Letter by House et al Regarding Article, “Prosthesis-Patient Mismatch in Bovine Pericardial Aortic Valves: Evaluation Using 3 Different Modalities and Associated Medium-Term Outcomes”

To the Editor:

The proverbial gold standard for evaluating prosthesis-patient mismatch (PPM) is the effective orifice area index. This is attributable to the inverse relationship that exists between the effective orifice area index and mean gradient. Other tools have been promoted to identify PPM but have not withstood scrutiny.1

In a recent edition of Circulation: Cardiovascular Imaging, Chacko et al2 propose applying the American Society of Echocardiography guidelines for prosthetic valves to exclude the presence of PPM. In these guidelines, there is a useful algorithm for the evaluation of high transprosthetic gradients. This algorithm was specifically created to assist in the evaluation of aortic prostheses with elevated peak velocities exceeding 3 m/sec.

A common pathogenesis of velocities exceeding 3 m/sec is PPM, although this is not the exclusive reason for increased velocities. In addition, PPM is not invariably associated with velocities exceeding 3 m/sec, as demonstrated in low-flow states. These low-flow states can occur with reduced left ventricular ejection fraction (LVEF; ie, classical low-flow) but also with preserved LVEF (paradoxical low-flow).3

The authors did exclude patients with LVEF <50%, with the goal of creating a hemodynamically similar cohort. However, it has been well established that a normal LVEF is not synonymous with a normal stroke volume, and that a large proportion (10%–35%) of patients with preserved LVEF have in fact reduced transvalvular gradients.4 This paradoxical low-flow state is often associated with pseudonormalization of transvalvular flow velocities and gradients in patients with native aortic valve stenosis, leading to underestimation of stenosis severity. The same concept applies to patients with prosthetic heart valves, such that patients with preserved LVEF who have reduced stroke volume can have PPM even with flow velocities <3 m/sec. Similarly to what is observed in patients with paradoxical low-flow, low-gradient aortic stenosis, these patients with preserved LVEF and concomitant low-flow, low-gradient PPM likely have worse prognosis compared with those with normal flow and elevated gradient PPM. Not taking into account this phenomenon of velocity/gradient pseudonormalization associated with paradoxical low-flow obviously led to a significant underestimation of the true incidence of PPM in this series. Although the American Society of Echocardiography guidelines algorithm provides a useful template to guide the investigation of potential pathogeneses of increased transprosthetic velocities, it is unlikely that it was intended for the comprehensive evaluation of PPM. In particular, this algorithm does not address the case of patients with paradoxical low-flow who may exhibit low velocities and gradients despite the presence of significant PPM.

Manufacturer-provided effective orifice area index charts have been shown to overestimate EOAs and ultimately underestimate the incidence of PPM.5 The publication from Chacko et al2 is supportive of this because only 3 of 614 patients were found to have PPM by the manufacturer estimates.

It is noted that the 28 patients identified as having PPM on the basis of the American Society of Echocardiography algorithm, all had mean gradients >20 mm Hg, with some ≥30 mm Hg. However, the manufacturer-provided charts method would have suggested that the majority of these individuals did not have PPM. So, the conclusions that the manufacturer charts are consistent with the American Society of Echocardiography algorithm, and that these charts can thus be used in routine practice, may not be appropriate.

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References


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