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CASE REPORT

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Atypical de Winter ECG pattern may be the mirror image of ST elevation

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Abstract

Background: The de Winter ECG pattern of ST-segment depression and tall symmetrical T waves, known as an ST elevation equivalent, accounts for approximately 2% of patients with occlusion of the proximal left anterior descending (LAD) coronary artery. The classic de Winter pattern is restricted to cases without ST elevation. However, mixed cases with different types of ST deviation have been described. Here, we describe an interesting case as an example of an ST elevation myocardial infarction (STEMI) equivalent, showing transient transmural ischemia of the inferolateral myocardium, with ECG changes that mimic the de Winter pattern.

KEYWORDS
De Winter ECG pattern, ST elevation equivalent

1 | CASE REPORT

A 65-year-old male patient who was a current smoker with hypertension was admitted to our hospital with chest pain radiating to the jaw for 6 months and aggravation for 1 month. Chest pain induced by activity persisted for approximately 10–20 min each time and was gradually alleviated after rest. Physical examination revealed an anxious appearance. His pulse rate was 54 beats/min, his blood pressure was 121/73 mmHg, and his respiratory rate was 16 breaths/min. The initial ECG showed slight ST-segment elevation in leads I and aVL with T-wave inversion in the inferior leads (Figure 1a). The cardiac troponin I level was 0.07 (normal value 0–0.09 ng/ml), and all other basic laboratory tests were within normal limits. An echocardiogram showed no regional wall motion abnormalities. The patient was treated with aspirin, ticagrelor, enoxaparin sodium, amlodipine, atorvastatin, and isosorbide mononitrate. One day after admission, he experienced sudden chest pain. An ECG was performed, showing upsloping ST-segment depression up to 6 mm at the J point in leads V1-V6, I, and aVL; tall symmetrical T waves in leads V2-V5 together with a 1 mm J point elevation in the lead aVR; and elevation at the J point in the inferior leads with a heart rate of 34 beats/min (Figure 1b). After the administration of nitroglycerin (5 mg) three minutes later, the patient became symptom-free, and repeated ECG showed that the pattern had returned to its former shape. A coronary arteriogram was performed, confirming total occlusion of the proximal right coronary artery (RCA) with collateral circulation (Figure 2) from the left coronary artery and no significant lesions of the LAD or the left main artery; the left circumflex artery (LCX) was almost completely occluded at its middle portion. A drug-eluting stent was implanted in the LCX (Figure 2). A few days later, the patient was discharged without any signs of complications.

2 | DISCUSSION

We first thought our case verified that the de Winter ECG pattern is not exclusively associated with occlusion of the proximal LAD (Winter et al., 2008), which may be consistent with some recently published literature (Montero Cabezas et al., 2016; Karna et al., 2019; Xu et al., 2019). However, after careful observation, we found

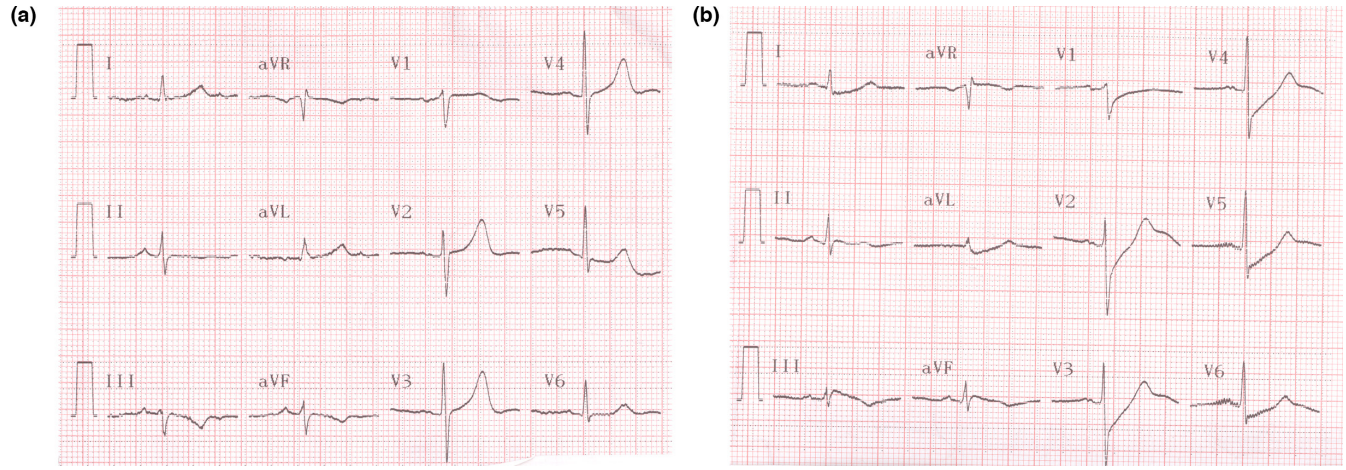

FIGURE 1 Twelve-lead ECG of the patient. (a) Initial ECG showed slight ST-segment elevation in I, aVL with T-wave inversions in the inferior leads. (b) When he experienced chest pain, ECG was performed, showing upsloping ST-segment depression at the J point from V1 to V6 V1-V6, I, and aVL; tall symmetrical T waves in leads V2-V5 together with a J point elevation in the lead aVR; and elevation at the J point in the inferior leads with a heart rate of 34 beats/min

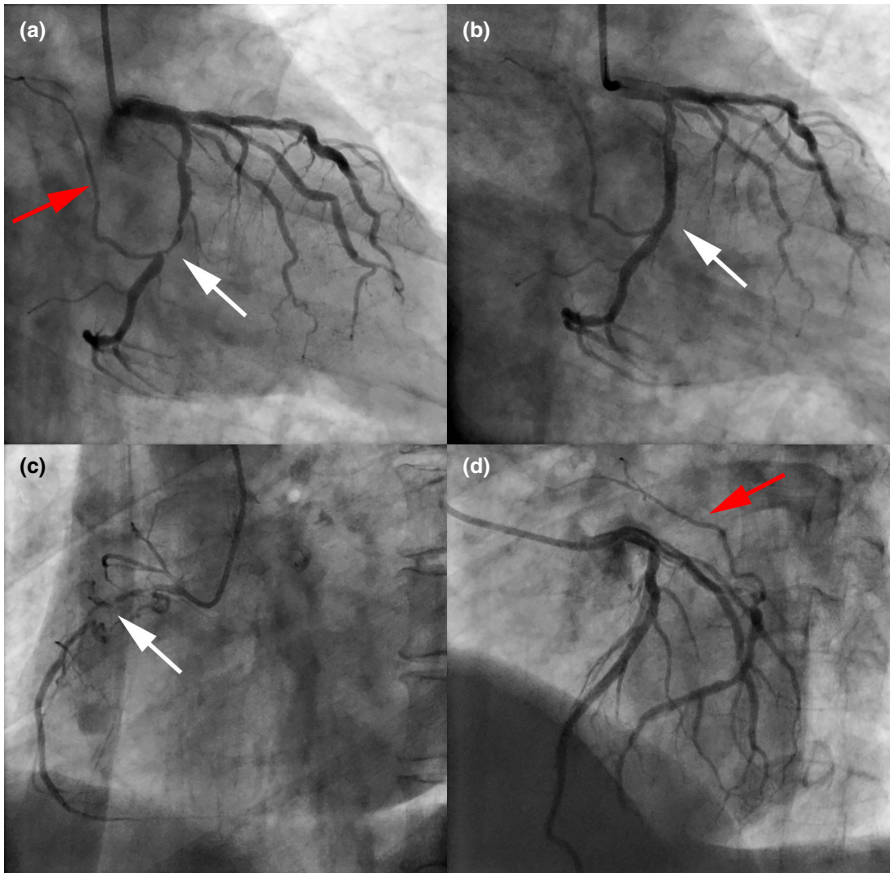

FIGURE 2 Coronary angiography. Coronary angiogram showed that the left circumflex coronary artery (LCX) was almost completely occluded at its middle portion (a, white arrow), followed by insertion of a drug-eluting stent (b, white arrow). Proximal right coronary artery occlusion (RCX) was observed (c, white arrow) with collateral circulation from the left coronary artery (a, d, red arrow)

that the ECG in our case did not fulfill the criteria for the de Winter pattern.

There are variations in the numbers of millimeters of junctional ST depression and symmetric T waves in the cases published about the de Winter pattern. Zhan et al. (Zhan et al., 2020) described that maximal ST depression in V2 or V3 had a positive predictive value of 89% in all patients for detecting acute LAD lesions. Morris and Brody (Morris & Body, 2017) tried to quantify the ECG characteristics of all published cases and summarized them as follows: "All ECGs showed maximal upsloping ST depression in lead V3 with a median amplitude of 0.3 mV (interquartile range: 0.2–4 mV). T-wave height peaked in lead V3 with a median amplitude [of] 0.9 mV (interquartile range: 0.8–1.1 mV)." Obviously, our case does not fit that description in lead V3. At the same time, the ECG in Figure 1B is compatible with inferior STEMI and concomitant reciprocal ST depression in I and aVL and upsloping ST depression in the precordial leads, not associated with the de Winter pattern.

The LCX and the RCA supply blood to the inferior and posterior walls of the ventricles. The culprit artery in inferior wall acute myocardial infarction (AMI) is usually the RCA and, less often, the LCX (Chia et al., 2000). In our case, the coronary arteriogram revealed occlusion of the proximal RCA with collateral circulation from the left coronary artery, and the LCX was almost completely occluded. We speculate that when the LCX was occluded, blood flow to the RCA was decreased, which led to ECG changes.

Evidence of myocardial ischemia is a prerequisite for the diagnosis of MI, and ECG is the main diagnostic tool for detecting acute myocardial ischemia (Birnbaum et al., 2020). Therefore, various ECG patterns need to be identified in a timely and accurate manner, especially atypical patterns, so urgent coronary angiography can be performed as soon as possible.

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CONFLICT OF INTEREST

The authors declare no potential conflicts of interest.

AUTHOR CONTRIBUTIONS

JW performed the collection of data and wrote the manuscript. FD performed the literature search. JL, DS, and HX guaranteed the integrity of the entire study. All authors have read and approved the manuscript and reviewed the literature.

ETHICAL APPROVAL

This case report has been conducted according to the standards of the Declaration of Helsinki.

DATA AVAILABILITY STATEMENT

All data are available and can be provided if requested.

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