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Wedensky Modulation of T-Wave Accurately Predicts Arrhythmic Events

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Abstract:

Introduction: Wedensky Modulation (WM) is based on subthreshold transthoracic electrical stimulation delivered to every other QRS complex. The WM Index (WMI) is computed from electrocardiographic (ECG) differences between stimulated and non-stimulated QRS complexes and accurately predicts arrhythmic events. We hypothesized that WM effects measured within T-waves would also accurately predict arrhythmic events. Methods: The WM T-wave index was prospectively evaluated post-hoc using patient ECG data derived from a recently completed study (prospective observational study, 8 global centers). There were 268 post-myocardial infarction (post-MI) patients with ICD implantation with at least one 6 month follow-up completed. Patients were placed into the TMI-L group (TMI = 0, T-wave index \leq 0.5, n = 202) or the TMI-H group (TMI = 1, T-wave index $>$ 0.5, n = 66). Cumulative ICD-treated arrhythmia event rates for the two TMI groups were compared using Kaplan-Meier estimates. Results: There were 35 events in the first year for the TMI-L group compared to 23 events in the same time period for the TMI-H group (log-rank $p < 0.01$). Comparing TMI-L to TMI-H, the hazard ratio for event rates was > 2 at one year (95% CI of 1.2 to 3.5, Wald $p < 0.01$). TMI is significantly different from WMI regarding future cardiac-related events prediction ($p < 0.0001$ regarding discordant pairs). When combined with WMI study results to form an R-wave T-wave index the event rate predicted by this combined index significantly improves the separate predictive power of the two indices, raising the positive predictive value (PPV) from 64% (WMI) and 40% (TMI) to 81%. The event rate for the RTI-L group (RTI = 0, n = 106) was 10% compared to the event rate of 29% for the RTI-H group (RTI = 1, n = 162). Conclusions: Post-MI infarction patients with a high T-wave modulation index may have a significantly increased risk of a life-threatening arrhythmia when compared to patients with a low index. When combining the R-wave index with the T-wave index, the predictive power of Wedensky modulation testing for future cardiac-related events accurately predicted more than 80% of events occurring in the first 12 months following myocardial infarction.