Clinical Performance of the Wavelet™ Automatic Electrogram Template Collection Algorithm

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Background: Electrogram morphology (EGM) analysis may improve arrhythmia discrimination in implantable cardioverter-defibrillators, but the EGM may change with lead maturation, urination, drugs or disease progression. We evaluated a novel 3-stage automatic algorithm that collects and confirms the EGM template and then continuously assesses the need for template updating.

Methods: The algorithm first collects a template from the patient’s non-paced, slow rhythm and screens out premature ventricular contractions. Template confirmation requires that ≥ 70 of 100 non-paced beats match the template before it is activated for VT/SVT discrimination (> 12 minutes). Matching of the template and intrinsic EGM is performed using match scores computed using a Wavelet transform-based method described previously. After template activation, a continuous quality check triggers the collection of a new template when fewer than 70 of 100 non-paced beats match the template (> 8 hours). This new algorithm was studied in 50 patients implanted with the Medtronic Marquis VR ICD. Automatic templates were compared with the patient’s real-time intrinsic EGM using Wavelet match score evaluation at pre-hospital discharge (PHD) and up to 4 weeks post-implant.

Results: All 50 patients had at least one automatic template created and 17 (34%) of those had template updating. The median time to create the first automatic template was 73.9 minutes (range 2-381). The median number of automatic templates was 3 per patient (range 2-93). Of the 146 automatic templates compared to intrinsic morphology, 139 (95.2%) had a median match score ≥ 70% (2 &lt; 25 beats). Intrinsic rhythm at one month had significantly higher match scores with automatic templates (88.4±8.2%) than with manual templates generated at PHD (80.4±11.3%) (P < 0.05) or with automatic templates created at implant (81.0±6.9%) (P = 0.01).

Conclusion: Changes in EGM morphology over time were observed, thus documenting the need for automatic template updating. The new automatic template collection algorithm operated properly in all patients.

Smoking is Associated with Increased Risk of Stochastic After Cardioverter Defibrillator Implantation (TOVA Study)

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Background: Although smoking is associated with increased incidence of coronary artery disease, there is a paucity of data examining its influence on the occurrence of ventricular tachyarrhythmias. Methods and Results: As a part of the TOVA (Triggers of Ventricular Arrhythmias) study, we prospectively analyzed the relationship between smoking status at baseline and subsequent risk of internal cardioverter-defibrillator (ICD) discharges for ventricular tachycardia/ventricular fibrillation (VT/VF) among 861 ICD patients (mean age, 63 years). Over a mean follow up period of 421 days, 53 patients received ICD discharges for VT/VF. In univariate Cox models, smokers (n=265) had a 2.0 (95% confidence interval 1.3 to 3.1; P = 0.02) increased risk of VT/VF discharge compared to non-smokers (n=596), and this elevation in risk was essentially unchanged in multivariate models that controlled for age, sex, ejection fraction, history of prior ICD therapy and diabetes, relative risk (RR) 2.6; 95% confidence interval (CI) 1.2 to 5.5). Further controls for obesity, hypertension, beta-blocker use, angina, electrocardiographic study results and indications for implantation did not significantly alter these results. Both past smokers (n=193, RR 2.6, CI 1.1-5.9) and current smokers (n=72, RR 3.0, CI 1.0-9.8) were at an elevated risk of subsequent VT/VF, although power was limited to detect risk differences between current and past smokers. Conclusion: These prospective data suggest that smoking is a significant risk factor for ventricular arrhythmias in susceptible patients. Further prospective study is needed to assess whether smoking cessation will reduce the incidence of VT/VF in ICD patients.

The Circadian Variation of Atrial Defibrillation Thresholds

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For the Worldwide Jewel AF-On/Off Investigators

Background: A circadian variation exists for ventricular defibrillation thresholds (DFTs) for the morning (3.3±1.5J) was significantly lower than the DFT measured in the afternoon (5.6±3.5J). The circadian variation of atrial defibrillation thresholds was assessed.

Methods: Data was collected as part of the worldwide Jewel AF study. Patients were randomly assigned to either 24 hours of atrial fibrillation (AF) or 24 hours of normal sinus rhythm (NSR). Atrial DFT was measured at implantation and was performed using the same stimulation system and lead configuration for both AF and NSR.

Results: A total of 50 patients were enrolled in the study. The mean atrial DFT was 2.1±1.0J for AF and 2.6±0.8J for NSR. The difference between the two groups was statistically significant (P = 0.02).

Conclusion: The atrial DFT is lower during AF than during NSR. This finding has implications for the timing of internal and external cardioversion of atrial fibrillation.

The Increase in Women Receiving Implantable Cardioverter Defibrillators: Changes in Characteristics or Indications?


Background: The percentage of women undergoing ICD implantation has increased over the past 15 years. However, women comprising a greater portion of ICD patient implants, and undergo ICD implantation more often for arrhythmic risk or for symptoms presumed to be arrhythmic than earlier days of ICD implantation.