HYPERTROPHY
- **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

LEFT ATRIAL ENLARGEMENT (P mitrale)
- P wave > 0.12s (3 small squares) and bifid in lead II

RIGHT ATRIAL ENLARGEMENT (P pulmonale)
- P wave > 0.25mV (2.5 small squares) in lead II

ST SEGMENT DEPRESSION
- Acute posterior MI
  - R waves in leads V1-V3
  - ST depression in V1-V3
  - Upright, tall T waves
  - Myocardial ischemia

ST SEGMENT ELEVATION
- Anterior MI = V1-V4
- Lateral MI = I, aVL, V5-V6
- Anteroapex MI = I, V1-V6
- Inferior MI = II, III, aVF
- Inferolateral MI = I, II, III, aVL, aVF, V5, V6

Q WAVES
- Normal in leads aVl, I, II, V5, V6
- Normal on expiration in lead III

PATHOLOGICAL Q WAVES
- >2 small squares deep
- >25% of height of following R wave in depth
- >1 small square wide

SHARP J POINT
- ST seg. & T wave well demarcated, not merged as in STE

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

J POINT ELEVATION
- Normal in young, healthy athletes

TALL T WAVES
- Should be no more than 1/2 preceding QRS (as a general guide)

FALSE T WAVES
- Evaluation is subjective

INVERTED T WAVES
- Normal in leads aVR, V1
- Normal in lead V2 in young pts
- Normal in lead V3 in black pts
- Normal in lead III, absent in inspiration

RATE

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<th>300</th>
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AXIS DEVIATION

|  | Normal | Lead I QRS | Lead II QRS |
|  |  |  |  |
|  | + | + |  |
| Left | + | - |  |
| Right | - | + |  |

INTERVALS

0.12s<PR<0.2s
0.35s<QTc<0.45s
QTc=QT/sqr(RR)

ST SEGMENT DEPRESSION

LATERAL MI
- V1, V2

ANTERIOR MI
- V3, V4

INFERIOR MI
- II, III, aVF

POSTERIOR MI
- V5, V6

NORMAL ECG
- V1-V6
### Differential Diagnosis

**Short PR interval**
- AV junctional rhythms
- WPW syndrome
- LGL syndrome

**Long PR interval**
- 1st degree AV block
- Ischemic heart disease
- Hyperkalemia
- Acute rheumatic myocarditis
- Lyme disease
- Digoxin, quinidine, BB, Ca blockers

**Wide P wave**
- LAE

**Tall P wave**
- RAE

**Pathological Q waves**
- STEMI
- LVH
- WPW syndrome
- BBB
- Pulmonary embolism

**Large R or S waves**
- LVH, RVH
- Posterior MI
- WPW syndrome
- Dextracardia
- BBB

**Small QRS complexes**
- Obesity
- Emphysema
- Pericardial effusion

**Wide QRS complexes**
- BBB
- Ventricular rhythms
- Hyperkalemia

**Abnormal shaped QRS complexes**
- Incomplete BBB
- Fascicular block
- WPW syndrome

### ST segment elevation
- ST segment elevation MI
- Left ventricular aneurysm
- Prinzmetal’s (vasospastic) angina
- Pericarditis
- High take-off
- LBBB
- Brugada syndrome

### ST segment depression
- Acute posterior MI
- Myocardial ischemia
- Drugs (digoxin, quinidine)
- Ventricular hypertrophy + ‘strain’

**J waves present**
- Hypothermia
- Early repolarization, LVH with strain, pericarditis, acute MI

### Short QTc interval
- Hereditary short QT syndromes
- Hypocalcemia
- Digoxin effect
- Hyperthermia

### Long QTc interval
- Hypocalcemia
- Drugs (quinidine, procainamide, amiodarone, sotalol, flecainide, antipsychotics, TCAs, terfenadine, macrolides, quinolones)
- Acute myocarditis
- Long QT syndrome

### Tall T waves
- Hypothermia
- Acute MI
- Hyperkalemia

### Small T waves
- Hypokalemia
- Pericardial effusion
- Hypothyroidism

### Inverted T waves
- Myocardial ischemia
- Myocardial infarction
- Ventricular hypertrophy + ‘strain’
- Digoxin toxicity

### Prominent U waves
- Hypokalemia
- Hypercalcemia
- Hyperthyroidism

### Pathological Q waves
- STEMI
- LVH
- WPW syndrome
- BBB
- Pulmonary embolism

### Large R or S waves
- LVH, RVH
- Posterior MI
- WPW syndrome
- Dextracardia
- BBB

### Small QRS complexes
- Obesity
- Emphysema
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### Wide QRS complexes
- BBB
- Ventricular rhythms
- Hyperkalemia

### Abnormal shaped QRS complexes
- Incomplete BBB
- Fascicular block
- WPW syndrome

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**ETC**
- Pulmonary embolism
- Pericardial effusion
- Hypokalemia
- Hyperkalemia

### Rhythms & Arrhythmias

**SA nodal rhythms**
- Sinus rhythm
- Sinus arrhythmia
- Sinus tachycardia
- Sick sinus syndrome
- Sinus bradycardia
- SA block
- Sinus arrest

**AV blocks**
- First-degree
- Second-degree
  - Mobitz Type I
  - Mobitz Type II
- Third-degree

**Atrial rhythms**
- Atrial tachycardia
- Atrial flutter
- Atrial fibrillation

**Ectopic beats**
- Atrial ectopic beats
- AV junctional ectopics
- Ventricular ectopics
- Bigeminy

**SVTs**
- AV re-entry tachycardia
- AV nodal re-entry tachycardia

**Ventricular rhythms**
- Ventricular tachycardia
- Accelerated idioventricular rhythm
- Torsades de pointes
- Ventricular fibrillation

**Conduction disturbances**
- Left bundle branch block
- Right bundle branch block
- Bifascicular block
- Trifascicular block

**Escape rhythms**
- AV junctional escape rhythm
- Ventricular junct. escape rhythm

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### Peaked T waves, wide QRS, long PR
- P wave for q QRS, QRS for q P wave
- HR inc during inspiration
- >100bpm
- Dysfunction of sinus node
- <60bpm
- P fails, next P where expected
- P fails, next P not where expected

### Long PR
- non-conducted P waves
- progressive lengthening of PR
- PR constant
- atria and ventricles are independent

### >100bpm, abnormally shaped P waves
- sawtooth P, atrial rate 300/min, AV bl.
- no P waves, irregularly irregular

### Early P wave, abnormal P wave shape
- early QRS, narrow QRS
- early QRS, broad QRS
- ventricular ectopic follows q norm. beat

### Narrow QRS, inverted P, P half-buried
- narrow QRS, P buried inside QRS

### Broad QRS, 3+ PVCs in a row
- broad QRS, HR <120bpm
- broad QRS, polymorphic, long QT
- no identifiable waves, erratic

### V1: small Q, R, S; V6: R, S, R’
- Left axis dev, left ant. hemiblock, RBBB
- bifascicular block, 1st degree AV block

### Narrow QRS, absent P, 40-60bpm
- broad QRS, absent P, 15-40bpm