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Educational Electrocardiographic Findings in a Man with a Totally Occluded Left Main Coronary Artery

Sol Ana Koroneri Tamamen Tıkalı Olan Bir Hastadaki Eğitici Elektrokardiyogram Bulguları

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ABSTRACT

Significant left main coronary artery (LMCA) disease and total occlusion of the LMCA are very important cardiovascular emergencies and indicate an urgent need for invasive treatment strategies. Furthermore, a significantly higher risk of catheter-based procedural complications in these patients must be taken into consideration. All of these facts are important issues in estimating significant LMCA disease using electrocardiography (ECG) findings, the fastest and easiest method for the diagnosis and evaluation of acute coronary syndrome. We present here a case report of a 52-year-old man admitted to our emergency department with anterior myocardial infarction complicated by cardiogenic shock. There were Q waves and ST elevations in leads V1-V6, D1, aVL and aVR, as well as marked ST depressions in the inferior leads with right bundle branch block (RBBB) and left anterior fascicular block (LAFB) on the ECG. The left main coronary artery (LMCA) was totally occluded with no antegrade or retrograde coronary flow on coronary angiography.

Keywords: Right bundle branch block, left anterior fascicular block, acute coronary syndrome
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ÖZET

Belirgin sol ana koroner arter (LMCA) hastalığı ve LMCA'nın total oklüzyonu çok önemli bir kardiyak acil olmakla birlikte acil invazif tedavi stratejilerinin uygulanmasını gerektirir. Ayrıca, bu hastalarda anlamlı derecede daha riskli kateter işlemlerine de dikkat edilmesi gerekir. Tüm bu faktörler, anlamlı LMCA hastalığının tahmin edilmesinde, akut koroner sendromların değerlendirilmesindeki en hızlı ve kolay metot olan elektrokardiyogram (EKG) bulgularının önemini pekiştirir. Bu yazıda, acil servisimize kardiyojenik şok ile komplike olan akut anterior miyokart infarktüsü ile başvuran 52 yaşındaki bir erkek hastanın olgusunu sunmaktayız. Hastanın EKG'sinde sağ dal bloğu, sol anterior hemiblok ile V1-6, D1, aVL ve aVR derivasyonlarında Q dalgaları ve ST elevasyonları ile inferior derivasyonlarda belirgin ST çökmeleri mevcuttu. Koroner anjiyogramda LMCA total tıkalı olmakla birlikte herhangi bir antegrad veya retrograd kollateral akım yoktu.

Anahtar Kelimeler: Sağ dal bloğu, sol anterior hemiblok, akut koroner sendrom
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Introduction

Total occlusion of the LMCA is a very important cardiovascular emergency. Unless treated immediately, it almost always results in mortality. ECG is the easiest and most readily available method for the diagnosis and evaluation of acute coronary syndromes. In this paper, we will discuss the electrocardiographic findings in patients presenting with critical LMCA disease and acute coronary syndrome after the presentation of a case report of an unlucky man.

Case Report

A 52-year-old man was admitted to our emergency department with complaints of dyspnea and increasing chest pain lasting for two days. His appeareance was very nervous and dyspneic. He was a current smoker, but did not have other risk factors

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for cardiovascular disease. Upon physical examination, his pulse rate was 130 beats per min and his blood pressure was 74/47 mmHg. An S3 was heard on cardiovascular examination and there were rales in both basilar lung fields. On the emergently ECG, there were Q waves and ST elevations in leads V1-V6, D1, aVL and aVR as well as marked ST depressions in leads D2, D3 and aVF. Right bundle branch block (RBBB) and left anterior fascicular block (LAFB) were also present (Figure 1). The patient was diagnosed with anterior myocardial infarction (MI). Since the patient was in cardiogenic shock, he was immediately taken to the catheter laboratory for primary percutaneous intervention. The left main coronary artery (LMCA) was totally occluded with no antegrade or retrograde coronary flow (Figure 2), while the right coronary artey (RCA) was patent on coronary angiography. Percutaneous coronary intervention was performed on the LMCA, left anteror descending artery and circumplex artery. In spite of extreme interventional and medical efforts, the patient went into cardiovascular collapse and died.

Discussion

Critical LMCA disease is present in 4-10% of patients undergoing coronary angiography, but total occlusion is encounterd in only 0.04%-0.42% of elective cases. When detected, RCA dominance and well-developed collateral circulation are almost always present (1).

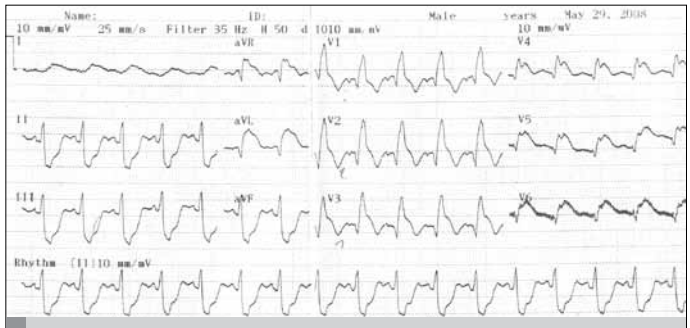

Figure 1. Electrocardiography showing Q waves and ST elevations in leads V1-V6, D1, aVL and aVR; marked ST depressions in leads D2, 3 and aVF with right bundle branch block and left anterior fascicular block

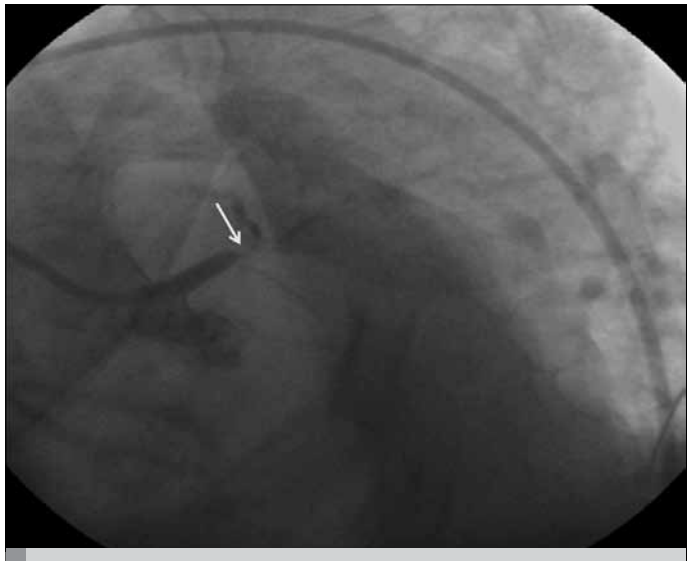

Figure 2. Coronary angiography showing a totally occluded left main coronary artery with no antegrade flow (white arrow)

Various ECG paterns can be seen in patients with significant LMCA disease. Widespread ST segment depressions with ST elevations in lead aVR have been shown in some case reports and in a small series of studies. In patients with non-ST elevation acute coronary syndrome, ST elevation in lead aVR is associated with significant LMCA disease or three-vessel disease with adverse outcomes (1, 2). In a descriptive study of 16 patients by Yamaji et al., ST segment elevation in lead aVR with a shorter elevation in lead V1 was shown to be an important predictor of left main obstruction in patients admitted within 12 hours from the onset of acute MI (1, 3).

A considerable proportion of patients with acute LMCA occlusion present with acute ST elevation MI. The predominant pattern is a typical anterior ST elevation MI with varying numbers of affected precordial leads. Hori et al. (4) presented a small series of 13 patients with acute MI caused by total occlusion of the LMCA encountered during an eight-year period. Eight of 13 patients had ST elevation in the precordial leads with varying patterns of ST segment depression. Six of 13 patients died and five of the six non-survivors had ST elevations in both the aVR and aVL leads. Kurisu et al. (5) reported 25 patients with LMCA occlusion in patients undergoing coronary angiography within 24 hours of the onset of MI. The findings of the LMCA group were compared to those from patients with proximal occlusion of other locations. ST segment depression in the inferior extremity leads predicted LMCA occlusion with a sensitivity of 88%, and ST elevation in the aVR and aVL leads had the highest specificity (98%).

A study performed by Hirano et al. included a large study population of patients with subtotal LMCA occlusion (6). However, of 35 patients with LMCA-associated acute MI, 89% had more than 90% critical stenosis on coronary angiography. ST segment elevation in lead aVR predicted LMCA disease with a sensitivity of 80% and specificity of 92% when compared to patients with culprit lesions in other locations. Hirano et al. summarized the special ECG features of LMCA infarction as relative left axis deviation, prolongation of the QTc interval, prolongation of the QRS interval, ST segment elevation in aVR, ST segment elevation in extensive precordial leads and newly emerged abnormal Q waves. They classified these ECG changes into two main groups:

- the RBBB+Left Axis Deviation (LADEV) Type, which occured in 37.1% of their patients and was characterized by marked QTc and QRS prolongation with an abnormal axis deviation (left axis deviation or a northwest axis) and ST segment elevation in leads aVR and/or I and aVL.
- the LAD Type, which occured in 51.4% of their patients and was characterized by marked QTc prolongation and marked ST elevation in leads V2-6, aVR and/or I and aVL, with a higher incidence of inverted T and abnormal Q waves.

The remaining 11.5% of patients did not fit into either group.

Significant LMCA disease and total occlusion of the LMCA are very important cardiovascular emergencies and indicate an urgent need

for invasive treatment strategies. Patients usually present with sudden cardiac death, serious ischemia and cardiac failure. Furthermore, a significantly higher risk of catheter-based procedural complications must be taken into consideration in this patient group. All of these facts are important for estimating significant LMCA disease using ECG findings, the most commonly used method for the diagnosis of acute coronary syndromes. Our case presentation supports the importance of this assessment, since it is a presentation of total LMCA occlusion without any collateral flow, which comprises only a very small number of patients included in published studies. The ECG changes in this patient included all the characteristic features of both ECG groups described by Hirano et al. as well as ST elevations in both the aVL and aVR leads, as seen in the non-survivors in the study by Kurisu et al. Although our patient did not survive in spite of comprehensive intervention, the patient's very late admission played an important role in this outcome as well as the unfortunate anatomy of the lesion.

Conclusion

Significant LMCA disease and total occlusion of LMCA are very important emergencies and urgent invasive treatment is mandatory. Electrocardiography is the first easy, accurate and common tool which helps for identification of LMCA occlusion.

Conflict of interest

No conflict of interest was declared by the authors.

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