Letter by Poullis and Warwick Regarding Article, “Paradoxical Low-Flow, Low-Gradient Severe Aortic Stenosis Despite Preserved Ejection Fraction Is Associated With Higher Afterload and Reduced Survival”

To the Editor:

In their article, Hachicha et al1 raise a number of key points that merit further questioning. Despite the direct relevance of their findings to everyday clinical practice, it is our opinion that their use of the terms paradoxical low-flow and higher afterload may be flawed.

The gradient across a stenotic valve can be estimated using the Bernoulli equation (4V²). The velocity across a stenosis equals flow divided by area of stenosis, ie, cardiac output divided by aortic valve area in aortic stenosis. Thus, the gradient for a given stenosis depends entirely upon the cardiac output.

The term preserved ejection fraction indicates that the ejection fraction’s value is maintained above 50%. As demonstrated by the authors’ data,1 however, the group with a normal flow and significantly higher gradient had significantly higher ejection fractions, cardiac outputs, and cardiac indices, so their hemodynamic findings are as expected. Thus, the finding is not paradoxical. The lower cardiac output, representing ventricular failure, is linked to poorer outcome if left uncorrected.

Although most values that Hachicha et al1 quote are indexed, no mention is made of patients’ size. Small patients have lower cardiac output than larger patients have; hence, a small person will have a lower gradient for an equivalent aortic valve area.

With regard to afterload, the term valvulo-arterial impedance designates a double-derived variable that inversely reflects the cardiac output. First, the systemic vascular resistance is calculated from the blood pressure and cardiac output. This derived value is then used to derive the valvulo-arterial impedance. As cardiac output is the fundamental variable, the valvulo-arterial impedance has to be higher in the low-flow group, as the cardiac output is lower and the blood pressures are equal.

Demonstration that severe aortic stenosis will be missed if the patient is assessed by gradient alone affirms the inclusion of aortic valve area in the latest American College of Cardiology/American Heart Association guidelines.2

The findings of Hachicha et al1 are that low-gradient severe aortic stenosis is due to reduced cardiac output, despite preserved ejection fraction, and that it indicates that surgical replacement is prognostically beneficial. The findings are neither paradoxical nor due to higher afterload.

Disclosures

None.

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References


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