Arrhythmia Diagnosis Following an ICD Shock

Arrhythmia Quiz 3

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A 70 year old male with coronary artery disease, severe left ventricular dysfunction (LVEF 20%), first degree AV block and underlying QRS of 154 msec underwent upgrade of an existing dual chamber ICD system with a Medtronic Insync Model 7272. The device was programmed to provide atrial synchronized biventricular pacing in the DDD mode. He experienced significant improvement in heart failure symptoms following cardiac resynchronization therapy. His ICD was programmed for single zone detection in the VF zone at 182 bpm with first shock therapy of 24J. Pacing was programmed in the DDD mode with lower rate limit of 70 and upper rate limit of 120ppm.

He presents with an ICD shock while seated watching television. He had minimal prodromal symptoms prior to the shock although he admitted to being more dyspneic for the past two days. Data recovered during ICD interrogation is shown below:

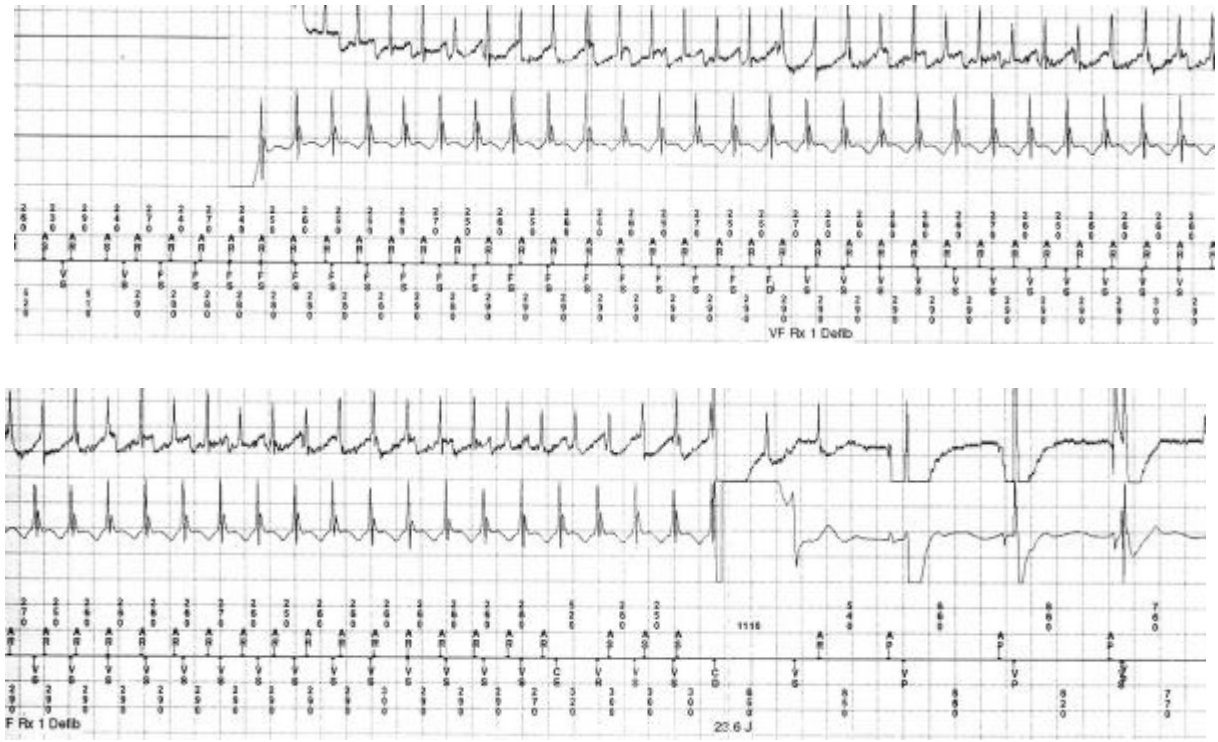

Figure 1: Electrograms and markers obtained during ICD interrogation. The top and bottom panels show the onset and termination of arrhythmia respectively. In each panel, the following information is displayed from top to bottom: atrial electrogram, ventricular electrogram, atrial marker channel with cycle length and ventricular marker channel with cycle length.

Which of the following is a true statement regarding this arrhythmia?

1. A supraventricular tachycardia is a present
2. Programming of the ICD as a two zone device with activation of the SVT discrimination algorithm may have delayed or prevented this ICD shock
3. A ventricular tachycardia with 1:1 VA conduction is successfully terminated by the ICD shock
4. This arrhythmia is best treated with radiofrequency ablation of the AV node
5. Separate atrial and ventricular arrhythmias are present

Answer: (5) Separate atrial and ventricular arrhythmias are present.

The initial part of the upper panel display the marker channels before electrogram storage began. Atrial cycle lengths ranging between 230 and 290 msec are apparent at a time when the ventricular marker channel shows sensed beats (Vs) at cycle lengths of 520 and 510 msec suggesting that an atrial arrhythmia preceded the onset of the ventricular arrhythmia. The third ventricular event on the marker channel in the upper panel is the onset of ventricular tachycardia. During the arrhythmia, atrial cycle lengths (250 to 270 msec) are distinctly different from that of the ventricular cycle lengths (280 to 300msec). There is no Wenckebach periodicity to the ventricular rhythm excluding atrio-ventricular conduction during an SVT as the mechanism.

SVT discrimination algorithms would have classified this arrhythmia as a ventricular arrhythmia and delivered ICD therapy.

Based on the cycle length of the atrial arrhythmia, atrial flutter is likely and any ablative therapy should initially be targeted at eliminating flutter. RF ablation of the AV node is an option if heart rates are excessive during the atrial arrhythmia despite AV nodal blocking drugs or if biventricular pacing is frequently inhibited as a result of native conduction.

Atrial arrhythmias complicate ventricular tachycardia is approximately 10 to 15% of cases. In some patients, atrial flutter or fibrillation can trigger ventricular tachycardia or fibrillation. Control of the atrial arrhythmia is particularly important in this patient with a biventricular pacing device. Native conduction via the AV node during atrial tachycardias is a common reason for loss of biventricular pacing.