We appreciate the insightful comments by Drs Jenni and Martin regarding our recent publication.1 We agree with them that the determination of serial gradients using conventional Doppler data is problematic. The derivation used for Figure 3 results in the generation of negative gradients, which are nonphysiological, supporting the conclusions that we and Drs Jenni and Martin have presented.

Drs Jenni and Martin correctly pointed out that the velocity V2 in our article was not corrected for pressure recovery. As they suggested, we have now applied the equation derived by Garcia et al2 to the data derived from our patient to correct for energy loss. In this equation, energy loss (EL), which represents the actual workload caused by the stenosis, \( E_L = 4V_c^2(1 - EOA/A_v) \), accounts for both static and dynamic pressure changes across the system and was derived by combining the Bernoulli and linear momentum equations. We used the following assumptions: (1) \( A_v \) represented the aortic area (7.1 cm\(^2\)) distal to the vena contracta (VC); (2) the Doppler velocity across the aortic valve was used for \( V_c \); and (3) we used the Gorlin-derived aortic area (1.2 cm\(^2\)) from catheterization for effective orifice area (EOA). The resulting curve very closely approximated the invasively measured gradient across the aortic valve with a mean gradient of 21.6 versus 21.3 mm Hg (figure available upon request).

However, although this computation provides an accurate derivation of the aortic valve gradient, it does require knowledge of the EOA or aortic valve area. In the clinical scenario presented, the purpose of hemodynamic evaluation was to determine the severity of valvular aortic stenosis. Therefore, we agree with Drs Jenni and Martin that accurate calculation of valve gradients in obstruction in series can be derived from their proposed methodology of determining the degree of pressure recovery, but invasive hemodynamics may still be needed for the clinical determination of valve severity in select cases.

Disclosures

None.

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References

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