

Stroke Volume Detection Using Existing RV Shocking Leads

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Introduction: Modern ICDs monitor intracardiac electrograms (EGM) and respond to detected arrhythmias through observation, anti-tachycardia pacing or shock delivery. However, inappropriate shocks are delivered to many patients within the first year. Coupling EGMs with a hemodynamic assessment of RV Stroke Volume (SV) may help to discriminate between malignant and benign arrhythmias. We propose the use of admittance measured using a single existing RV lead, as a new method to monitor right sided hemodynamics.

Methods: Eight dogs were implanted with AICD shocking leads and LV volume was measured using 2D trans-esophageal echocardiography (TEE). Admittance was measured using electrodes on the RV lead (Fig 1A). SV was lowered step-wise with overdrive atrial pacing and two sets of measurements were made on each animal 30 and 60 days post implant. Admittance was used to separate myocardial and blood components, resulting in a signal proportional to the volume of blood in the chamber. Dogs with dislodged RV leads or compromised TEE data were excluded from the analysis.

Results: 2D TEE calculated volumes confirm that SV was lowered during faster pacing rates. Instantaneous blood admittance tracks these acute changes and drops significantly at higher rates (Fig 1B, dog #7). The percentage drop in admittance derived RV SV vs. TEE LV SV is analyzed in N=11 observations (Fig 1C).

Conclusion: Monitoring of RV SV is possible using the admittance method with existing ICDs and RV leads and RV SV correlates well with LV SV ($r = 0.7$). The technology can be added onto existing ICDs to help determine if shocking is necessary during rapid arrhythmias.

Figure 1

