

Case #35: Questions & Answers:

1. Acute STEMI? Yes.
2. Territory? Right Ventricular.
3. What is the Culprit Vessel? Proximal RCA

Arrival ECG Findings:

- STEMI criteria: $>1\text{mm}$ of STE in at least 2 contiguous leads (other than V2-3).
- ST segment elevation on the inferior lead: L-III & not on L-II and aVF suggestive of right ventricle STEMI (needing right sided leads with STE for confirmation).
- ST segment elevation of $>1\text{mm}$ upon lead V1 (as a right precordial lead).
- ST segment elevation on the right-sided leads of $>0.5\text{mm}$ (figure-3; additional right precordial leads: RV4, RV5 and RV6, replacing the usual left precordial V4-V6 leads).
- Old chronic inferolateral Q-waves consistent with past MI scar (since present on his baseline ECG (figure-2)).
- STD on L-1 and aVL may be related to RV STEMI reciprocal changes, or recruited subendocardic ischemia from additional CAD.

Figure-1: Arrival ECG

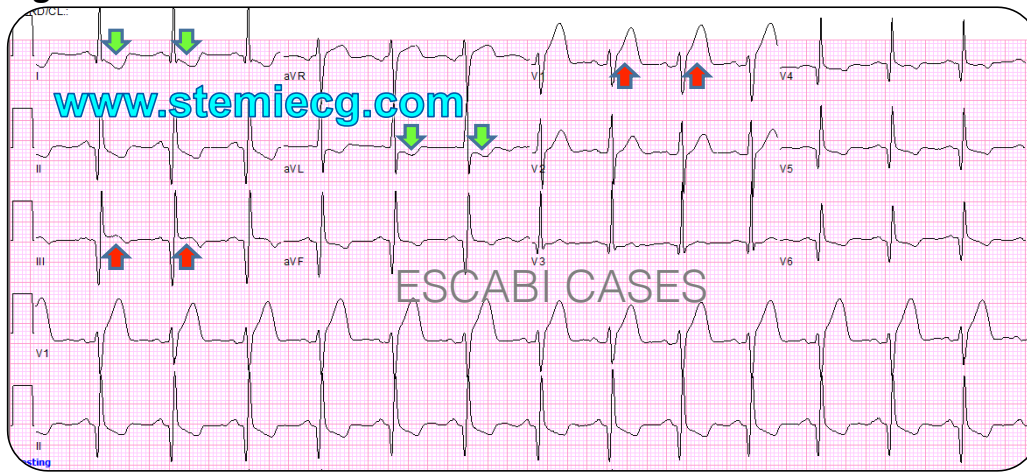


Figure-2: Baseline ECG

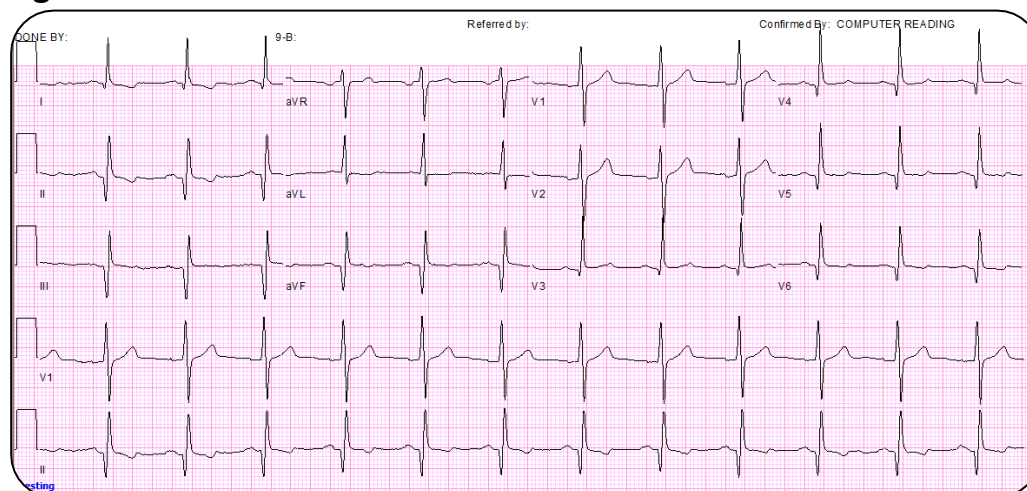
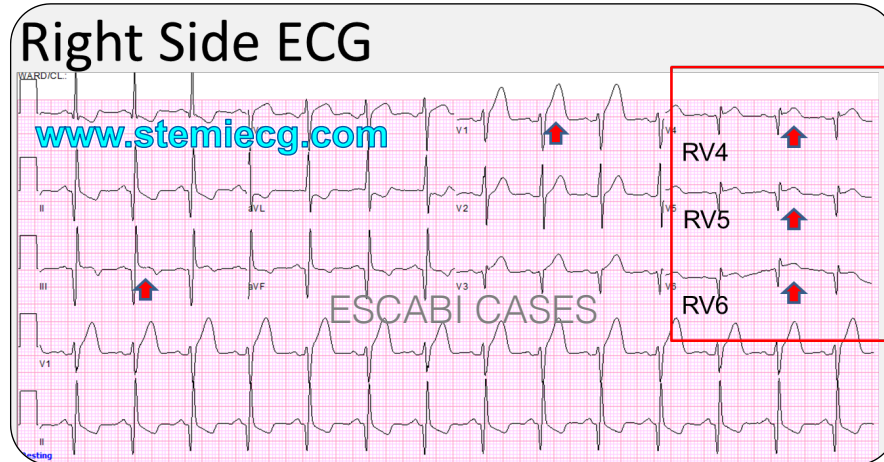


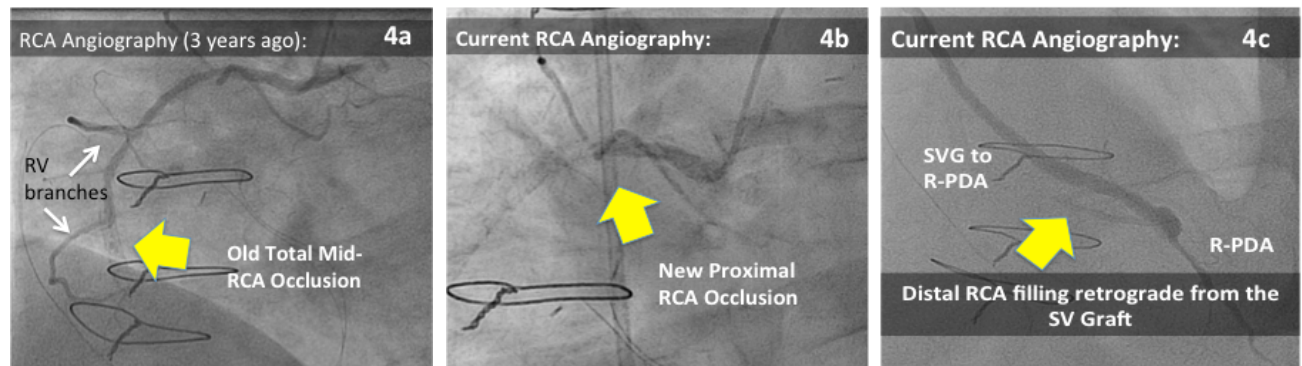
Figure-3: Right Sided ECG



Coronary Angiography Findings:

- Baseline angiography findings (figure 4a) from a coronary angiography 3 years prior to current catheterization, with a mid RCA total occluded lesion and the distal RCA filling retrograde from a SV graft to his R-PDA. As may be appreciated, this RCA gives off two arterial branches (white arrows) that provide the arterial circulation of the RV.
- Current RCA angiography (figure 4b) with evidence of a new proximal RCA occlusion of 100%, compromising the RV arterial circulation.
- Distal RCA was adequate with adequate SVG perfusion, reason why he did not present with inferior or posterior ST segment elevations (figure 4c).

Figure-4: RCA coronary angiography 3years before (4a) and on current angiography (4b). In the baseline study, the RCA had a mid-RCA complete chronic occlusion, with the distal RCA filling by the SVG to the R-PDA.



Teaching Points:

- Cardiac troponin elevation is not needed for the diagnosis of acute STEMI. Early AMI presentations will not necessarily present with elevated values, even with high sensitive troponins.

- The specificity of the ECG in AMI is limited by the large individual variations in coronary anatomy as well as the presence of preexisting CAD, past MI, collateral circulation or prior surgical bypass grafts.
- RV infarcts are related to proximal RCA 100% occlusion and commonly present with concomitant inferior STEMI since ~ 75-85% of the general population have a dominant RCA or a balance coronary dominance, meaning that the RCA gives rise to the posterior descending artery (PDA) or shared with the left coronary artery (LCA) respectively.
- Common ECG findings related to a proximal RCA occlusion with a dominant RCA anatomy include:
 - Inferior leads STE, most significantly with STE Lead III > II.
 - Precordial STE in leads V1 and V2 (right sided precordial leads).
 - STD in L-1 and aVL as reciprocal changes associated to inferior STEMI.
 - Right-sided ECG derivatives (RV4-RV6) with STE of > 0.5mm is diagnostic for RV STEMI.
- A patient with a left coronary dominance (15-20% of the population) the PDA is supplied by the LCA circumflex vessel and the RCA is usually small and only supplying the RV circulation.
- Proximal RCA occlusion in non-dominant RCA or on patients with dominant RCA that is distally revascularized with a surgical graft supplying the distal RCA (PDA) with a pre-existing distal RCA occlusion (without retrograde supply to the more proximal RCA), such as in this case, may present with only RV STEMI, not necessarily presenting with inferior STE.
- For this reason, patients presenting with AMI symptoms and with an initial 12-lead ECG without ST segment elevation, should be followed not only with repeat 12-lead ECGs to detect an acute evolving STEMI (every 15-30 minutes, as recommended by clinical guidelines), but also with additional ECG derivatives such as right ventricle leads (RV4, RV5 & RV6; commonly referred as 15-lead ECG) and posterior leads (V7, V8 & V9; commonly referred as an 18-lead ECG when combined with prior RV leads), as illustrated in figure 5.

Figure-5: 12-Lead ECG plus extended leads required to exclude acute STEMI.

