

Consecutive Sessions of Rescue Balloon Aortic Valvuloplasty for Critical Aortic Valve Stenosis Followed by Successful Bridging to Trans-Catheter Aortic Valve Implantation

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Percutaneous balloon aortic valvuloplasty (BAV) was a rare procedure in catheterization laboratories because of its limited prognostic impact. The recent advent of transcatheter aortic valve implantation (TAVI) has led to a resurgence of BAV, opening the way to a new indication as a bridge to TAVI. Herein, we reported an 83-year-old man with critical aortic valve stenosis and pulmonary edema, who strongly declined surgical aortic valve replacement. He also lacked financial support or insurance reimbursement for TAVI. He received BAV for relief of syncope, pulmonary edema and impending respiratory failure 4 times within 4 years and was successfully bridged to TAVI after receiving charity aid funding from the hospital.

Key Words: Aortic valve stenosis • Balloon aortic valvuloplasty (BAV) • Transcatheter aortic valve implantation (TAVI)

INTRODUCTION

Percutaneous balloon aortic valvuloplasty (BAV) has rarely been performed in catheterization laboratories because of its limited prognostic impact and the associated procedural risks. Indeed, registries in the 1980s reported a certain incidence of serious complications, including stroke, hypotension and shock, cardiac tamponade, severe aortic regurgitation, systemic emboliza-

tion, vascular surgery and death.^{1,2} The 2008 focused update incorporated into the 2006 American College of Cardiology/American Heart Association (ACC/AHA) guidelines recommended BAV with only limited indications: bridging to surgical aortic valve replacement (sAVR) in hemodynamically unstable patients at high risk or in patients with symptomatic severe aortic stenosis who require urgent major non-cardiac surgery, and palliation in individual cases.³ The recent advent of transcatheter aortic valve implantation (TAVI) has led to a resurgence of BAV, opening the way for a new indication as a bridge to TAVI.⁴⁻⁶

Herein, we reported an 83-year-old gentleman with critical aortic valve stenosis and pulmonary edema, who strongly declined sAVR. He also lacked financial support and did not qualify for insurance reimbursement for TAVI. He received BAV for relief of syncope, pulmonary edema and impending respiratory failure 4 times within 4 years and was successfully bridged to TAVI after receiving funding aid from the hospital.

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CASE REPORT

The patient was an 83-year-old man who had type 2 diabetes mellitus, chronic kidney disease (serum creatinine 2.3 mg/dL), and coronary artery disease who underwent percutaneous coronary interventions 3 times in the past 10 years. He began suffering from symptomatic critical aortic valve stenosis in June 2009. The initial presentation was syncope. His echocardiogram revealed a mean trans-aortic valve pressure gradient of 60 mmHg and aortic valve area of 0.9 cm². The patient declined sAVR and underwent palliative BAV with immediate reduction of trans-aortic valve pressure gradient from 53 to 35 mmHg. After discharge, he was referred as a possible candidate of TAVI to another major medical center, which was enrolling the first 10 cases of a pioneer CoreValve (Medtronic, Minneapolis, MN, USA) program in Taiwan. Because the patient could not afford the co-payment fee of the device, he declined to receive the treatment. He was relatively well until January 2012, one and a half years later, when he presented with pulmonary edema at our emergency room. He still declined sAVR after consultation with the surgeons. We informed the patient and his family about the poor prognosis of critical aortic valve stenosis with congestive heart failure and did another session of palliative BAV with 18 mm × 4 cm balloon (XXL, Boston Scientific, Natick, MA, USA). The trans-aortic valve pressure gradient was immediately reduced from 90 mmHg to 60 mmHg. The pulmonary edema was further resolved with intravenous diuretics and inotropics. A similar episode happened in November 2012, when the patient presented to our emergency room with pulmonary edema and impending respiratory failure, needing a non-invasive positive pressure O₂ mask support (Figure 1A). After he was given intravenous diuretics and inotropics, he underwent the 3rd session of palliative BAV (Figure 1B). The calcified and stenotic aortic valve was crossed with a straight tip 0.035 inch wire (Glidewire, Terumo Medical, Japan) and an Amplatz left (AL) 1 angiographic catheter (6F, Expo, Boston Scientific, Natick, MA, USA) under fluoroscopic guidance (left anterior oblique 30 degree). After wiring across the aortic valve, the AL1 catheter was advanced to the left ventricle (LV). A 260 cm J-curved tip 0.035 inch wire (Glidewire, Terumo Medical, Japan) was introduced for exchanging the AL1 catheter for a 6F pigtail

catheter. By way of the pigtail catheter, the supporting wire was further exchanged for a 0.035 inch 260 cm Amplatz super-stiff guide wire (Boston Scientific, Natick, MA, USA). The stiff part of the wire tip was hand-made rounded to fit the LV apex shape for avoiding trauma. Then, an 18 mm × 4 cm balloon was positioned to the aortic annulus and inflated under right ventricular burst pacing up to 180 bpm. The trans-aortic valve pressure gradient was immediately reduced from 71 mmHg to 45 mmHg. After conditions improved, the patient underwent screening examinations for TAVI, including the multi-slice computed tomography, and was recruited

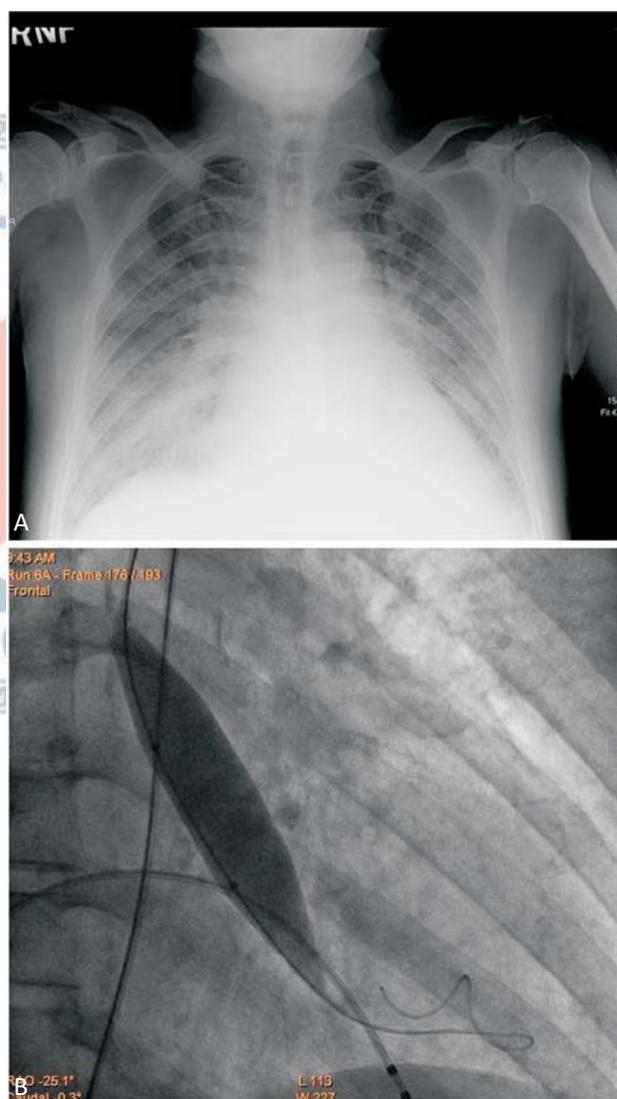


Figure 1. (A) The chest X-ray revealed severe pulmonary edema. (B) The patient underwent a rescue balloon aortic valvuloplasty for palliation of pulmonary edema with impending respiratory failure.

into the candidate list for TAVI in our hospital. In January 2013, the CoreValve device for TAVI was formally approved by the Department of Health, Taiwan. In April 2013, the patient presented to our emergency room again with pulmonary edema and impending respiratory failure, needing a non-invasive positive pressure O₂ mask for support. Due to a lack of funding support, he underwent the 4th session of BAV and the trans-aortic valve pressure gradient was reduced from 74 mmHg to 49 mmHg. Finally, in August 2013, the hospital raised sufficient charity funding on behalf of the patient for the TAVI program. He underwent TAVI with the 29 mm CoreValve via the right femoral artery access (Figure 2). Before the procedure, his baseline electrocardiogram (ECG) revealed complete right bundle branch block, left posterior hemi-block and 1st degree AV block. After the procedure, the immediate hemodynamic measurement revealed a less than 10 mmHg of trans-aortic valve pressure gradient and a mild para-valvular regurgitation. We had informed the patient and his family in advance that there would be an increased chance that a permanent pacemaker would be necessary after TAVI. On the 5th day post implantation, we recorded a paroxysmal atrial flutter with a ventricular pause for 7 seconds. Thereafter, a permanent pacemaker was implanted on that day. The patient recovered well and was discharged two weeks after the TAVI procedure.

DISCUSSION

Cribier et al. first introduced BAV in 1986.⁷ Subsequent reports about BAV showed improvement of trans-aortic valve pressure gradient but with a certain complication rate and no impact on survival because of a higher restenosis rate within 6 months to one year.^{1,2} Hence, use of the procedure declined gradually in the next 15 years. The resurgent interest in BAV has been stimulated to a large extent by the development of TAVI. Bridging to TAVI has been adopted by the 2012 European valvular heart disease guideline and the 2014 AHA/ACC guideline as a potential indication.^{5,6}

In our case, BAV was effective in reducing trans-aortic valve pressure gradient, stabilizing the patient from syncope, or to address critical pulmonary edema and impending respiratory failure status 4 times. The

immediate hemodynamic improvements were compatible with findings from both past and recent reports.^{2,8} However, the latest reports have shown declines in major complication rates such as stroke or tamponade as compared with the reports in the 1990s.^{8,9} In our case, the patient had four sessions of BAV without complications, indicating that with the refinement of wire, balloon catheter, sizes of sheath, and skills, BAV should not be deemed as a high-complication or ineffective procedure in this era.

In this case, the last 3 sessions of rescue BAV were separated by symptom-remission intervals of 5-10 months. This finding is also compatible with past reports indicating that there was a high restenosis rate within 6-12 months after BAV.^{1,2} Moreover, repeated BAV will increase the risk of stroke and lethal aortic regurgitation, and it should not be encouraged if immediate bridging to TAVI or sAVR is readily available and feasible. Early bridging to a definite treatment of either sAVR or TAVI is mandatory to improve patient survival.

In our case, the patient had a pre-existing right bundle branch block, left posterior hemiblock and 1st degree AV block on baseline ECG and developed a complete AV block with a 7-second pause on the 5th day post

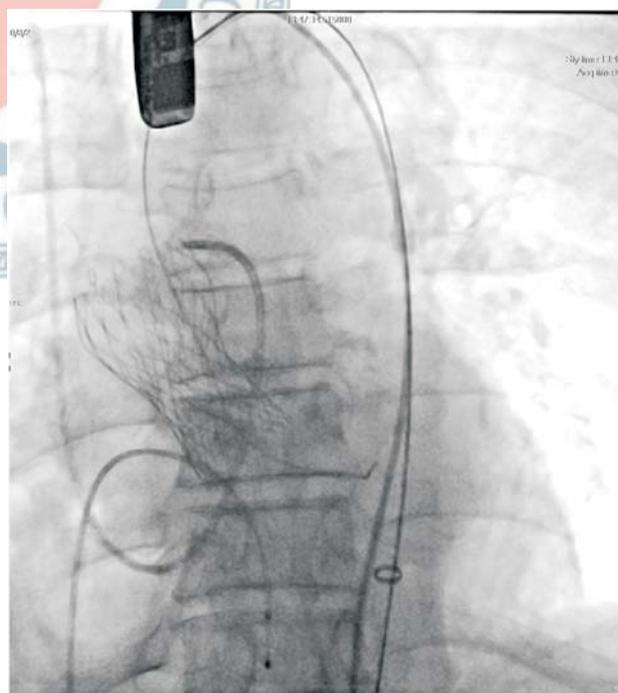


Figure 2. The patient underwent transcatheter aortic valve implantation with a 29 mm CoreValve device.

TAVI. Previous reports showed a 20-30% permanent pacemaker rate after the CoreValve implantation.¹⁰ According to the literature and the clinical scenario of this case, physicians should be alert for conduction abnormalities post TAVI for those with pre-existing bundle branch block on the baseline ECG.

CONCLUSIONS

In conclusion, BAV is effective in alleviating the symptomatic critical aortic valve stenosis when sAVR or TAVI is not an option or unavailable. However, bridging to a definite treatment with either sAVR or TAVI is mandatory as proven in our case.

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