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Hemodynamics of the Aortic Jet and Implications for Detection of Aortic Stenosis Murmurs[1] CHI ZHU, JUNGHEE SEO, HANI BAKHSHAEE, RAJAT MITTAL, Johns Hopkins University — Cardiac auscultation with a stethoscope has served as the primary method for qualitative screening of cardiovascular conditions for over a hundred years. However, a lack of quantitative understanding of the flow mechanism(s) responsible for the generation of the murmurs, as well as the effect of intervening tissue on the propagation of these murmurs has been a significant limiting factor in the advancement of automated cardiac auscultation. In this study, a multiphysics computational modeling approach is used to investigate these issues. Direct numerical simulation (DNS) is used to explore the fluid dynamics of the jets formed at the aortic valve and the pressure fluctuations generated by the interaction of this jet with the aortic wall. Subsequently, structural wave propagation in the tissue is resolved by a high-order, linear viscoelastic wave solver in order to explore the propagation of the murmurs through a tissue-like material. The implications of these results for cardiac auscultation are discussed.

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