P18 - Posters - Cardiac Imaging

56 **Detection of Stress-Induced Myocardial Ischemia Using Analysis of Depolarization Abnormalities**

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57 **A Novel Dyssynchrony Index of Chest Vibrations for the Evaluation of Cardiac Synchrony**

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58 **Coronary Blood Flow Velocity Measurement by Transthoracic Parametric Doppler, a New Technique for Mapping Blood Flow Along Coronary Artery**

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Detection of Stress-Induced Myocardial Ischemia Using Analysis of Depolarization Abnormalities

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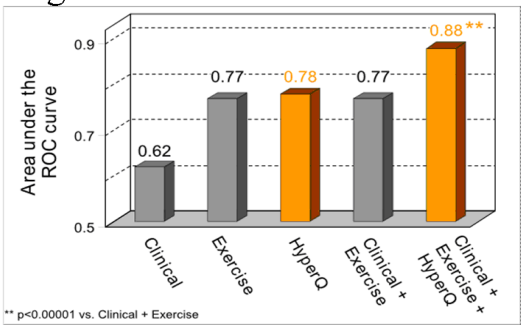
Detection of stress-induced myocardial ischemia typically focuses on changes in the repolarization phase of the ECG, manifested in the ST segment. However, ischemia also induces changes in the depolarization phase, which can be quantified by analysis of high-frequency mid-QRS components. We aimed to determine incremental diagnostic value of this technique over standard ECG exercise testing. **Methods.** Exercise SPECT myocardial perfusion imaging (MPI) was performed in 941 consecutive pts (630 men) referred for evaluation of CAD at 2 medical centers and used as gold standard of ischemia. Conventional exercise ECG was combined with high resolution ECG acquisition, which was digitized and analyzed using the HyperQ™ System (BSP, Israel). A 50% decrease in the intensity of high frequency QRS components (HyperQ) during exercise was used as an index of ischemia. Logistic regression was used to assess incremental diagnostic value of HyperQ data over conventional ST analysis. **Results.** Moderate/severe MPI ischemia was found in 52 pts. HyperQ index was more sensitive than ST segment analysis (69% vs 48%, p=0.03) with similar specificity (84%). HyperQ index offered significant incremental diagnostic value over clinical and exercise test data (fig) and correlated to ischemia severity (R^2=0.8, p<0.001). **Conclusions.** HyperQ analysis provides a significant improvement over conventional ST segment analysis in detecting ischemia, and may thus aid in enhancing the non-invasive diagnosis of ischemic heart disease.



A Novel Dyssynchrony Index of Chest Vibrations for the Evaluation of Cardiac Synchrony

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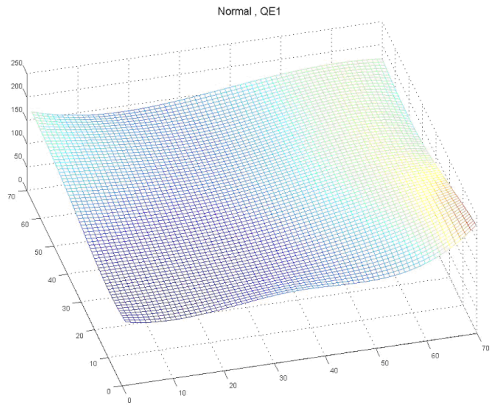
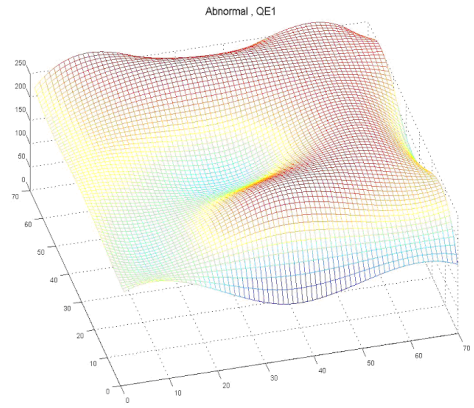
Width of QRS and echocardiographic methods for the evaluation of cardiac synchronicity and prediction of response to biventricular pacing are limited. Right ventricular pacing alters sequence of ventricular contraction and may result in reduced ventricular systolic function. We developed a new transthoracic method for recording and mapping of cardiac mechanical vibrations. Aim: Evaluation of cardiac synchrony in subjects with right ventricular pacing using a new tarnsthoracic vibration systolic dyssynchrony index (VSDI) and comparison to normal subjects. Methods: Thirty four subjects were examined, 24 were normal controls and 10 subjects with right ventricular apical pacing. A matrix of 5x5 transducers was applied to the chest and the vibrations were mapped and recorded digitally. The interval between the onset of q-wave and the peak of the amplitude of vibration for each transducer was measured and a colored three dimensional map for the whole matrix of transducers was generated (figures). VSDI for each subject was determined as the standard deviation of the difference between the median value and each transducer interval. Results: VSDI for normal controls (12.6±6.2msec) was lower than for patients with right ventricular pacing (30.3±9.9msec), $p<0.05$. VSDI correlated with QRS width, however with various degrees of dyssynchrony. Conclusions: A simple new transthrocic dyssynchrony index can differentiate between various degrees of cardiac dyssynchrony related to QRS width in patients with right ventricular pacing.





Coronary Blood Flow Velocity Measurement by Transthoracic Parametric Doppler, a New Technique for Mapping Blood Flow Along Coronary Artery

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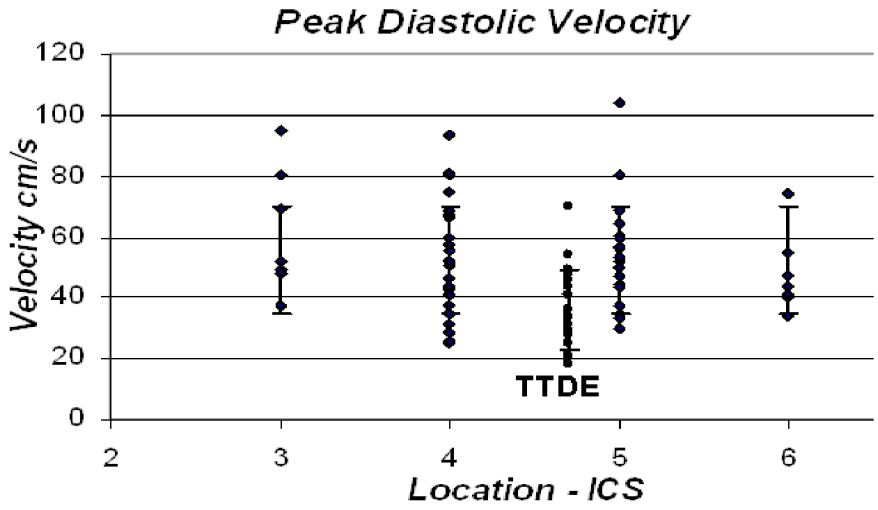
Background: Coronary blood flow velocity measurement by transtoracic Doppler echocardiography (TTDE) has been shown to be a reliable diagnostic and prognostic approach. However these measurements provide the flow velocity at a single location along the coronary artery, usually the mid distal segment of LAD. Therefore we tested the feasibility of a new non-imaging multi-gating Doppler technique: the transthoracic parametric Doppler (TPD), in measuring coronary blood flow velocity along the LAD coronary artery.

Methods: coronary blood flow velocity in LAD was acquired by TTDE and TPD in 20 consecutive patients (52 ± 19 yrs) who were referred to Echocardiography. The measurements with TTDE (Acuson, Philips) were acquired at mid-distal segment of LAD, while measurements with TPD (Echosense) were acquired at four locations along the pathway of LAD. These locations were related to the intercostal spaces (ICS).

Results: successful measurements with TTDE were achieved in all patients and at 2.9±0.8 (2-4) locations/patient by TPD. Blood flow velocity was acquired along 15-20 mm into the LAD at each location by TPD. The peak diastolic velocity by TTDE was significantly lower compared to the corresponding location by TPD, 36.2 ± 13.2 vs 5 3.2 ± 17.2 cm/s ($p<0.01$, t-test), whereas velocity time integral was 12.6 ± 6.0 vs 18.6 ± 5.5cm ($p=0.08$) respectively. The velocities by TPD along LAD were similar in all locations.



Conclusions: TPD enables the measurement of blood flow velocity along coronary artery thus having the potential for further quantitative assessment of coronary flow and early identification of coronary artery disease.