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EFFECTIVE ORIFICE AREA IS PATIENT-SPECIFIC!

To the Editor:

I read with great pleasure the European Association for Cardio-Thoracic Surgery document addressing prosthetic valve size labeling of surgical prostheses by Durko and colleagues.¹ It was a treat to read such a concise and comprehensive summary of prosthetic valve sizing, size selection, and the principles of their hemodynamic comparisons. The text sheds ample light onto the current confusion regarding these topics and offers easily comprehensible solutions for (1) understanding the problem of the various prosthetic valve dimensions and their impact on hemodynamics and (2) intervalve comparisons of hemodynamics. The figures elegantly explain key principles of valve dimensions, and the functionally relevant dimensions that are related to each prosthesis. Figure 6 illustrates the important recognition that hemodynamic results of an aortic valve replacement arise from the combination of geometric characteristics of the implanted prosthesis AND the anatomic dimensions of the patient. Thus, the resulting effective orifice area (EOA) is patient-specific and it is not the same as the actual opening of the prosthesis (in Figure 6, termed GOA).²

In the accompanying text, the authors then appropriately refer to an in vivo–obtained EOA. However, they also describe a “normal in vivo EAO value reported for the same model and size of SHV” (surgical prosthetic heart valve). The latter statement raises concern, because it underscores the erroneous assumption that EOAs can be valve-specific. In addition, the terminology of a “normal reference value” of an “EOA for a corresponding model and size of SHV” and the suggestion that this value may be used to predict prosthesis–patient mismatch may be

questioned. As described in the text of the article, the EOA is the result of the interplay between flow velocities and the individual patient's outflow tract area (continuity equation). Thus, it is patient-specific and the same prosthesis in 2 anatomically different patients will result in 2 different EOAs despite the same GOA of the prostheses.^{2,3} What is referred to in the text as reference values for EOAs of SHV can therefore only be the mean of all individually measured EOAs after aortic valve replacement. The value thereby reflects the average hemodynamic result of what we do daily. It should not allow judging the hemodynamic quality of the implant or the presence of prosthesis–patient mismatch (as suggested by relating an individual in vivo EOA to this reference value including two standard deviations). As was correctly described long ago, the hemodynamic result of a surgical valve replacement is never as good as that of the normal native valve.^{4–6} The only value surgeons may derive from this mean value is the information whether their implantation of a specific valve type and size resulted in hemodynamics that were above or below the average of all surgeons (ie, better or worse than the average). The reference value is therefore a valuable piece of information, but more so for the surgeon than for the patient. The EOA, however, is always patient-specific.

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