Critical impact of pressure recovery on assessment of aortic valve stenosis

Importance du phénomène de restitution de pression dans la quantification de la sténose aortique

Marjorie Richardson-Lobbedez, Pierre Vladimir Ennezat, Sylvestre Maréchaux

A 78-year-old hypertensive woman was admitted to hospital for syncope and acute heart failure. She had recently been diagnosed with severe aortic valve stenosis. B-type natriuretic peptide concentration was 957 pg/mL (normal value < 100 pg/mL) and haemoglobin was 12 g/dL. Trans thoracic echocardiography showed normal left ventricular ejection fraction, concentric hypertrophy and mild aortic valve calcifications (loop 1). Stroke volume index was calculated at 50 mL/m². Peak instantaneous aortic velocity was 4.10 m/s with a triangular-shaped continuous wave signal (Fig. 1). The mean pressure gradient was 30 mmHg and the effective orifice area was 0.95 cm² (0.55 cm²/m²), left ventricular outflow tract diameter and velocity time integral (VTI) were 21 mm and 25 cm, respectively, and aortic jet VTI was 90 cm. Small aortic root and preserved aortic leaflets opening with an orifice cautiously planimetered at 1.35 cm² were finally demonstrated using transoesophageal echocardiography (Figs. 2 and 3; loop 2). Moreover, sub- and supravalvular obstructions were ruled out. Electrocardiographic monitoring demonstrated severe sinus node dysfunction. A cardiac stimulator was implanted. The patient received diuretics and did not experience syncope during follow-up.
Figure 1. Doppler continuous wave tracing from the right parasternal view showing a peak instantaneous aortic velocity of 4.10 m/s associated with a triangular-shaped continuous wave signal.

Figure 2. Long axis transesophageal view showing a small aortic root and preserved aortic leaflets opening.

Figure 3. Short axis transesophageal view demonstrating preserved aortic leaflets opening.

According to current guidelines, severe aortic valve stenosis is considered when the maximal jet velocity is greater than 4.0 m/s or the effective orifice area is less than 1.0 cm² or 0.60 cm²/m² and warrants surgery when symptoms occur. However, apart from anaemia and aortic regurgitation or arteriovenous fistula, Doppler overestimation of aortic stenosis severity should be considered when the sinotubular junction is less than 30 mm. A significant rise in static pressure downstream from the orifice due to reconversion of kinetic energy into potential energy occurs if the ascending aorta is narrow and leads to an overestimation of Doppler-derived gradients. In our case, the correction for pressure recovery yielded an effective orifice area at 1.26 cm², congruent with planimetry data. Both the mild calcifications and the triangular (and not arched) waveform signal indicated moderate stenosis. Lastly, the observed mean gradient was in agreement with that predicted (33 mmHg), which is approximately one-half the peak in moderate stenosis while it is two-thirds of the peak in patients with severe aortic stenosis.

Conflicts of interests
None.

Appendix A. Supplementary data
Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.acvd.2009.05.007.