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Substernal Chest Pain with an Abnormal Electrocardiogram in an Adolescent Male Presenting to a Pediatric Emergency Department

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We report a case of an adolescent male who developed acute-onset, substernal chest pain and was noted to have electrocardiographic changes concerning for inferior and lateral myocardial ischemia. Although adult emergency departments (EDs) manage cardiac chest pain on a daily basis, pediatric EDs have very little experience with chest pain suggestive of myocardial infarction (MI). In addition, MI is being recognized more frequently in the pediatric age group. Historically, evaluation for MI was initiated in the ED but was completed as an inpatient. Recent laboratory and technologic advances have made ruling out MI an ED skill in low-risk patients. It is helpful for pediatric emergency medicine physicians to be aware of current evaluation techniques and their application to at-risk patients.
Clin Ped Emerg Med 6:257-262 © 2005 Published by Elsevier Inc.

KEYWORDS myocardial infarction, troponin, CPK, CK-MB, myoglobin, chest pain

Chest pain is a common complaint in both pediatric and adult emergency departments (EDs). Approximately 5 million patients with chest pain suspicious for acute coronary syndrome (ACS) present to EDs in the United States yearly, with an estimated 11 000 who have acute myocardial infarction (MI) being discharged home with an incorrect diagnosis [1]. Previous studies have shown that pediatric chest pain is rarely cardiac and much more commonly musculoskeletal [2,3]. In a retrospective review of hospitalized patients from 1967 through 1992, 96 cases with confirmed MI were seen at Texas Children's Hospital [4]. Of these, only 28 were from acquired heart disease and none were due to atherosclerotic coronary artery disease. We present a case of an adolescent male who presented to our pediatric ED with acute-onset, substernal chest pain and electrocardiographic (ECG) findings concerning for acute MI.

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Case Report

A 16-year-old male presented to our pediatric ED with a chief complaint of "heart pain." About an hour before presentation, the patient noted sudden-onset, substernal chest pain after smoking marijuana and called 911. He described it to paramedics as chest pressure and tightness radiating to both arms, associated with dizziness, nausea, and shortness of breath. He denied diaphoresis, vomiting, other drug use, or trauma. He had similar episodes in the past related to heavy exercise or weight lifting, but these were less severe than the current episode. The initial tracing obtained by paramedics (Figure 1) revealed a heart rate of 142/min with P waves and his rhythm was analyzed as "abnormal ECG, sinus tachycardia, possible inferior infarct and anterolateral infarct." On the paramedic's examination a few minutes later, his pulse rate

1522-8401/$ - see front matter © 2005 Published by Elsevier Inc.
doi:10.1016/j.cpem.2005.09.007

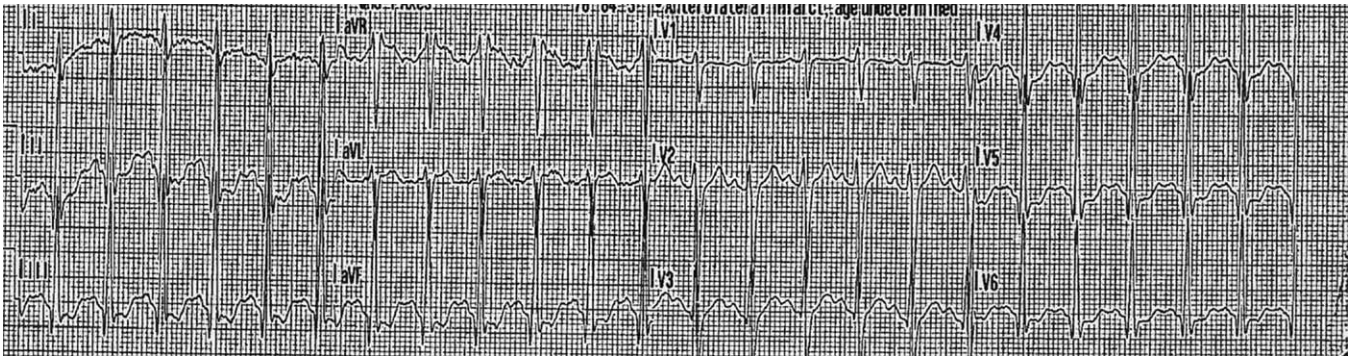

Figure 1. Twelve-lead rhythm strip done by paramedics.

was 176/min, respiratory rate 16/min, and blood pressure 152/88 mm Hg. They felt he was possibly in supraventricular tachycardia and treated him during transport with 6 mg of intravenous adenosine without slowing of his heart rate. Adenosine was repeated at a dose of 12 mg, after which his heart rate slowed to 108/min over the next 2 minutes. Despite the decreased heart rate, there was no relief of his chest pain.

In the ED, further history revealed tobacco use of one pack of cigarettes per week for 4 years and occasional marijuana use, but he had never experienced pain previously on those occasions. His uncle had died at age 40 years from an MI. His pain was 8/10 on our pain scale, and vitals were pulse rate 100/min, respiratory rate 18/min, blood pressure 100/67 mm Hg, and pulse oximetry of 100% in room air. He was alert and nondiaphoretic. There was no jugular venous distension. His chest wall was nontender to palpation. His lungs were clear to auscultation. Cardiac examination demonstrated normal first and second heart sounds, with no murmur or gallop. There was no hepatomegaly. Distal perfusion was normal and no edema was found.

A repeat ECG done in our ED is shown in Figure 2. The ECG reveals Q waves in leads II, III, aVF, V_5, and V_6, as well as inverted T waves in leads III and aVF. There is possible ST-segment elevation versus J-point elevation in leads V_2 and V_3. Laboratory findings included a white blood cell count of 7800/mm^3, hematocrit of 39%, platelet count of 256 000/mm^3, normal electrolytes, and a urine drug screen positive only for marijuana. Creatine phosphokinase (CPK) was 105 U/L (normal 0-250) and CK-MB fraction 2.7 ng/mL (normal 0-5.8). A cardiac

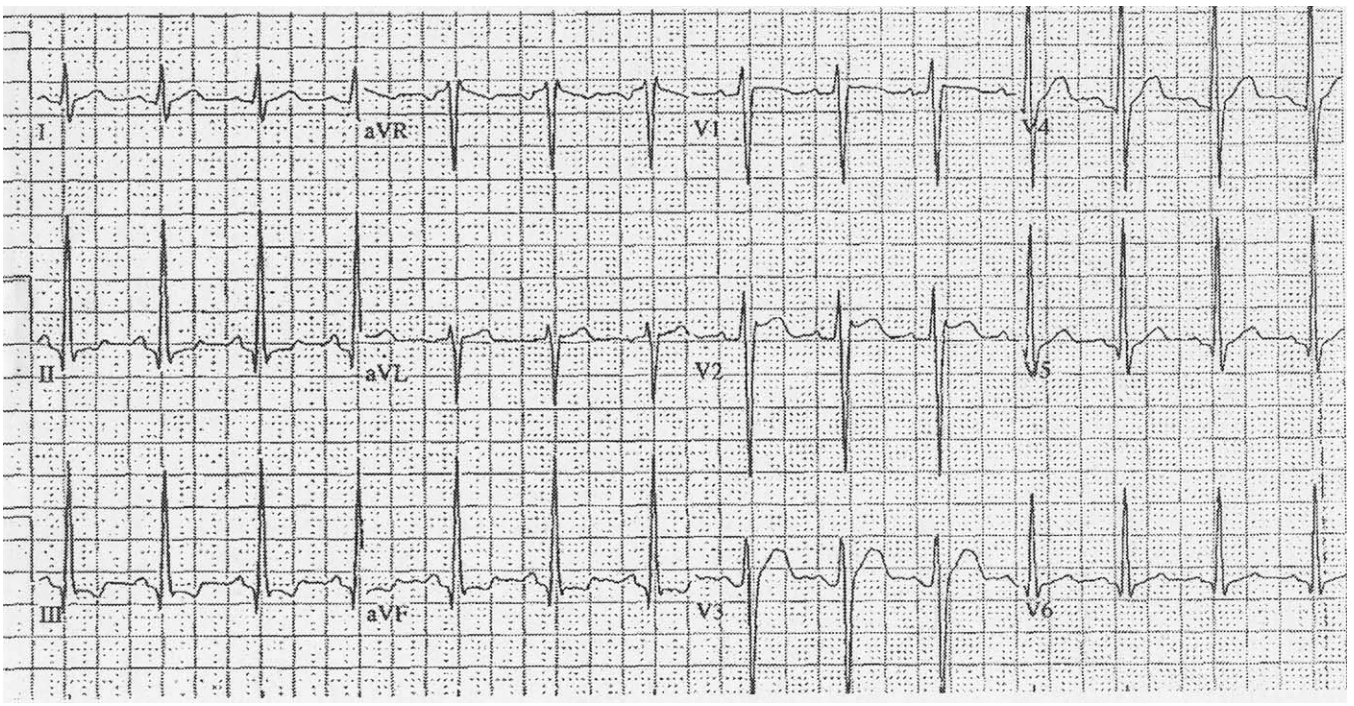

Figure 2. Twelve-lead ECG done in the ED.