High Doppler-derived gradients across the aortic valve may be misleading: potential causes of valve gradient overestimation

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Doppler echocardiography is widely used to assess cardiac valve function. Under- or overestimation of transvalvular gradients may occur with this technique. In the case presented, the observed transvalvular gradient overestimation is most likely of multifactorial genesis. The colour Doppler images showing high velocity turbulent flow in the aortic root suggest that the causative factors are mainly of supravalvular origin. Although MR imaging (MRI) of the thoracic aorta revealed no signs of graft obstruction, the non compliant, small-for-size Dacron graft has almost certainly contributed to the increased Doppler gradients. Moreover, the pressure recovery phenomenon may have played an important role. Pressure recovery – the increase in pressure downstream from the valve caused by the reconversion of kinetic energy to potential energy – is a potential reason for gradient overestimation and, consequently, of valve area underestimation [1, 2]. Usually, it can be neglected if the ascending aortic diameter exceeds 30 mm.
but it has to be considered in the case of smaller diameters, such as in our patient due to the 22-mm graft.

To separate these two factors using echocardiography, and to evaluate their individual impact on Doppler measurements is challenging. One possibility, which was not performed in our case, would be the use of pulsed wave Doppler measurements within the graft with the high pulse repetition frequency (PRF) technique. However, it may be difficult to place the high PRF samples at an adequate interrogation angle and in such a way that only the flow within the graft would be interrogated.

This case shows that interpretation of elevated Doppler gradients across an aortic valve may be challenging. If implausibly high Doppler gradients are found, factors such as supravalvular obstruction or the pressure recovery phenomenon have to be considered.

Echo and MRI loops (AVI video files) can be viewed on the website of “Cardiovascular Medicine” http://www.cardiovascular-medicine.ch.

References