

PREDICTION OF ABNORMAL MYOCARDIAL RELAXATION FROM SIGNAL PROCESSED SURFACE ECG

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Purpose/Premise

This study examined the benefits of using signal-processed surface electrocardiography (spECG) to diagnose abnormal cardiac muscle relaxation.

Materials and Methods

The authors used signal-processing techniques to magnify small changes on the surface ECG frequency spectrum related to the development of abnormal myocardial relaxation. The study used a 12-lead electrocardiogram on 188 patients who had been referred for coronary computed tomography. A method similar to Fourier analysis was used to deconstruct the ECG signals.

Discussion/Outcomes

Some of the key points discussed included:

- Doppler imaging showed that 70% (133 of 188 subjects) had abnormal myocardial relaxation.
- Using a 12-lead spECG, an area under the curve of 91% was shown for predicting abnormal myocardial relaxation (80% sensitivity, 84% specificity).
- The prediction of low early diastolic relaxation velocity (e') also allowed for the identification of significant underlying coronary artery disease in 82% of the cases. Integrated discrimination and net reclassification were also shown to be better for spECG compared to clinical features and conventional ECG.
- Among the findings, the authors noted that by adding the random forest classifier-based prediction of low e' the prediction was improved as indicated by a 19% improvement in the area under the curve, an improvement of integrated discrimination index by 0.42 ($p < 0.001$), and accurate reclassification of more than 80% of low e' and normal subjects.
- There was also a 16% improvement of the area under the curve after adding Glasgow risk categorization, with integrated discrimination index by 0.40, and correct reclassification of more than 80%.
- Because the incidence of LVDD is high, as it can't reliably be diagnosed by physical examination, and because of the limitations of a standard ECG, it is important that a physician carefully identify patients who should have an echocardiogram.

Conclusion/Recommendation

The authors conclude that:

- spECG demonstrates excellent predictive ability for abnormal myocardial relaxation
- Predicting abnormal e' helps identify patients with advanced diastolic dysfunction and concurrent coronary artery disease (CAD).
- This shows much greater incremental value compared to the use of clinical variables and surface ECG.
- spECG can enhance screening strategies that identify subjects at risk for LVDD who might benefit from Echo evaluations.



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