Case 42: Questions & Answers:

1. STEMI? Yes. STEMI complicated with an out of hospital VF and cardiac arrest.

2. Territory? Extensive anterior and lateral walls involved.

3. What is the Culprit Vessel? Proximal left anterior descending (LAD) artery.

ECG findings:

- *His past baseline ECG* (figure 1): presents with a sinus rhythm, RBBB & normal ST-Tw.
- *His arrival ECG* (figure 1):
  - Presents with a wide complex QRS tachycardia at ~146/min, with a RBBB QRS morphology appearance and a new left axis or LAFB. Also, upon defining if this was a supraventricular or a ventricular rhythm, the first is favored in the presence of p-waves preceding the QRS complexes as viewed in figure-2 (marked with red arrows).
  - Anterior and lateral precordial ST-segment elevations upon V1-V6, L-1 and aVL, consistent with STEMI (marked with blue arrows in figure 2).
  - Precordial V1 and V2 present with a fusion of QRS, ST-segment, and T-waves giving a **triangular waveform, similar to a shark fin appearance** (marked with green arrows in figure 2).
  - Also suggested of a proximal LAD occlusive myocardial infarction is the reciprocal ST segment depression upon leads II, III and aVF, besides evidence of high lateral STE (L-1 & aVL) and septal STE (V1-V2).

ECG Traces (past baseline and arrival ECG);

Figure-1

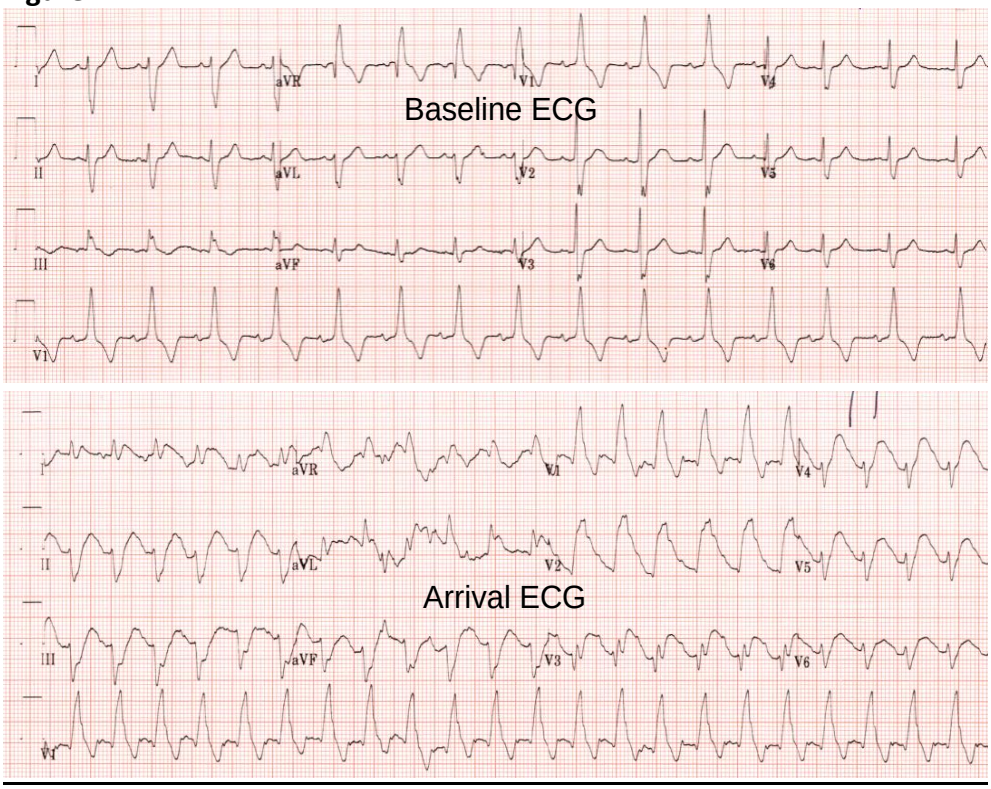
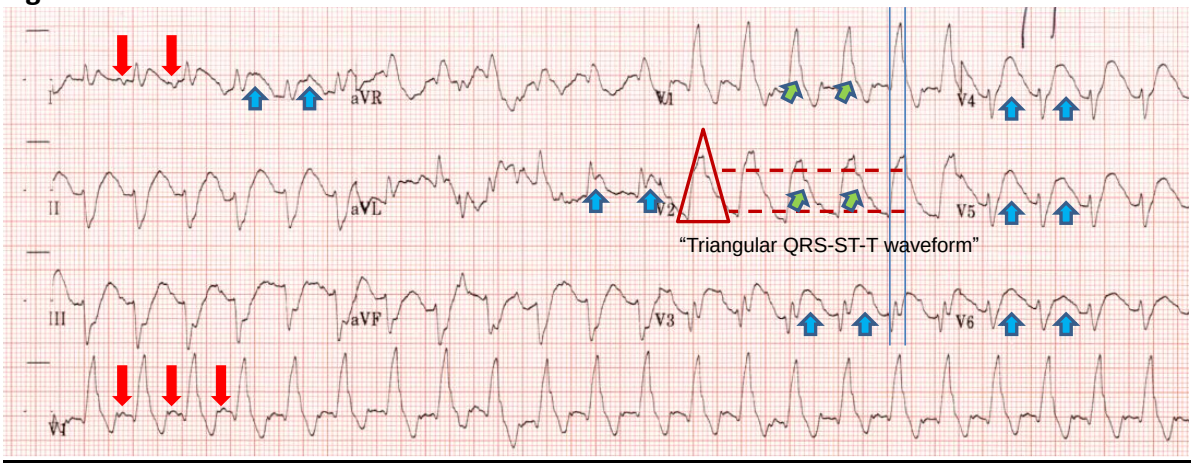
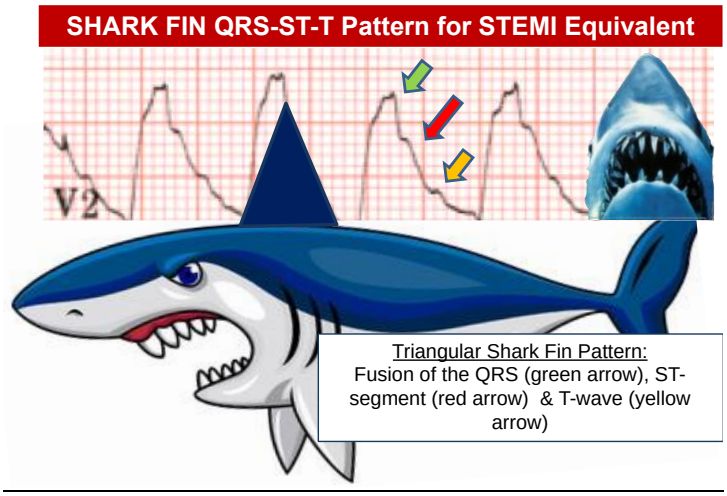


Figure #2:





Coronary angiography:

Figure-3

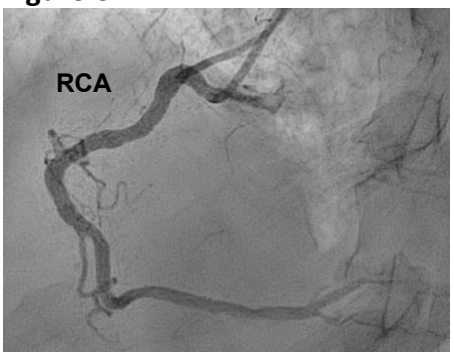


Figure-4

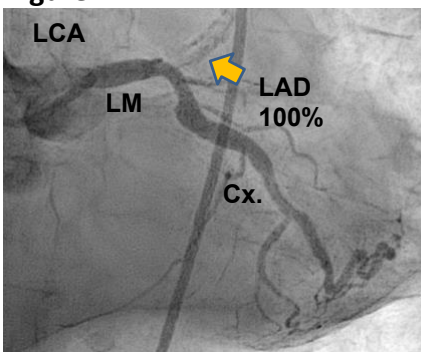
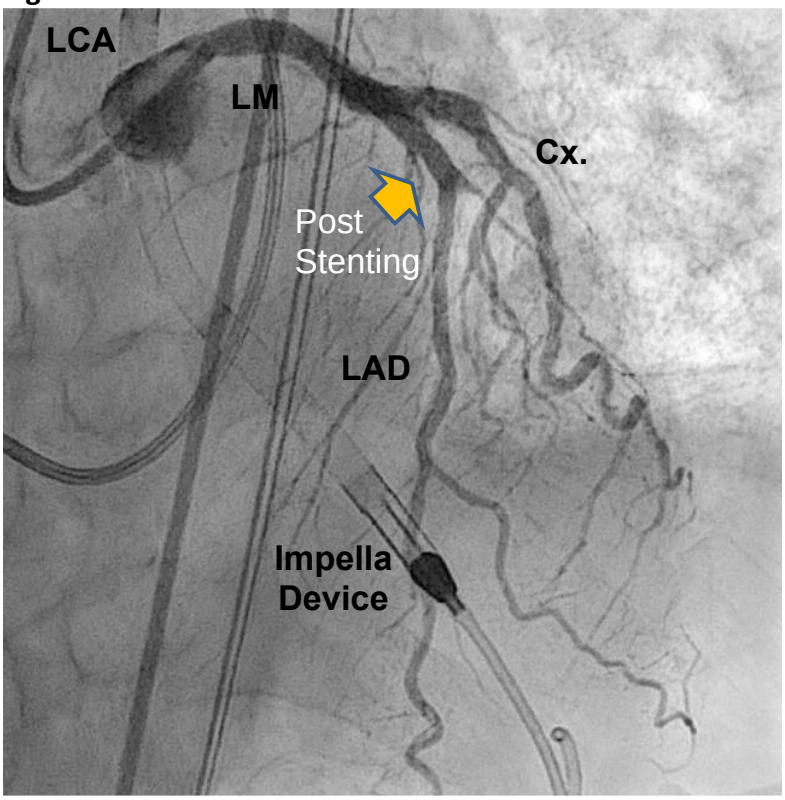


Figure-5



Clinical Progress:

- Upon performing the patients first diagnostic 12-lead ECG after his pre-hospital EMS defibrillation, the Emergency Department 12-lead ECG was misinterpreted as ventricular tachycardia (VT) which resulted in management with further defibrillations x3, intravenous amiodarone treatment, and mechanical ventilation.
- Upon persistence of the wide QRS tachycardia and pulmonary edema, the on-call cardiology team was called for emergent assistance.
- The ECG was thoroughly reviewed and determined that the patient had a sinus tachycardia and with an extensive anterolateral STEMI. A bedside echocardiogram revealed a severe LV systolic dysfunction and mark anterolateral and apical akinesia. The patient was rushed to the Cath-Lab for emergent coronary angiography.
- He was found with normal RCA (figure 3) and CX vessels w/o obstructive disease and with an ostial LAD 100% occlusion (figure 4) and underwent a successful PCI stenting under hemodynamic support with an Impella assist device (figure 5). The PCI led to a normal TIMI flow and with a 0% residual stenosis. Unfortunately, the patient required intravenous vasopressors and persistent hemodynamic assistance with the Impella CP.
- Despite the above interventions the patient died from advanced multiorgan failure and refractory VT storm.

Teaching Points:

- “Time is LIFE”
- Out-of-hospital cardiac arrest with STEMI is most often due to lethal ventricular arrhythmias, including sustained VT and VF.
- Early performance of 12-lead ECG after cardiac arrest resuscitation for assessment for STEMI or equivalent STEMI changes is critical.
- “Shark-fin” ECG pattern, also known as ‘triangular QRS-ST-T waveform” (TW), “Lambda-wave”, or “giant R-wave” is a dangerous ECG pattern associated with ST-segment elevation myocardial infarction (STEMI).
- It is formed by the fusion of QRS, ST-segment, and T-waves and predicts a high risk of mortality due to cardiogenic shock and ventricular fibrillation.
- This ECG pattern has been reported as a rare manifestation of STEMI, being revealed in only 1.4% of patients [1]. It may arise irrespective of the culprit coronary artery provided a large enough amount of myocardium has developed acute ischemia; yet, the LMCA or the left anterior descending (LAD) artery are the commonly revealed culprits.
- This shark-fin pattern significantly more often showed a LM coronary artery involvement (2/4, 50% vs 2/322, 0.6%; $p < 0.001$) [1].
- This ECG pattern is not specific for myocardial ischemia since it has been reported in other clinical settings such as takotsubo syndrome, Brugada syndrome, vasospastic angina, propofol infusion syndrome, hyperkalemia, hypocalcemia and acute myocarditis.
- This ECG pattern may be misdiagnosed as a wide complex tachycardia, as occurred in the current case, leading to some delay of STEMI diagnosis and reperfusion.
- Early recognition and differentiating it from other causes of similar ECG changes is critical to avoid delays in reperfusion therapy and to prepare for prompt use of ventricular hemodynamic support if needed.

References:

1. Cipriani A, D’Amico G, Brunello G, Perazzolo Marra M, Migliore F, Cacciavillani L, 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. 2018;51(1):8–14.

By: Jose Escabí-Mendoza, MD

www.stemiecg.com