Wide-QRS Tachycardias

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A 61-year-old man came from out of state to attend a football game. He felt well during the game, but when he stood up to leave, he became dizzy and dyspneic. The symptoms lasted 15 to 20 minutes, and when the paramedics arrived, they diagnosed an idioventricular rhythm and brought the patient to the emergency department where a 12-lead electrocardiogram (ECG) was recorded (Figure 1).

FIGURE 1: ECG recorded on admission to the emergency department. See text for explication.
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**DIAGNOSIS:** Wide-QRS (218 ms) tachycardia; notches on the T waves (best seen in leads V₁ and V₂) suggest P waves, and this is probably sinus tachycardia. Wide-QRS complexes not typical of right or left bundle branch block and tall peaked T waves more vertical on their upstrokes than their downstrokes suggest hyperkalemia. The QT interval (518 ms; QTc=684 ms) is exceptionally long.

The patient had an extensive and complex medical history that included non-Hodgkin’s lymphoma, now in remission; an illness diagnosed by some as POEMS syndrome (polyneuropathy, organomegaly, endocrinopathy, circulating M protein, and skin changes) and by other physicians as Waldenstrom’s macroglobulinemia; hepatic cirrhosis with a TIPS procedure (transjugular intrahepatic portosystemic shunt), a TIPS revision, and at least one episode of hepatic encephalopathy; systemic arterial hypertension; diabetes mellitus; and mild chronic renal insufficiency. His current medications included hydralazine 50 mg PO qid, amlodipine 10 mg qd, metoprolol 100 mg qd, furosemide 40 mg qd, calcitriol 0.25 ugm qd, prednisone 35 mg qod, lactulose PO bid, and nortriptyline 50 mg q hs.

Physical examination revealed a regular heart rate at 100 beats/min, a blood pressure of 111/53 mmHg, a respiratory rate of 19 breaths/min, slight jugular venous distention suggesting a right atrial mean pressure of 8-10 cm of blood, crackles at both lung bases (L>R), a soft systolic murmur in the 2nd left intercostal space at the sternal edge, 1+/4+ pretibial edema bilaterally, and slight abdominal distention. Chest radiograph showed generalized cardiomegaly.

The patient was anemic with a hematocrit of 23.7% and a hemoglobin of 7.7 g/dL. White blood cell count was 5,700/mm³, and the platelet count was 409,000/mm³. Serum creatinine and blood urea nitrogen were elevated at 2.1 and 23 mg/dL, respectively. Serum electrolytes were abnormal (in mEq/L):
sodium 133, potassium 6.2, chloride 112, bicarbonate 13, and magnesium 2.4, and suggested a hyperchloremic acidosis. Serum calcium was 7.4 mg/dL and corrected to 8.2; phosphorus was 5.5 mg/dL.

The initial ECG (Figure 1) suggested hyperkalemia as the cause of the wide-QRS tachycardia even though the serum potassium was only moderately elevated (6.2 mEq/L). Nortriptyline overdoses typically have caused sinus tachycardia, a corrected QT interval ≥ 0.418 seconds, a terminal 0.04-second QRS vector in the frontal plane between 130° and 270°, and a prolonged QRS duration that has been a better predictor of seizures and ventricular arrhythmias than serum drug levels. Thus, this ECG could result from the ingestion of large amounts of nortriptyline, but not from a dose of 50 mg a day.

The patient was treated with glucose, insulin, and calcium gluconate intravenously and sodium polystyrene sulfonate per rectum followed by a couple of days of hemodialysis. Before the sodium polystyrene sulfonate and while the patient was still in the emergency department, he had a 30-second run of a different monomorphic wide-QRS tachycardia and briefly lost consciousness (Figure 2). This tachycardia was thought to be ventricular tachycardia, and the patient received a short course of amiodarone.

As the patient’s serum potassium returned to normal, his heart rate slowed, P waves became more visible, QRS complexes narrowed, and the repolarization changes of hyperkalemia disappeared (Figure 3). The patient was discharged after 3 days in the hospital.

REFERENCES


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