Abstract Submitted
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A New Parameter for Cardiac Efficiency Analysis[1] IMAN BORAZJANI, NAVANEETHA KRISHNAN RAJAN, ZEYING SONG, KENNETH HOFFMANN, University at Buffalo SUNY, EILEEN MACMAHON, MAREK BELOHLAVEK, Mayo Clinic Arizona — Detecting and evaluating a heart with suboptimal pumping efficiency is a significant clinical goal. However, the routine parameters such as ejection fraction, quantified with current non-invasive techniques are not predictive of heart disease prognosis. Furthermore, they only represent left-ventricular (LV) ejection function and not the efficiency, which might be affected before apparent changes in the function. We propose a new parameter, called the hemodynamic efficiency (H-efficiency) and defined as the ratio of the useful to total power, for cardiac efficiency analysis. Our results indicate that the change in the shape/motion of the LV will change the pumping efficiency of the LV even if the ejection fraction is kept constant at 55% (normal value), i.e., H-efficiency can be used for suboptimal cardiac performance diagnosis. To apply H-efficiency on a patient-specific basis, we are developing a system that combines echocardiography (echo) and computational fluid dynamics (CFD) to provide the 3D pressure and velocity field to directly calculate the H-efficiency parameter. Because the method is based on clinically used 2D echo, which has faster acquisition time and lower cost relative to other imaging techniques, it can have a significant impact on a large number of patients.

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