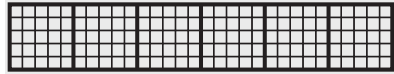


RATE
300 150 100 75 60 50 43



- Count number of complexes x 6 (standard ECG = 10sec)

RHYTHM

- Locate the P wave (rate, axis, morphology)
- What is the relationship between the P wave and QRS?
- Analyze QRS morphology

AXIS DEVIATION

Normal (-30 to 90°)

Left

Right

Lead I QRS

+

+

-

Lead II/aVF QRS

+

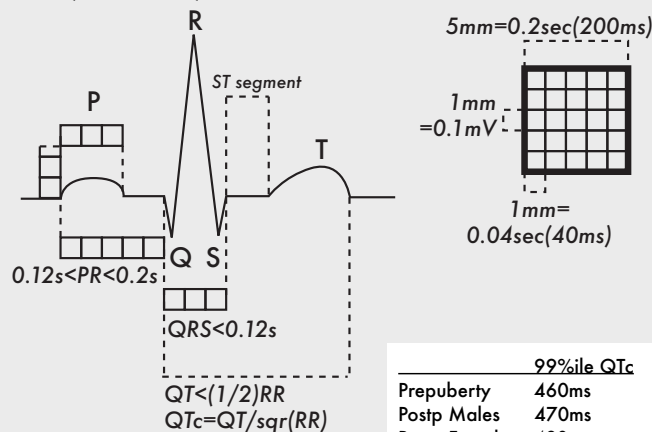
-

+

HYPERTROPHY

- LEFT ATRIAL ENLARGEMENT (P mitrale)
 - P wave > 0.12sec and bifid in **lead II**
- RIGHT ATRIAL ENLARGEMENT (P pulmonale)
 - P wave > 0.25mV in **lead II**
- LVH
 - R wave in **V5** or **V6** > 25mm
 - S wave in **V1** or **V2** > 25mm
 - Sum of R wave in **V5** or **V6** + S wave in **V1** > 35mm
- RVH
 - R wave > S wave in **V1**

WAVES, INTERVALS, & SEGMENTS



NORMAL Q WAVES

- Small (septal) q waves normal in **leads aVL, I, II, V5, V6**
- Can be normal on expiration in **lead III**

PATHOLOGICAL Q WAVES (PRIOR MI)

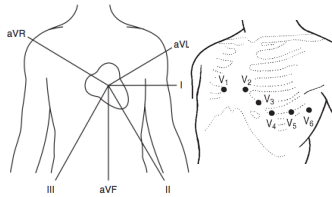
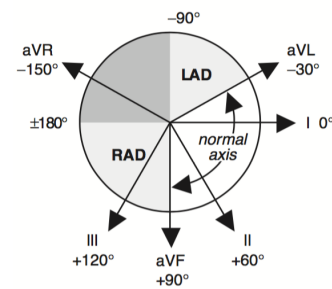
- > 1-2 small squares deep (or > 25% of R wave)
- > 1 small square wide (or ≥ 30ms)
- More likely diagnostic if with inverted T wave

DOMINANT R WAVE

- In **lead V1**: normal in young children; seen in RVH, RBB, HCM, posterior MI
- In **lead aVR**: TCA poisoning, dextrocardia, VT

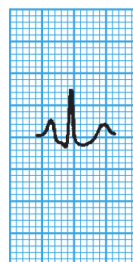
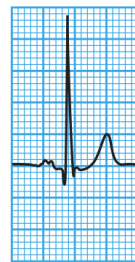
POOR R WAVE PROGRESSION

- Prior anteroapical MI, cardiomyopathy, LVH, RVH/COPD, LBBB



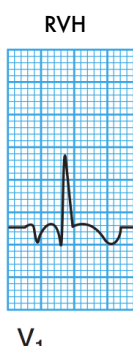
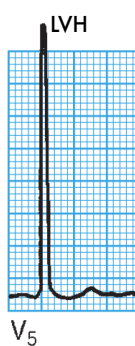
LAE

RAE



II

II



V5

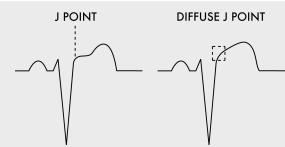
V1

SHARP J POINT

- ST seg. & T wave well demarcated, not merged as in STE
- J point elevation is normal in young, healthy athletes

DIFFUSE J POINT

- ST slowly curving with only an area J point can be found



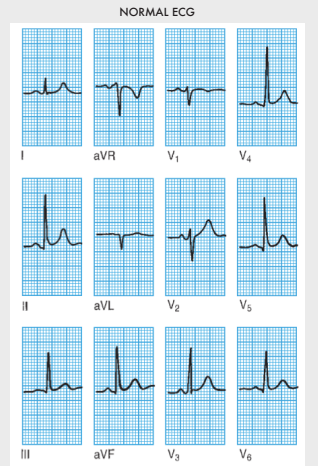
ST SEGMENT ELEVATION

- (New STE at the J point)
- In **all leads (except V2-V3)**, significant STE =
 - In two contiguous leads
 - ≥ 0.1mV
- In **leads V2-V3**, significant STE =
 - ≥ 0.15mV in women
 - ≥ 0.2mV in men ≥ 40yo
 - ≥ 0.25mV in men ≤ 40yo

ST SEGMENT DEPRESSION

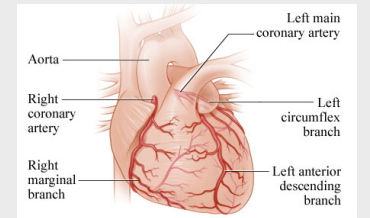
- (New horizontal or down-sloping STD)
- Significant STD =
 - In two contiguous leads
 - ≥ 0.05mV
- and/or
 - T-wave inversion ≥ 0.1mV in two contiguous leads with
 - Prominent R wave or R/S ratio > 1

(Known LBBB and pacing make ECG less diagnostic for ACS)



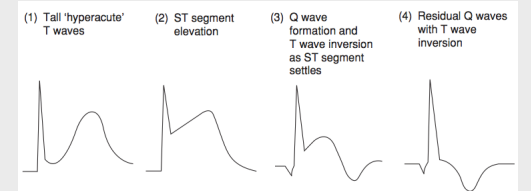
PATTERNS

- Anterior MI (LAD) = **V1-V4**
- Lateral MI (LCx) = **I, aVL, V5-V6**
- Anterolateral MI (LAD) = **I, aVL, V1-V6**
- Inferior MI (RCA, LCx) = **II, III, aVF**
- Inferolateral MI (RCA, LCx) = **I, aVL, V5-V6, II, III, aVF**
- Acute posterior MI (RCA or LCx):
 - Dominant R waves in **leads V1-V3**
 - ST depression in **V1-V3**
 - Upright, tall T waves



STEMI EVOLUTION

- Hyperacute T waves (tall, peaked, symmetric)
- STE in contiguous leads (concave → convex, merging with T wave)
- Development of Q wave and T wave inversions as ST returns to baseline



NORMAL INVERTED T WAVES

- Normal in **leads aVR, V1**
- Can be normal in **lead V2** in young pts, **lead V3** in black pts, **lead III** during expiration

INVERTED T WAVES IN ISCHEMIA

- ≥ 0.1mV in two contiguous leads

TALL T WAVES

- < 1/2 preceding QRS

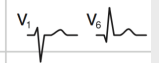
LVH → LV STRAIN PATTERN → TWI in **leads I, aVL, V5-6**

RVH → RV STRAIN PATTERN → TWI in **leads II, III, aVF**



BBB

Normal



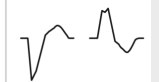
V1: "M"
V6: "W"

RBBB



V1: "W"
V6: "M"

LBBB



SOURCES: ECG tutorials on UpToDate (Basic principles of ECG analysis, Myocardial ischemia and infarction), Making Sense of the ECG by Houghton, Pocket Medicine by Sabatine; Third Universal Definition of Myocardial Infarction by Thygesen et al; lifeinthefastlane.com; compiled by Henry Del Rosario MD; last update 5/2018