

Abstract Submitted
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Insights into mitral regurgitation quantification by proximal isovelocity surface area (PISA) and vena contracta area (VCA): A numerical study¹ TONGRAN QIN, ANDRES CABALLERO, Georgia Inst of Tech, REBECCA HAHN, Columbia University, RAYMOND MCKAY, Hartford Hospital, WEI SUN, Georgia Inst of Tech — Mitral regurgitation (MR) is the most common valvular heart disease, with a prevalence of 9.3% in US population aged 75 and above. Although Doppler echocardiography (Echo) is the primary tool to assess MR severity, MR quantification remains challenging and a true gold standard technique is still lacking. Therefore, the objectives of this study are to evaluate the fundamental assumptions in MR quantification with Echo and identify their pitfalls using computational modeling. The MR models were created from a subject-specific left heart and fluid-structure interaction (FSI) simulation were used to obtain 3D flow field, where simulated Echo acquisition were performed. Regurgitant volume (RVol) was estimated using 2D and 3D proximal isovelocity surface area (PISA) method, and vena contracta area (VCA) method. In addition, the measurement from both peak PISA/VCA and integrated PISA/VCA were reported. By comparing Rvol using different methods with the reference value obtained directly from FSI models, we found that in general, integrated method was more accurate, 3D PISA was much better than 2D PISA, and VCA was more robust than PISA due to its more concrete theoretical basis.

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