ECG FINDINGS IN PULMONARY EMBOLISM


Take home points:
1. S1Q3T3 is a sign of acute cor pulmonale
2. Any cause of acute cor pulmonale (PE, PTX, bronchospasm, etc) can result in the S1Q3T3 finding on the electrocardiogram
3. The ECG is often abnormal in PE, but findings are not sensitive, not specific
4. Anterior T wave inversions? Consider the diagnosis of massive or sub-massive PE.
5. The ECG is a poor diagnostic test for PE. The greatest utility of the ECG in the patient with suspected PE is ruling out other potential life-threatening diagnoses such as MI.

The S1Q3T3 sign:
- Many call this pattern the “right heart strain pattern”, but the more appropriate term is: acute cor pulmonale
- The S1Q3T3 is the ECG manifestation of acute pressure and volume overload of the right ventricle
  - An S wave in lead I signifies a complete or more often incomplete RBBB
  - In lead III, look for a Q wave, slight ST elevation, and an inverted T wave. These findings are due to the pressure and volume overload over the right ventricle which causes repolarization abnormalities.
- The S1Q3T3 was first described by McGinn and White in JAMA in 1935.
- Any cause of acute cor pulmonale can cause the S1Q3T3 finding on the ECG. This includes PE, acute bronchospasm, pneumothorax, and other acute lung disorders. In addition, transient LPFB may cause this finding as well.

Studies of ECG findings in PE:
  - Anterior T wave inversions had a sensitivity of 85%, specificity of 81% for massive PE in 80 patients with suspected to have PE; this was the most common finding on ECG (68%), followed by S1Q3T3 (50%)
  - In 246 consecutive patients with PE compared to controls, only tachycardia and incomplete RBBB differentiated PE from no PE.
  - In 49 patients with PE, ECGs were analyzed for RV overload. Although many of the patients with PE had signs of RV overload on ECG, these signs were non-specific and performed poorly in patients with underlying lung disease.
  - In this retrospective study of 117 patients with acute PE, non-specific ST-T wave changes were the most common finding on the ECG (49%).

The bottom line: The ECG is a really poor diagnostic test for pulmonary embolism. The greatest utility of the ECG in the patient with suspected PE is ruling out other potential life-threatening diagnoses such as MI.