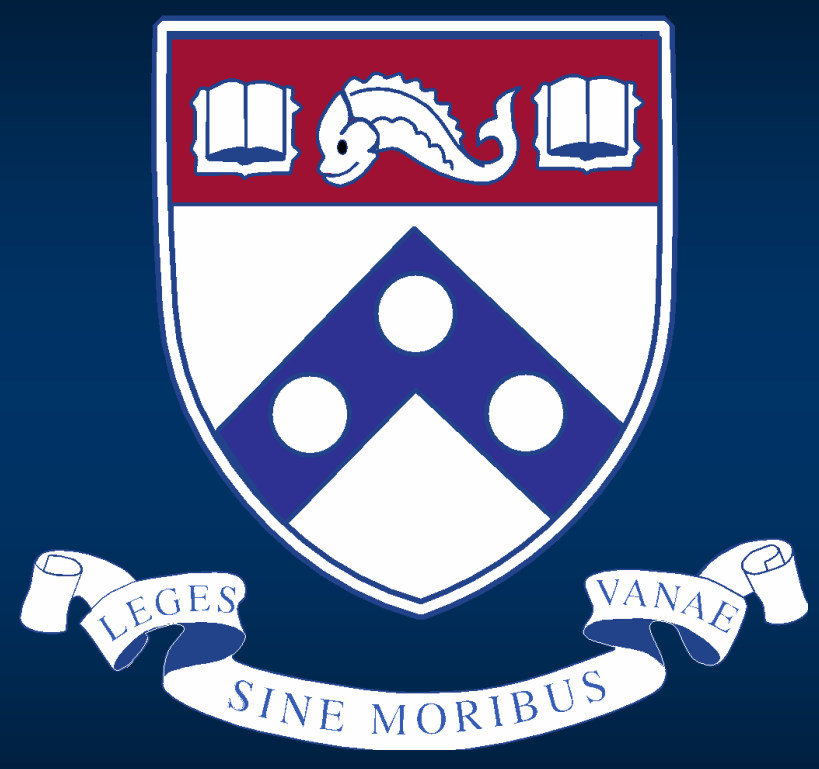


Quantitative Modeling of LV Inflow Characterizes Impaired Left Ventricular Function, Atrial Function and LV-LA Coupling

Julio A. Chirinos¹, Swetha Gaddam¹, Zeba Hashmath¹, Anila Hussain¹, Bilal Ansari¹, Jonathan Lee¹, Yueya Ge¹, Jessica Kim¹, Rachana Miller¹, Rushik Bhuva², Scott Akers³

¹University of Pennsylvania, Philadelphia, PA, USA ²Canton Medical Education Foundation, Canton, OH, USA ³VA Medical center, Philadelphia, PA, USA



Background

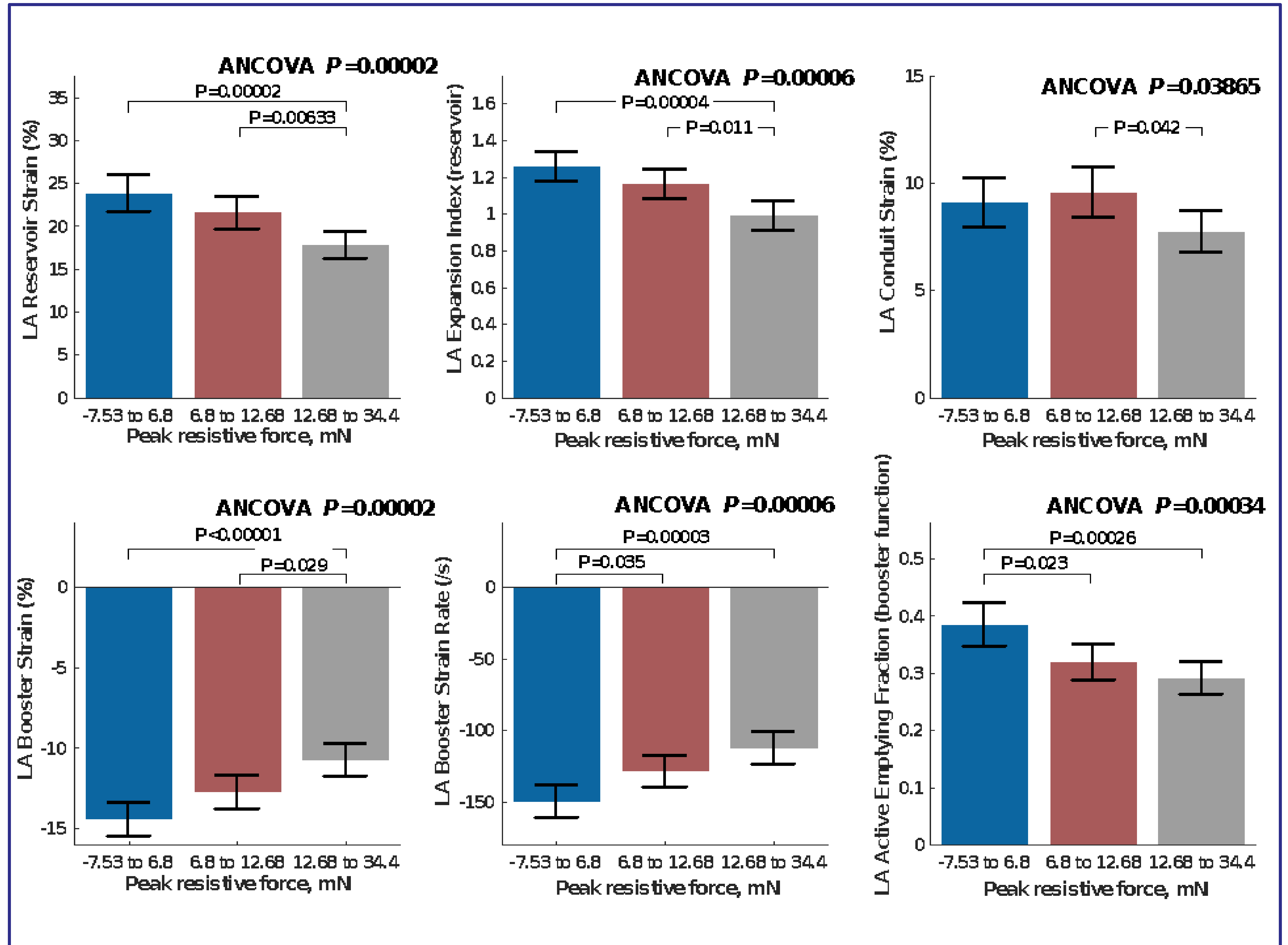
- There is a clinical need for a more detailed, non-invasive characterization of diastolic function.
- Parametrized kinematic modeling of diastolic filling (diastolic filling formalism, PDFF) based on the Doppler echocardiographic E-wave velocity profile, may provide a detailed characterization of diastolic abnormalities.
- However, early diastolic filling is dependent on interactions between left atrial and ventricular properties.
- The relationship between PDFF parameters, left atrial (LA) function and LV circumferential vs. longitudinal function, is unknown.

Methods

- We studied 304 subjects with varying degrees of systolic and diastolic function.
- Mitral diastolic inflow was measured using echocardiography and PDFF modeling was applied using custom-designed software.
- LV and atrial strain were measured with tissue-tracking cardiac SSFP MRI.

Results

- Increasing tertiles of the filling load parameter x0, (which represents the load compressing the elastic myocardium at end systole and promoting restoring forces in early diastole) were associated with increased circumferential (-14.5, -16.7 and -16.9; ANOVA P<0.00001) and longitudinal (-14.7, -16.7, -17%; P=0.0004) strain.
- Higher LV stiffness was associated with a lower booster pump LA function (active emptying fraction=0.36, 0.34, 0.29; P=0.019), whereas higher viscoelasticity was associated with impaired reservoir and booster pump LA function.
- The resistive force to LV filling was strongly and associated with poor LA reservoir, conduit and booster function, even after adjustment for multiple confounders, including LV longitudinal and circumferential strain, LV end-diastolic volume, LV mass and EF (Figure).



Conclusions

- The PDFF characterizes important phenotypes of LV and LA function, including reduced LV systolic deformation (related to elastic recoil in early diastole), and LA dysfunction, which adversely impacts LA-LV coupling.

Disclosures

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