

Section 6

Landscape of Ischemia
Acute Infarct
Old MI

Objectives

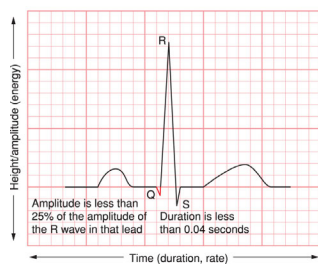
- At the conclusion of this presentation the participant will be able to
 - Outline a systematic approach to 12 lead ECG interpretation
 - Demonstrate the process for determining axis
 - List criteria for LVH, RVH, LBBB, RBBB, Bifasicular and trifasicular block, **acute and chronic MI changes**
 - Define QTc significance

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Q Wave

- First part of QRS complex
- First downward deflection from baseline



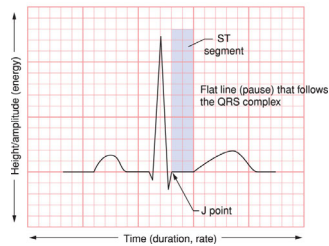
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ST Segment

- Flat line that follows the QRS complex and connects it to T wave

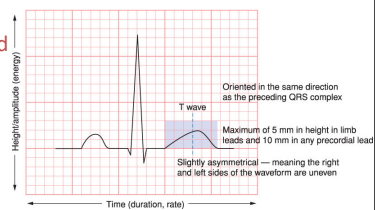


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T Wave

- Slightly asymmetrical and oriented in same direction as preceding QRS complex

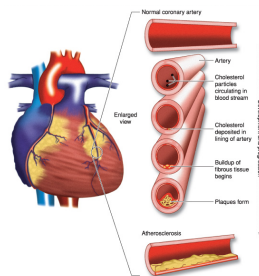


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Ischemia, Injury, and Infarction

- Occurs with interruption of coronary artery blood flow
- Often a progressive process



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Landscape of an MI

- Changes in the 12 lead that may indicate :
Ischemia
Injury
Infarct
- Must have changes in two or more contiguous leads

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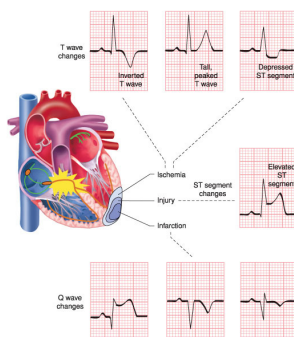
I Lateral	aVR	V1 Septal	V4 Anterior
II Inferior	aVL Lateral	V2 Septal	V5 Lateral
III Inferior	aVF Inferior	V3 Anterior	V6 Lateral

Diagram showing the contiguous leads in the same color

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ECG Indicators

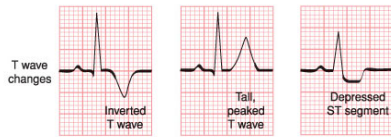


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Myocardial Ischemia

- Characteristic signs:

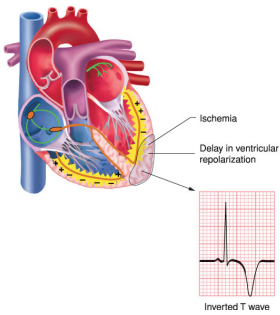


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T Wave Inversion

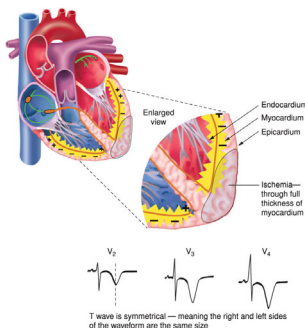
- Occurs because ischemic tissue does not repolarize normally



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T Wave Inversion

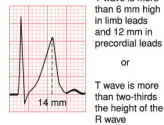
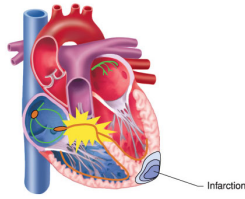


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Peaked T Waves

- May be seen in early stages of acute myocardial infarction
- Within a short time (two hours) T waves invert

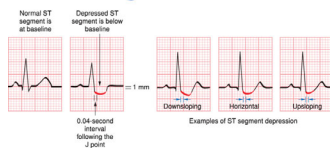
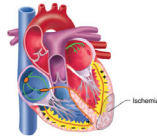


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ST Segment Depression

- May or may not include T wave inversion

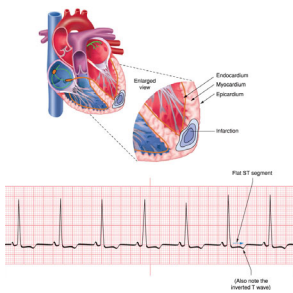


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Flat ST Segment Depression

- Results from Non STEMI



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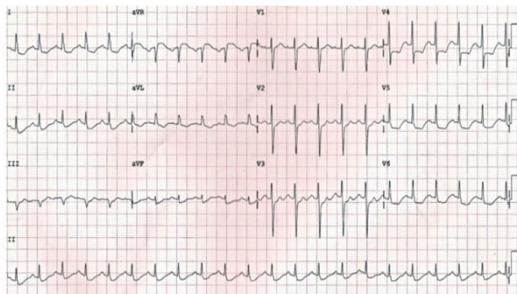
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Landscape of an MI

- **Ischemia:** T wave inversion
ST segment depression
- Other causes of T wave inversion
 - Cardiac:** BBB
 - Ventricular hypertrophy
 - Pericarditis
 - Non-cardiac:**
 - Electrolyte disorders
 - Shock
 - Positional changes
 - CNS disorders(subarachnoid hemorrhage)

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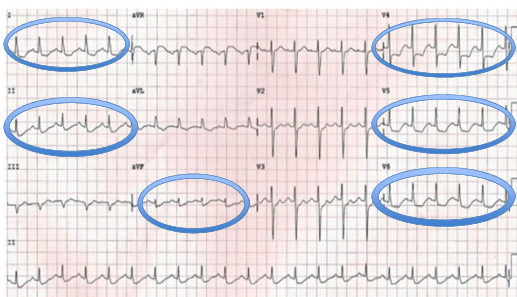
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Inferior and Lateral Ischemia

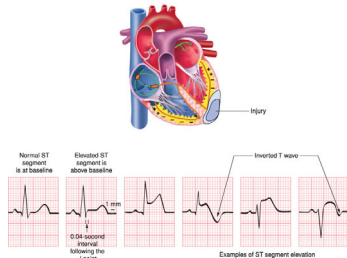


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ST Segment Elevation

- Earliest reliable sign that myocardial infarction has occurred



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Landscape of an MI cont.

- Injury: ST elevation
Indicates acute injury:
1mm or > in limb leads
2mm or > in precordial leads
Other causes:
Pericarditis
Ventricular aneurysm

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I Lateral	aVR	V1 Septal	V4 Anterior
II Inferior	aVL Lateral	V2 Septal	V5 Lateral
III Inferior	aVF Inferior	V3 Anterior	V6 Lateral

Diagram showing the contiguous leads in the same color

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Landscape of an MI cont.

- Necrosis (infarction): Q wave

Q wave: indicates dead tissue, results in a negative deflection. Significant or pathologic Q waves are wide and deep. A Q wave is at least 0.04 in duration (1mm) and 25% of the entire QRS complex.

Other causes:

- Ventricular hypertrophy
- Diffuse myocardial disease
- Fascicular blocks

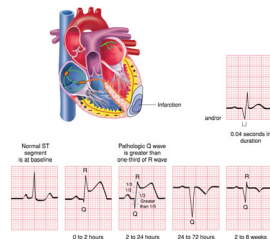
Small Q waves may be present in presence of Non STEMI

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Pathologic Q Waves

- Indicate presence of irreversible myocardial damage or myocardial infarction



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Landscape of an MI cont.

- Myocardial ischemia

Results from temporary interruption of blood flow

Least acute phase

Electrically irritable, prone to dysrhythmias

Alters repolarization of ischemic cells

Appears on ECG as ST segment or T wave changes

Reversible with prompt treatment

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Landscape of an MI cont.

- Myocardial Injury
 - Results from prolonged interruption of oxygen and nutrients
 - Causes tissue damage
 - Appears on ECG as ST elevation > 1mm with or without loss of R wave
 - Reversible with prompt treatment

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Landscape of an MI cont.

- Myocardial Infarction
 - Results from cell destruction
 - Causes electrically inert tissue, non-conducted electrical impulses
 - Prevents depolarization/repolarization of myocardial cells
 - ECG is abnormal with evidence of abnormal Q waves, ST or T wave abnormalities
 - Irreversible due to scar tissue

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Landscape of an MI cont.

- Diagnosis of infarcts
- Importance of lead grouping
 - Inferior wall MI: Leads II, III, aVF
 - High Lateral wall MI: Leads I, aVL
 - Low Lateral wall MI: Leads V5, V6
 - Anterior wall MI: V1-V4
 - Septal wall MI: V1, V2
 - Posterior wall MI: V7- V9, or mirror changes V1-V3
 - Right ventricular wall MI: V2R, V3R, V4R

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Landscape of an MI cont.

Review Coronary Anatomy

- Right Coronary Artery
 - 55% supply to SA node
 - 90% supply to AV node
 - RA and RV
 - Posterior wall of left ventricle
 - Inferior wall of left ventricle
 - Posterior interventricular septum
 - Left posterior fascicle

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Landscape of an MI cont.

Review Coronary Anatomy

- Left Anterior Descending
 - Anterior wall of left ventricle
 - Apex of heart
 - Anterior interventricular septum
 - RBB
 - LAF
 - LPF
 - Bundle of His

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Landscape of an MI cont.

Review Coronary Anatomy

- Left Circumflex
 - 45% of blood SA node
 - 10% of blood to AV node
 - LA
 - Lateral wall of left ventricle
 - Posterior wall of left ventricle
 - Small percentage of population the CX is dominant and supplies the entire left posterior ventricle and interventricular septum

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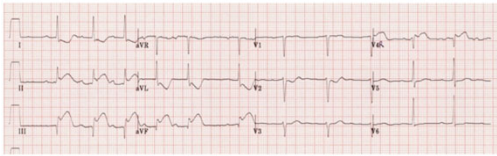
Landscape of an MI Most common and complications

- Inferior MI
 - Leads II, III, aVF
 - Characterized first by hypodynamic response (bradycardia and hypotension)
 - Transient AV HB
 - Papillary muscle dysfunction leading to Valvular insufficiency
 - CHF
 - A-Fib/A-Flutter
 - Increase parasympathetic tone

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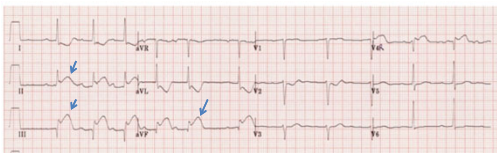
What is your diagnosis?



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What is your diagnosis?

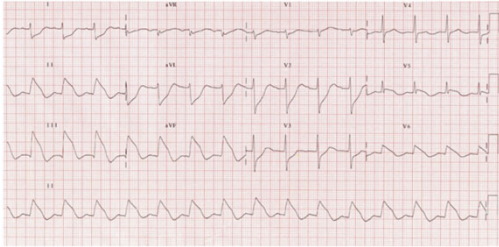


Acute Inferior Wall MI

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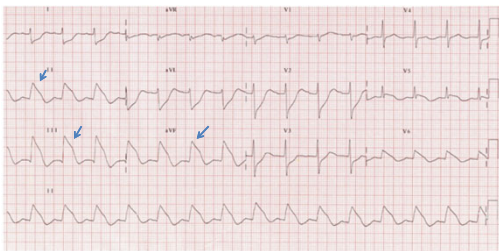
What is your diagnosis?



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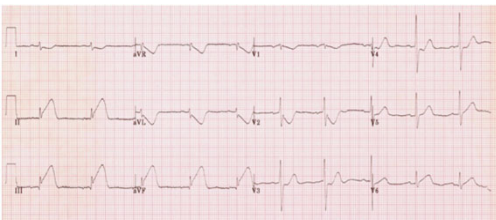


Acute Inferior lateral MI

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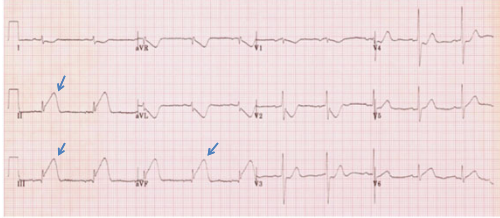
What is your diagnosis?



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Acute Inferior MI

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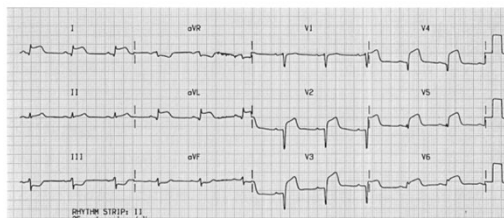
Landscape of an MI

Most common and complications

- Anterior MI
 - Hyperdynamic response (tachycardia and hypertension)
 - Decreased LV Function
 - CHF
 - Pulmonary Edema
 - Cardiogenic shock
 - Multifascicular BBB and AV blocks
 - Ventricular aneurysm
 - Increased sympathetic stimulation
 - Leads V1-V4

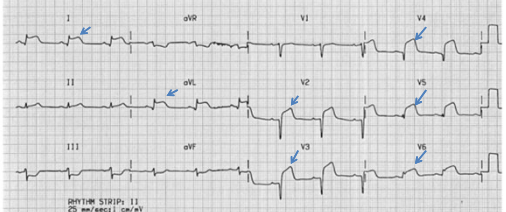
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What is your diagnosis?



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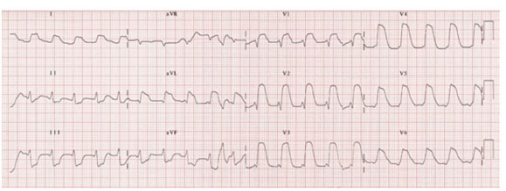
What is your diagnosis?



Acute Anterior Lateral MI

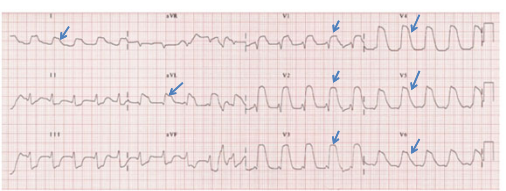
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What is your diagnosis?



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What is your diagnosis?



Acute Anterior Lateral MI with Tombstone T waves

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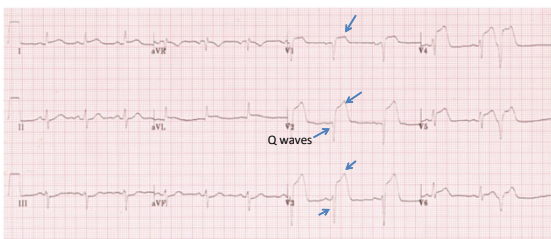
What is your diagnosis?



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What is your diagnosis?

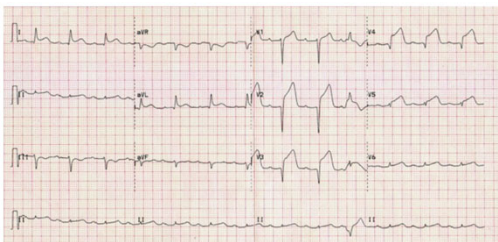


Acute Anterior MI with q waves in V1, V2, V3, V4

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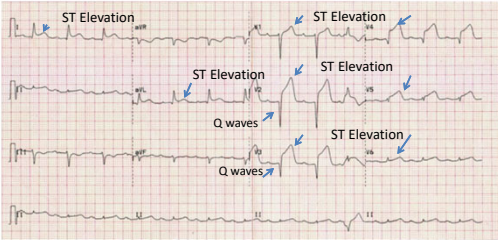
What is your diagnosis?



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What is your diagnosis?



Acute Anterior Lateral MI with q waves in V1-V4

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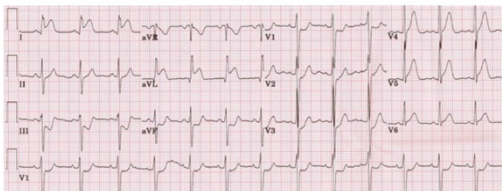
Landscape of an MI

Most common and complications

- Lateral Wall MI
 - 1st and 2nd degree blocks
 - CHF
 - Atrial arrhythmias
 - Posterior wall involvement
 - Changes in Leads I, aVL, V5, V6
 - Reciprocal Changes II, III, aVF

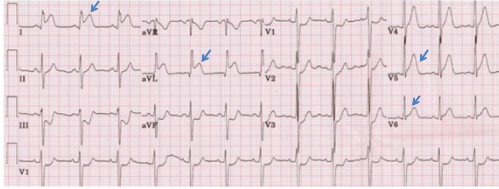
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What is your diagnosis?



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What is your diagnosis?

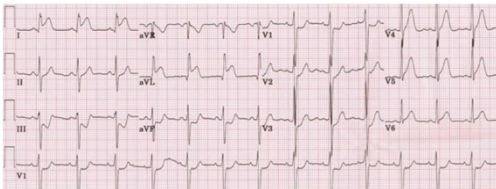


Acute Lateral MI with reciprocal changes in inferior anterior leads

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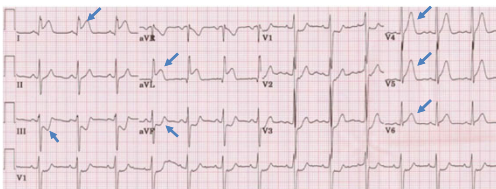
What is your diagnosis?



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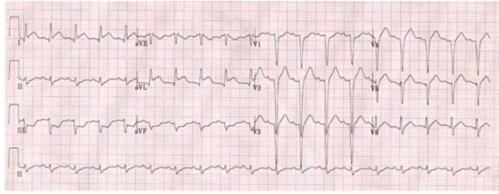


Acute Lateral MI with reciprocal changes inferiorly

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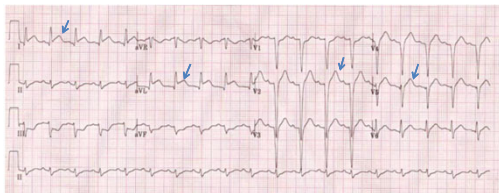
What is your diagnosis?



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What is your diagnosis?

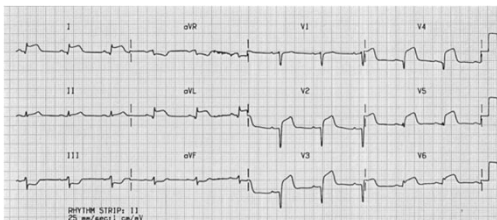


Acute Anterior lateral MI with reciprocal changes in inferior leads

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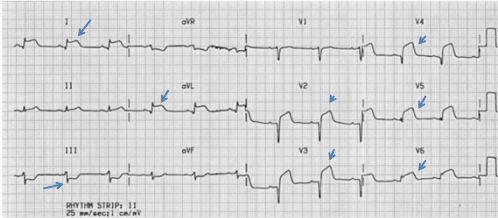
What is your diagnosis?



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What is your diagnosis?



Acute Anterior lateral MI with reciprocal changes in inferior leads

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Other MI's

- Septal Wall
 Leads involved: V1-V2
 Reciprocal leads: II, III, aVF
 Complications: BBB, hemiblocks

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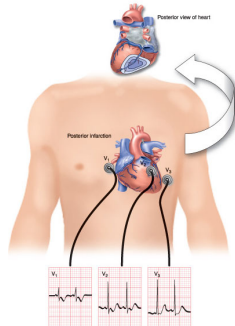
Other MI's

- Posterior MI
 Indicative leads: Posterior leads with ST, T wave changes (mirror changes, increase in R wave in V1-2)
 Reciprocal changes: V1-2
 Complication: same as Inferior MI

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Posterior Myocardial Infarction

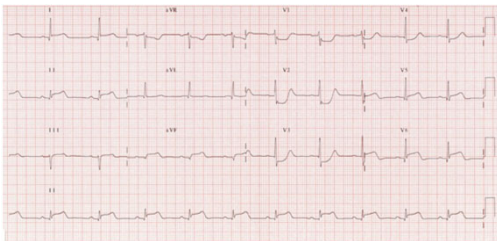
- Involve posterior surface of the heart
- Look for reciprocal changes in leads V_1 and V_2



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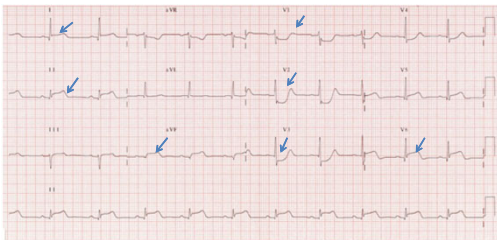
What is your diagnosis?



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What is your diagnosis?

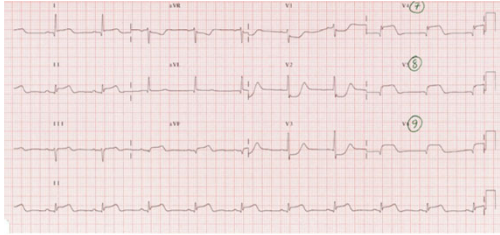


Acute Inferior Posterior MI with lateral involvement
Likely the circumflex region and dominant left circ

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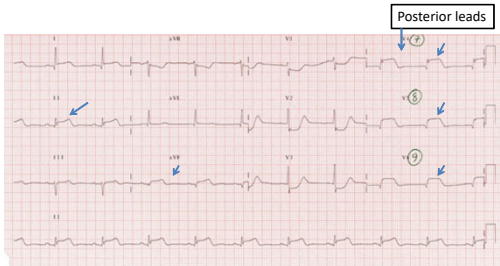
What is your diagnosis?



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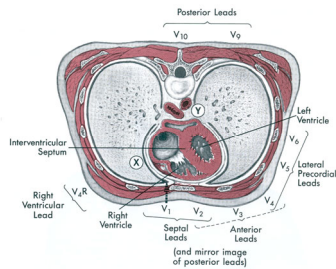


Acute Inferior Posterior MI

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Additional Leads



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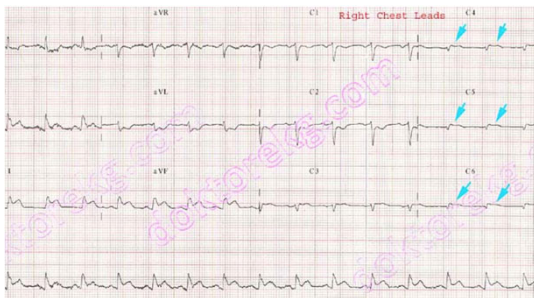
Other MI's

- Right Ventricular Infarct
Indicative leads: V 3-6R (II, III, aVF)
Reciprocal leads: I aVL
Complications: Right ventricular failure, same as inferior wall MI

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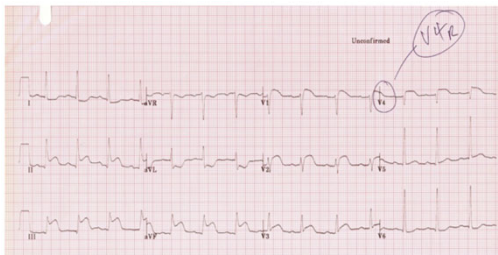
Right sided leads



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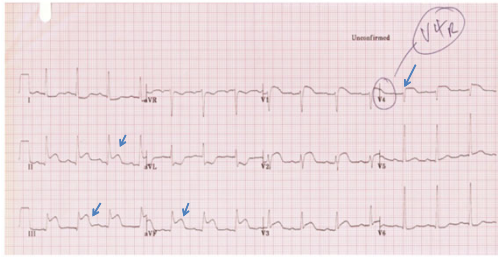
What is your diagnosis?



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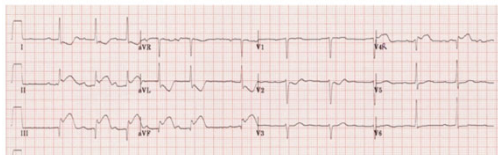


Acute Inferior, RV infarct

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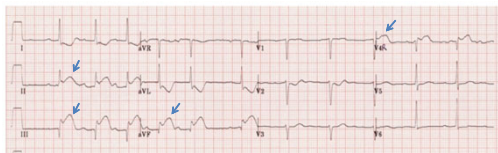
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Acute Inferior MI with RV involvement

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ECG Sensible Approach

- Rate
- Rhythm
- Axis
- Hypertrophy
- **4 I's**

Intervals, Ischemia, Injury, Infarction

If possible, always have an old ECG for comparison

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