

A novel ICD morphology discriminator to improve discrimination between Ventricular and Supraventricular tachycardias

Abstract:

Introduction:

Implantable Cardioverter Defibrillator (ICD) morphology discriminators (MDs) discriminate ventricular (VT) from supraventricular tachycardias (SVT) by comparing single-beat electrogram (EGM) shape during tachycardia versus sinus rhythm (Fig. A) and counting the matches.

Objective:

To introduce a novel MD (NMD) that is less susceptible to ICD sensing errors.

Methods:

Our NMD computes the difference between each NSR EGM sample and all samples of current EGM within a fixed time window (Fig. B). This eliminates local EGM distortions (e.g. those due to ICD sensing errors or noise). We analyzed 177 physician-adjudicated EGM events from 22 pts, with a mix of VT and SVT rhythms. Each EGM event was run through the NMD as well as our implementations of VTC (Boston Sci.) and Wavelet (WAV; Medtronic) MDs. We plotted the per-EGM sensitivity vs. specificity curve (SSC) of each MD by varying the match percentage threshold (TH). We introduced ICD sensing errors and plotted the per-EGM SSC. Two sensing algorithms were tested to extract single-beat EGMs before feeding them to NMD.

Results:

For a given value of per-EGM specificity, NMD achieves better per-EGM sensitivity than either VTC or WAV, across most values of TH (Fig. C). The result remained unchanged after shifting each EGM by up to 8% to model sensing errors (Fig. D). The result also holds across ICD sensing algorithms.

Conclusion:

Implementation of a novel morphology discriminator with improved single-EGM matching compared with current discriminators results in improved VT/SVT discrimination.

