



Letter to the editor: Is “triangular QRS-ST-T waveform” a left main total occlusion marker?



Dear Editor,

We have read with great interest the article by Cipriani et al. [1] concerning the incidence and clinical implication of a special ECG pattern that they have called “triangular QRS-ST-T waveform” (TW). They observed that patients with ST-segment elevation acute myocardial infarction (STEMI) and TW had a higher risk of ventricular fibrillation, cardiogenic shock and in-hospital mortality. Furthermore, patients with TW pattern significantly more often showed a left main coronary artery (LMCA) involvement (2/4, 50% vs 2/322, 0.6%; $p < 0.001$). About this point, there are some contributions that we would like to add, based in the literature and in our own experience.

Acute myocardial infarction due to completely occluded LMCA has a high mortality in the acute setting due to frequently developing of cardiogenic shock and malignant arrhythmias. The electrocardiographic features of LMCA total occlusion are not well described because patients usually die before medical assistance. Several electrocardiographic patterns have been described suggesting acute LMCA lesion, most of them derived of small series.

Authors presented two striking ECG of patients with TW and LMCA occlusion. Recently, we reported a case with a very similar ECG pattern that we named “Graveyard ECG” [2] because of the “tombstones and graves” appearance reminding of the poor prognosis associated to a total LMCA occlusion.

These three cases displayed the ECG features described by Fiol et al. in 7 patients with total left main obstruction [3]: STEMI pattern of left anterior descending coronary (LAD) occlusion proximal to first septal and first diagonal without ST-segment elevation in V1 and aVR and intraventricular conduction disturbances (frequently left anterior fascicular block and right bundle branch block). We got similar results in our own population of 17 patients with LMCA total occlusion [4] that we have recently increased with 3 more cases.

Since Fiol et al. provided ECG and clinical characteristics for their whole cohort, we merged his data and ours and reviewed both cohorts of LMCA patients, looking for TW pattern. We found that, from the total

of 27 patients with LMCA total occlusion, 14 (51%) have TW, all of them in anterolateral leads. Patients with TW have a significantly higher in-hospital mortality (12/14, 86% vs 5/13, 38% $p 0.02$) and more often developed cardiogenic shock (13/14, 93% vs 5/13, 38% $p 0.004$) than those without TW pattern.

These results support the conclusions of Cipriani et al. associating TW as with extensive myocardial ischemia and poor prognosis because of high risk of cardiogenic shock. Furthermore, TW seems to be an indicator of poorer outcomes even in patients with LMCA total occlusion, whose is known to have a particularly adverse prognosis. Finally, given the much higher prevalence of TW in the group of LMCA occlusion (51%) than in general STEMI (1.4% according to Cipriani et al.), we hypothesized that TW could be a not exclusive, but important marker of LMCA total occlusion.

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References

- [1] Cipriani A, D'Amico G, Brunello G, et al. The electrocardiographic “triangular QRS-ST-T waveform” pattern in patients with ST-segment elevation myocardial infarction: incidence, pathophysiology and clinical implications. *J Electrocardiol* 2017;51(1):8–14. <https://doi.org/10.1016/j.jelectrocard.2017.08.023>.
- [2] Ruiz-Pizarro V, Palacios-Rubio J, Mejía-Rentería H, Cobos-Gil MÁ. Graveyard electrocardiogram. *J Emerg Med* 2017;52(2):e49–50. <https://doi.org/10.1016/j.jemermed.2016.08.015>.
- [3] Fiol M, Carrillo A, Rodríguez A, Pascual M, Bethencourt A, Bayés De Luna A. Electrocardiographic changes of ST-elevation myocardial infarction in patients with complete occlusion of the left main trunk without collateral circulation: differential diagnosis and clinical considerations. *J Electrocardiol* 2012;5:487–90 Elsevier Inc. <https://doi.org/10.1016/j.jelectrocard.2012.05.001>.
- [4] Ruiz Pizarro V, Palacios-Rubio J, Gómez-Polo JC, Jiménez-Quevedo JC, Cobos-Gil MA. Alteraciones electrocardiográficas en pacientes con oclusión total aguda del tronco coronario izquierdo. *Rev Esp Cardiol* 2015;68(Suppl. 1):690 (Abstract 6010-154).

Virginia Ruiz Pizarro, MD*

Julián Palacios-Rubio, MD

Miguel Ángel Cobos-Gil, PhD

Instituto Cardiovascular, Hospital Clínico San Carlos, Madrid, Spain

*Correspondence author.

E-mail address: virginia.ruizpizarro@gmail.com (V.R. Pizarro).