic valve had been increased. After medical treatment for approximately 1 year, the patient decided to receive operative treatment and signed the informed consent. She greatly hoped to give birth to a child in the future.

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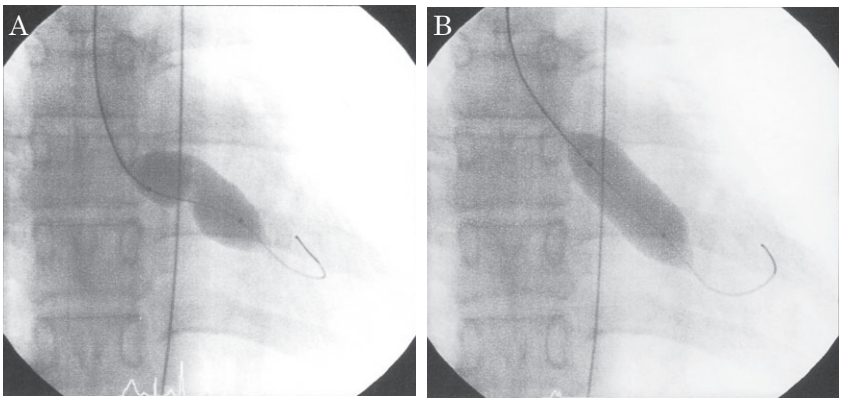

Fig. 1. Percutaneous balloon aortic valvuloplasty in a 14-year-old girl with congenital aortic valve stenosis, before (1-a) and after (1-b) the procedure. A balloon catheter of 18 mm ×; 30 mmwas inflated twice with standard atmospheres.

On examination, a Levine III/IV systolic heart murmur radiating to the neck and normal vesicular sounds on bilateral lung fields were audible. Laboratory findings showed a hemoglobin level of 9.8 g/dL and a brain natriuretic peptide level of 1,511 pg/mL. Other laboratory findings were within normal limits. A chest X-ray showed a cardiothoracic ratio of 58% with slight bilateral pulmonary congestion. An electrocardiogram showed a normal sinus rhythm with high voltage QRS complexes in V5-6 leads indicating left ventricular hypertrophy. A trans-thoracic echocardiogram revealed a calcified bicuspid aortic valve, V-A PG of 104 mmHg, AVA of 0.40 cm^2, moderate aortic valve regurgitation, and left ventricular hypertrophy. Left ventricular EF was 70%. A chest computed tomogram showed that the ascending aorta was dilated up to 43 mm in diameter.

The patient underwent aortic valve replacement with a bioprosthetic valve combined with replacement of the ascending aorta under standard cardiopulmonary bypass. The patient requested a bioprosthesis in order to make the next pregnancy possible. Operative findings confirmed that the bicuspid valve was of the right non-coronary cusp fusion type (Fig. 4). The commissure between the left and non-coronary cusps was severely calcified and a raphe was identified at the middle of the right-sided cusp. Histologic findings revealed highly fibrotic hypertrophy and calcification of the resected cusps without infiltration of inflammatory cells, indicating a senile degeneration of bicuspid valves (Fig. 5).

Anticoagulation therapy after aortic valve replacement was continued for 3 months. We recommended that the patient's planned pregnancy be delayed for 1 year.

DISCUSSION

PERCUTANEOUS BALLOON AORTIC valvuloplasty was originally introduced for congenital aortic stenosis. Currently, P-BAV contributes to the palliative treatment of critical aortic valve stenosis as a bridge to radical valve surgery, such as valve replacement, and trans-arterial aortic valve implantation among acquired cases, such as a calcified aortic valve stenosis. Some investigators have reported the clinical usefulness of P-BAV in case reports and in a nationwide survey. However, the long-term effect of P-BAV is limited, particularly among children.

Tirilomis and colleagues analyzed the 10-year experience of 32 patients (23 males and 9 females) who underwent aortic surgery as a secondary intervention. The mean age at surgery was 13.5 ± 11.3 years. Seventeen patients had undergone initial aortic balloon valvuloplasty. Re-intervention within the first year was carried out in 7 of the 17 patients. The interval between the last intervention and the first repeated aortic surgery was 3.1 ± 3.5 years. The authors concluded that re-intervention is often indicated after balloon valvuloplasty.

Hochstrasser and colleagues evaluated 77 patients with congenital aortic stenosis and a mean age of 5.8 ± 5.6 years at diagnosis for 14.8 ± 9.1 years. Long-term survival after the first procedure was excellent, with 91% survival at 25 years. At a mean interval of 7.6 ± 5.3 years, 30 patients required a re-intervention, and freedom from re-intervention was 97%, 89%, 75%, 53%, and 42% at 1, 10, 15, 20, and 25 years, respectively. They concluded that aortic valve intervention is a safe and effective procedure for congenital aortic stenosis with excellent survival results, and that the rate of re-intervention is high after balloon valvuloplasty.

Pregnancy in women with congenital aortic stenosis might have potential risks for both maternal and fetal outcomes. Some result in therapeutic abortion, and Tzemos and colleagues concluded that women with congenital aortic stenosis who have undergone pregnancy have a higher frequency of late cardiac events compared to those who have never been pregnant. Generally speaking, maternal heart valve disease per se is a major cause of non-obstetric mor-

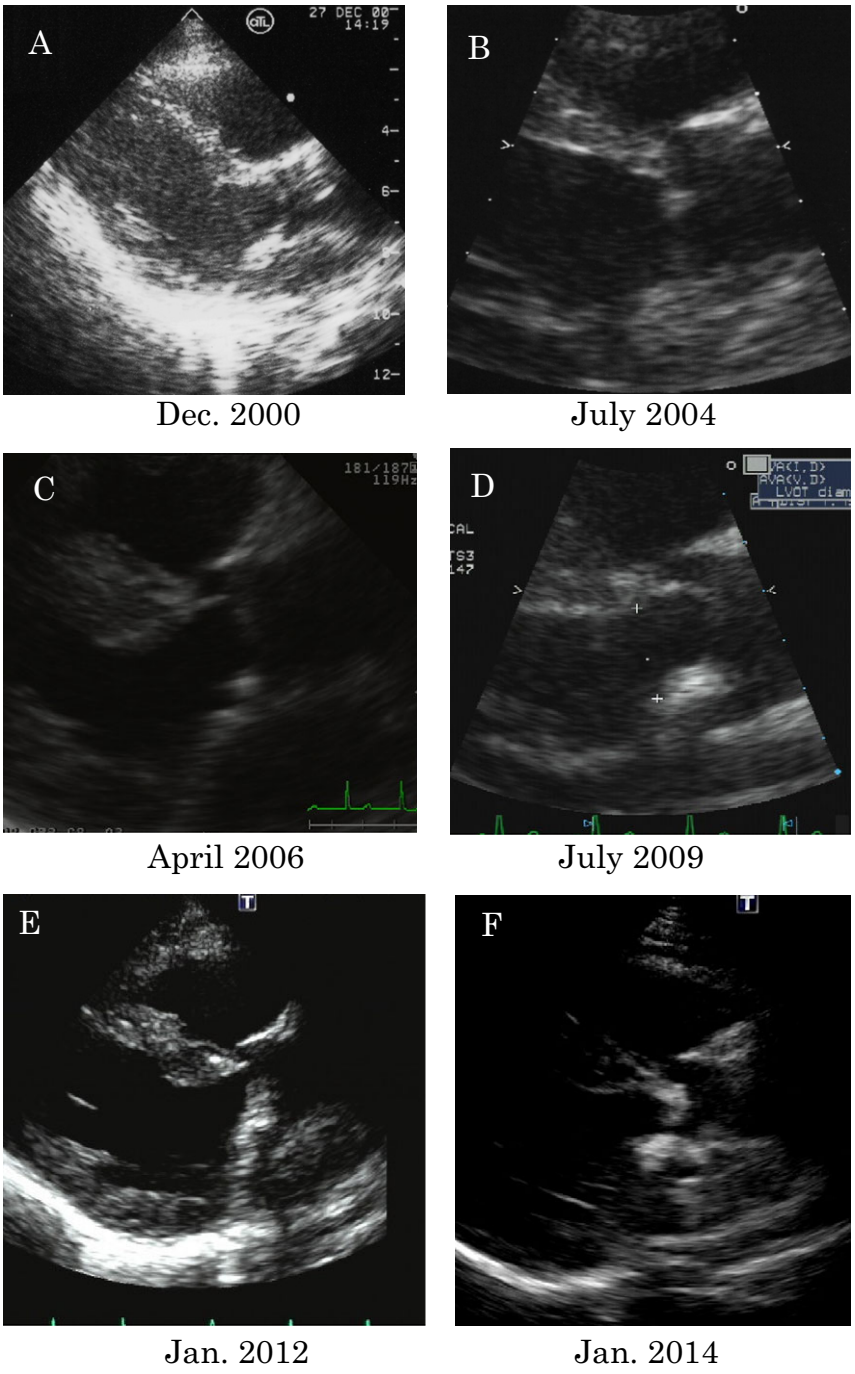

Fig. 2. Pre- and post-valvuloplasty trans-thoracic echocardiogram in a female patient with congenital aortic valve stenosis. Serial changes of a long axis view of the left ventricle. The echocardiogram revealed a progressive calcified bicuspid aortic valve and left ventricular hypertrophy.

bidity and accounts for 10–25% of maternal mortality. Thanks to the P-BAV at the age of 14, our patient could deliver her first baby without major adverse cardiac event when she was 20 years old. Although there still may be some non-obstetric risks during the next pregnancy and perinatal period after the bioprosthetic valve replacement, it would be acceptable for the patient to have the chance to give birth to another child. Both P-BAV and bioprosthetic valve replacement seem to be meaningful interventions, especially for a young female patient.

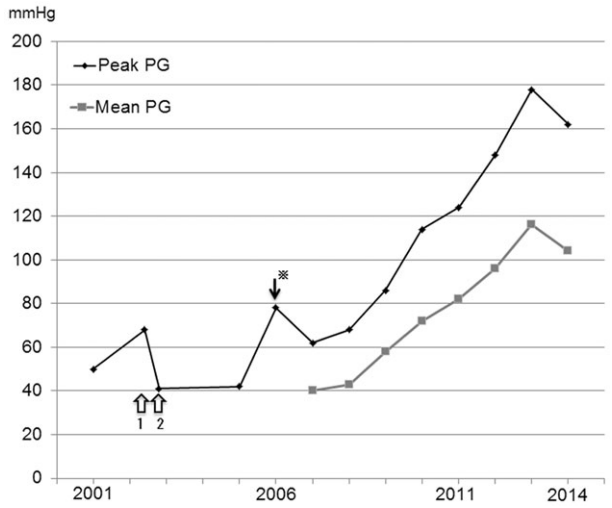

Fig. 3. Serial changes of pressure gradients between the left ventricle and the ascending aorta by echocardiogram in a female patient with congenital aortic valve stenosis. White arrows 1 and 2 show the pressure gradients before and after percutaneous balloon aortic valvuloplasty. The black arrow and asterisk show the pressure gradient before elective cesarean section. Mean PG, mean pressure gradient between the left ventricle and the ascending aorta; Peak PG, peak pressure gradient between the left ventricle and the ascending aorta.

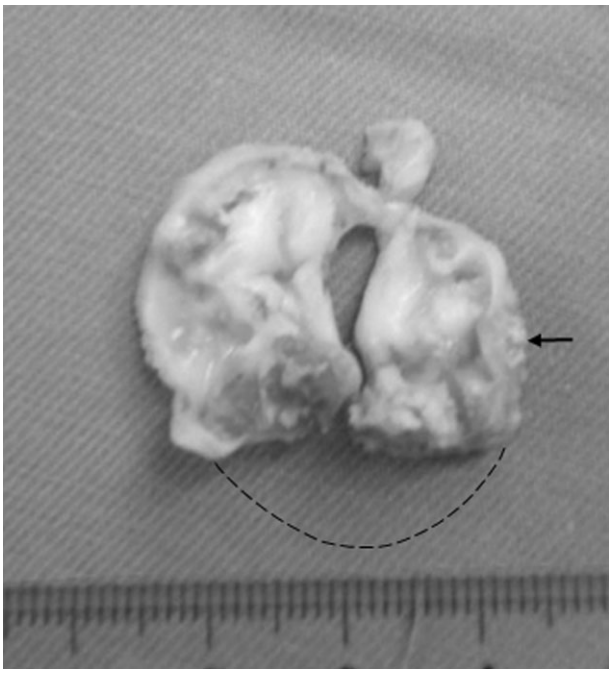

Fig. 4. Resected aortic valve of a 26-year-old woman with congenital aortic valve stenosis. The commissure between the left and non-coronary cusps (within the dotted lines) was severely calcified, and it was removed by shattering. A raphe was observed at the middle of the right-sided cusp (arrow).

CONCLUSION

BALLOON AORTIC VALVULOPLASTY should be considered in patients with congenital aortic stenosis. The long-term prognosis might be acceptable for some patients, even though this procedure is associated with the possibility of secondary interventions.

CONFLICT OF INTEREST

YOSHIO MISAWA SERVES as a consultant to Terumo Co. and Edwards Lifesciences Co.

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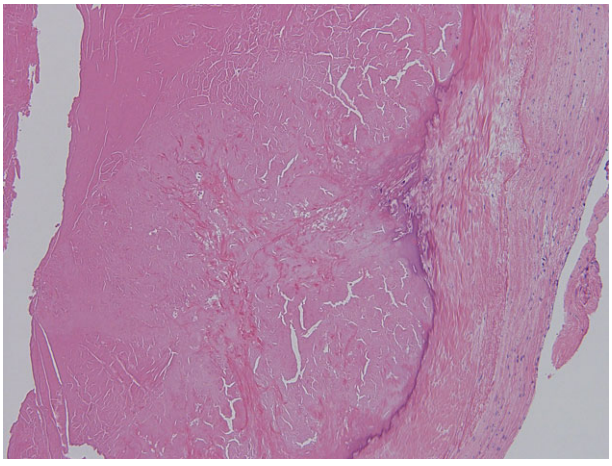

Fig. 5. Histologic findings of the resected aortic valve of a 26-year-old woman with congenital aortic valve stenosis. Highly fibrotic hypertrophy and calcification of the resected cusps were recognized, indicating a senile degeneration of bicuspid valves.

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