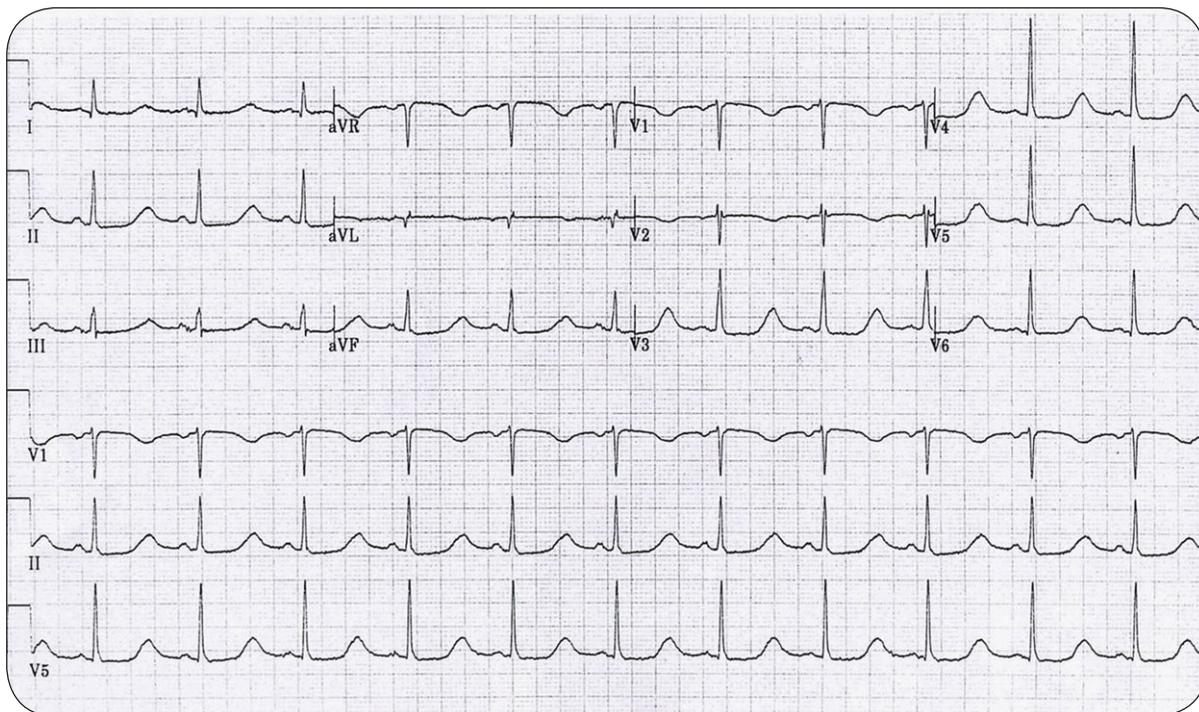


>> ECG CHALLENGE

By Amal Mattu, MD

CLINICAL PRESENTATION

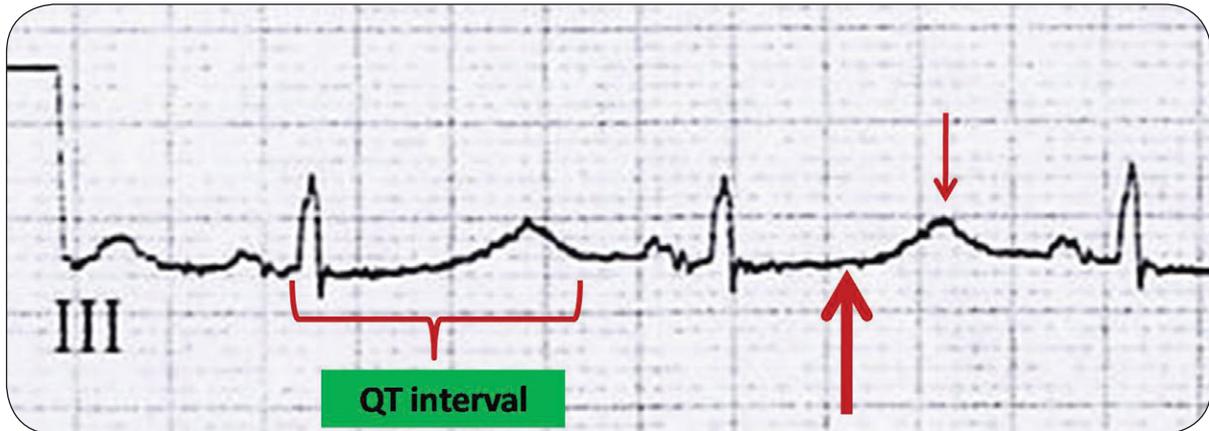


>> A 56-year-old woman presents to your emergency department complaining of muscle aches, “nervousness,” and numbness in her hands and feet. Her vital signs are unremarkable, but physical examination reveals mild hyperreflexia. Her cardiopulmonary exam is normal. The nurse obtains the ECG above.

What is your diagnosis?

Turn page for answer >>

DIAGNOSIS AND DISCUSSION



>> The patient's ECG demonstrates abnormal prolongation of the QT interval. The QT interval is measured from the beginning of the QRS complex to the end of the T wave (see image). The normal duration of the QT interval varies based on ventricular rate. There are several formulas for calculating the corrected QT interval (QT_c) based on rate, the most accepted being to divide the QT interval by the square root of the RR interval (the Bazett formula). The QT_c is considered prolonged when it is longer than 450 ms in men and 460 ms in women and children. In this patient, the QT_c is 653 ms.

Prolonged QT_c can be caused by hypokalemia, hypomagnesemia, hypocalcemia, cardiac ischemia, elevated intracranial pressure, hypothermia, certain medications (especially sodium-channel blockers), and congenital prolonged QT syndrome. In most of these conditions, QT prolongation occurs due to prolonging the T wave. Here, however, the T waves appear normal (small arrow) and the ST segment is prolonged (large arrow). Only hypocalcemia and hypothermia are known to produce ST-segment prolongation.

Given her normal vital signs, hypocalcemia was the most likely diagnosis for this patient, and it proved correct. She had a total serum calcium level of only 4.7 mg/dL (versus a normal level of 8.7 to 10.4 mg/dL). Her albumin level was normal. Hypothyroidism was diagnosed on the basis of further testing and determined to be the cause of the hypocalcemia. After administration of supplemental calcium, the ECG abnormality as well as all neurologic symptoms resolved.

Dr. Mattu, a regular contributor to "ECG Challenge," is director of the emergency medicine residency program and an associate professor in the department of emergency medicine at the University of Maryland School of Medicine.