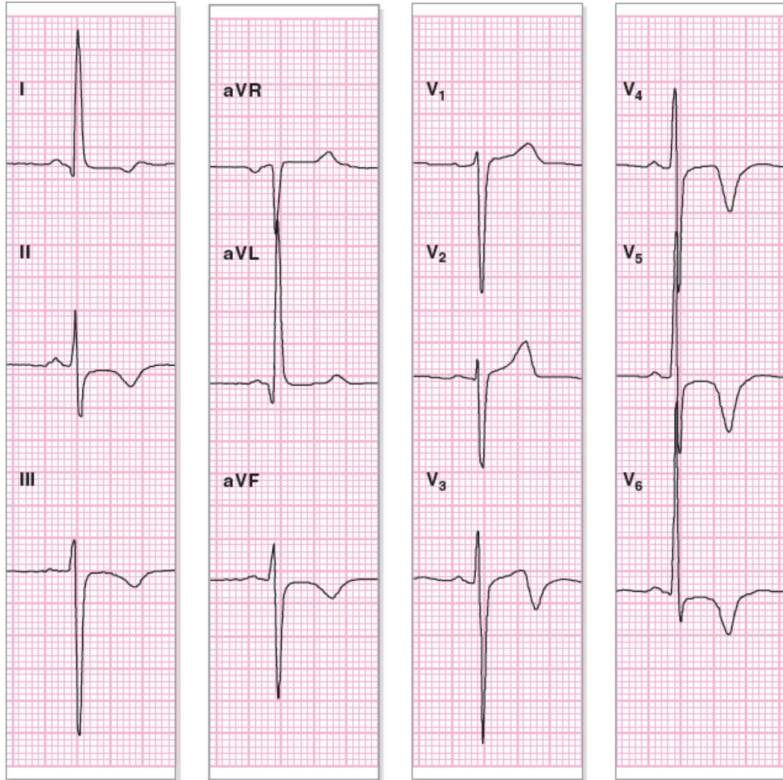


- Left ventricular hypertrophy (LVH)



VOLTAGE CRITERIA FOR LVH (sufficient for diagnosis without repolarization abnormalities)

- Cornell Criteria (most accurate):
  - R wave in aVL + S wave in V3:
    - > 28 mm in males
    - > 20 mm in females

- Other commonly used voltage-based criteria

#### PRECARDIAL LEADS (one or more)

- S wave in V1 or V2  $\geq 30$  mm
- R wave in V5 or V6  $\geq 30$  mm
- R wave in V5 or V6 + S wave in V1 (the modified Sokolow criteria use V1 or V2)
  - $> 35$  mm if age  $> 40$  years
  - $> 40$  mm if age 30–40 years
  - $> 60$  mm if age 16–29 years
- Maximum R wave + S wave in precordial leads  $> 45$  mm
- R wave in V5  $> 26$  mm
- R wave in V6  $> 20$  mm
- R wave in V5 or V6  $> 30$  mm

#### LIMB LEADS (one or more)

- R wave in aVL  $\geq 12$  mm (*a highly specific finding, except when associated with LAFB*)
- Largest R or S wave in the limb leads  $\geq 20$  mm
- R wave in lead I + S wave in lead II  $\geq 26$  mm
- R wave in lead I  $\geq 14$  mm
- S wave in aVR  $\geq 15$  mm

The amplitude of the QRS (and sensitivity for the diagnosis of LVH by voltage criteria) is often decreased by conditions that increase the amount of body tissue (obesity), air (COPD, pneumothorax), fluid (pericardial or plural effusion), or fibrous tissue (coronary artery disease [CAD], sarcoid or amyloid of the heart) between the myocardium and ECG surface electrodes, decreasing the sensitivity of the voltage criteria. Severe RVH can also underestimate the ECG diagnosis of LVH by canceling prominent QRS forces from the thickened LV. LBBB may also reduce QRS amplitude. In contrast, thin body habitus, left mastectomy, LBBB, WPW, and LAFB may increase QRS amplitude in the absence of LVH, decreasing the specificity of the voltage criteria.

#### NON-VOLTAGE RELATED CHANGES (often present but not required for the diagnosis of LVH)

- Left atrial abnormality/enlargement
- Left axis deviation ( $< -30^\circ$ )
- Nonspecific intraventricular conduction disturbance (IVCD)
- Delayed onset of intrinsicoid deflection (beginning of QRS to peak of R wave  $> 50$  msec)
- Small or absent R waves in V1–V3 (low anterior forces)
- Absent Q waves in leads I, V5, V6
- Abnormal Q waves in leads II, III, aVF (due to left axis deviation)
- Prominent U waves
- R wave in V6  $> V5$  (provided there are dominant R waves in these leads)

#### REPOLARIZATION (ST-T) ABNORMALITIES OF LVH

PSEUDO-INFARCT PATTERN: QS complexes or poor R wave progression in leads V1–V3, at times with ST segment elevation, can mimic anteroseptal MI. Inferior Q waves can mimic inferior MI.