Anatomy of an MI

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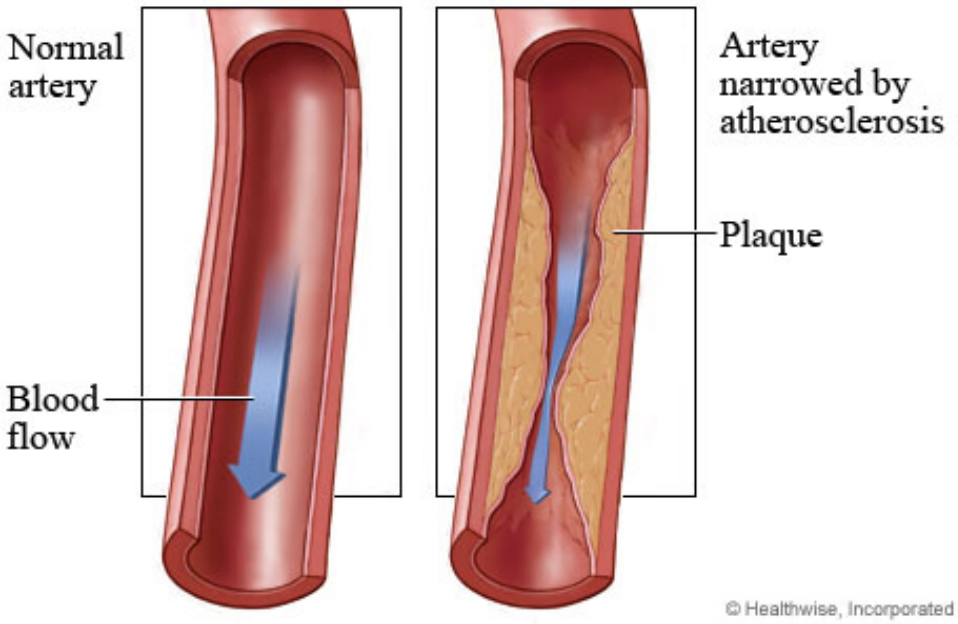
Outline

- Pathophysiology
- History and Physical Exam
- EKG
  - STEMI
  - Reciprocity
  - Additional Leads
  - Ischemic changes
- Treatment

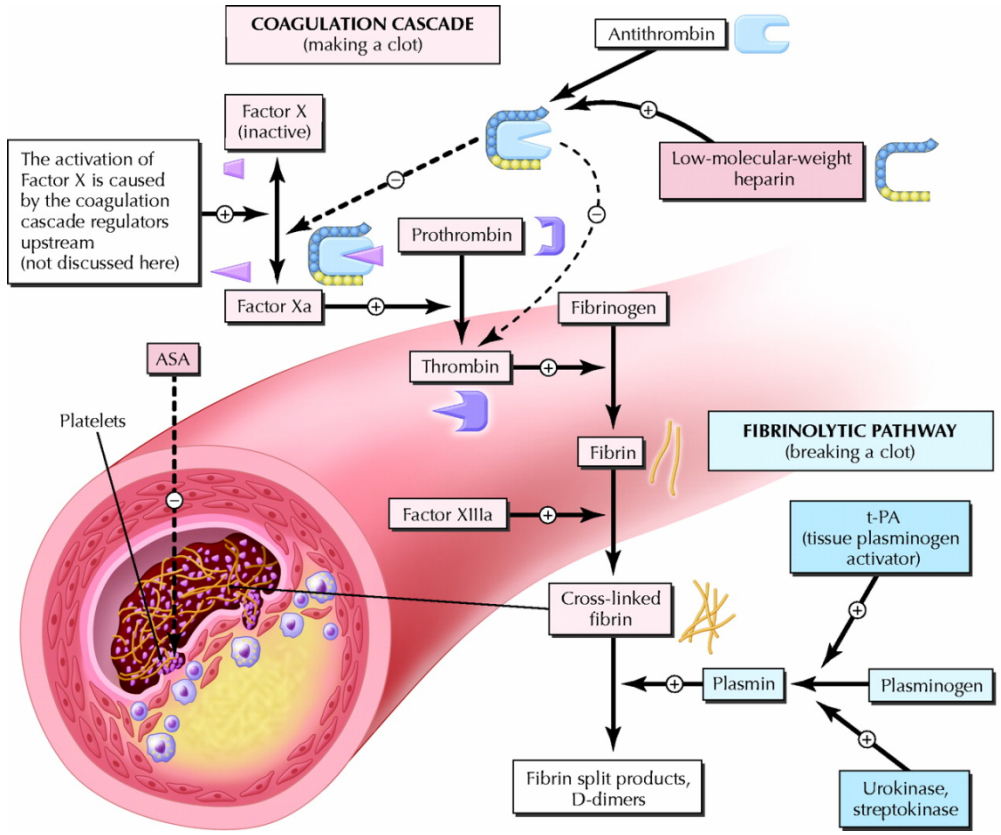
Pathophysiology

- Coronary artery disease
- Buildup of plaques
- Consequences
  - MI
  - Stroke
  - Peripheral vascular disease
  - Renal failure



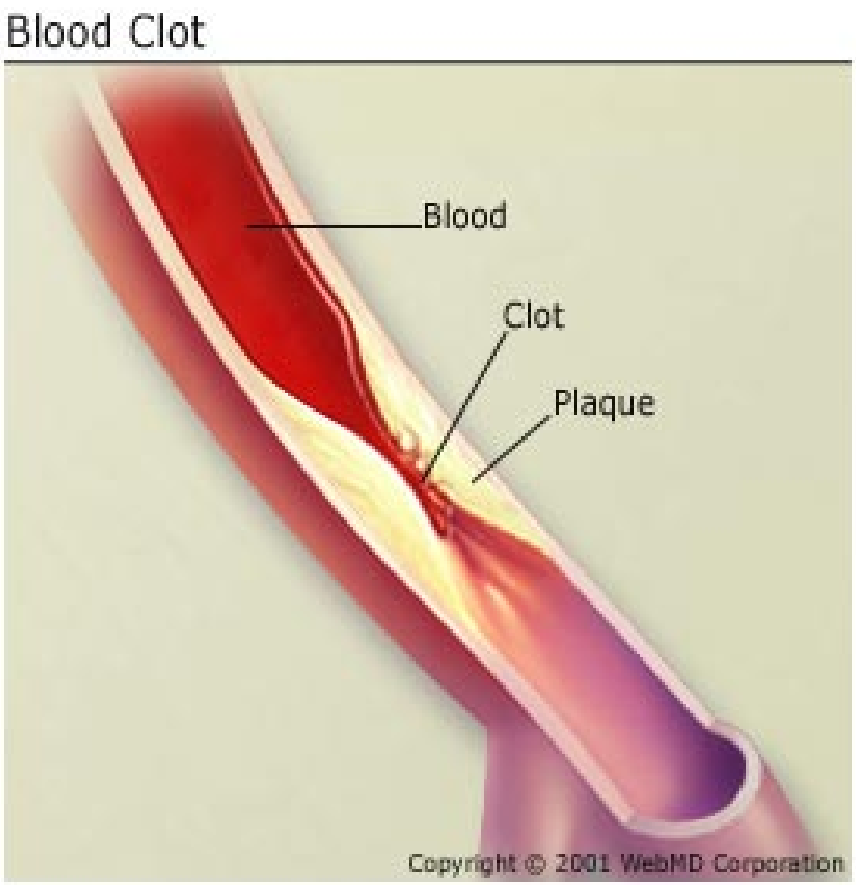
Pathophysiology

- Plaque rupture
- Platelet thrombus
- Inflammatory Cascade
- Vessel occlusion



Pathophysiology

- Vessel occlusion
- Myocardial Ischemia or Infarction

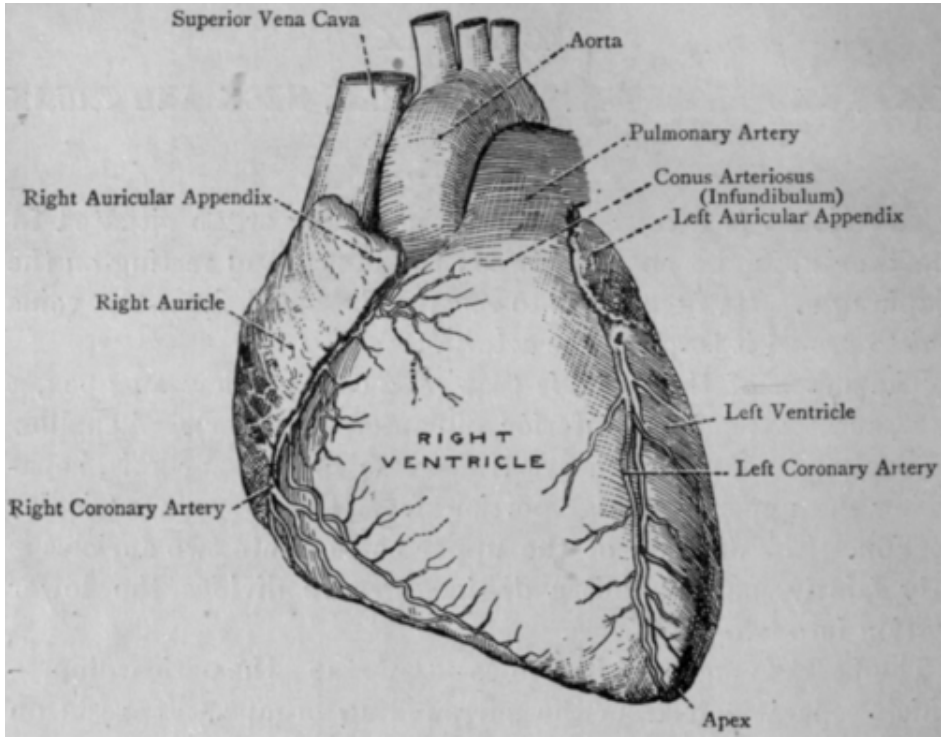


Acute Coronary Syndrome

- **Spectrum of disease**
  - STEMI
    - ST elevation on EKG or new LBBB
    - Positive enzymes
  - NSTEMI
    - ST depression, TW inversion on EKG
    - Positive enzymes
  - Unstable Angina
    - EKG changes as above
    - Negative enzymes

ACS - Epidemiology

- **Prevalence**
  - #1 cause of death
  - 13,000,000 with CAD
- **Incidence**
  - 500,000 first ACS event
  - 550,000 first MI
  - Age
    - 70 for women
    - 65 for men



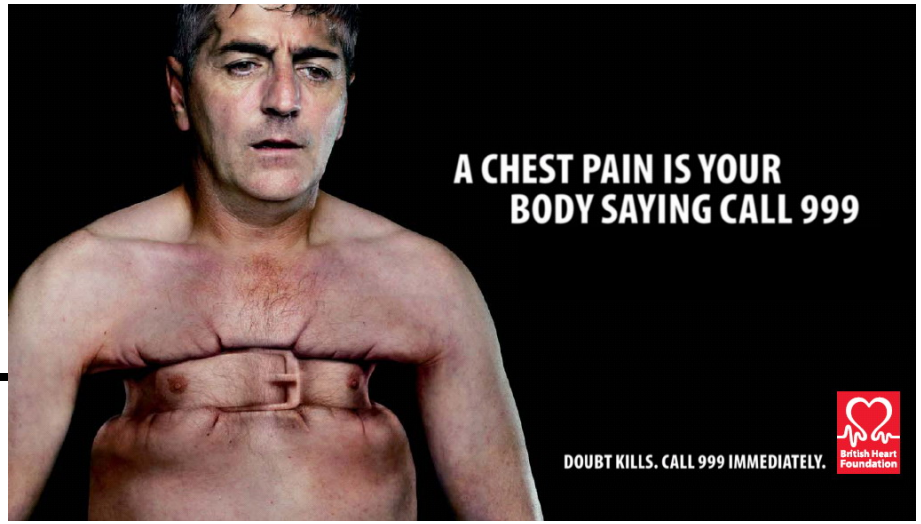
ACS - Epidemiology

- **Mortality**

  - ACS event every 26 seconds.
  - Death from ACS every 60 seconds.
  - 41% of with an ACS event will die from it.
  - 25% of men and 38% of women die within the first year following their initial ACS event.
  - 50% of patients with an ACS before age 65 are dead in 8 years.

ACS - Epidemiology

- **Chest pain evaluation**
  - 6-8 million visits yearly for acute chest pain.
  - 40% of those are admitted for evaluation.
  - Of those admitted to CCU, only 50% have ACS.
  - Missed MI = 2%
  - Missed Unstable Angina = 2%



ACS - Epidemiology

- **Yearly Cost of ACS**

  - Treatment of ACS is $142.1 billion.
  - Evaluation of ACS is $13 billion.
  - Largest category of loss from ED malpractice litigation.

ACS - Diagnosis

- History
- ROS
- Risk Factors
- Physical Exam
- EKG

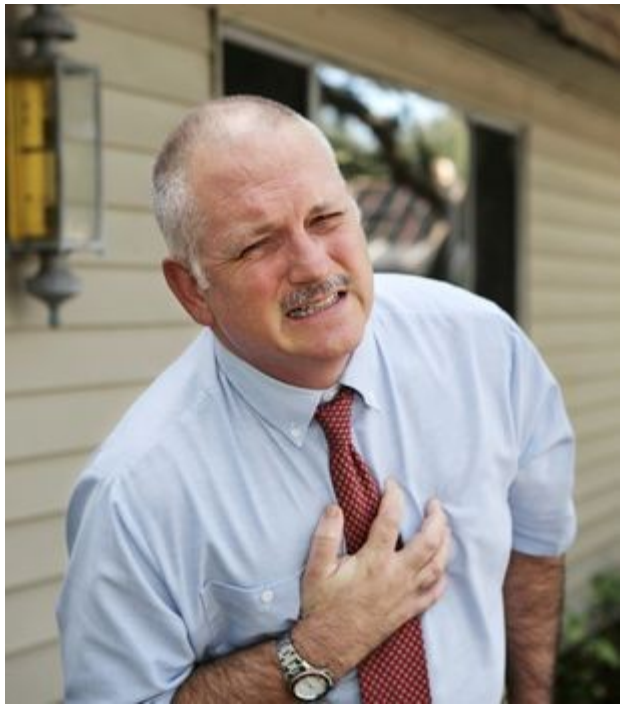
ACS – History

- Chief complaint
  - Classic
    - Central
    - Tight, pressure, squeeze
    - Radiate to left arm or jaw
    - Lasting 5 – 10 minutes
    - Worse with exertion
    - Relieved by rest

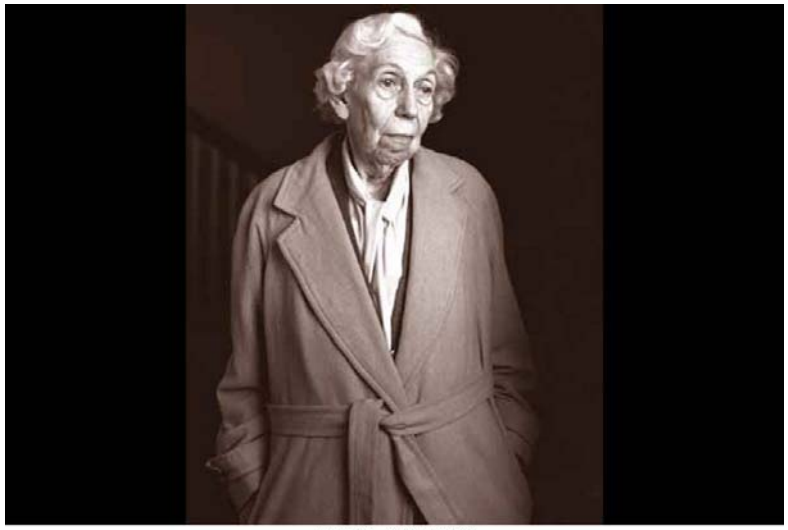
ACS – History

- Chief complaint
  - Atypical
    - New dyspnea on exertion
    - Shortness of breath
    - Nausea
    - Vomiting
    - Weakness
    - Fatigue
    - Epigastric pain
    - Indigestion
    - Altered mental status

ACS – History

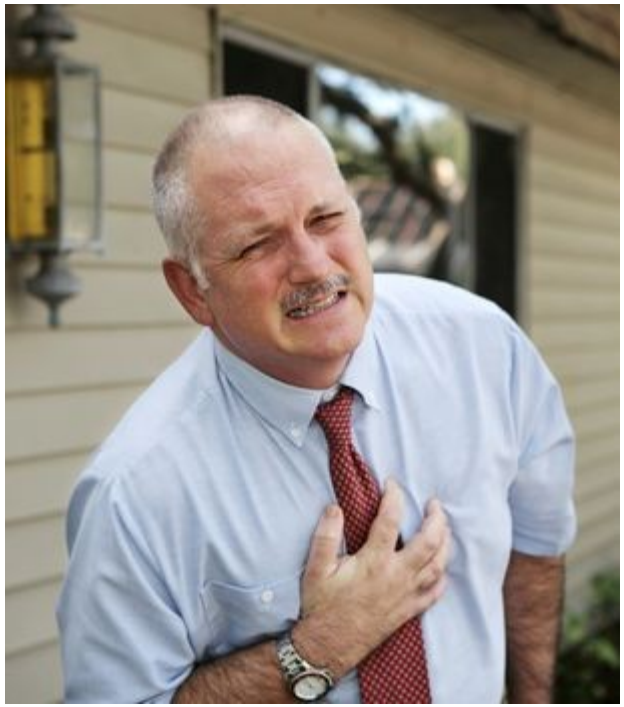


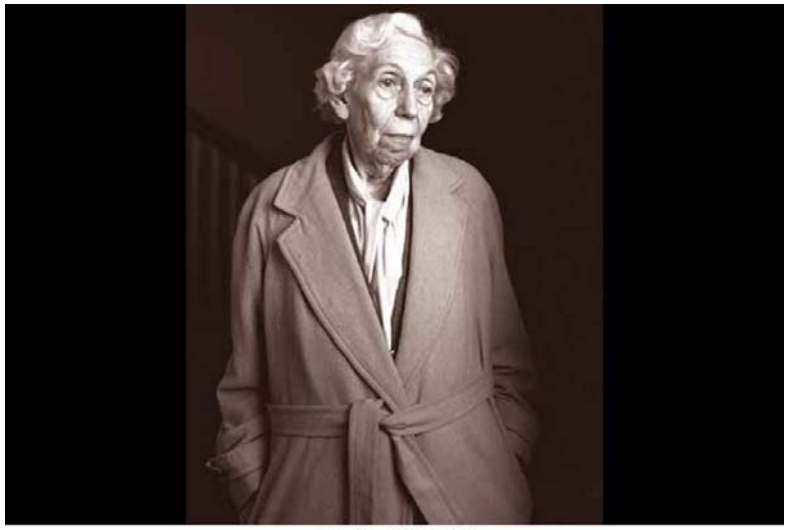
I have chest pain.



I have nausea and just don't feel right.

ACS – History





Eudora Welty
Pulitzer Prize winning
Mississippi Author

ACS – History

- ROS
  - Nausea
  - Vomiting
  - Shortness of breath
  - Lightheadedness
  - Weakness

ACS - History

- Quality of pain – Can also be…
  - Pleuritic, sharp pain
  - Right arm pain
  - Reproducible pain
- Response of pain to nitrates – not reliable

ACS – Risk factors

- Traditional
  - Smoking
  - HTN
  - Cholesterol
  - Fam Hx
  - DM
  - Age
  - Male
- Newer Risk Factors
  - HIV
  - DM = CAD
  - HIV
  - SLE
  - CRI

ACS – EKG Changes

EMS is first contact.

Prompt diagnosis

↓

Prompt treatment

↓

Better outcomes

EKG Changes

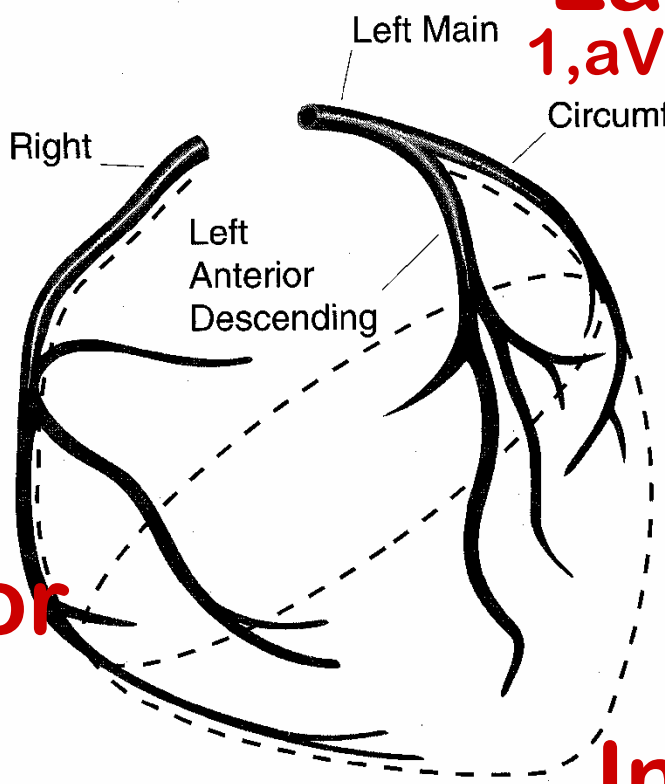
What counts as ST elevation?

- > 1 mm
- 0.04 – 0.06 s from J point
- Relative to isoelectric line (TP segment)
- Anatomically contiguous leads

EKG Changes

- Anatomically Contiguous Leads
  - Pattern of ST elevation
  - ex. Anterior MI → V1 – V4

Anatomically Contiguous Leads



Lateral
1,aVL,V5-6

RV Wall
V4R

Anterior
V1-4

Posterior
V8-V9

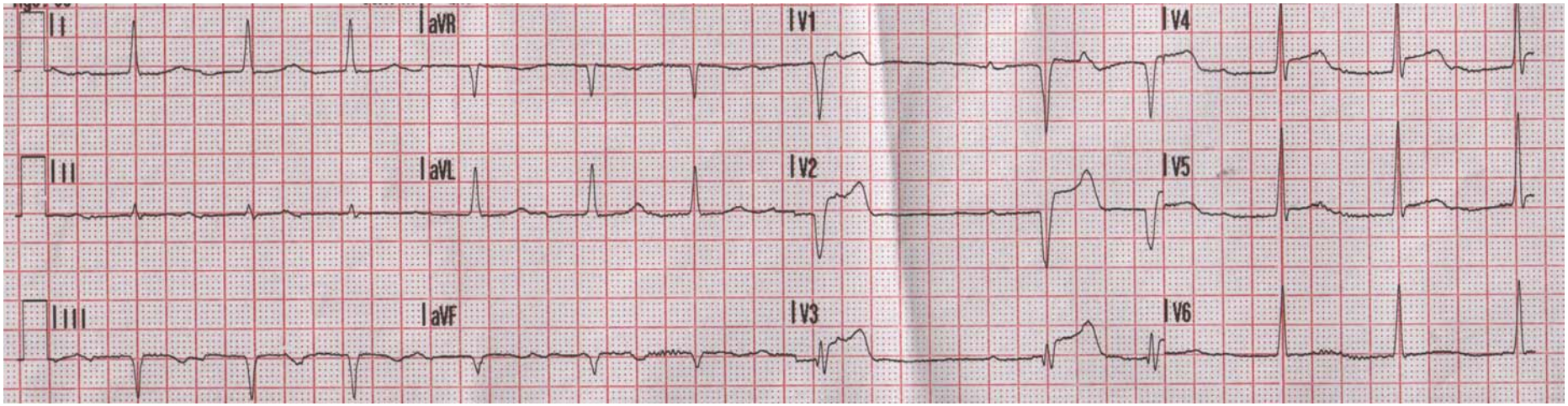
Inferior
2,3,aVF

Anatomically Contiguous Leads

Location	Leads	ST Segment
Anterior Wall	V1 - V4	Elevation
Lateral Wall	I, aVL, V5, V6	Elevation
Inferior Wall	II, III, aVF	Elevation
RV Wall	V4R	Elevation
Posterior Wall	V8 – V9 V1 - V3	Elevation Depression

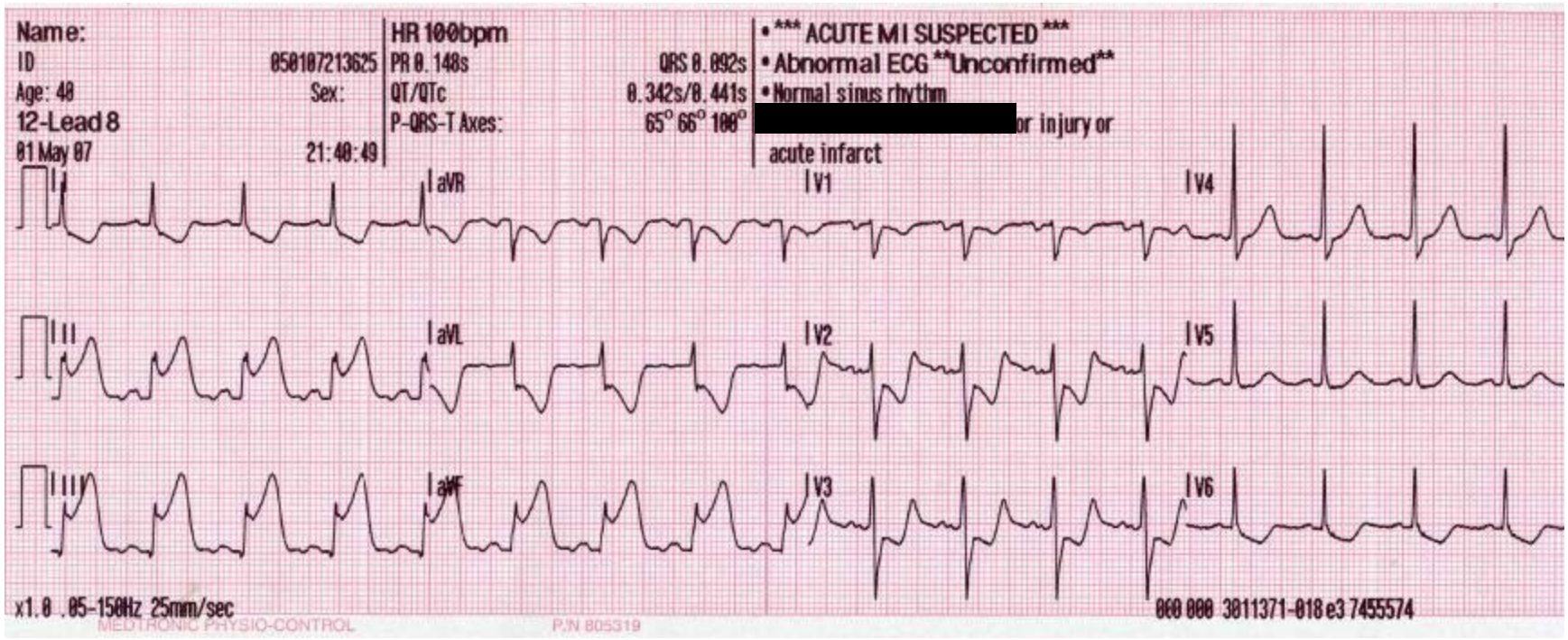
EKG Changes

Anterior, Inferior or Lateral?



EKG Changes

Anterior, Inferior or Lateral?



EKG Changes

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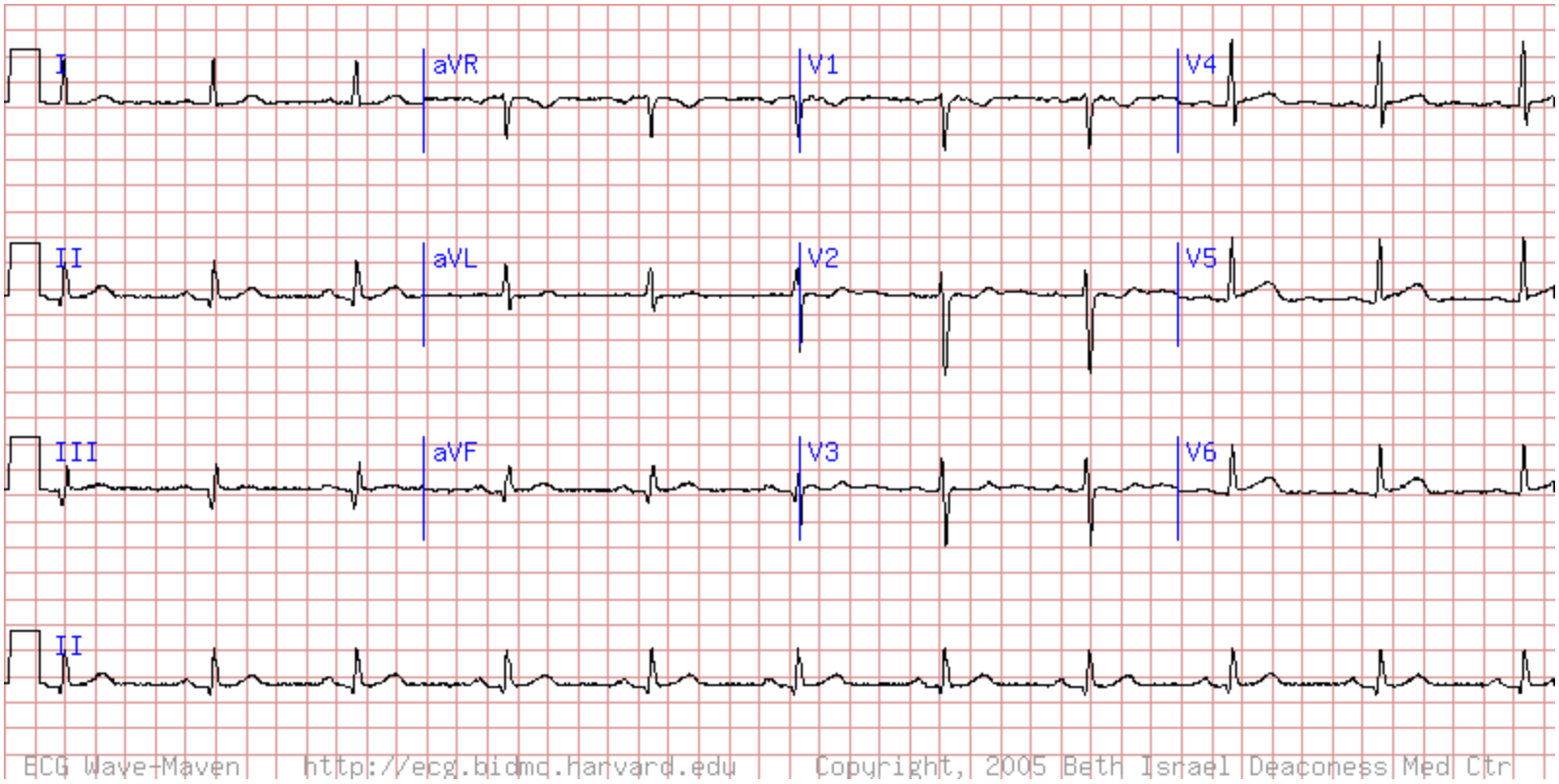
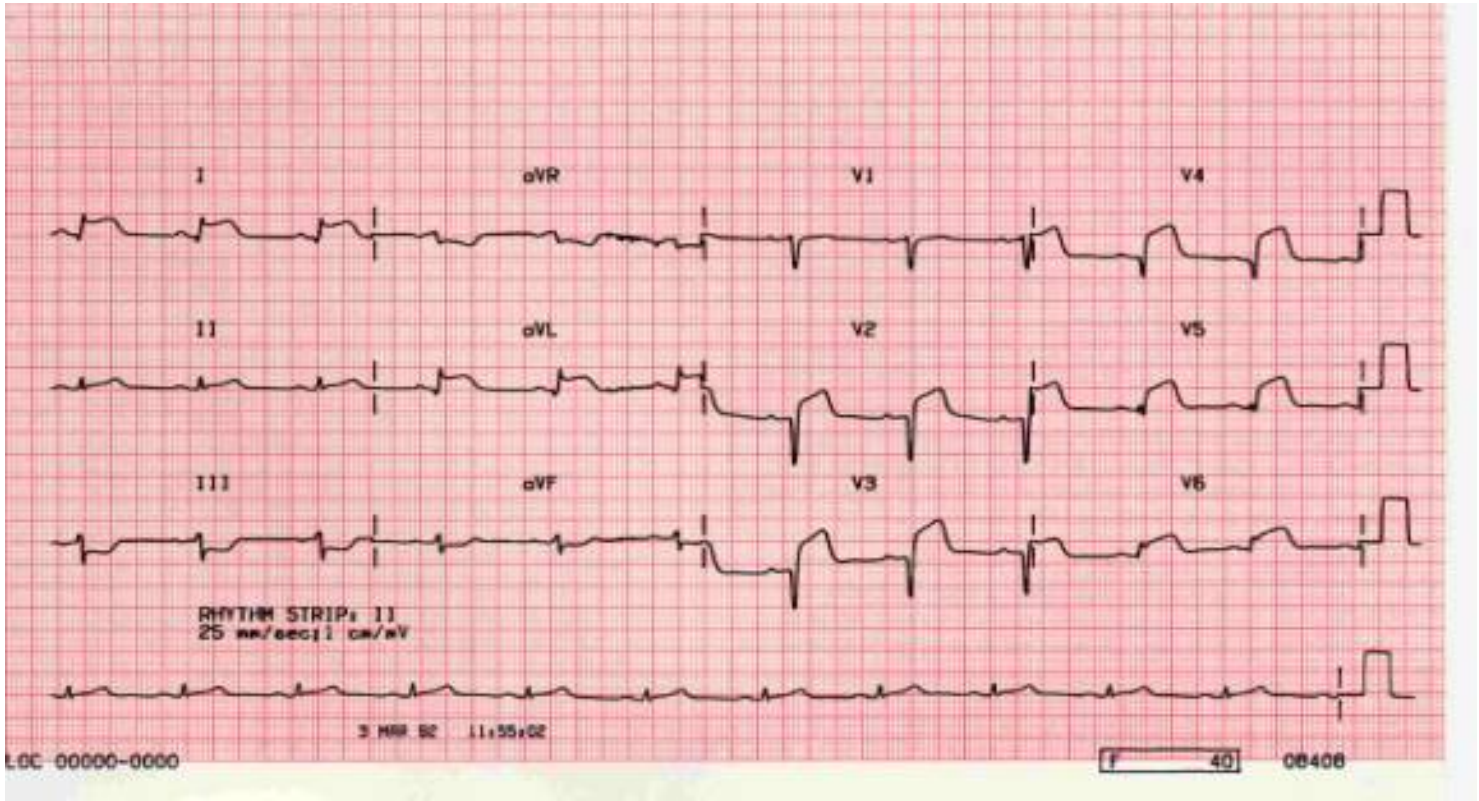


Where is the lesion?



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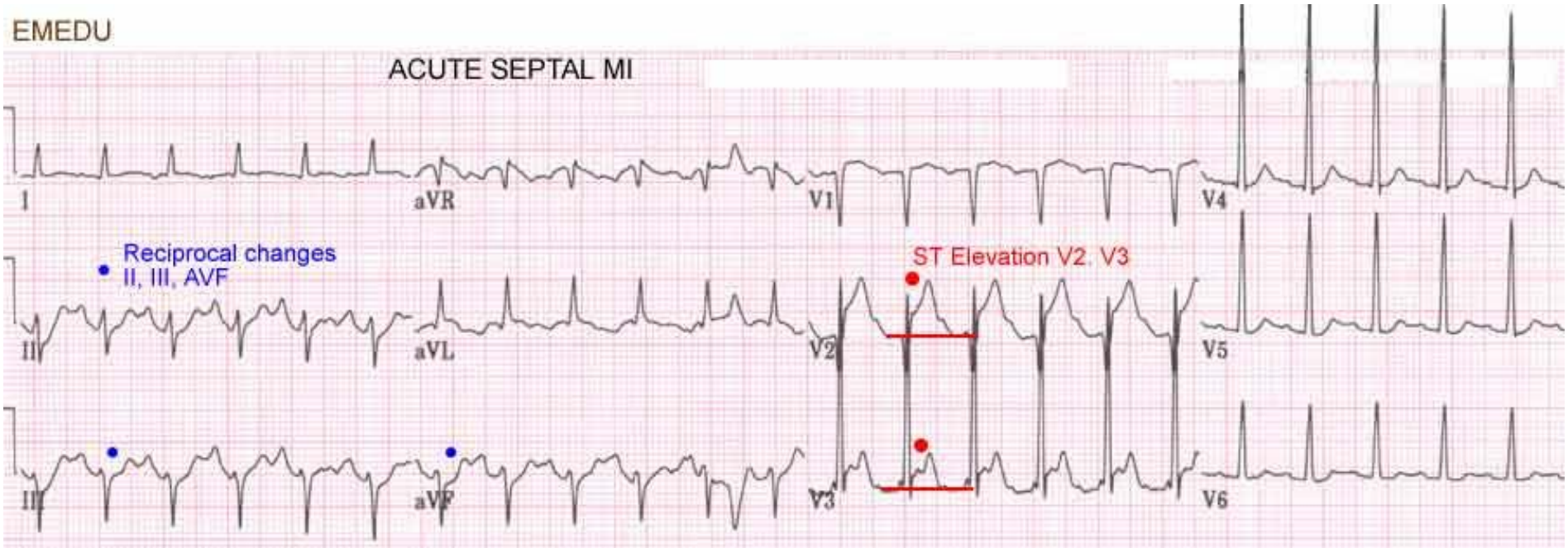
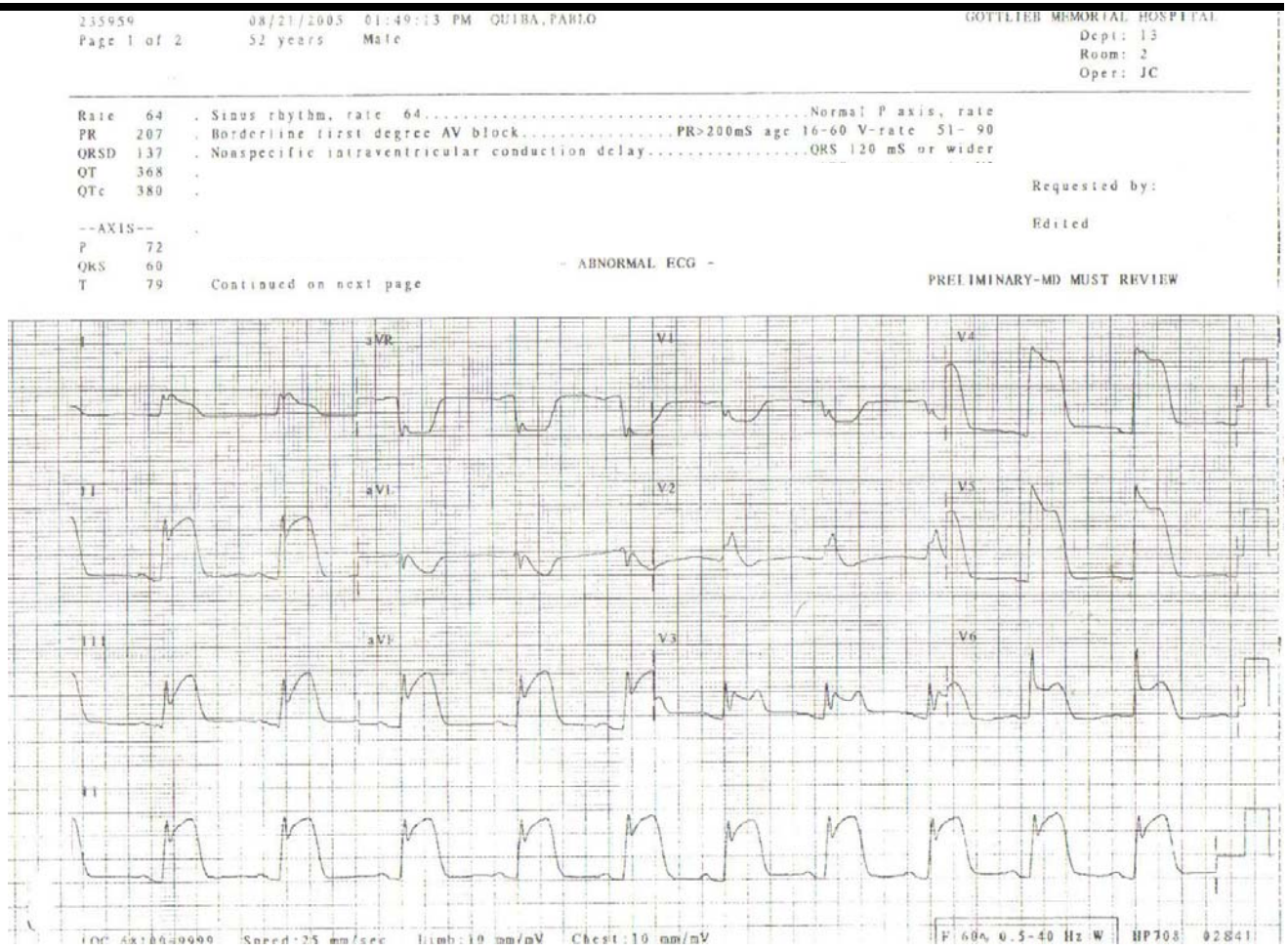


Where is the lesion?



EKG Changes

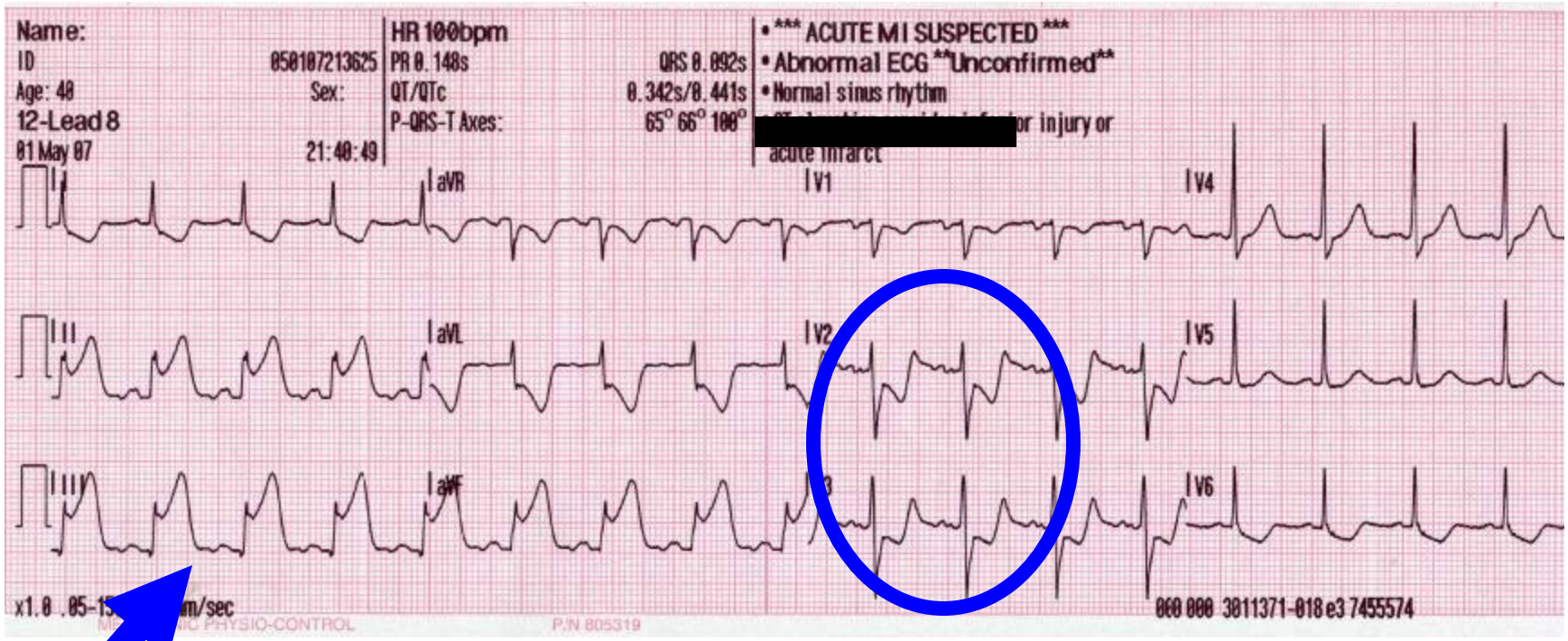
- Reciprocity
  - Interesting phenomena
  - First, diagnose a STEMI
  - Then, look at the opposite anatomic area
  - Should see ST segment depression

EKG Changes

- Anterior MI V2 – V4 → Inferior reciprocal change II, III, aVF
- Inferior MI II, III, aVF → Anterior reciprocal change V1 – V6
- Lateral MI V4 – V6 → Inferior reciprocal change II, III, aVF

EKG Changes

- Reciprocity

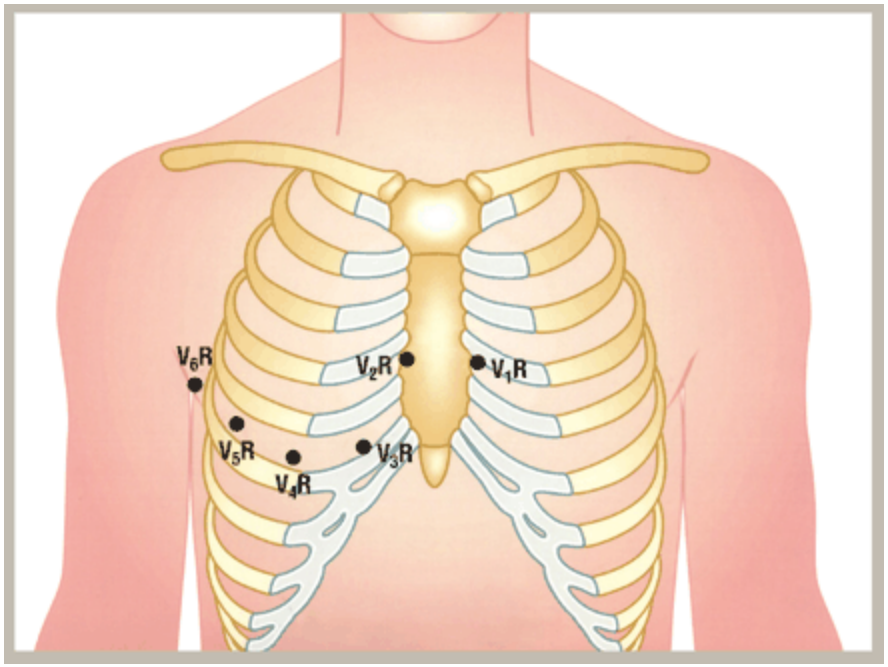


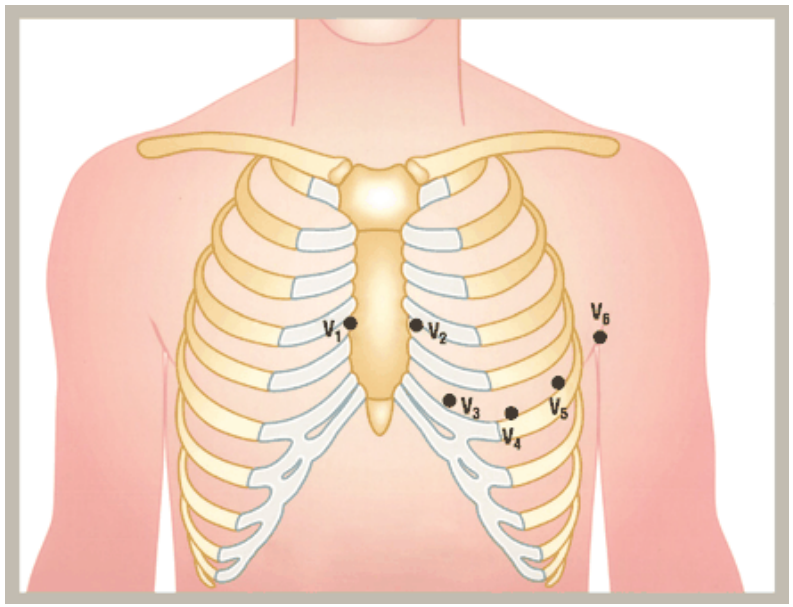
EKG Changes

- What about the parts of the heart the EKG cannot “see”?
  - Right sided
  - Posterior

EKG Changes

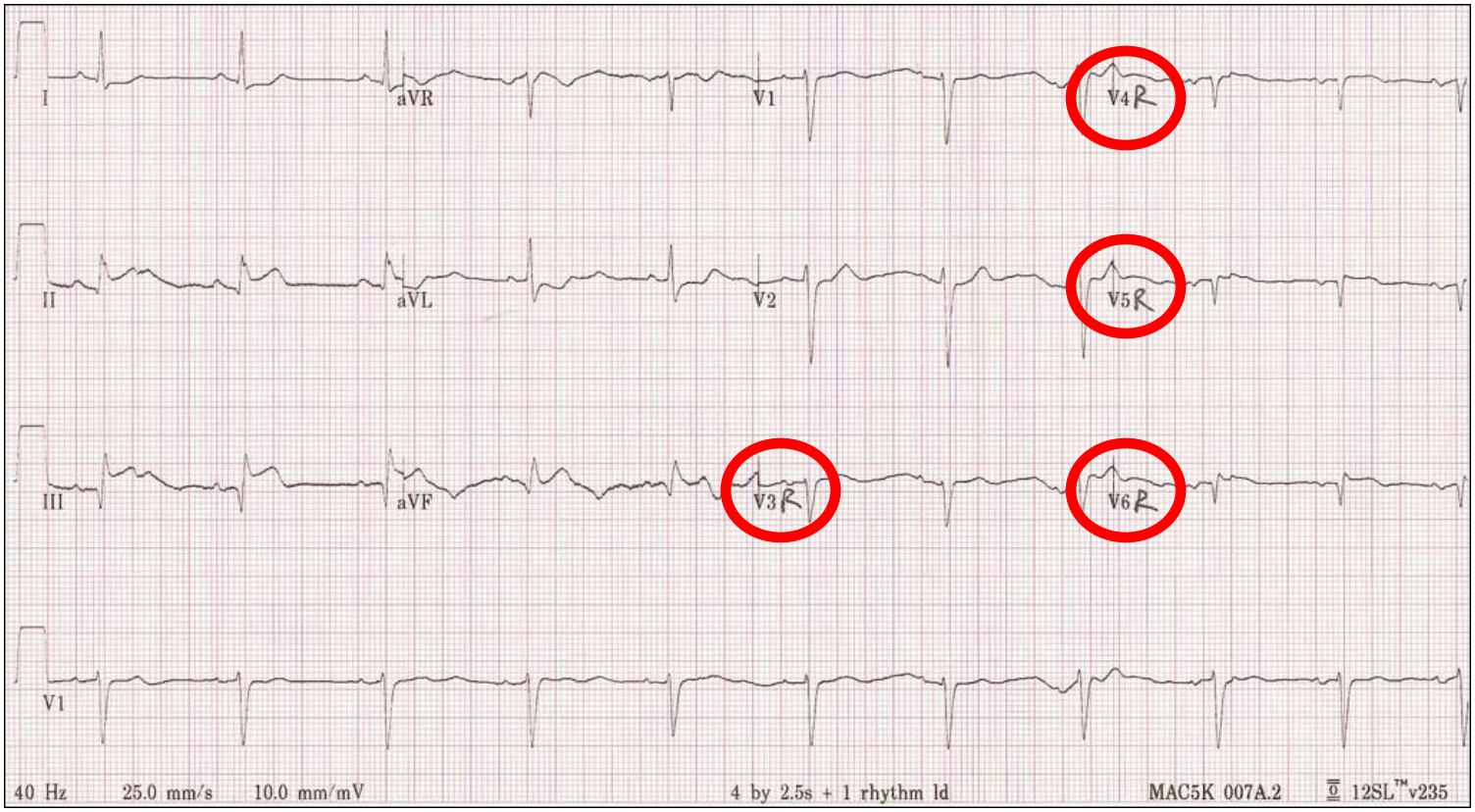
- Right Sided Leads





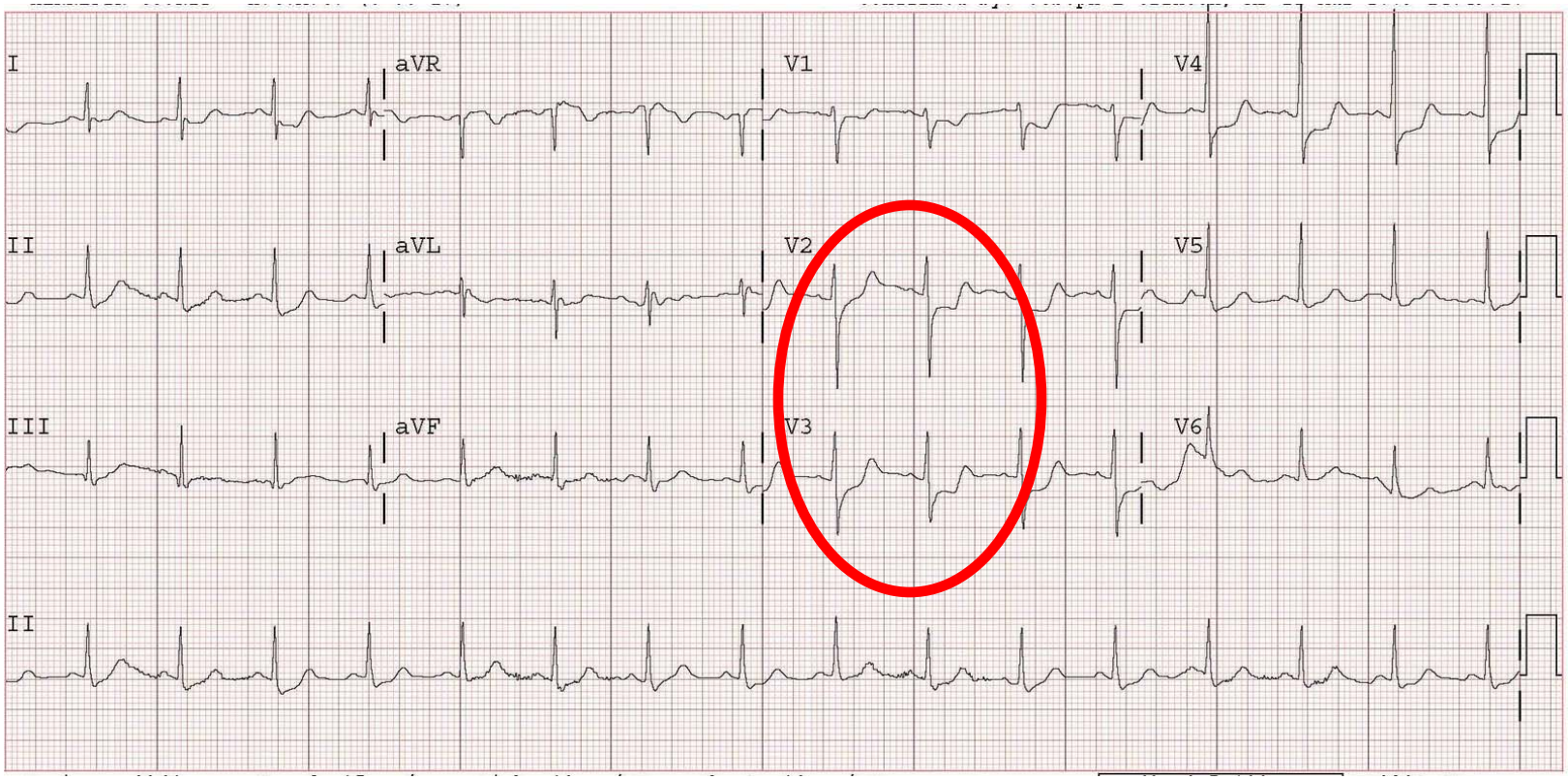
EKG Changes

- Right sided EKG



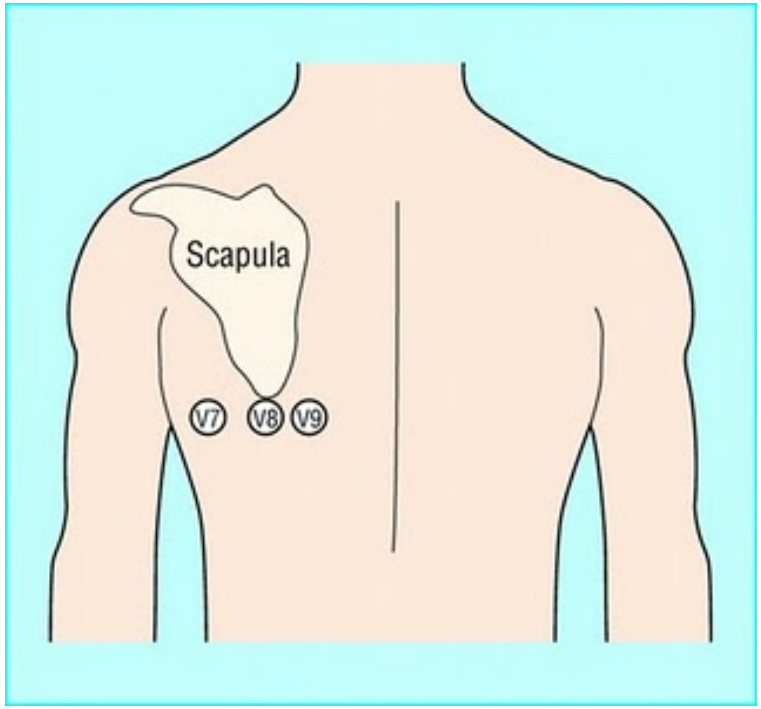
EKG Changes

- When should you consider posterior leads?



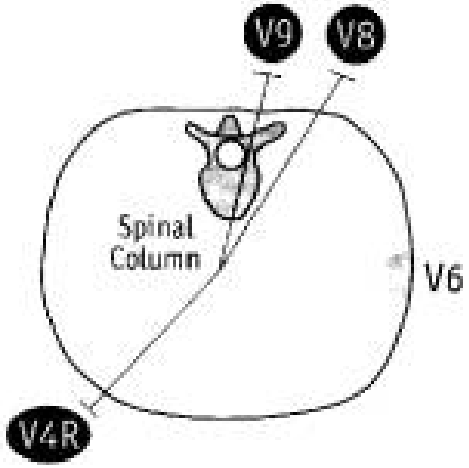
EKG Changes

- Posterior Leads

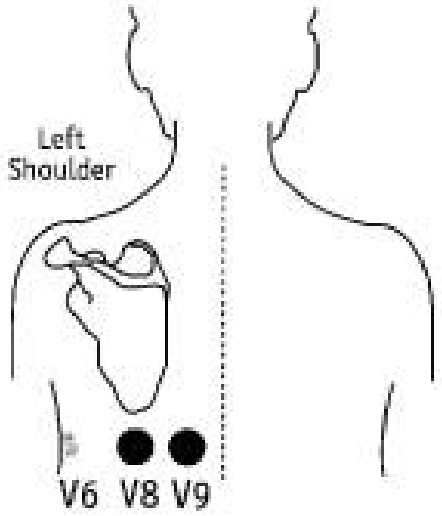


EKG Changes

- Best of both worlds
- 15 lead EKG



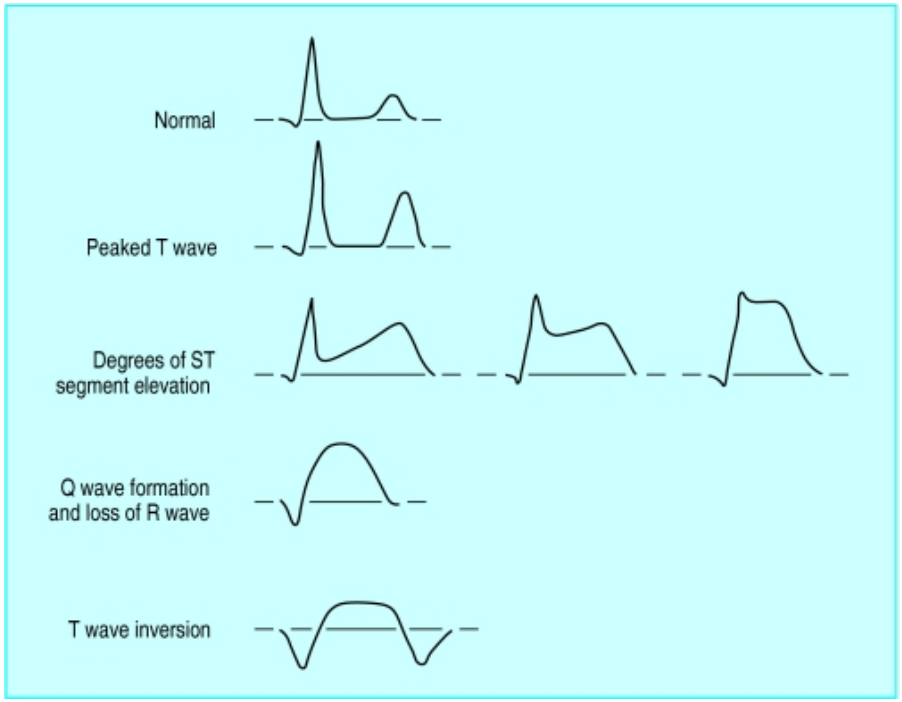
Right Ventricular Lead



Posterior Leads

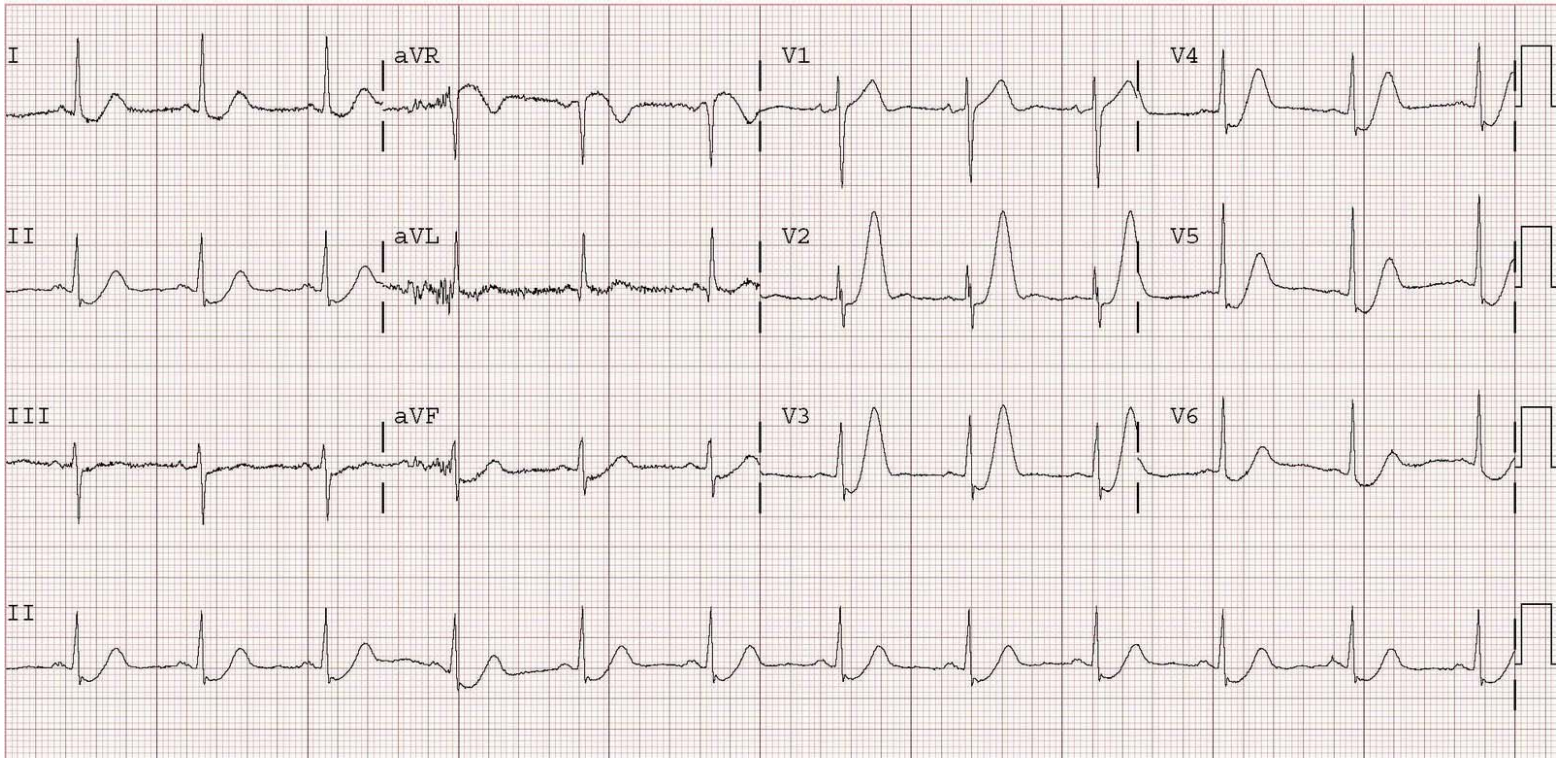
EKG Changes

- Other than ST Elevation
- Progression of EKG changes for STEMI



EKG Changes

- Hyperacute T waves

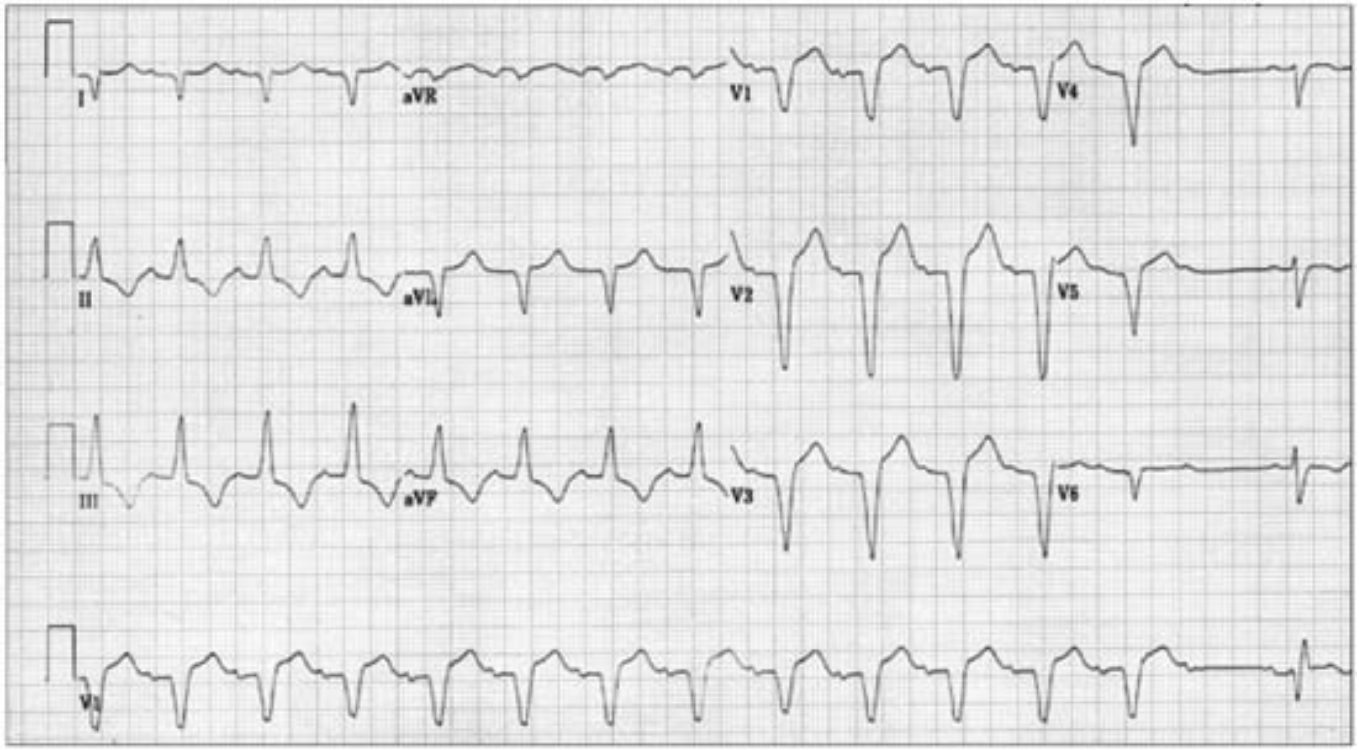


EKG Changes

- Tombstone

EKG Changes

- New Left Bundle Branch Block



EKG Changes

- Dynamic and changing
- Normal one minute
- STEMI the next

EKG Changes

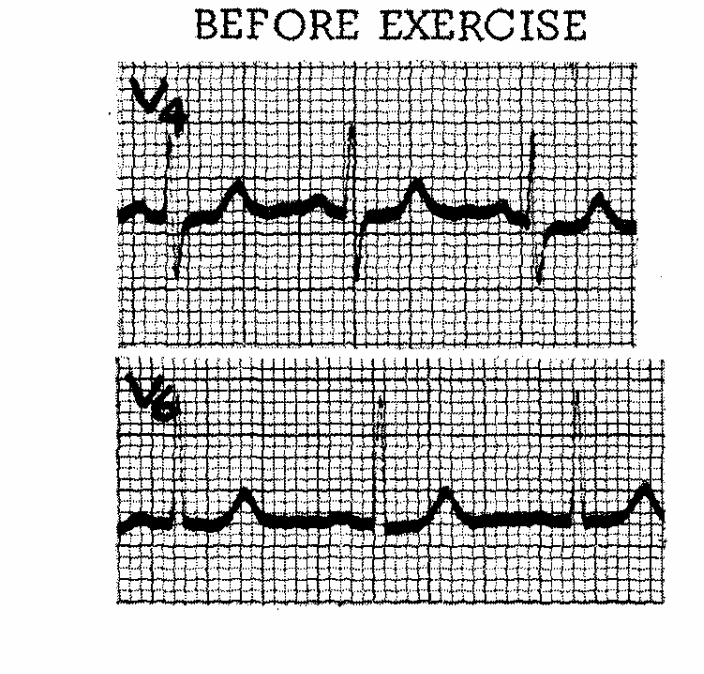
- Ischemia vs. Infarction

- What about partial occlusion?
  - Unstable Angina
  - TWI
  - ST depression

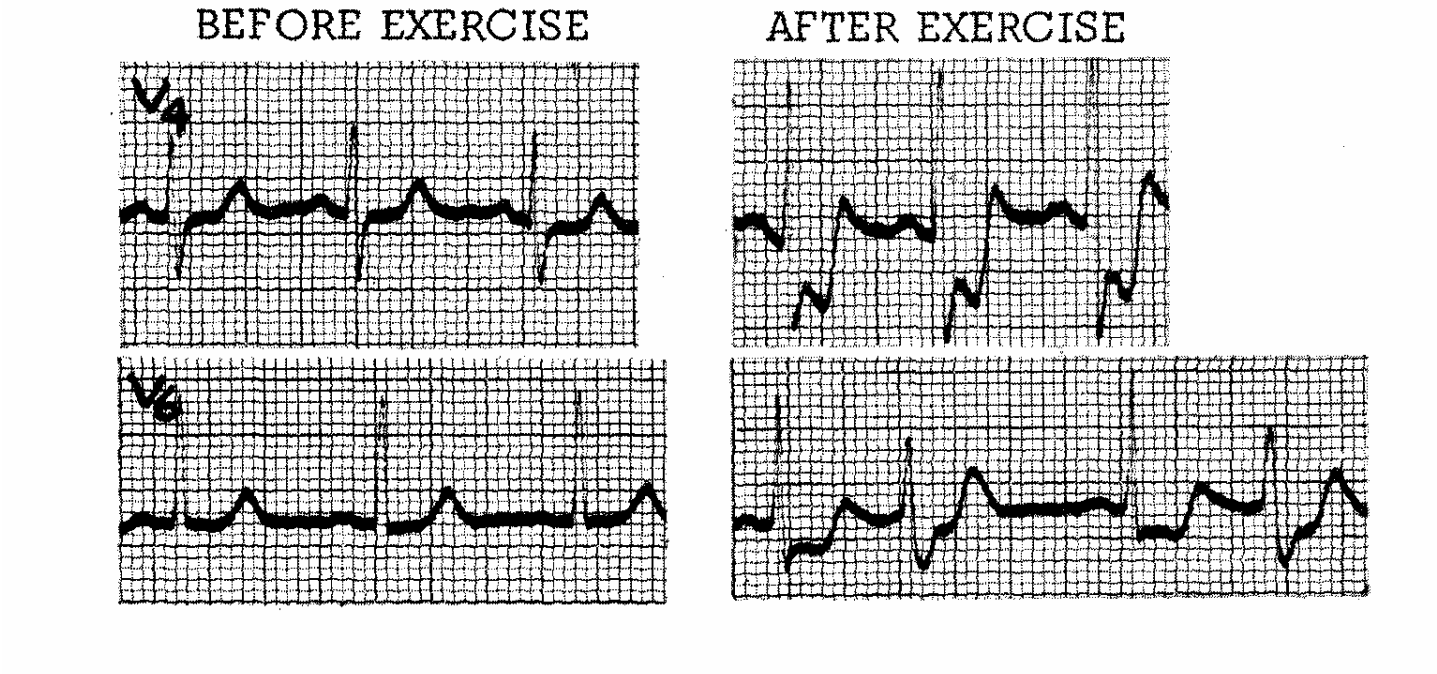
Pathophysiology

- Supply and demand
- Stress Test
  - Increasing demand
  - Observes for ischemia
  - Identifies decreased blood flow across a fixed lesion

Stress Test



Stress Test



Treatment

- Aspirin, Oxygen
- To Hospital
- Call ahead of time
  - pre-hospital alert the cath lab

Treatment

- Caution with Morphine
- Caution with Nitrates
  - Esp for INFERIOR MI

Treatment

- Hypotension
  - Avoid morphine
  - Avoid nitrates

  - Give IVF – may be pre-load dependent

Treatment – Cardiac Arrest

- Follow ACLS
- Prompt CPR
  - Less important is the Airway
  - Less important are the Drugs

- ROSC – Return of Spontaneous Circulation
  - Repeat 12 lead
  - Maintain HR and BP
  - Get them to PCI/TH Center

Treatment – PCI