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Atypical ischemic repolarization in right bundle branch block

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ABSTRACT

A 70-year-old male presented to emergency room 16 h after the onset of acute chest pain. Initial ECG showed sinus rhythm with a wide QRS and right bundle branch block (RBBB) with concordant and symmetric T waves in V1–V2. A plausible explanation for the atypical positive T waves in leads V1–V2 in conjunction with RBBB could be non-reperfused lateral MI (LMI) as a "mirror-image" of inverted T waves in the posterior leads V7–V9. Coronary angiography showed total thrombotic occlusion TIMI thrombus grade 5 of the circumflex artery. One ECG expression of circumflex artery occlusion is isolated LMI.

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Clinical case

70-year old male with past medical history of heavy smoking and hypertension. He arrived at the emergency room 16 h after the onset of an oppressive chest pain while cutting the garden grass. His vital signs were SaO2 95%, HR 95 bpm and BP 150/70 mm Hg. He had no cardiac murmurs but S3 and basal pulmonary rales were noticed. Electrocardiogram (ECG) was performed (Fig. 1). Laboratory studies reported: CKMB 60 ng/mL (0.6 to 6.3 ng/mL), NT-proBNP 7825 pg/mL (<300 pg/mL) and troponin I 16.8 ng/mL (0.03 ng/mL). Initial management included aspirin 300 mg, clopidogrel 300 mg, unfractionated heparin 4000 IU, atorvastatin 80 mg and intravenous furosemide 40 mg. Could you identify the culprit artery of this myocardial infarction?

Response to the ECG challenge

The ECG of Fig. 1 shows a right bundle branch block (RBBB) with positive (concordant), symmetric T waves in V1–V2, contrary to the negative (discordant) and asymmetric T waves usually present in this intraventricular conduction disorder (the latter phenomenon caused by the repolarization vector that moves away from V1–V2) [1]. In the electrocardiographic evolution of a ST-elevation myocardial infarction appears symmetric inversion of the T wave in the same leads that demonstrated ST-segment elevation usually within a few hours to 1–2 days after its onset and this temporal development tends to make T wave inversion a fairly late finding in electrocardiographic evolution of a non-reperfused myocardial infarction. Also an inverted T wave in ST segment elevation myocardial infarction (STEMI) evolution is considered a post-ischemic ECG change, as it could represent reperfusion (early T waves) or injured myocardium. In the lateral myocardial infarction (LMI) there is a tall R wave, depression of the ST segment along with positive and symmetric T waves in the right precordial leads (this findings represents the "mirror image" of the posterior leads V7–V9) [2]. In isolated LMI the circumflex is usually the responsible artery of the infarction [3]. It has been recently described that in presence of RBBB and acute ischemic chest pain, the excessive discordance (downsloping) of the ST segment in V1–V2 suggests the possibility of associated so-called posterior myocardial infarction [4]. In LMI associated with RBBB, positive T waves in V1 and V2 could represent a mirror-image of an inverted T wave in the posterior if recorded with ECG leads "overlying" the involved myocardium (leads V7–V9). To provide a better understanding of the findings, an upside down photograph was taken of the patient's ECG in a mirror (Fig. 2); the negative and symmetric T waves in V1–V3 matches with the positive and symmetric T waves of the original ECG, therefore the mirror image could represent non-reperfused LMI with RBBB. The electrocardiographic findings correlated with total thrombotic occlusion with a TIMI (Thrombolysis in Myocardial Infarction) flow scale of 0 at the proximal segment of the circumflex artery (Fig. 3). The correct interpretation of these findings is critical to the appropriate management of this condition.

Authors contribution

D.M.-S., J.A.C.-G., J.F.G.-B., participated in the process of the collection and analysis of clinical data, image edition, bibliographic search and writing the discussion.

Disclosures

None.

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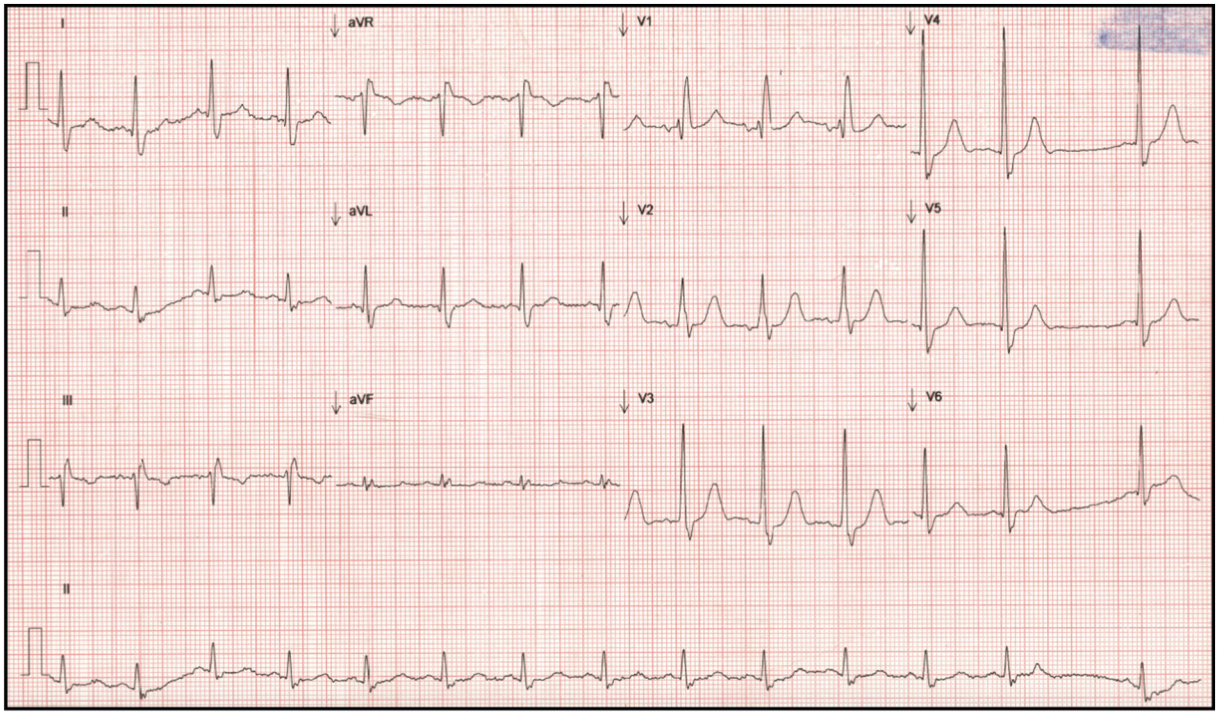

Fig. 1. Patient's ECG at arrival to the emergency room.

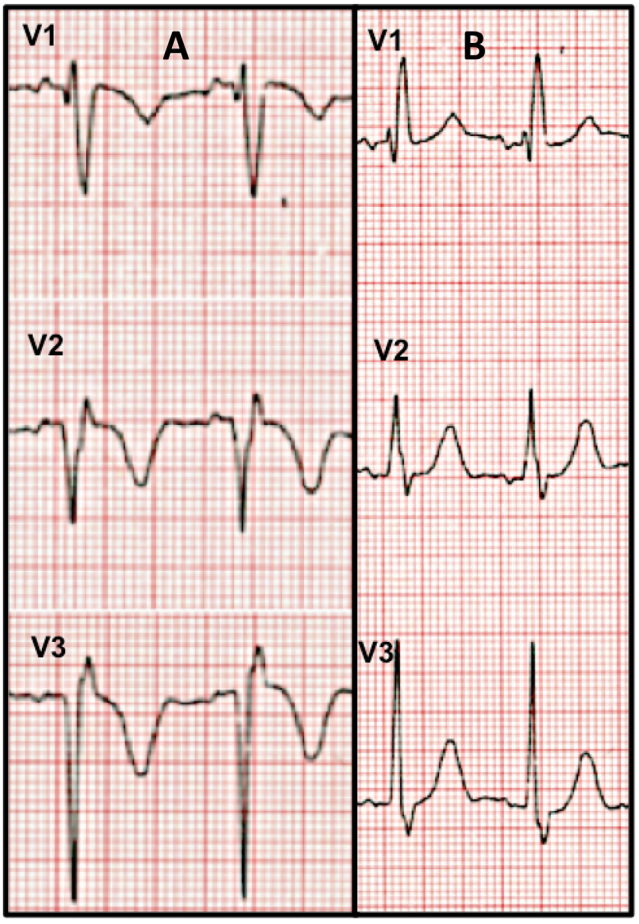

Fig. 2. A. Upside down photograph of leads V1–V3. B. Original ECG.

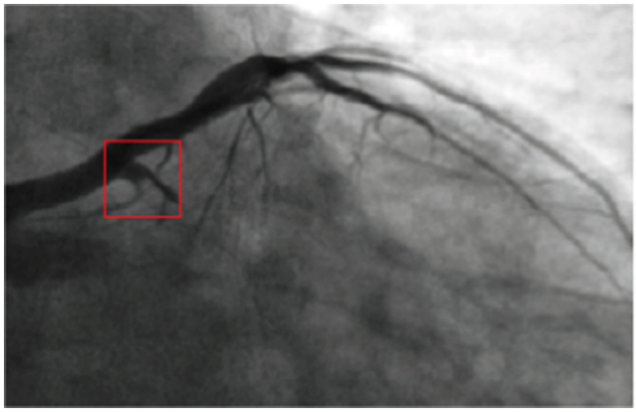

Fig. 3. Coronary angiography with total thrombotic occlusion of the proximal segment of the circumflex artery (red box).

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