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ECG TEACHING COMPETITION

INTERMEDIATE

IMAGING VIGNETTE: ECG CHALLENGE

Chest Pain and Hemodynamic Instability in a Young Woman

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ABSTRACT

We report the case of an 18-year-old female admitted to the hospital for severe hemodynamic instability and fatal outcome within 6 hours following admission. Significant electrocardiographic modifications were noted and are presented with diagnostic options. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2021;3:1367–1369)

CASE

This is the case of an 18-year-old female patient who complained of nausea, vomiting, and dyspnea. She also reported epigastric pain, nausea, and paresthesia. At hospital entrance, a garlic fetor was noted. Six hours after the admission, significant hemodynamic instability occurred. She experienced a progressive cardiogenic and untreatable shock. Despite aggressive resuscitation, she died 8 hours after admission. Extracorporeal membrane oxygenation and counterpulsation therapies were considered but not used as they were not available in the hospital.

WHAT IS THE DIAGNOSIS?

A. Ventricular tachycardia
B. Hyperkalemia
C. Tamponade
D. Anterior ST-segment elevation myocardial infarction (STEMI)
E. Myocardial poisoning with ST-segment elevation

The correct answer is E.

EXPLANATION

A careful analysis of the electrocardiogram (ECG) (**Figure 1**) shows P waves are present before the QRS complex and are visible in lead aVF and on the rhythm strip. Rhythm is irregular due to atrial premature contractions. These are solid arguments against the diagnosis of ventricular tachycardia. Tamponade can also be ruled out as it usually associates low voltage, sinus tachycardia, electrical alternation, and PR depression. This ECG is not classic for hyperkalemia, which usually provokes tented T waves, disappearance of P waves, and finally a sine wave pattern preceding ventricular fibrillation (VF). Anterior STEMI could be an option. However, as significant ST-segment modifications are present in aVR, left main occlusion or a very proximal left anterior

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ABBREVIATIONS AND ACRONYMS

AV = atrioventricular

ECG = electrocardiogram

LAD = left anterior descending artery

STEMI = ST-segment elevation myocardial infarction

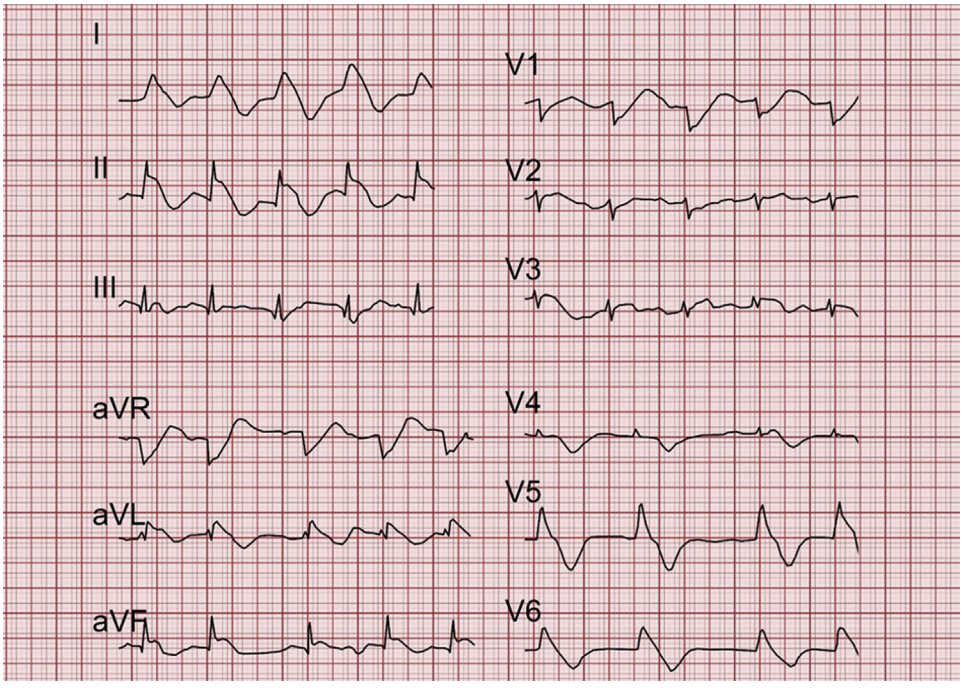
VF = ventricular fibrillation

descending artery (LAD) lesion could be suspected. In that situation, STEMI must be present in leads V_2 to V_4. In addition, the ST-segment is also elevated in 2 inferior leads (II and aVR), making segmental ischemia less probable. Diffuse injury of the myocardium should be suspected as it can be seen in myocardial involvement during poisoning. In the present case, aluminum phosphide injury was suspected.

Aluminum phosphide is a solid fumigant used in grain fumigants or as a low-cost rodenticide. Its properties are considered optimal because it is toxic to all stages of insects, it does not affect seed viability, and it is free from toxic residues. Due to its use as a rat poison and its low price, it is widely available, and many studies have reported a significant number of deaths, especially in India, where it is the most common cause of acute poisoning. It was also found to be the most common cause of suicidal death in north India (1,3).

Lipid peroxidation in turn results in damage to cellular membrane, disruption of ionic barrier, nucleic acid damage, and cell death. Myocardial necrosis and changes in membrane action potential altered permeability to sodium, magnesium, and calcium (2,4). ECG abnormalities are very common and highly varied, ranging from modifications of the ST-segment with elevation or depression, various arrhythmias such as atrial fibrillation, and atrial flutter or ventricular tachycardia. Conduction abnormalities are also common with all sorts of AV blocks (5).

FIGURE 1 Patient Baseline Electrocardiogram on Admission



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