Chameleons

Electrocardiogram Imitators of ST-Segment Elevation Myocardial Infarction

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KEYWORDS

• Electrocardiography • STEMI • Myocardial infarction • Electrocardiogram

KEY POINTS

- Rapid recognition of ST-segment elevation myocardial infarction (STEMI) is imperative; however, the characteristic electrocardiographic (ECG) pattern of ST-segment elevation may be seen in other diagnoses.
- An understanding of these other diagnoses, and an awareness of how to distinguish them from STEMI, often requires obtaining a satisfactory history, comparing with previous ECGs, assessing serial tests, and uncovering subtle clues in the ECG pattern.
- The morphology of ST-segment elevation may provide a valuable clue at determining if the evaluated pattern is concerning for either STEMI or one of its imitators.
- Specifically, ST-segment elevation may be seen in patients with left ventricular hypertrophy, early repolarization, left bundle branch block, myopericarditis, Brugada syndrome, hyperkalemia, Takotsubo cardiomyopathy, and ventricular aneurysm.

INTRODUCTION

The need for timely reperfusion is critical to improving outcomes following ST-segment elevation myocardial infarction (STEMI). Indeed, the most recent iteration of the guideline from the American College of Cardiology Foundation (ACCF) and American Heart Association (AHA) continues to emphasize rapid recognition and reperfusion for patients with STEMI.[1] Clinicians must recognize electrocardiographic (ECG) patterns diagnostic of STEMI and rapidly coordinate the delivery of definitive care in the form of percutaneous coronary intervention or fibrinolysis. Importantly,

Disclosures: The authors have no commercial associations or sources of support that might pose a conflict of interest.
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Emerg Med Clin N Am 33 (2015) 529–537
http://dx.doi.org/10.1016/j.emc.2015.04.004 **emed.theclinics.com**
0733-8627/15/$ – see front matter

the 2013 ACCF/AHA guideline clarified the definition of STEMI to include elevations, as measured from the J point, of at least 1 mm in two or more anatomically contiguous leads (with allowance of up to 1.5 mm in leads V_2–V_3 for women and 2 mm in the same leads in men).[1]

Unfortunately, ECG features seen in association with STEMI also appear in other benign, nonischemic presentations. Although a certain amount of overtriage is accepted, it is desirable to minimize patient risk. Patients with evidence of left ventricular hypertrophy (LVH) without actual acute infarction, for example, will likely not benefit from emergent reperfusion. Risks associated with inappropriate coronary revascularization include radiation exposure, dye administration, and medication-induced bleeding. A thorough understanding of conditions that have the potential to mimic or confound the diagnosis of STEMI is essential to the provision of timely and safe patient care. This article focuses on ECG findings, specifically ST-segment elevation, occurring in the absence of ischemia.

LEFT VENTRICULAR HYPERTROPHY

Chronic and uncontrolled hypertension results in remodeling of the heart's left ventricle. The increase in muscle mass also alters the manner in which cardiac repolarization occurs. Characteristic ECG changes associated with LVH may mimic the ST-segment elevation seen in the setting of acute myocardial infarction (AMI).[2] Other changes attributed to LVH include prominent septal q waves, T-wave inversion, and ST-segment depression.[3] Several features unique to LVH assist the emergency clinician in differentiating it from the STEMI-related ECG changes. First, ECG changes in the setting of LVH are static. Unlike an evolving ischemic event, the ST-segment morphology of the ECG in LVH remains constant. Serial ECGs are therefore of value when considering the diagnosis of LVH. The ST-segment changes are appropriately discordant with respect to hypertrophy (**Figs. 1–3**). Deep QS waves appear in the septal precordial leads. The resultant repolarization is upright and occurs on the opposite side of the baseline.

Similarly, high-amplitude R waves occur in the lateral precordial leads. ST-segment changes, including strain-associated ST-segment depression, occur below the isoelectric line.[3] ECG "strain" seen in LVH does not typically manifest as ST-segment elevation. A characteristic strain pattern reveals a downsloping ST segment ending

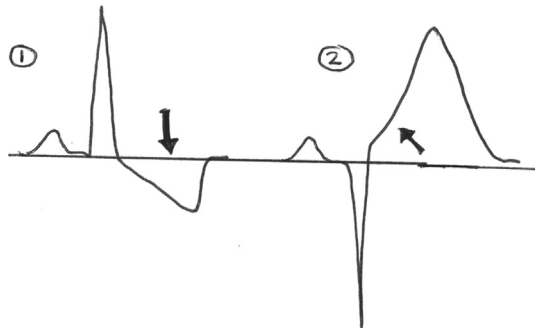

Fig. 1. Left ventricular hypertrophy appropriate discordance. Appropriately discordant ST segment changes in the setting of left ventricular hypertrophy. The ST segment is below baseline when the QRS complex is positively deflected (*1*), whereas the ST segment is above baseline when the QRS complex is negatively deflected (*2*).