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IS IT VT OR SVT: AN UNUSUAL CASE OF SUSTAINED VT RECOGNIZED AS SVT DUE TO FAR FIELD R WAVE SENSING

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Introduction

- Implantable cardioverter defibrillators (ICDs) reduced the risk of sudden cardiac death by detecting and aborting ventricular arrhythmias.
- Inappropriate ICD therapies can occur with inappropriate firings causing psychological anxiety, stress and decreased quality of life.
- More importantly, failure to accurately discriminate ventricular tachycardias (VTs) from supraventricular tachycardia (SVT) could result in a devastating outcome.

SVT/VT Discriminator

Stability

Onset

Activation pattern

Wavelet morphology

- Far-field R waves (FFRW) of the atrial lead can impede the activation pattern discriminator of the ICD. Often, FFRW can be reduced with atrial sensitivity reprogramming

Case Presentation

- HPI:** A 66-year-old male presented to the ED after a witnessed syncope episode. Granddaughter witnessed the patient fell from a seated position; this was followed by 3 more episodes subsequently. The most recent medication changes included an increase of his torsemide from 20 mg daily to 20 mg BID.

- PMH:** Nonischemic cardiomyopathy, CKD stage IIIa, Diabetes
- FHx:** Brother developed heart failure at 38 years old
- SHx:** Patient never smoked, He denied ever used illicit drugs or alcohol.

- Vitals on presentation:** BP 109/79; HR 80; RR 18; Temp 36.4C; 99% on RA; BMI 23.5

- Cardiovascular Exam:**
 - Normal S1 and S2,
 - Regular rate and rhythm.
 - No murmurs, rubs, or gallops appreciated.
 - Mild bilateral lower extremities edema

- Labs:**
 - Potassium: 2.7 mmol/L,
 - Magnesium 2.4 mg/dL,
 - Creatinine 1.33 mg/dL

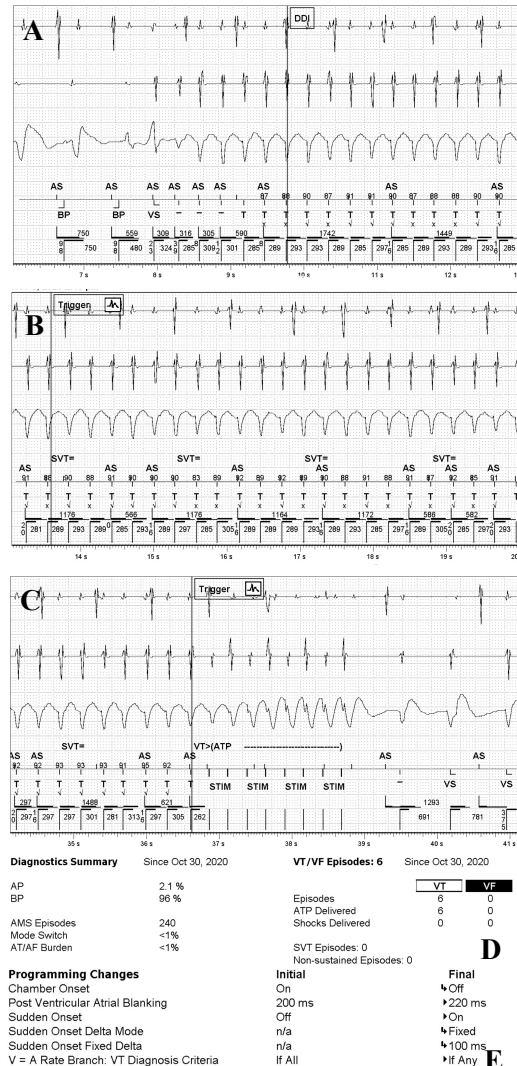


Figure 1. One of the VT episodes recognized as SVT due to FFRW with good morphology match (A). Continued VT misdiagnosed as SVT (B). Device correctly differentiated the VT after 36 seconds and treated with ATP (C). Diagnostic summary since 10/30/20 with over 240 episodes of automatic mode switching (AMS) (D). Final programming changes of the SVT/VT differentiation algorithm (E).

Clinical Course

- Initial presentation with syncope and device check confirmed VT
- Patient was taken for left heart catheterization that revealed normal coronaries
- Potassium was replaced and Echocardiogram revealed ejection fraction of 20%
- Patient received amiodarone for arrhythmia suppression in addition to home carvediol
- The inappropriate ICD therapy was concluded to be FFRW interfere with SVT/VT differentiation
- Patient's native P wave measured at 4.3 mV making current sensing threshold of 3.6 mV unsafe to increase to avoid FFRW
- Post ventricular atrial blanking was then increased from 200 ms to 220 ms. Chamber onset was turned off. Sudden onset was turned off with fixed delta. VT diagnosis changed from all criteria to any
- Repeat interrogation in the hospital revealed no additional arrhythmia

Discussion

- Inappropriate ICD therapy frequently includes false positives such as SVT being treated as VT. Rarely it includes false negative where VT did not receive appropriate therapy.
- In our case, FFRW presented as a challenge 6 years after the initial implantation. Patient's P wave sensing threshold could not be increased to decrease the sensitivity without risking under-sensing during future atrial fibrillation. Morphology match did not differentiate the VT from the stored template. PVAB provided our initial step of better differentiating future VT events
- Changing the chamber onset to sudden onset added a second step as we avoid making diagnosis of VT from comparing atrial and ventricular rates with the potential of FFRW interfering to diagnosing VT based on the abrupt start. Finally changing VT diagnosing criteria from all criteria required to any will provide an aggressive detection strategy for VT.
- Our patient experienced no additional inappropriate ICD therapy in follow up
- Patients with ICD require a combination of medical therapy titration and device reprogramming to provide appropriate therapy as congestive heart failure is a dynamic disease process.

Reference

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