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Imaging

A NOVEL TECHNIQUE TO IDENTIFY TRANSPORT TEMPLATES IN THE HUMAN LEFT VENTRICLE USING DOPPLER ECHOCARDIOGRAPHY AND COMPUTATIONAL MODELING

Poster Contributions
Poster Sessions, Expo North
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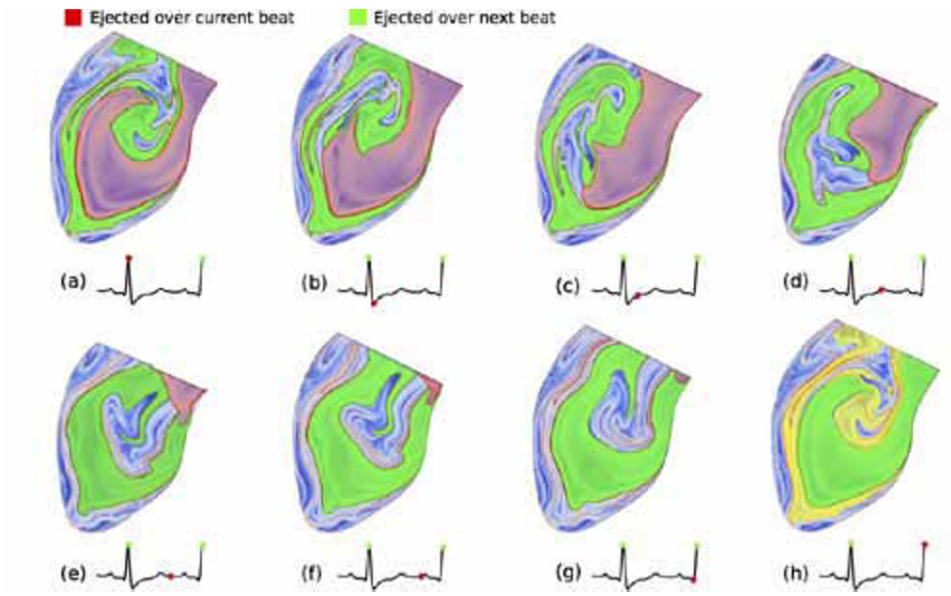
Background: Imaging of left ventricle (LV) hemodynamics can provide substantial diagnostics of pumping deficiencies. Color-Doppler provides a single velocity component aligned with the ultrasound beam. While useful, this constitutes a particular limitation for assessing full intracardiac hemodynamics. E.g. thrombosis due to stasis in the LV is a major concern in diseased hearts and there is currently no means to quantify LV stasis clinically.

Methods: We develop a novel technique to construct bi-directional, time-resolved LV velocity maps from conventional transthoracic color Doppler and LV wall measurements. We develop a novel post-processing technique that enables rapid and precise tracking of regions of injected and ejected blood.

Results: Transport patterns of injected and ejected blood to and from the LV (Fig) are presented. These regions were tracked over several beats, enabling quantitative and visual assessment of LV transport. This data was used to compute 2 surrogates for LV stasis: (1) "Direct Inflow", defined as the percentage of blood directly passed from the left atrium to aorta during a single beat, and (2) "Residual Volume", defined as the percentage of blood residing in the LV for more than 4 beats. Results are presented for 20 patients.



Conclusion: Novel velocity reconstruction and post-processing techniques enable qualitative and quantitative assessment of transport inside the LV from traditional transthoracic Doppler, providing for the first time means to assess LV stasis.