Shocking T on T: A Defibrillator Misfiring
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Introduction
- Recognize that Implantable Cardioverter-Defibrillators (ICDs) have been shown to improve the survival in patients with specific cardiac arrhythmias such as Ventricular Tachycardia (VT), Ventricular Fibrillation (VF), Long QT Syndrome and various cardiomyopathies.
- Understand that complications associated with the placement of an ICD can occur, especially if there is poor medical compliance.

Case Presentation
- A 73-year-old Caucasian male with a past medical history of Atrial Fibrillation and single-chamber ICD placement presented to the hospital with complaints that his ICD had fired eight times that evening. He denied any chest pain until after his defibrillator fired. He was unsure of his medications and had recently quit taking one of them.
- At the time of evaluation in the emergency department, he was slightly confused, tachycardic, had an elevated blood pressure of 185/115.
- Initial laboratory studies revealed potassium 4 mEq/L, magnesium 2.0 mEq/L, sodium 123 mEq/L, cardiac troponin 0.1 ng/mL, CPK 5, CPK-MB 6.4, alcohol level <5 and a negative urine toxicology screen.
- Initial electrocardiogram demonstrated sinus tachycardia with no ST changes but high-peaked-T waves in the precordial lead V2.
- Chest radiography showed proper placement of the single ventricular lead.

Hospital Course
- The patient was started on Lopressor for rate control and Aspirin, placed on telemetry, Cardiology was consulted, and the ICD manufacturer was contacted to interrogate the device.
- Further investigation revealed the following information:
  - Last interrogation of the ICD was more than two years prior to hospital presentation
  - ICD had fired total 29 times secondary to VT/VF episodes
  - ICD had fired 11 times in the past twenty-four hours
  - ICD was oversensing T waves and initiating shocks
- ICD Manufacturer made adjustments to patient’s ICD to limit the oversensing of T waves
- Repeat EKGs were performed and cardiac enzymes trended down
- Echocardiogram performed one month prior to admission revealed normal left ventricular systolic function with mildly dilated left atrium, moderately dilated left ventricle, mild increase in thickness of left ventricular wall with some mild mitral regurgitation. No cardiomyopathy.
- The patient experienced no ICD firings during his hospitalization.
- The patient has a history of hyponatremia that responded well to fluid restriction in the past. Patient was placed on 1 liter/day fluid restriction during his hospitalization with normalization of his sodium level at time of discharge.
- He was discharged with close follow-up with Cardiology and establishment with a primary care physician.

Discussion
- ICDs are effective medical devices to prevent sudden death in various arrhythmias, such as symptomatic or sustained VT.
- Complications can arise with the placement of an ICD, especially with poor follow-up.
- Patients with an ICD placement should be monitored throughout their lifetime with interrogations of the device performed every three to six months.
- The most common complication noted with ICDs is inappropriate detection and subsequent shock which occurs in 20-25% of patients with an ICD.
- Oversensing T waves can be associated with long or short QT syndrome, cardiomyopathies, Brugada syndrome, and electrolyte abnormalities.
- Oversensing the T wave can be resolved with various options such as manipulation of the ventricular lead, reprogramming, generator replacement, and decreasing heart rate.

References