

Identification of heart failure patients by seismocardiography

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Background: Heart failure (HF) is a significant global health concern, with limited diagnostic tools for efficient, cost-effective, and non-invasive detection. Transthoracic echocardiography (TTE) is widely used due to its availability and affordability, its accuracy depends on operator skill and requires specialist training for accurate results. This study aims to develop and validate seismocardiography (SCG)-based algorithms for HF detection.

Aims: The study aimed to develop an SCG algorithm and assess its diagnostic performance in detection of heart failure (HF) and SCG's accuracy in identifying HF with preserved ejection fraction (HFpEF).

Methods: The study included 199 subjects with suspected HF and 20 patients with known HF with reduced ejection fraction (HFrEF). Assessments were conducted using SCG, electrocardiogram, NYHA classification and transthoracic echocardiography. The SCG algorithm, "AnyHF-score" was developed to identify all subtypes of HF, including HFrEF, HF with mildly reduced (HFmEF) and HFpEF. Diagnostic accuracy was assessed using sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and the area under the receiver-operating characteristic curve (AUC-ROC).

Results: Following exclusion criteria, 208 subjects formed the final study population. The Any-HF score demonstrated an AUC of 82%, sensitivity of 90.9%, NPV of 87.5% and PPV of 52.6% in detecting all HF versus no HF. The AnyHF-score showed an AUC of 78.2 %, with a sensitivity of 88.2%, specificity of 43.8%, NPV of 93.3%, and PPV of 29.4% in detecting HFpEF vs no HF.

Conclusions: This study demonstrates the potential of SCG for identifying HF. The Any-HF score showed high diagnostic accuracy in detecting all types of HF and HFpEF. SCG could offer a cost-effective, non-invasive alternative for HF detection.