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Balloon Aortic Valvoplasty in Patient With Severe Calcific Aortic Stenosis and Cardiogenic Shock

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Abstract

The standard treatment of calcific aortic stenosis (AS) is aortic valve replacement (AVR). However, as population has become older, the number of patients who have prohibitive surgical risk is increasing. Although transcatheter aortic valve implantation (TAVI) has been indicated to some of these high-risk patients, its indication is limited because of anatomical contraindications, unstable clinical situations and financial problems. Thus, in experienced hands, the option for balloon aortic valvoplasty (BAV) should be considered, as it may be a good alternative to selected patients to ameliorate symptoms and prolong survival. In this report, we describe the case of an old patient with severe AS who evolved with cardiogenic shock and had contraindications to surgery and transcatheter valve implantation and who was successfully treated by BAV.

Keywords: Aortic valve stenosis; Cardiogenic shock; Interventional radiology; Survival

Introduction

Calcific aortic stenosis (AS) is the most common presentation of aortic valve disease in the Western world, with an increasing prevalence as the population ages [1-3]. Nearly 4% of all adults 75 years of age or older have moderate or severe AS, which is characterized by a long latency period associated with high mortality after symptom onset [4]. Although surgical aortic valve replacement (AVR) is the definitive treatment of calcific AS, many patients do not undergo surgery because of prohibitive comorbidities. Three-year survival rates among symptomatic patients with severe AS who do not undergo AVR may be as low as 25% [5-7]. Lately, transcatheter aortic valve implantation (TAVI) has been suggested as a less invasive treatment for high-risk patients with AS [8-12]. However, poor clinical status and anatomical restrictions could prevent TAVI performance. In these settings, balloon aortic valvoplasty (BAV) could be an alternative to provide temporary symptomatic and hemodynamic benefit [13, 14]. Here, we report a case of percutaneous BAV in a patient who developed cardiogenic shock and had clinical and technical contraindications to AVR and TAVI.

Case Report

A 74-year-old Caucasian man presented with symptoms of dyspnoea, associated with orthopnoea, paroxysmal nocturnal dyspnoea, extreme generalized edema and caquexy (BMI = 15.4 kg/m^2), with repeated hospitalizations. He had history of arterial hypertension, dyslipidemia, stable coronary artery disease, chronic renal failure, with a baseline serum creatinine of 2.0 mg/dL, and previous coronary arterial bypass grafting surgery. Despite aggressive medical therapy, he remained in New York Heart Association (NYHA) functional class IV. Due to worsening of symptoms, the patient was hospitalized at our institution.

The initial electrocardiogram revealed atrial fibrillation and left bundle branch block with normal heart rate.

A bedside echocardiogram showed left ventricular ejection fraction of 35%. The aortic valve was heavily calcified and severely stenotic with a valve area of 0.7 cm^2, maximum transvalvular pressure gradient of 66 mm Hg and medium of 40 mm Hg (Fig. 1).

The thoracic abdominal CT presented plaques with mobile thrombi in the descending aorta and inadequate valvular annulus size and shape for anchorage of percutaneous prosthesis (Fig. 2).

Cardiac angiography demonstrated native arteries occluded and patent bypass graftings.

EuroSCORE and STS scoring system were calculated and registered rates of overall mortality of 33% and 42%, respectively. Due to the high surgical risk and technical inability to TAVI treatment, the multidisciplinary team recommended percutaneous BAV.

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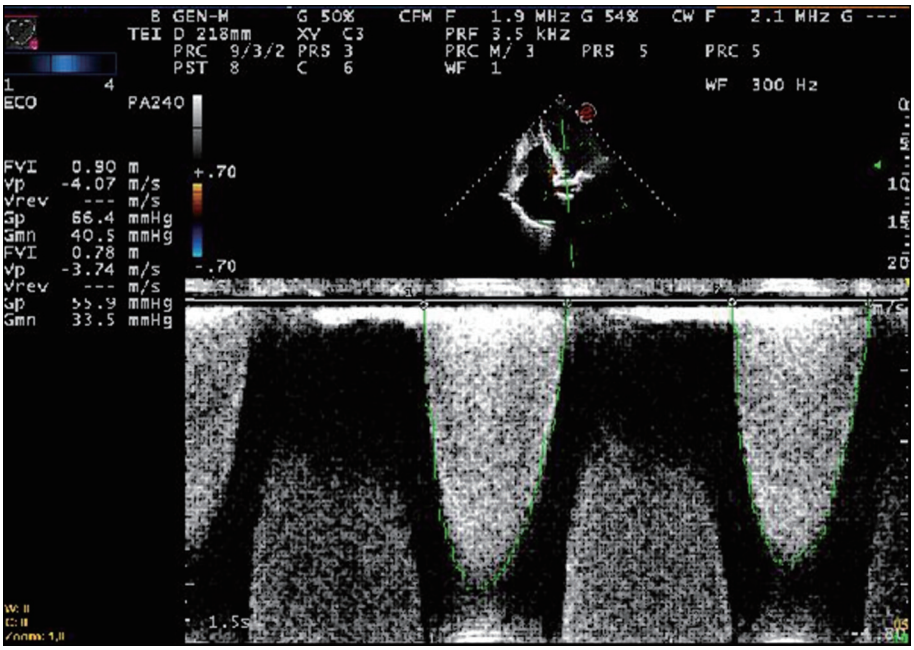

Figure 1. Doppler ultrasound curves demonstrating aortic transvalvular gradient pressures compatible with severe aortic stenosis before balloon aortic valvoplasty.

During the hospitalization, the patient evolved with clinical deterioration, and signs of severe cardiogenic shock, with oliguria and worsening of renal function, hypotension and finally to torpor, with no improvement with the use of endovenous inotropes. Thus, BAV was performed urgently. Interestingly, the patient presented immediate improvement in the hemodynamic status, an excellent recovery of mental status and renal function. This first procedure resulted in the reduction of maximum transvalvular pressure gradient of 100 to 50 mm Hg (Fig. 3). The patient was discharged 7 days later. He needed a second BAV 3 months later, and again there was a reduction of maximum transvalvular pressure gradient of 35 to 20 mm Hg with attenuation of heart failure symptoms.

After 24-month follow-up, the patient remains on class II of the NYHA functional classification with improvement in general clinical status.

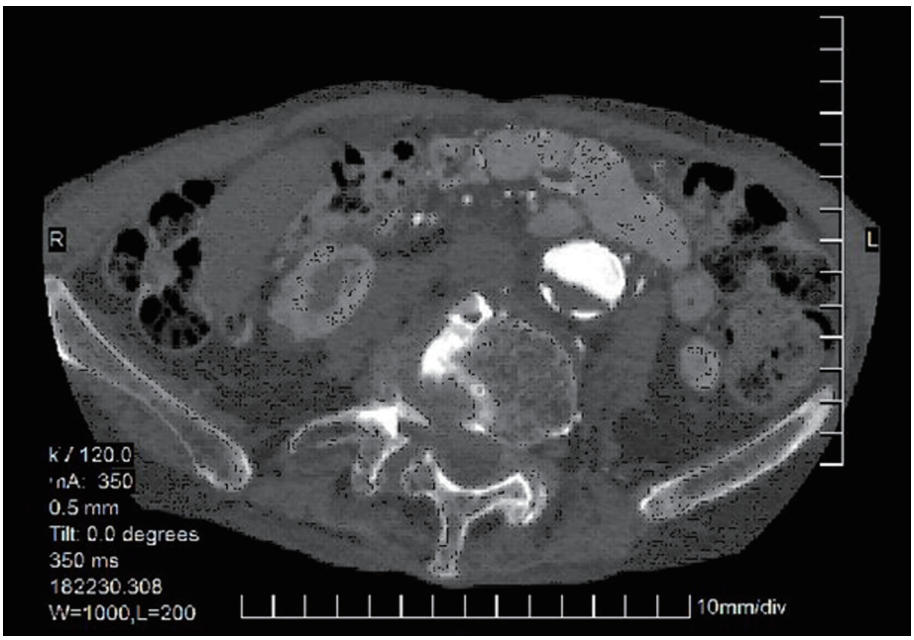

Figure 2. Abdominal angiography CT depicts aortic thrombi.

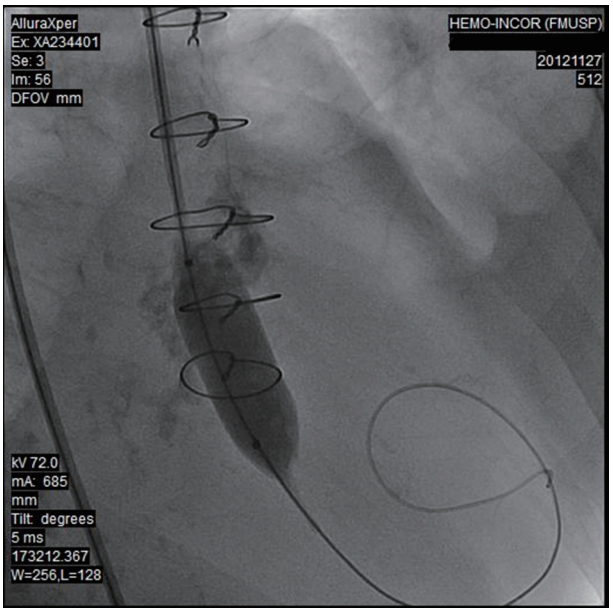

Figure 3. Second balloon aortic valvoplasty performed 3 months after the first procedure. The balloon catheter is inflated at the region of the stenotic aortic valve.

Discussion

AVR is the mainstay of treatment of symptomatic AS. AVR offers substantial improvements in symptoms and life expectancy [15]. However, situations in which the valve replacement is unfeasible to perform, TAVI and percutaneous BAV are alternative options to selected patients. TAVI is a good alternative but it still challenges some problems, especially related to the high costs, technical difficulties in patients with diseased femoral access and also due to the size and shape of the aortic annulus of some patients, which may complicate the anchorage of the prosthesis and cause paravalvular leak, which is one of the greatest problems to clinical outcomes. Besides, atrioventricular blocks with the need of pacemakers are another frequent complication of this procedure. Of note, in developing countries, the high cost of the percutaneous prosthesis is a major issue that poses conflicts and difficulties to the indication to a substantial number of patients.

Percutaneous BAV is another treatment option to patients with severe AS with clear benefits, but with some other challenges. This technique was developed as a nonsurgical option in the 1980s [16]. It was used to manage unstable and critically ill patients such as those in cardiogenic shock or refractory heart failure. As the number of very elderly patients with this disease increases, especially those in whom surgical options are not available, an effective and less invasive treatment of severe AS is essential. About one-third of patients with severe AS are not referred for valve replacement surgery because of the risks perceived by both patients and physicians. Furthermore, a consistent limitation for this therapy among younger patients with greater longevity was the high restenosis rate and the need for reintervention. BAV was thus found to be of limited utility for many of these patients who were acceptable candidates for AVR [17].

Although the literature shows that BAV is associated with serious complications in historical series, currently the rates of complications have decreased substantially [18]. When executed by experienced hands, in order just to improve hemodynamic status, due to the fact that even little improvements in the orifice area turn into great improvements in the transvalvular gradient, this translates into lesser rates of severe complications. One special consideration of BAV is the fact that restenosis and clinical worsening with the need of a second BAV procedure may occur 6 - 12 months after the first procedure [19]. Actually, some investigators have suggested repeated BAV because its results might also improve survival rates over a single dilatation, which might merit further evaluation in clinical trials [20].

As a consequence, all inoperable patients who are eligible for this procedure should receive it as soon as possible. Therefore, we can offer to most of these remaining no-option patients a low-cost and relatively safe procedure in experienced hands, associated with significant immediate hemodynamic and clinical improvement, and with an improvement in quality of life. Pain control and palliative service are an important part of medical care, and BAV might well fit within this area even in the era of TAVI [21-23].

Thus, BAV can be used successfully to improve the health of some nonsurgical patients with severe symptomatic AS. The use of BAV for palliation of symptoms has been undervalued in this difficult-to-treat patient group.

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Conflict of Interest

There is no conflict of interest.

References

1. Lindroos M, Kupari M, Heikkila J, Tilvis R. Prevalence of aortic valve abnormalities in the elderly: an echocardiographic study of a random population sample. J Am Coll Cardiol. 1993;21(5):1220-1225.
2. Iung B, Baron G, Butchart EG, Delahaye F, Gohlke-Barwolf C, Levang OW, Tornos P, et al. A prospective survey of patients with valvular heart disease in Europe: The Euro Heart Survey on Valvular Heart Disease. Eur Heart J. 2003;24(13):1231-1243.
3. Nkomo VT, Gardin JM, Skelton TN, Gottdiener JS, Scott CG, Enriquez-Sarano M. Burden of valvular heart diseases: a population-based study. Lancet. 2006;368(9540):1005-1011.
4. Ross J, Jr., Braunwald E. Aortic stenosis. Circulation. 1968;38(1 Suppl):61-67.

5. Varadarajan P, Kapoor N, Bansal RC, Pai RG. Survival in elderly patients with severe aortic stenosis is dramatically improved by aortic valve replacement: Results from a cohort of 277 patients aged > or =80 years. Eur J Cardiothorac Surg. 2006;30(5):722-727.
6. Filsoufi F, Rahmanian PB, Castillo JG, Chikwe J, Silvay G, Adams DH. Excellent early and late outcomes of aortic valve replacement in people aged 80 and older. J Am Geriatr Soc. 2008;56(2):255-261.
7. Thourani VH, Myung R, Kilgo P, Thompson K, Puskas JD, Lattouf OM, Cooper WA, et al. Long-term outcomes after isolated aortic valve replacement in octogenarians: a modern perspective. Ann Thorac Surg. 2008;86(5):1458-1464; discussion 1464-1455.
8. Cribier A, Eltchaninoff H, Tron C, Bauer F, Agatiello C, Nercolini D, Tapiero S, et al. Treatment of calcific aortic stenosis with the percutaneous heart valve: mid-term follow-up from the initial feasibility studies: the French experience. J Am Coll Cardiol. 2006;47(6):1214-1223.
9. Webb JG, Pasupati S, Humphries K, Thompson C, Altwegg L, Moss R, Sinhal A, et al. Percutaneous transarterial aortic valve replacement in selected high-risk patients with aortic stenosis. Circulation. 2007;116(7):755-763.
10. Grube E, Laborde JC, Gerckens U, Felderhoff T, Sauren B, Buellesfeld L, Mueller R, et al. Percutaneous implantation of the CoreValve self-expanding valve prosthesis in high-risk patients with aortic valve disease: the Siegburg first-in-man study. Circulation. 2006;114(15):1616-1624.
11. Grube E, Schuler G, Buellesfeld L, Gerckens U, Linke A, Wenaweser P, Sauren B, et al. Percutaneous aortic valve replacement for severe aortic stenosis in high-risk patients using the second- and current third-generation self-expanding CoreValve prosthesis: device success and 30-day clinical outcome. J Am Coll Cardiol. 2007;50(1):69-76.
12. Svensson LG, Dewey T, Kapadia S, Roselli EE, Stewart A, Williams M, Anderson WN, et al. United States feasibility study of transcatheter insertion of a stented aortic valve by the left ventricular apex. Ann Thorac Surg. 2008;86(1):46-54; discussion 54-45.
13. Otto CM, Mickel MC, Kennedy JW, Alderman EL, Bashore TM, Block PC, Brinker JA, et al. Three-year outcome after balloon aortic valvuloplasty. Insights into prognosis of valvular aortic stenosis. Circulation. 1994;89(2):642-650.
14. Lieberman EB, Bashore TM, Hermiller JB, Wilson JS, Pieper KS, Keeler GP, Pierce CH, et al. Balloon aortic valvuloplasty in adults: failure of procedure to improve long-term survival. J Am Coll Cardiol. 1995;26(6):1522-1528.
15. Bonow RO, Carabello BA, Chatterjee K, de Leon AC, Jr., Faxon DP, Freed MD, Gaasch WH, et al. 2008 focused update incorporated into the ACC/AHA 2006 guidelines for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to revise the 1998 guidelines for the management of patients with valvular heart disease). Endorsed by the Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons. J Am Coll Cardiol. 2008;52(13):e1-142.
16. Cribier A, Savin T, Saoudi N, Rocha P, Berland J, Letac B. Percutaneous transluminal valvuloplasty of acquired aortic stenosis in elderly patients: an alternative to valve replacement? Lancet. 1986;1(8472):63-67.
17. Bach DS, Siao D, Girard SE, Duvernoy C, McCallister BD, Jr., Gualano SK. Evaluation of patients with severe symptomatic aortic stenosis who do not undergo aortic valve replacement: the potential role of subjectively overestimated operative risk. Circ Cardiovasc Qual Outcomes. 2009;2(6):533-539.
18. Ben-Dor I, Pichard AD, Satler LF, Goldstein SA, Syed AI, Gaglia MA, Jr., Weissman G, et al. Complications and outcome of balloon aortic valvuloplasty in high-risk or inoperable patients. JACC Cardiovasc Interv. 2010;3(11):1150-1156.
19. Percutaneous balloon aortic valvuloplasty. Acute and 30-day follow-up results in 674 patients from the NHLBI Balloon Valvuloplasty Registry. Circulation. 1991;84(6):2383-2397.
20. Cubeddu RJ, Jneid H, Don CW, Witzke CF, Cruz-Gonzalez I, Gupta R, Rengifo-Moreno P, et al. Retrograde versus antegrade percutaneous aortic balloon valvuloplasty: immediate, short- and long-term outcome at 2 years. Catheter Cardiovasc Interv. 2009;74(2):225-231.
21. Kvidal PD, Stahle E, Nygren A, Landelius J, Thuren J, Enghoff E. Long-term follow up study on 64 elderly patients after balloon aortic valvuloplasty. J Heart Valve Dis. 1997;6(5):480-486.
22. Robicsek F. The burst of the balloon. The Mansfield Scientific Balloon Aortic Valvuloplasty Registry. Eur J Cardiothorac Surg. 1993;7(2):57-62; discussion 62-54.
23. Soyer R, Bouchart F, Bessou JP, Redonnet M, Mouton-Schleifer D, Derumeaux G, Arrignon J, et al. Aortic valve replacement after aortic valvuloplasty for calcified aortic stenosis. Eur J Cardiothorac Surg. 1996;10(11):977-982.

