LONGITUDINAL AND TRANSVERSE IMPEDANCE CAN QUANTIFY LEFT VENTRICULAR DIASTOLIC FUNCTION

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Authors: Erina Ghosh, Sandor Kovacs, Washington University, St. Louis, MO, USA

Background: Longitudinal (ZL) and transverse (ZT) impedances are used in vascular biology to describe arterial system properties. These established physiologic metrics have not been previously considered for diastolic function assessment. We hypothesized that ZL and ZT are causally related to LV longitudinal filling function characterized by E/E'.

Methods: For proof of concept 4 subjects were selected from our database. Two had impaired longitudinal function (classified by Tissue Doppler E'peak < 8 cm/s and Doppler E/E' > 8) and 2 subjects had normal E/E'. Simultaneous LV pressure (Millar catheter) and Doppler E-wave data was analyzed. ZL and ZT as previously defined were computed.

Results: ZL average was 1.4 mm Hg. s/cm4 for two subjects with impaired longitudinal motion and 0.9 mm Hg. s/cm4 for two controls. The value of ZT was 91 mm Hg. s/cm2 for subjects with impaired longitudinal motion and 260 mm Hg. s/cm2 for controls.

Conclusions: Our proof of concept results show that subjects with impaired longitudinal motion (low E') have: 1) higher ZL than controls, indicating higher long axis resistance (impedance mismatch) to filling 2) lower ZT compared to controls, indicating lower transverse resistance to filling as a compensatory feature to maintain stroke volume. Hence, directional impedances characterize filling pattern of the LV based on directional chamber properties. Further study in larger sample is in progress.

Fig 1: (Left) Value of ZL for the four subjects. Subject 1 and 2 have E/E' < 8 (in blue) and the average value ZL for the two is 0.9 mm Hg. s/cm4. Subject 3 and 4 have E/E' > 8 (in red) and the average value for ZL is 1.4 mm Hg. s/cm4. (Right) Value of ZT for the four subjects. The average value of ZT for the two subjects with low E/E' (blue) is 260 mm Hg. s/cm2 and the average value of ZT for the subjects with high E/E' (red) is 91 mm Hg. s/cm2.