



## Transient triangular QRS-ST-T waveform with good outcome in a patient with left main coronary artery stenosis: A case report

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### ARTICLE INFO

### ABSTRACT

Triangular QRS-ST-T waveform, also known as “shark fin pattern”, is an ECG presentation of ST segment elevation myocardial infarction with a unique wave composed by the QRS complex, the ST segment, and the T wave. It is associated with very poor prognosis and recently has been shown to be more common in patients with left main coronary artery (LMCA) involvement. Nevertheless, data supporting this correlation is scant. Herein we present a case of a patient with LMCA subtotal occlusion who developed a transient triangular QRS-ST-T waveform after an initial ECG had shown subendocardial ischemia. Electrocardiographic findings resolved spontaneously, and the patient was successfully treated without major complications. It is uncertain what caused the change between patterns.

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### Introduction

Left main coronary artery (LMCA) involvement is an uncommon yet serious cause of myocardia ischemia: in fact, most patients die before reaching medical services due to cardiogenic shock or cardiac arrest [1]. Diffuse ST segment depression with ST elevation in aVR is the ECG hallmark of these lesions, albeit discussion regarding its clinical meaning and accuracy persists. Another pattern, the triangular QRS-ST-T waveform (TW), has been recently described in two patients with LMCA occlusion [2,3]. We present a case of a patient with LMCA involvement who developed transient TW after an initial ECG had shown ST segment depression in multiple leads.

### Case presentation

A 54-year-old white man presented to the Hospital Emergency Unit due to intense chest pain which started 40 min before, with irradiation to the upper left arm, associated with nausea and sweating. He had a medical history of diabetes mellitus, dyslipidemia and prior tobacco use. Physical examination showed blood pressure of 90/50 mm Hg, heart rate of 50 bpm, and normal chest auscultation.

Admission ECG (Fig. 1) showed sinus rhythm with a rate of 56 bpm, T wave inversion in leads II, III, and aVF, and downsloping ST depression

with negative-positive biphasic T waves in V3–6. Laboratory tests revealed a troponin value of 0,319 ng/mL (normal value: <0,1 ng/mL), hemoglobin of 11,6 mg/dL, creatinine of 1,1 mg/dL, and sodium and potassium within normal ranges.

The patient improved and remained asymptomatic for about 4 h, when he had a new episode of severe chest pain. The ECG then (Fig. 2) showed sinus rhythm, HR of 59 bpm, and marked ST segment elevation in leads V2 to V6, I and aVL, with evident fusion of QRS complex and T wave. The pain relieved spontaneously in 7 min, and resolution of the TW changes occurred 9 min after (Fig. 3).

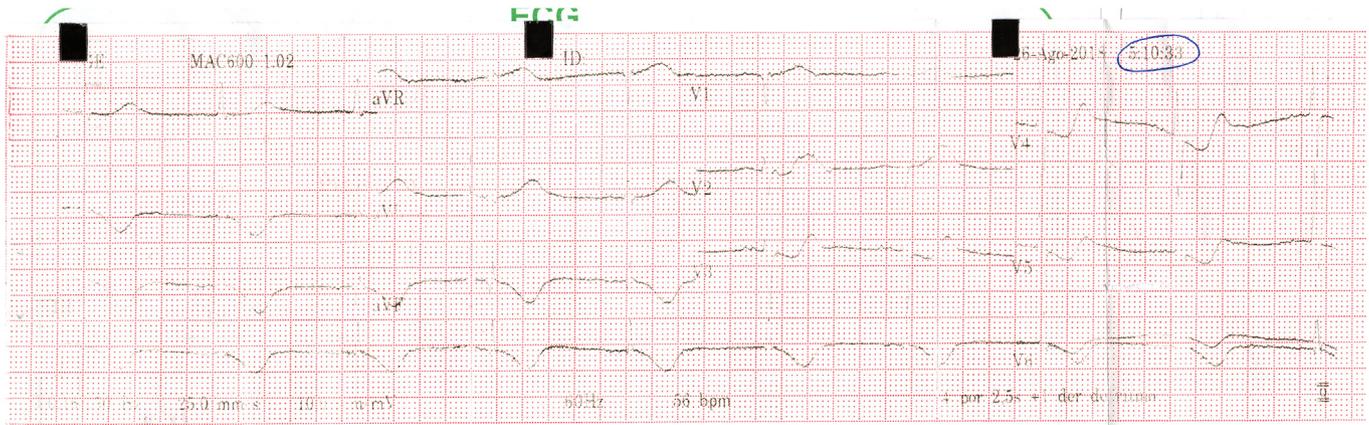
The patient was referred to the hemodynamics laboratory. Coronary angiography showed a critical stenosis of the left main coronary artery, without involvement of the ostia of the anterior descending or the circumflex branches (Fig. 4A); drug-eluting stent implantation was performed (Fig. 4B) uneventfully. The patient presented clinical improvement without new pain episodes and was discharged two days later.

### Discussion

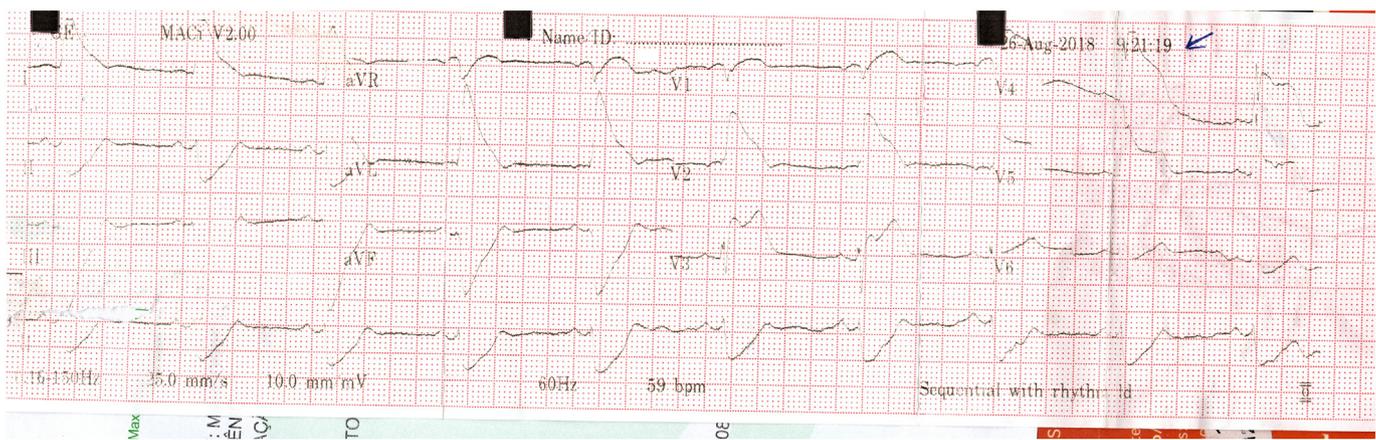
Electrocardiography is a cornerstone in diagnosis and risk stratification of acute coronary syndromes. Different patterns lead the physician to consider specific clinical conditions, such as in the presented case. The presence of diffuse ST segment depression with ST elevation in aVR is a well-known sign of circumferential ischemia; in the setting of acute coronary syndromes (ACS), it suggests LMCA, left main-equivalent, or three-vessel disease. It is not classified as STEMI and should instead be

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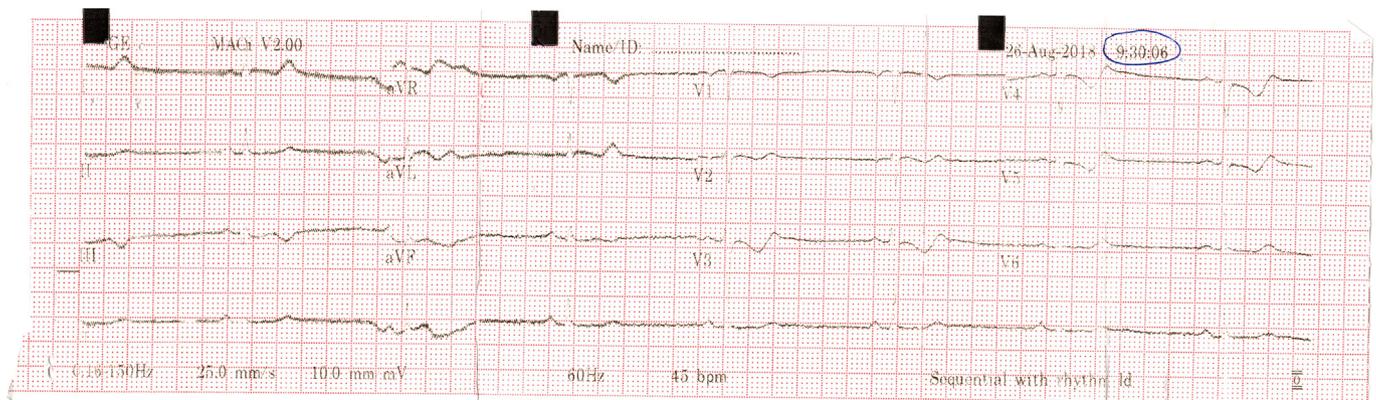
**Fig. 1.** Initial ECG showing sinus rhythm with T wave inversion in leads II, III, and aVF. Also, there are downsloping ST segment depression and negative-positive biphasic T waves in leads V3 to V6.



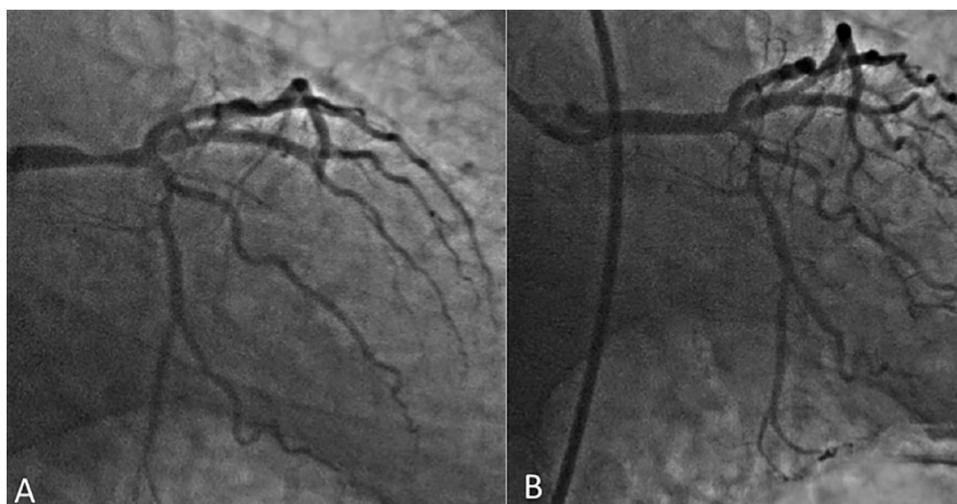
**Fig. 2.** ECG during the new episode of pain. It shows sinus rhythm with massive triangular QRS-ST-T waveforms pointing to the anterior and lateral walls.

treated as high-risk non-ST segment elevation acute coronary syndrome (NSTEMI-ACS). Furthermore, it may be caused by other conditions that create a supply-demand mismatch in the coronary bed, such as anemia, aortic stenosis, and hemodynamic compromise [2]. Our patient's admission ECG shows signs of subendocardial ischemia, with ST depression and biphasic T waves in leads V3–6 and T wave inversion in leads II, III, and aVF; other leads may also present minor ST depression, probably reflecting the global impairment caused by a LMCA stenosis.

On the other hand, the uncommon STEMI pattern with merged QRS-ST-T resembling a triangle has also been statistically correlated to LMCA involvement. Research around this presentation is exiguous, and it had been previously referred to as “shark fin pattern”, “giant R wave”, and “lambda-like ST” [3–5]. In the only longitudinal study of the topic, the terminology “triangular QRS-ST-T waveform” has been suggested. There, Cipriani and colleagues [3] demonstrated the pattern to have an incidence of 1.4% among patients admitted for STEMI, upholding the clinical impression of its rarity. Moreover, they found that half of the



**Fig. 3.** ECG soon after relief of pain. The triangular waveforms disappeared, and there are T wave inversion in leads III, aVF, and V1 and biphasic T waves in leads V3–V6.



**Fig. 4.** Coronary angiography of the left coronary artery. (A) Critical lesion in the middle of the left main coronary artery. (B) Recovered blood flow after placement of drug-eluting stent.

cases had LMCA disease, against 0,6% of patients with regular STEMI patterns ( $p < 0.001$ ).

LMCA involvement harbors very poor prognosis. Patients with diffuse ST segment depression are at high risk of cardiogenic shock and cardiac arrest, and all the patients with TW studied by Cipriani et al. had ventricular fibrillation [2,3]. Nonetheless, it is uncertain why some patients with LMCA disease may present with ST depression or instead with massive triangular ST elevation. In a small series [1], patients without flow at the LMCA showed ST elevation. It has been stated that lesions causing diffuse ST depression are rather subocclusive, thus inducing subendocardial ischemia. TW, as a STEMI pattern, would suggest total occlusion of the LMCA.

Yet our patient had a LMCA critical stenosis, he did not present any abovementioned complication. Moreover, the second episode of pain lasted <10 min and was concurrent to the presence of TW pattern. It is plausible that the clinical deterioration he experienced was due to coronary spasm in the region with plaque at LMCA or to thrombosis with spontaneous reperfusion, thereby creating a moment of transmural ischemia.

### Conclusion

Our case is the only report of transient TW pattern occurring in a patient with LMCA stenosis and supports the described anatomic

correlation [3]. Nevertheless, it is unclear what caused the shift from ST depression to TW at different moments of pain; we speculate there may have been LMCA spasm or thrombosis with spontaneous reperfusion, which led to transmural ischemia. The absence of major complications further implies that our patient had a brief moment of worsening perfusion, likely an exception among those who develop TW.

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