QRS Duration Does Not Predict Occurrence of Ventricular Tachyarrhythmias in Primary Prevention Patients With Implantable Cardioverter-Defibrillators

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Background: QRS duration (QRSd), measured on a standard ECG, correlates with total mortality risk in coronary artery disease (CAD) patients (pts) at high risk for sudden death. However, the relationship between QRSd and risk of ventricular tachyarrhythmias (VT/VF) is unclear.

Methods: PainFREE RX II (N=636) was a randomized trial comparing efficacy of anti-tachycardia pacing vs. shock therapy for fast VT (cycle length [CL] <=320msec) in pts receiving implanted cardioverter-defibrillators (ICD). Detection criteria were programmed uniformly, and available stored electrograms of VT/VF episodes were analyzed by an expert panel to verify ventricular origin of tachycardias. We correlated the QRSd on the 12 Lead ECG at study entry with occurrence of VT/VF during the trial.

Results: Of 168 CAD pts enrolled for primary prevention, 91 had QRSd <=120 msec. Over a mean follow-up of 11.3 months, VT/VF episodes occurred in 19/91 (21%) pts with QRSd <=120 msec vs. 17/77 (22%) pts with QRSd >120 msec. The odds of episodes in pts with QRSd >120msec is 1.07 times that of patients with QRSd <=120 (95% C.I. =0.51-2.25; p=0.85). We evaluated the sensitivity and specificity of QRSd in intervals of 0 msec ranging from 70 to 200. Sensitivity is the proportion of pts experiencing VT/VF episodes above each QRSd, reported in msec. Specificity is the proportion of true negatives below each reported QRSd. The optimal combination of sensitivity (75%) and specificity (42%) was obtained at QRSd 110 msec. Among patients who had VT/VF episodes, patients with QRSd >120 msec (median 2/pt) did not have significantly more episodes than those with QRSd <=120 msec (median 1/pt) (p=0.34).

Summary: 1. QRSd is not useful clinically to predict primary prevention pts who will benefit from ICDs. 2. We found no QRSd that resulted in acceptable sensitivity and specificity in this study population.

Conclusions: 1. QRSd is not useful clinically to predict primary prevention pts who will benefit from ICDs. 2. We found no QRSd that resulted in acceptable sensitivity and specificity in this study population.

Regional Distribution of Depolarization Alternans Preceding Ventricular Fibrillation Onset in a Canine Ischemic Model

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Repolarization alternans is associated with spontaneous arrhythmias. We devised an algorithm to quantify the degree of alternans in a 4 second window and tested it on epicardial electrograms from normal and ischemic dogs during sinus rhythm. Methods: Unipolar electrograms were recorded from a 112 electrode plaque placed on the left ventricle from 21 dogs before and 3-5 minutes after ligation of the left anterior descending artery (LAD). Sites were graded into R1(no ischemia), R2 and R3 (severe ischemia). The algorithm was used to detect alternans in the QRS and ST-T segment by fitting a saw-tooth against sequential peak-to-peak QRS and T wave amplitudes. The amplitude of the best fit saw-tooth was the alternans amplitude (AA). The alternans index (AI) was computed as the ratio of the AA divided by an error term. Results: The baseline QRS and ST/T AI was 1.06 ±1.2 and 1.48±2.06 and it increased to 2.99±6.31 and 5.73 ±11.0 respectively (P<0.0001 for each) after LAD occlusion. Six dogs developed spontaneous VF during ischemia and had a higher mean QRS and ST/T AI at sites with maximal ischemia before VF onset as opposed to dogs with no spontaneous VF who had the highest AI at sites with no ischemia (Table).Conclusions: This algorithm showed that depolarization and repolarization alternans increase during ischemia. In dogs with VF depolarization alternans preceding VF originates in the ischemic zone whereas dogs without VF have more alternans in regions without ischemia. This may simplify clinical alternans measurements.