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Spotlight on Special Topics

FULLY-AUTOMATED MITRAL E/A RATIO COMPUTATION USING A PHONOCARDIOGRAM-BASED FEATURE

Poster Contributions
Posters Hall_Hall A
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Background: Detection of heart failure with preserved ejection fraction (HFpEF) by non-expert clinicians requires training and experience in operating Doppler echocardiography machines.

Methods: Doppler echocardiography records were obtained for 18 patients scheduled to undergo right heart catheterization at the Oregon Health & Science University Hospital. Phonocardiogram (PCG) and electrocardiogram signals were acquired simultaneously using acoustic sensors and electrodes. Mitral E/A ratio was computed from a feature-based linear model using the ratio of early and late diastolic interval PCG signal spectral entropy, i.e., the negative product of the signal probability distribution estimate with its logarithm.

Results: Bland-Altman bias and limits of agreement were 0.00 +/- 1.28 (Figure 1). E/A ratio computation leveraged variations in diastolic interval PCG signal characteristics due to blood flow and wall motion. In patients with larger E/A ratios, the early diastolic interval showed lower PCG signal spectral entropy when compared to the late diastolic interval. Signal acquisition and processing techniques used in E/A ratio computation were fully automated and free of operator induced variability.

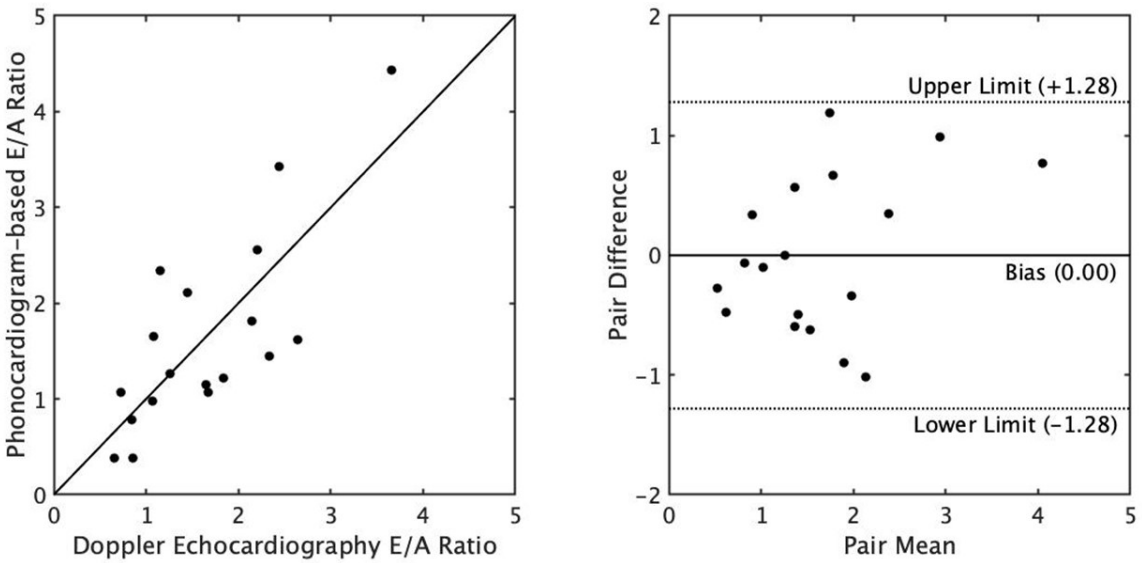

Figure 1. Scatter plot (left) and Bland-Altman analysis (right) of Phonocardiogram-based E/A Ratio vs. Doppler Echocardiography E/A Ratio for 18 patients.

Conclusion: Fully-automated PCG-based E/A ratio computation represents a first step towards heart failure screening at the point of primary care. Non-expert clinicians can obtain proxies for Doppler echocardiography parameters to use in subsequent HFpEF diagnosis.