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ECG QUIZ

ECG CORNER-“Watch the Watch”

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KEYWORDS

Counterclockwise Rotation
Tall R Wave in V1
ECG Interpretation
Left Atrial Abnormality

The ECG of a 53-year-old male with diabetes complains of chest pain.

QUESTIONS

1. Describe the ECG changes.
2. Why is this a clue?
3. What are the practical implications?

ANSWERS

1. ECG Findings

ECG shows sinus tachycardia, Tall R wave in V1, left atrial abnormality and normal axis. There is also a prominent septal q in V5, V6, as well as L1 and avL. There are many causes for a tall R wave in V1, including RVH, RBBB, Dextrocardia, Type A WPW pattern, Hypertrophic Cardiomyopathy, and Duchenne muscular dystrophy. In our patient, the cause of the tall R wave is likely to be due to counterclockwise rotation. This is unlikely to be Asymmetrical Septal Hypertrophy because there are no deep, narrow septal Q waves in V5, V6. Counterclockwise rotation is diagnosed if the equiphasic zone in the chest leads is shifted to the right. In our ECG, the equiphasic zone is in V1 and V2 (Figure 1).

Description of clockwise and counterclockwise rotation.

- Clockwise and counterclockwise rotation refers to a change in the electrical activity in a horizontal plane through the heart.
- Imagine the observer standing at the feet of the patient who is in bed.
- If the electrical activity of the heart has turned more to the right side of the patient, this is called *counterclockwise rotation*.
- If the electrical activity of the heart has turned more to the left side of the patient, this is called *clockwise rotation*
- Clockwise and counterclockwise rotation can be assessed only in the chest leads (V1 - V6).
- Normally, the R wave amplitude increases from V1 to V5. Around V3 or V4, the R waves become larger than the S waves, and this is called the ‘transitional zone’.
- If the transition occurs at or before V2, this is called counterclockwise rotation.
- If the transition occurs after V4, this is called clockwise rotation (Figure 2).
- Causes of clockwise rotation were:
  - intraventricular conduction abnormalities secondary to myocardial degeneration
    - right ventricular heart disease

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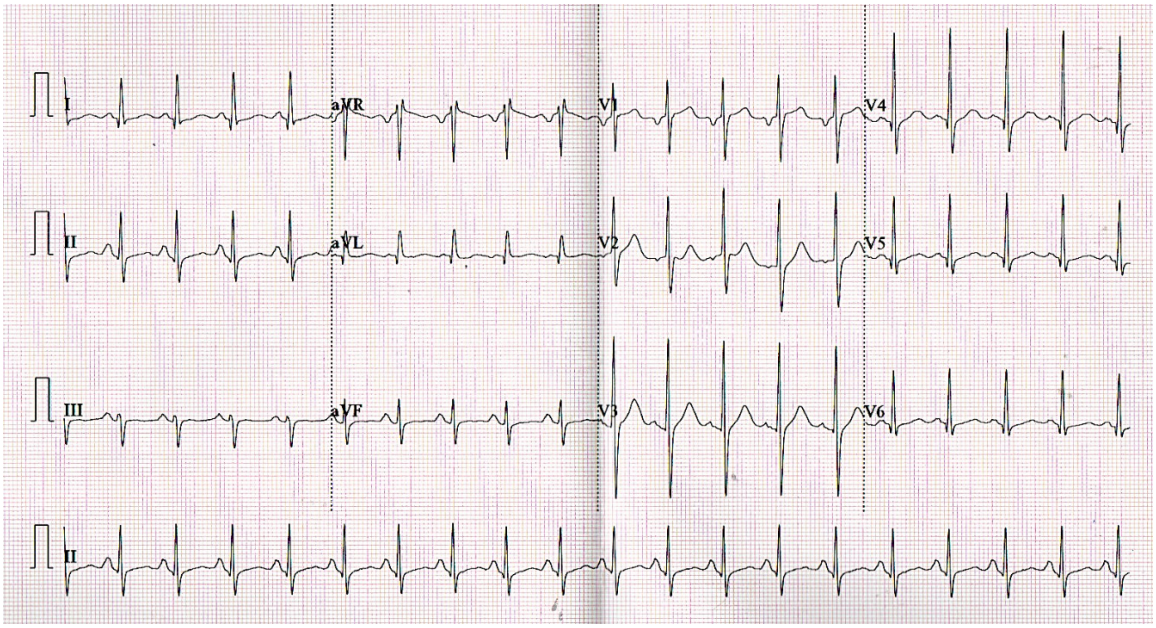

Figure 1. ECG of a 53-year-old male.

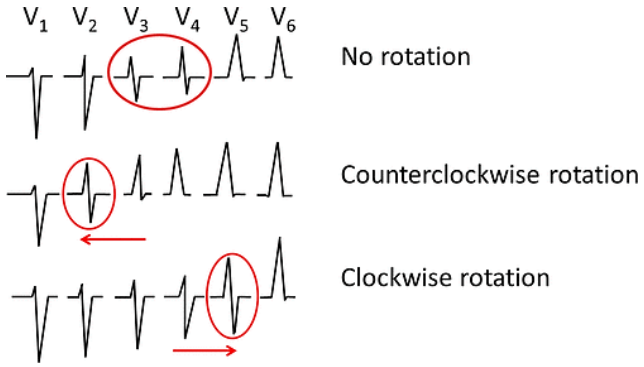

Figure 2. Showing ECG patterns of various rotations in chest leads.

- shift of the septum to the left
  - dilated cardiomyopathy
- shift of the whole heart
  - pulmonary emphysema
  - vertical heart (usually thin and tall persons)

• Causes of counterclockwise rotation were:

- electrical shift to the right
  - right ventricular hypertrophy
  - WPW Syndrome
  - Posterior myocardial infarction
  - Left post. fascicular block
- shift of the septum to the right
  - hypertrophic cardiomyopathy

The deep terminal negative component of P in V1 is suggestive of left atrial abnormality, and so left ventricular dysfunction has to be excluded.

2. Clue

The clue is about the counter-clockwise rotation as the cause of the Tall R wave in V1.

3. Practical Implication

Counter-clockwise rotation, the most prevalent QRS transition zone pattern, demonstrated the lowest risk of CVD and mortality. In contrast, clockwise rotation was associated with the highest risk of heart failure and non-CVD mortality. These results have implications for how to interpret QRS transition zone rotation in ECG.