Abstract: 50

Dead man walking: sinoventricular conduction and sine wave in severe hyperkalemia

Authors:
D B Petrov1, 1Emergency University Hospital Pirogov, Cardiology - Sofia - Bulgaria,

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A 29-year-old man presented to the emergency department with progressive weakness over the past 3 days. The patient admitted to recent methamphetamine use, but denied prior cardiac history. On physical examination vital signs were notable for a pulse of 96 beats/min, blood pressure of 100/60 mmHg and respiratory rate of 26 breaths/min. His chest examination was clear to auscultation and heart sounds were normal. The initial 12-lead electrocardiogram (ECG) demonstrated a regular, markedly widened QRS complex with a sine-wave configuration and indiscernible P waves (Figure 1). This ECG findings consistent with the sinoventricular rhythm that is a hallmark of severe hyperkalemia. The suspicion of hyperkalemia was confirmed by a serum potassium level of 9.2 mEq/L, and an arterial blood gas revealed a significant metabolic acidosis. The patient was diagnosed with methamphetamine-induced acute renal failure (creatinine 20.2 mEq/L) and was stabilized with calcium chloride, bicarbonate, insulin/glucose therapy, followed by emergency hemodialysis. The described rhythm is termed sinoventricular conduction and represents sinus rhythm, with the sinus impulse being transmitted via intra-atrial conduction tissue to the AV node and thence to the ventricles. This rhythm should not be mistaken with intraventricular conduction defects or ventricular tachycardia. Despite transmission of the sinus impulse through the atria, the atrial muscle fails to be depolarized because of the hyperkalemia. Because atrial depolarization does not occur, P waves are not inscribed on the surface ECG. This presentation demonstrated that early recognition of hyperkalemia-induced electrocardiographic sine wave and sinoventricular conduction can provide clues to diagnosis and is essential to successful treatment.