

Changes in Electrocardiogram from Inferior Myocardial Infarction to Anterior Myocardial Infarction

Aslı Yasemen Savaş¹, Nurşah Başol¹, Fatih Altunkaş², Halil İbrahim Damar²

¹Department of Emergency Medicine, Gaziosmanpaşa University School of Medicine, Tokat, Turkey

²Department of Cardiology, Gaziosmanpaşa University School of Medicine, Tokat, Turkey

Abstract

We describe a patient who developed acute chest pain and ST-segment elevation in the inferior leads on electrocardiography. In his control electrocardiography after 15 min, ST-segment elevation was observed in the anterior leads. Cardiac catheterization showed that there was wraparound left anterior descending artery and an occlusion in the proximal region. The occlusion was resolved by typical ballooning. To our knowledge, simultaneous ST elevations in anterior and inferior leads have been reported in the literature; however, in our case, with serial electrocardiographic (ECG) records, we realized that inferior ST-segment elevation altered to anterior ST-segment elevation. This indicates the importance of serial ECG records in emergency departments to explain the mechanism.

Keywords: Myocardial infarction, wrap, anterior, inferior

Introduction

Myocardial infarction (MI) results in necrosis of the myocardial muscle due to the occlusion of coronary arteries. Acute occlusion of the left anterior descending coronary artery (LAD) generally results in ST-segment elevations in precordial leads and reciprocal ST-segment depression in inferior leads (1). However, it is sometimes difficult to correlate electrocardiographic (ECG) findings and the infarct-related region. Here we describe a rare case of simultaneous anterior and inferior MI due to the occlusion of “wrapped LAD.”

Case Presentation

A 67-year-old man was admitted to the emergency department with chest and left arm pain. He had primer hypertension for 3 years and he was taking an anti-hypertensive agent but had no history of coronary artery disease. He was not a smoker, and there was no family history of coronary artery disease. His blood pressure was 130/80 mmHg, and his pulse rate was 87 bpm. There were no abnormal findings on physical examination. There were ST-segment elevations in D2, D3, and AVF derivations in his first

standard 12-lead ECG (Figure 1), and his troponin and CK-MB levels were 8400 ng/mL (0–100 ng/mL) and 102.6 ng/mL (0–5 ng/mL), respectively. He was referred to the cardiology clinic with inferior MI. Aspirin (300 mg orally), clopidogrel (300 mg orally), and heparin (5000 IU intravenous) were given to the patient. A percutaneous coronary intervention (PCI) procedure was suggested. In his second ECG that was taken after 15 min, ST-segment elevations were observed between V1 and V6 derivations and there were reciprocal ST-segment depressions in D2, D3, and AVF derivations (Figure 2). He then underwent angiography. Wrap around LAD and occlusion of the ostial region of LAD were detected (Figure 3a, b). In addition, there was 30% occlusion of the circumflex artery (Cx). The lesion was crossed with a 3-5 mm soft guide wire and predilated with Cross rail 20×15 mm balloons (Alvimedica, Turkey). Then, a coronary stent was placed. Angiography resulted in TIMI II flow, and intracoronary aggrastat (tirofiban HCL) was given; he was then taken to the coronary care unit his discharge with recovery. The patient was discharged after 5 days, with the prescription of aspirin (100 mg/day), clopidogrel (75 mg/day), bisoprolol fumarat (5 mg/day), perindopril (5 mg/day), and rosuvastatin (40 mg/day).

Written informed consent was obtained from the patient for the publication of this case report and any accompanying images.

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Correspondence to: Nurşah Başol e-mail: drnursahbs@hotmail.com

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Discussion

Twelve-lead ECG is a diagnostic tool that generally shows the right localization of MI based on ST elevation and reciprocal depression. Inferior ST elevation is generally indicative of the occlusion of the right coronary artery (2). It may rarely indicate the occlusion of the left coronary artery (LAD) (3). In 15% cases of MI with LAD as the culprit vessel, ST elevation in the inferior leads is observed (4). In a previous study, the efficacy of ECG was evaluated for acute MI of the inferior wall and it was suggested that the results from the interpretation of ECG do not change with angiographic findings, despite rare forms of presentations in inferior ST elevation (3). In the presented case, the first ECG record showed the diagnostic findings of inferior MI; however, after 15 min, the second ECG showed findings of anterior MI. In angiography, wraparound LAD was observed. Changes in

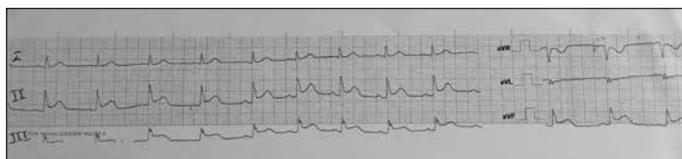


Figure 1. ECG taken during admission

ECG: electrocardiography

Note: We could not obtain chest derivations of the first EKG records

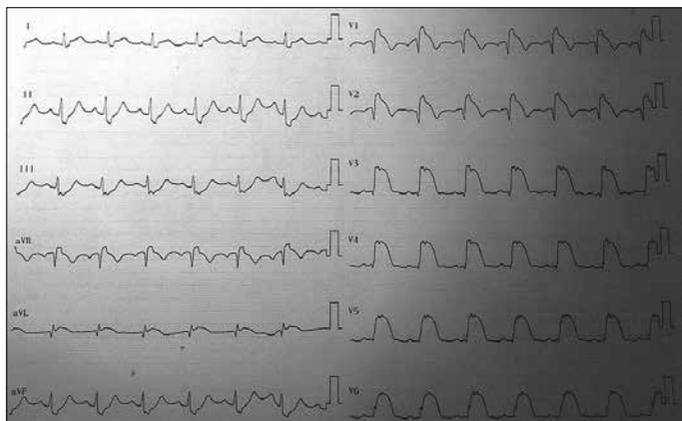
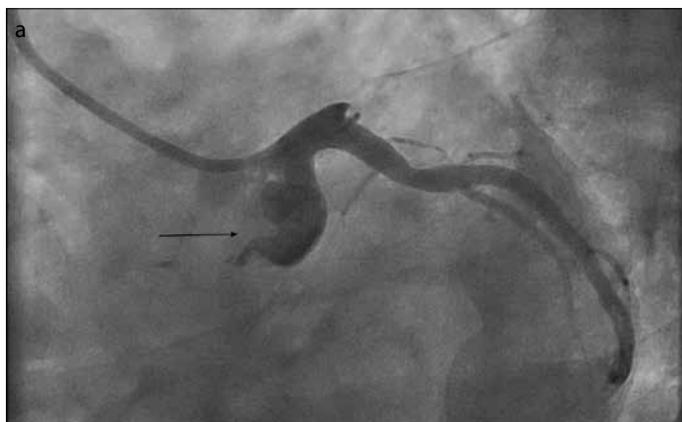


Figure 2. ECG taken after 15 min of admission

ECG: electrocardiography



ECG findings may be an indicator of anterior wall infarction. However, angiography was necessary to explain the reason for this alteration in ECG.

Wraparound LAD that extends around the cardiac apex can be anatomically observed in the normal population (5). When LAD wraps around the apex, it supplies blood anteriorly and postero-inferiorly to the myocardium. Thus, concomitant ST elevation could be observed and explained by anterior and inferior wall transmural ischemia simultaneously (6). In addition, it can be rarely observed because of significant collateral flow from LAD to the inferior wall (7). It is suggested that the combination of inferior and anterior ST elevation occurs in case of the occlusion of distal LAD to its major branches. In addition, it has been reported that patients who have combined inferior and anterior ST elevation due to wraparound LAD have a better prognosis than those who have anterior ST elevation (7). Similarly, Sadanandan et al. (5) suggested that combined anterior and inferior ST elevation in ECG records is a sign of limited AMI size and the patients have a better prognosis with isolated anterior ST elevation.

In the presented case, the first ECG record was concordant with inferior MI and the second showed anterior MI with reciprocal ST depressions. It may show revascularization of the occlusion of the inferior wall, and then, because of wraparound LAD, transmural ischemia of the anterior wall occurred. It is reported that although transmural ischemia consists of the anterior and inferior wall, ischemia in the inferior wall would disappear because of the force of the injury in the lateral wall (8).

Wraparound LAD caused stenosis of proximal LAD in this case. It is known that the occlusion of proximal LAD has high mortality and morbidity. In the literature, proximal LAD lesions are named as "widow makers" because of their high incidence of mortality (9). However, Sasaki et al. (10) have suggested that if the patient has wrapped LAD and the location of occlusion is proximal to D₁, ST-segments are elevated in the anterior leads and remain within the isoelectric lines in the inferior leads. In our case, ST-segment elevation in the inferior leads was observed before ST-segment elevation in the anterior leads. İlia et al. (11) have suggested that patients who have anterior ST elevation due to wraparound LAD have a worse prognosis than those who have isolated proximal LAD occlusion. Other factors may affect the severity of clinical outcome. LAD length is one of the important factors (12, 13). There is a relationship between LAD length

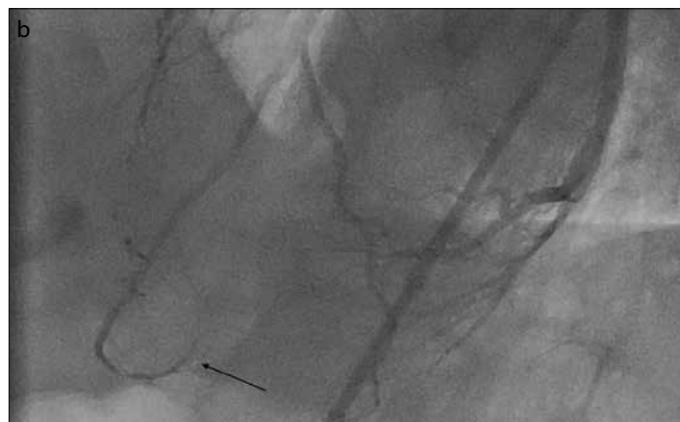


Figure 3. a, b. (a) Occlusion of the ostial region of LAD, (b) Wraparound LAD
LAD: left anterior descending coronary artery

and prognosis. As a result of the greater amount of muscle supplied by a long LAD (in which the vessel wraps around the apex), a greater amount of myocardial necrosis will occur when the vessel occludes. On the other hand, short LADs that do not wrap around the apex have a better prognosis (11).

In the literature, despite conflicts regarding prognosis, simultaneous inferior and anterior ST-segment elevation, due to wraparound LAD, has been reported (5-7, 14, 15). However, there has been an alteration in serial ECG records in the presented case. This indicates the importance of serial ECG records in the emergency department and the efficiency of angiographic findings to explain the mechanism. In addition, it draws attention to wraparound LAD, which can present with unusual ECG records.

Informed Consent: Written informed consent was obtained from patient who participated in this study.

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