

# Balloon rupture during aortic valvuloplasty: a severe complication or a well-tolerated event?

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An 86-year-old woman with paradoxical low-flow, low-gradient severe aortic stenosis, who was on the waiting list for transcatheter aortic valve implantation (TAVI) in our hospital, underwent balloon aortic valvuloplasty (BAV) as a bridge to TAVI, following an acute presentation with decompensated heart failure. Surgical intervention was considered high risk (EuroSCORE II, 8.26%). Transthoracic echocardiography showed aortic valve maximal velocity ( $AV V_{max}$ ) of 3.4 m/s and an aortic valve area (AVA) of 0.8 cm<sup>2</sup>. Cardiac computed tomography indicated left ventricular outflow tract maximum and minimum diameters of 22 mm and 16.8 mm, respectively, and an aortic annulus diameter of 22 mm.

Pre-BAV aortography showed trace aortic regurgitation (AR) (Supplementary material, *Video S1*). A 20 × 40 mm noncompliant balloon was inflated during rapid pacing at 180 bpm (FIGURE 1A), but it was suddenly ruptured at the level of the aortic annulus (FIGURE 1B; Supplementary material, *Video S2*), which caused a sudden release of contrast media in the ascending aorta and the left ventricle (FIGURE 1C and 1D). Aortic root rupture and severe AR were ruled out using bedside transthoracic echocardiography. The ruptured balloon was easily removed through the sheath, with no access-site injury, and the patient remained hemodynamically stable. Given that no satisfactory improvement was achieved ( $AV V_{max}$  2.81 m/s; AVA, 1 cm<sup>2</sup>), we successfully reattempted BAV with a bigger (22 × 40 mm) balloon (FIGURE 1E; Supplementary material, *Video S3*). Post-BAV aortography showed minimal AR and no rupture (FIGURE 1F; Supplementary material, *Video S4*). Post-BAV

measurements were as follows:  $AV V_{max}$  2.52 m/s and AVA, 1.2 cm<sup>2</sup>. The patient had an uneventful recovery.

Balloon aortic valvuloplasty was initially introduced in 1986 by Cribier as a treatment option for high-risk patients with severe aortic stenosis who were ineligible for surgical treatment.<sup>1</sup> During BAV, the AV orifice is widened by 3 means: stretching of valvular tissue, rupture of commissural fusion, and breaking of calcific deposits.<sup>2</sup> Even though the role of BAV became limited owing to high rates of valve restenosis, it is in the spotlight again, as it can be used either as a bridge to TAVI or surgical aortic valve replacement and it is also performed during TAVI.<sup>1</sup>

The incidence of balloon rupture during BAV has been reported between 5% to 33%.<sup>3,4</sup> Balloon rupture may occur at the level of the calcified aortic cusps. In most cases, it is well tolerated, with significant sequelae reported in only 0.5% of the patients.<sup>5</sup> It has been associated with air embolism, if the balloon has not been properly deaired, which can cause coronary artery obstruction. A ruptured balloon has a much higher crossing profile and can cause vascular injury or even peripheral artery occlusion during its retrieval. Significant leaflet calcification and inflating beyond the rated burst pressure are both associated with an increased risk of rupture. Although compliant, low-profile balloons that are made of thinner materials have been developed to reduce the number of access site complications, these balloons are more prone to rupture. Nevertheless, in an analysis by Seropian et al,<sup>4</sup> despite the high incidence of balloon rupture, the long-term mortality and efficacy of BAV was not affected.

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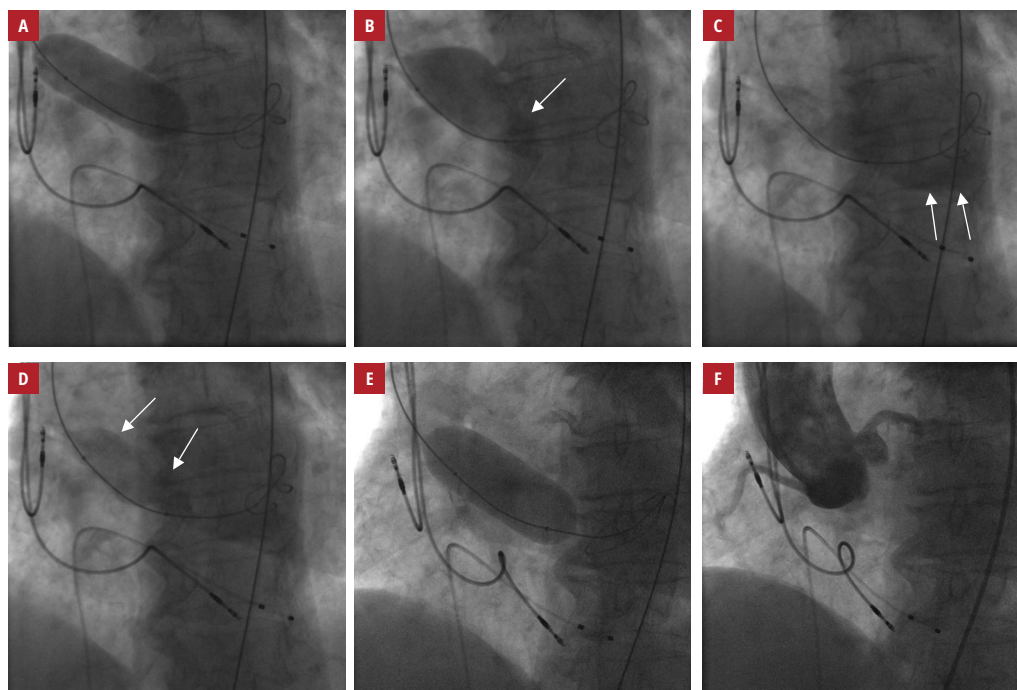
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**FIGURE 1** **A** – inflation of a 20×40-mm noncompliant balloon; **B** – rupture of the balloon at the level of the aortic cusps (arrow); **C** – release of contrast media in the left ventricle (arrows); **D** – the noncompliant balloon appears now deflated (arrows); **E** – successful dilatation of the aortic valve with a 22×40-mm noncompliant balloon; **F** – aortography following balloon aortic valvuloplasty

In conclusion, balloon rupture during aortic valvuloplasty is not a rare complication, especially with the advent of compliant, low-profile balloons manufactured using thinner materials. Despite the fact that balloon rupture is well tolerated in the majority of patients, every effort should be made to avoid this complication. Experienced operators should always thoroughly prepare the balloons and avoid overcoming the rated burst pressure.

**5** NHLBI Balloon Valvuloplasty Registry Participants. Percutaneous balloon aortic valvuloplasty. Acute and 30-day follow-up results in 674 patients from the NHLBI Balloon Valvuloplasty Registry. *Circulation*. 1991; 84: 2383-2397.

#### SUPPLEMENTARY MATERIAL

Supplementary material is available at [www.mp.pl/kardiologiapolska](http://www.mp.pl/kardiologiapolska).

#### ARTICLE INFORMATION

**CONFLICT OF INTEREST** None declared.

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#### REFERENCES

- 1 Kamran H, Sudhakar D, Jneid H. Balloon aortic valvuloplasty in the contemporary era. *Kardiol Pol*. 2020; 78: 956-958.
- 2 Letac B, Gerber LI, Koning R. Insights on the mechanism of balloon valvuloplasty in aortic stenosis. *Am J Cardiol*. 1988; 62: 1241-1247.
- 3 Yamen E, Daniels DV, Van H, et al. Use of a low-profile, compliant balloon for percutaneous aortic valvuloplasty. *Catheter Cardiovasc Interv*. 2010; 75: 794-798.
- 4 Seropian IM, Romeo FJ, Falconi M, et al. Balloon rupture during aortic valvuloplasty with compliant balloon: predictors and outcomes. *Cardiovasc Interv Ther*. 2020; 35: 291-299.