

## Case 21: Questions & Answers:

1. STEMI? No. This ECG reveals voltage criteria for left ventricular hypertrophy (LVH) commonly associated to ST segment changes of repolarization abnormalities that may mimic STEMI or acute subendocardial ischemia. Cause for his LVH is related to chronic arterial hypertension.

2. Territory? N/A (no STEMI)

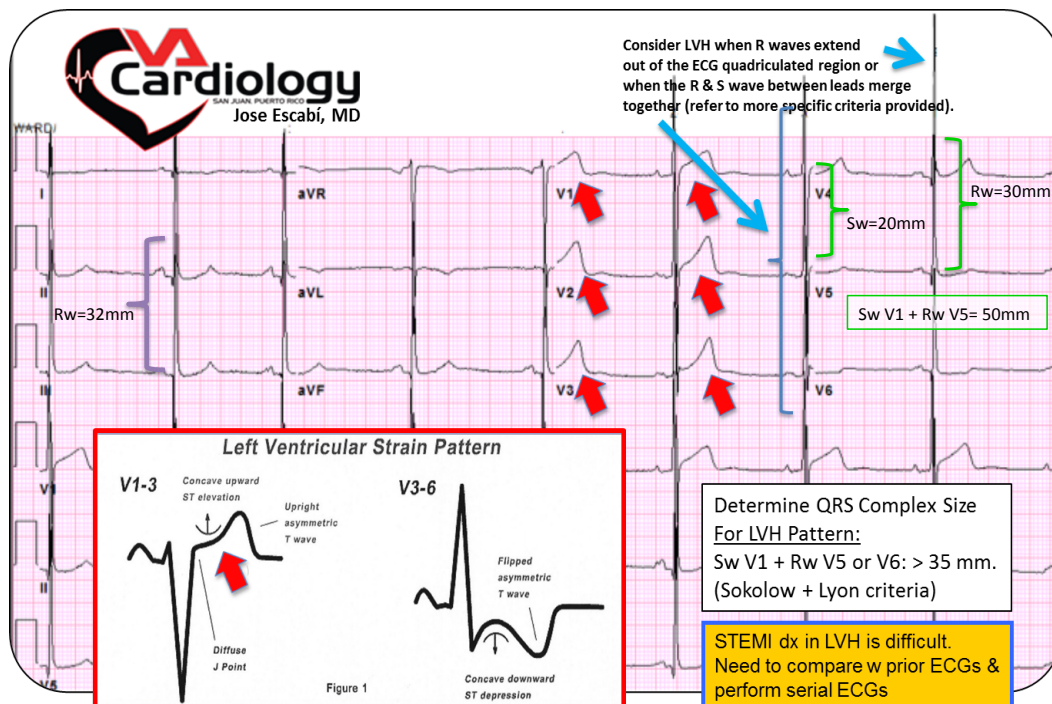
3. What is the Culprit Vessel? N/A (no STEMI)

### ECG findings:

- Marked voltage criteria for LVH: Precordial R-wave & S-wave merging; limb leads with R waves > 20mm; precordial S-wave in V1 or V2 + R-wave in V5 or V6 of > 35mm; and Romhilt-Estes criteria for LVH (voltage and ST segment abnormalities ≥ 5points).
- Characteristic ST segment changes of repolarization abnormalities from LVH are shown below with discordant ST segment to the predominant QRS vector. Pronounced precordial S-wave in V1-V3 produce ST elevation in these leads, typically with a concave upward appearance and an asymmetric T wave.

### Teaching Points:

- ST segment deviation due to LVH is generally **DISCORDANT** (opposite) to the QRS.
- ST segment elevation due to LVH may **MIMIC** STEMI or hide the ST elevation of a simultaneous AMI.
- Do NOT ascribe ST segment elevation to LVH unless voltage criteria for LVH are present.



# Left ventricular hypertrophy (LVH)

**ECG Diagnostic Criteria:** (The ECG often shows signs of increased voltage from the heart with LVH). None is perfect, though by using multiple criteria sets, the sensitivity and specificity is increased.

ST segment changes are commonly encountered related to repolarization abnormalities from this hypertrophy.

- Sokolow + Lyon (*Am Heart J*, 1949;37:161)
  - $S V_1 + R V_5 \text{ or } V_6 > 35 \text{ mm}$  (Sen 22% Spec 100%)
  - $R aVL > 9 \text{ mm}$  in women, &  $> 11 \text{ mm}$  in men (Sen 11% Spec 100%)
- Cornell criteria (*Circulation*, 1987;3: 565-72)
  - $S V_3 + R aVL > 28 \text{ mm}$  in men (Sen 42% Spec 96%)
  - $S V_3 + R aVL > 20 \text{ mm}$  in women
- Other Criteria:
  - $AVL: R > 11 \text{ mm}$ ,
  - $R V_4-6 > 25 \text{ mm}$ ,  $S V_1-3 > 25 \text{ mm}$ ,
  - $S V_1 \text{ or } V_2 + R V_5 \text{ or } V_6 > 35 \text{ mm}$ ,
  - $R I + S III > 25 \text{ mm}$
  - Lead 1:  $R > 14 \text{ mm}$
  - Lead AVR:  $S > 15 \text{ mm}$
  - Left atrial enlargement: Pw in V1 with bi-phasic wave, negative component of  $> 1 \text{ mm}$  deep and 40ms wide.



## Romhilt-Estes Criteria for LVH

*Am Heart J*, 1986;75:752-58

Diagnostic:  $\geq 5$  points (Sen 33% Spec 94%) ;

Probable: 4 points (Sen 54% Spec 85%)

+ECG Criteria	Points
<u>Voltage Criteria (any of):</u> R or S in limb leads $\geq 20 \text{ mm}$ S in V1 or V2 $\geq 30 \text{ mm}$ R in V5 or V6 $\geq 30 \text{ mm}$	3 points
<u>ST-T Abnormalities:</u> Without digitalis	3 points
With digitalis	1 point
Left Atrial Enlargement in V1	3 points
Left axis deviation	2 points
QRS duration 0.09 sec	1 point
Delayed intrinsicoid deflection in V5 or V6 ( $\geq 0.05 \text{ sec}$ )	1 point