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Vortex Formation Time in Progression of Cardiac Dysfunction ARASH KHERADVAR, University of South Carolina, MORTEZA GHARIB, Caltech — We previously showed that the trans-mitral vortex formation is affected by functionality of the cardiac left ventricle (LV). Additionally, we showed that in a healthy heart, the vortex formation time (VFT) closely follows the suggested values obtained *in vitro* by Gharib et al. Here, we assess the changes in VFT during the progress of cardiac dysfunction. In LV, the VFT can be independently derived from volumetric parameters and the ventricular ejection fraction (EF):

$$VFT = \frac{4(1-\beta)}{\pi}.\alpha^3.EF$$

where β is the contribution of atrial contraction phase to the LV stroke volume, and α is the ratio of the cubic root of LV end-diastolic volume to the effective mitral valve area diameter. Thus, α^3 is considered a non-dimensional measure for LV geometry. Substituting the values of α, β and EF obtained from patients in different stages of diastolic dysfunction into VFT equation would result in distinct range of VFT for each stage. This equation is also attributable to systolic dysfunction where EF has a significant contribution. Accordingly, by comparing the value of VFT during the progression of cardiac dysfunction, VFT can be considered as a factor that determines the deterioration of LV function, either from systolic and/or diastolic origin.

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