ΠΡΟΣΘΙΟ ΘΩΡΑΚΙΚΟ ΑΛΓΟΣ

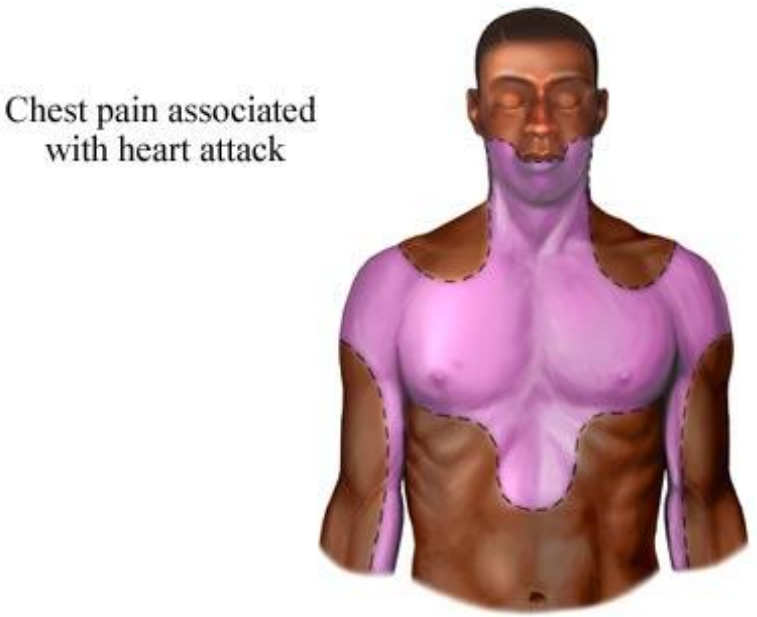
ΠΑΠΑΔΟΠΟΥΛΟΣ ΑΝΤΩΝΗΣ

ΕΠΙΚΟΥΡΟΣ ΚΑΘΗΓΗΤΗΣ

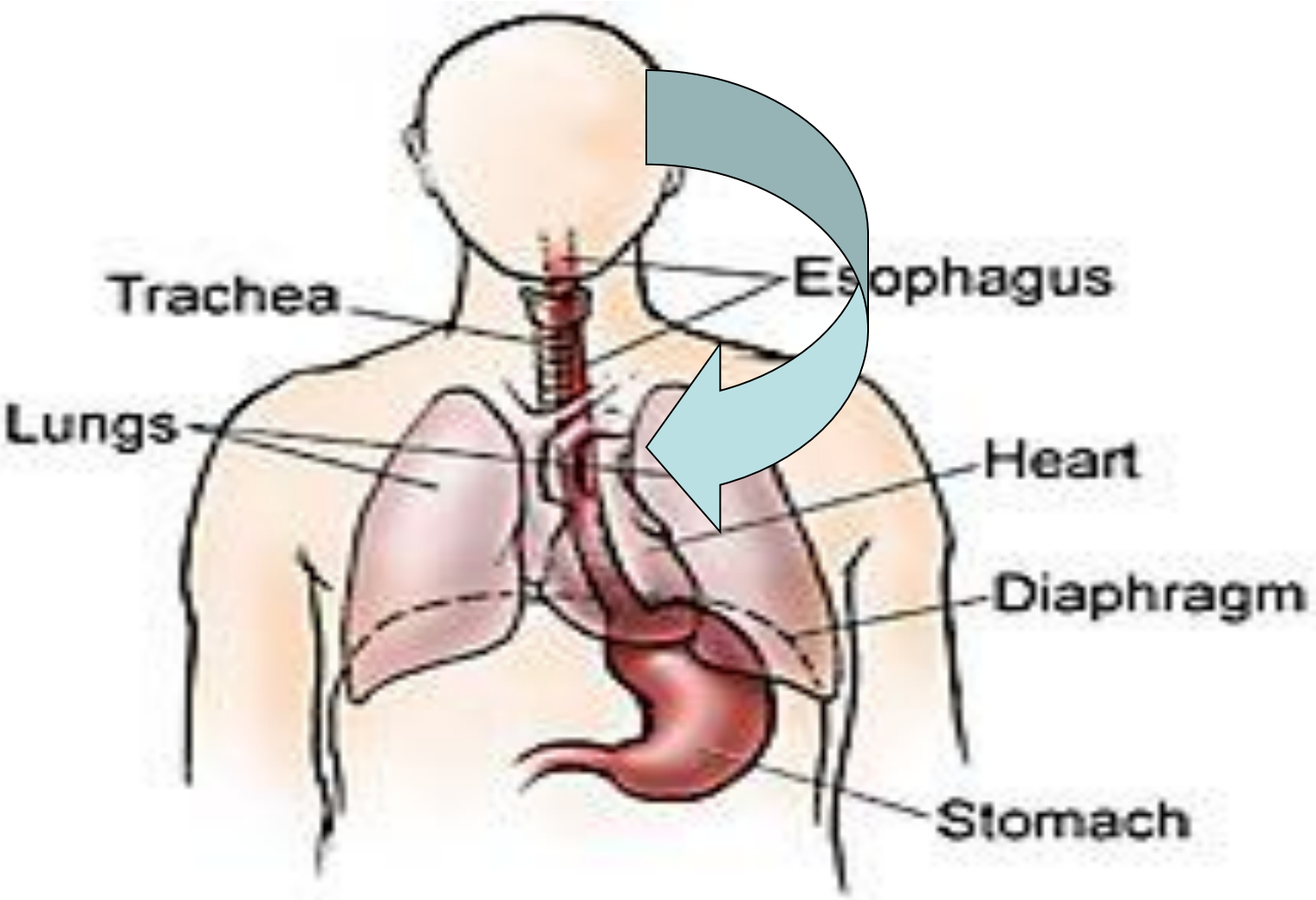
What to do when the nurses call to tell you that “so and so” is complaining of chest pain.

What is chest pain?

- Pain in the anterior thorax, from xiphoid to suprasternal notch and between the right and left midaxillary lines.
- Pain can be referred so adjacent areas are included
- Character is variable – tightness, pressure, stabbing, aching, burning, etc.



Differential Diagnosis: What could it be?



What information is available?

- History
- Physical Exam
- Laboratory Tests
- Imaging Tests

  - If at any time you are concerned of a life threatening cause of chest pain, the proper treatment should be initiated
  - Low risk interventions have a lower threshold

Go see the patient

and

write a note in the chart

Why is the patient admitted to the hospital?

This is why sign outs are so very important to effective cross cover.

Helps to focus on helping that individual patient.

- Talk to the patient
- Examination of the patient

Chest pain history

- Demographics:
  - Age, sex
- Chest Pain:
  - Onset, Duration
  - Exacerbating and Relieving factors
    - Exercise, position
  - Character
  - Location
  - Radiation
- Previous chest pain episodes
- Associated symptoms
- Cardiac risk factors and clotting risk factors
- Past medical history
- Previous testing

- General Appearance
- Vital Signs
  - At the time of your exam and the trend
  - BP in both arms
  - Pulses in all extremities
- Focused Cardiovascular Exam
  - Assessing for Heart Failure
    - Neck Veins
    - S3/S4
    - Murmurs (new MR murmur)
    - Lung exam for pulmonary edema (rales)
    - Friction Rub

Physical Exam

- Vital signs
  - Pulse
  - Temp
  - Blood Pressure
  - Respiratory Rate
  - Oxygen Saturation
- Overall patient appearance
- Neck Veins (JVD)
- Cardiac auscultation
  - Murmur, extra heart sounds
- Lung Auscultation
  - Infiltrates, lung volumes, effusion, wheezing
- Leg swelling
- Chest wall or abdominal tenderness

Laboratory Tests

- General Tests:
  - Panel 7
    - Creatine
    - Electrolytes
  - Complete Blood Count (CBC)
    - Anemia, elevated WBC
  - Arterial blood gas (ABG)
    - Ability to oxygenate
    - Acid-base status
- Myocardial Ischemia
  - Markers of cell injury: creatine kinase, troponin, and creatine kinase-MB
- Heart Failure:
  - B-type natriuretic peptide (BNP)
- Pulmonary embolism
  - D-dimer

Imaging Tests

- Electrocardiogram (ECG)
- Chest x-ray
- Chest CT with or without contrast
  - PE protocol
  - Dissection CT angiogram
  - Coronary CT angiogram
- Radionuclide Perfusion Stress Test
  - Exercise, persantine, dobutamine
- Coronary catheterization
- Magnetic resonance imaging/angiography (MRI/MRA)
- Echocardiography

Differential Diagnosis of Chest Pain

- Non Cardiac
- Cardiac

ΠΙΝΑΚΑΣ 1

Συνήθεις παθήσεις που προκαλούν οξεία πρόσθια θωρακαλγία

I. Καρδιαγγειακής αιτιολογίας

Από την καρδιά
- Στεφανιαία συνδρομή
- Αορτική βαλβιδοπάθεια
- Πρόπτωση μιτροειδούς
- Υπερτροφία δεξιάς κοιλίας κ.ά.

Από την αορτή
- Διαχωριστική ρήξη αορτής

Από το περικάρδιο
- Σύνδρομο Dressler
- Μικροβιακή περικαρδίτιδα
- Περικαρδίτιδα από κολλαγονώσεις κ.ά.

II. Πνευμονικής προελεύσεως

- Πνευμονική εμβολή
- Πνευμοθώρακας
- Πλευρίτιδα
- Πνευμονία
- Εμφύσημα μεσοθωρακίου
- Νεοπλάσματα κ.ά.

III. Γαστρεντερικού συστήματος

Παθήσεις οισοφάγου. Αχαλασία, Οισοφαγίτις, Νεοπλάσματα, Διαφραγματοκήλη, Γαστροοισ. παλινδρόμηση κ.ά.

Γαστροδωδεκαδακτυλικό έλκος

Οξεία παγκρεατίτιδα

Κωλικός ήπατος

Χολοκυστοπάθειες
- Χολοκυστίτιδα
- Κωλικός χοληδόχου.

IV. Μυοσκελετικού συστήματος

Παθήσεις μυϊκού συστήματος (μεσοπλεύριος σπασμός κ.ά.)

*Παθήσεις σκελετού (*οστεοαρθρίτιδα κατάγματα πλευρών κ.ά.)

Νευραλγίες (ριζίτιδα, ερπητική νευραλγία κ.ά.).

V. Λειτουργικής αιτιολογίας

- Αγχώδης νεύρωση
- Εθισμός στα ναρκωτικά.

ΠΙΝΑΚΑΣ ΙΙ

Καρδιακά αίτια πρόκλησης πρόσθιας θωρακαλγίας

1. Καρδιακά αίτια

I. Στεφανιαία συνδρομή
1. Στηθάγχη αθηροσκλήρυνσης
2. Ασταθής στηθάγχη
3. Στηθάγχη του Prinzmetal
4. Στεφανιαία ανεπάρκεια
5. Προεμφραγματική στηθάγχη
6. Έμφραγμα του μυοκαρδίου
7. Εμβολή στεφανιαίων
8. Γενικευμένη σκληροδερμία
9. Αορτίτιδα συφιλιδική
10. Οζώδης πολυαρτηρίτιδα
11. Αγγειόσπασμος σε φυσιολ. στεφανιαίες.
12. Σύνδρ. αποστέρησης νιτρογλυκ.
13. Νόσος Takayasu
14. Νόσος του Kawasaki

II. Υπερτροφία δεξιάς κοιλίας

III. Υποβαλβιδική αορτική στένωση

IV. Αορτική βαλβιδοπάθεια

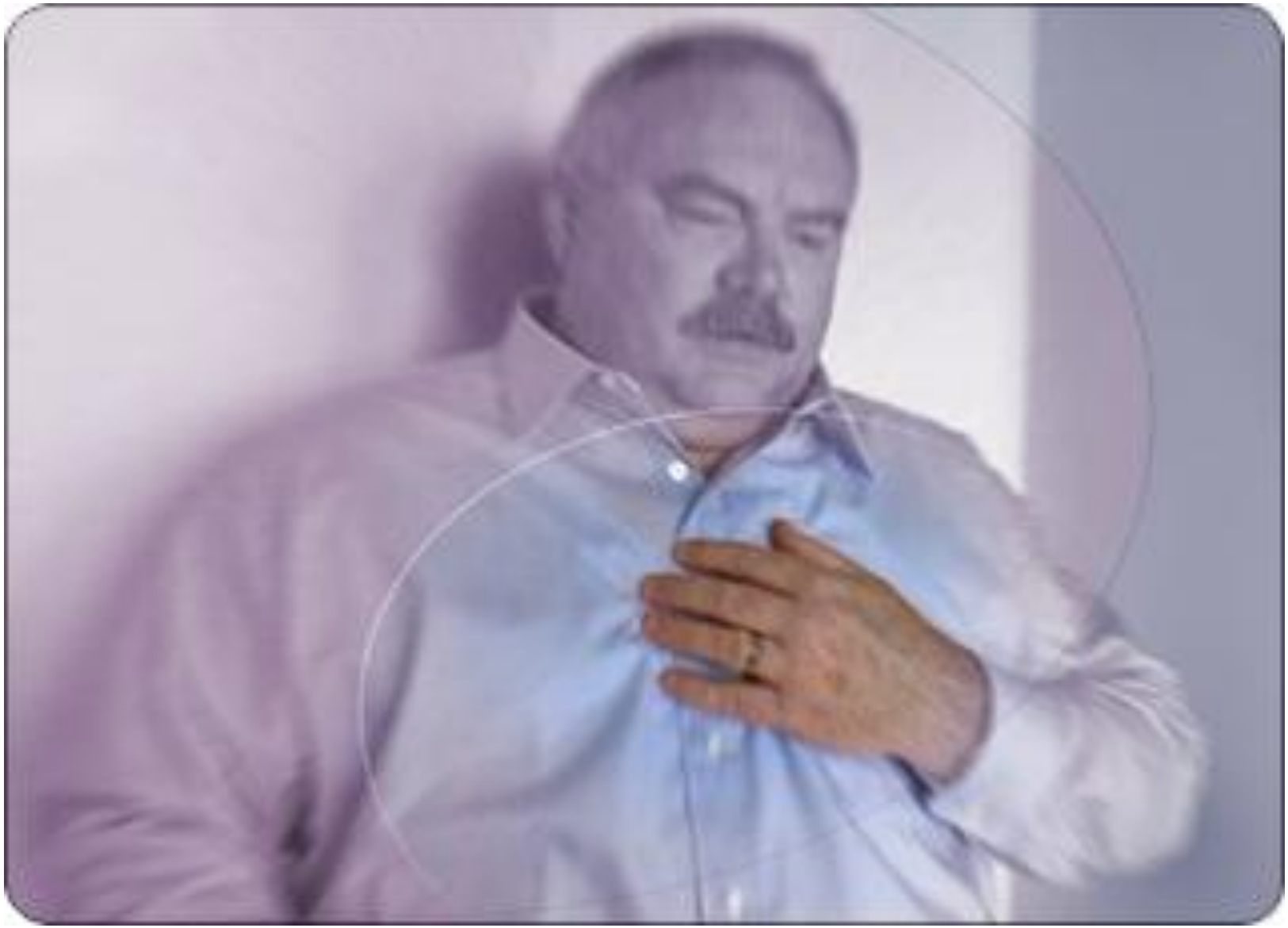
V. Σύνδρ. πρόπτωσης της μιτροειδούς «Σύνδρομο Barlow»

2. Αορτικά αίτια

Διαχωριστική ρήξη αορτής σε περιπτώσεις:
- Υπέρτασης
- Στένωσης ισθμού αορτής
- Συνδρόμου Marfan
- Κύησης
- Τραυμάτων κλειστών θώρακος
- Κυστικής νέκρωσης μέσου χιτώνα

3. Περικαρδιακά αίτια

1. Σύνδρομο Dressler
2. Ιογενής, φυματιώδης, μικροβιακή περικαρδίτιδα
3. Έμφραγμα μυοκαρδίου
4. Μετατραυματική, ουραιμική, νεοπλασματική περικαρδίτιδα
5. Περικαρδίτιδα από παθήσεις του κολλαγόνου
6. Περικαρδίτιδα μετά από ακτινοβολία «μετακτινική»



προς τα έξω απομακρύνοντας το ένα απ' το άλλο (ΣΧΗΜΑ 12).

ΣΧΗΜΑ 12. *Η "γλώσσα του σώματος" ως μέσο περιγραφής του στηθαγχικού πόνου: Με έναν απ' τους τρεις αυτούς τρόπους χρησιμοποιούν οι άρρωστοι τα χέρια τους για να περιγράψουν τον πόνο που νοιώθουν (από τον Edmonstone 1995, τροποποιημένο) .*

Life-Threatening Causes

- Pulmonary embolus
- Tension pneumothorax
- Pericarditis/cardiac tamponade
- Esophageal rupture
- Aortic dissection
- Acute myocardial infarction

Chest Pain That Can Kill

- Acute Coronary Syndromes
- Pulmonary Embolism
- Aortic Dissection
- Esophageal Rupture
- Pneumothorax
- Pneumonia

Various others: Pulmonary HTN, Myocarditis, Tamponade

Approach to Chest Pain

INITIAL GOAL in ED is to identify life threats

- MI, PE, aortic dissection

Remember ABCs always first

ANGINA

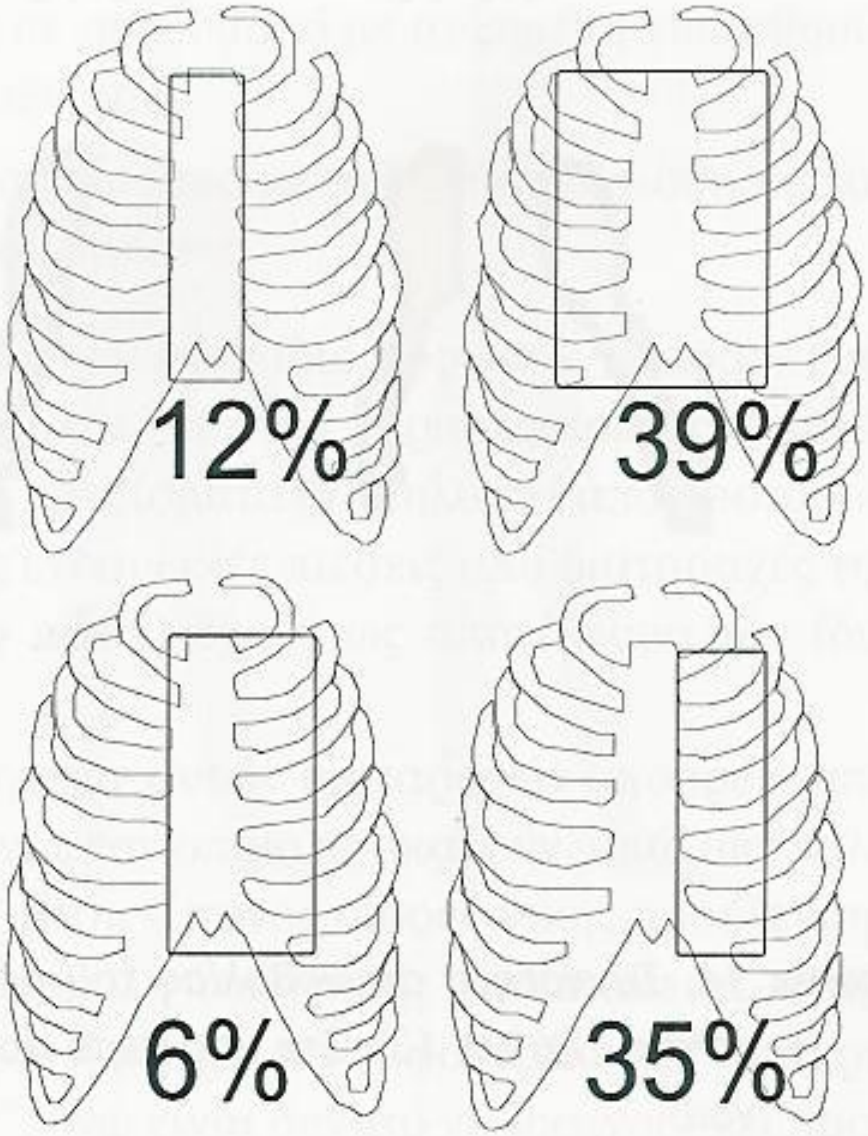
Pain

Pressure

Vice like squeezing

“elephant sitting on my chest”

Indigestion/heart burn



ΣΧΗΜΑ 13. *Ενδεικτική συχνότητα εντόπισης του πόνου του εμφράγματος του μυοκαρδίου με βάση παλαιότερη Σκανδιναβική μελέτη (Söwe U, Acta Med Scand 1971, 19:79).*

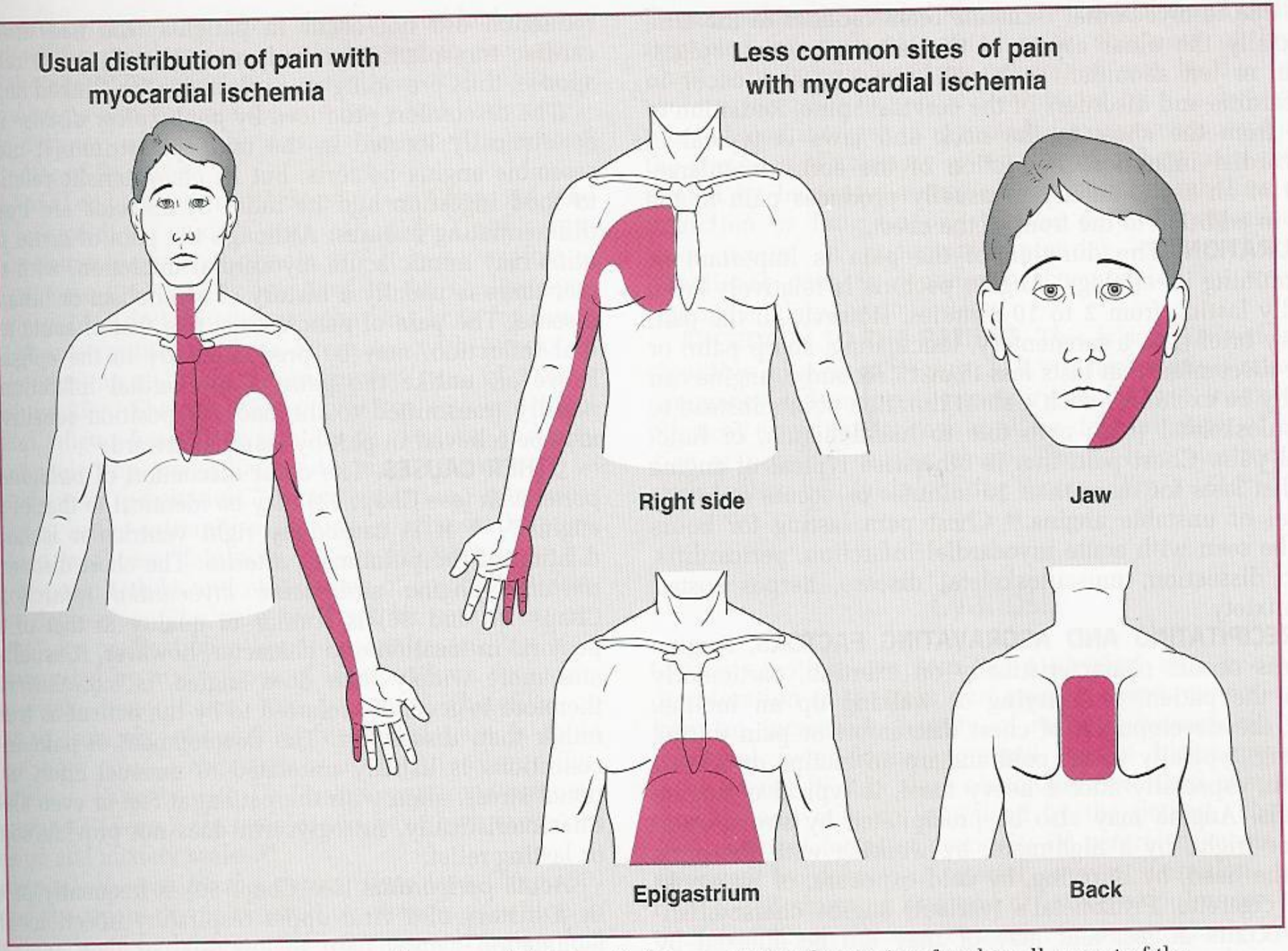
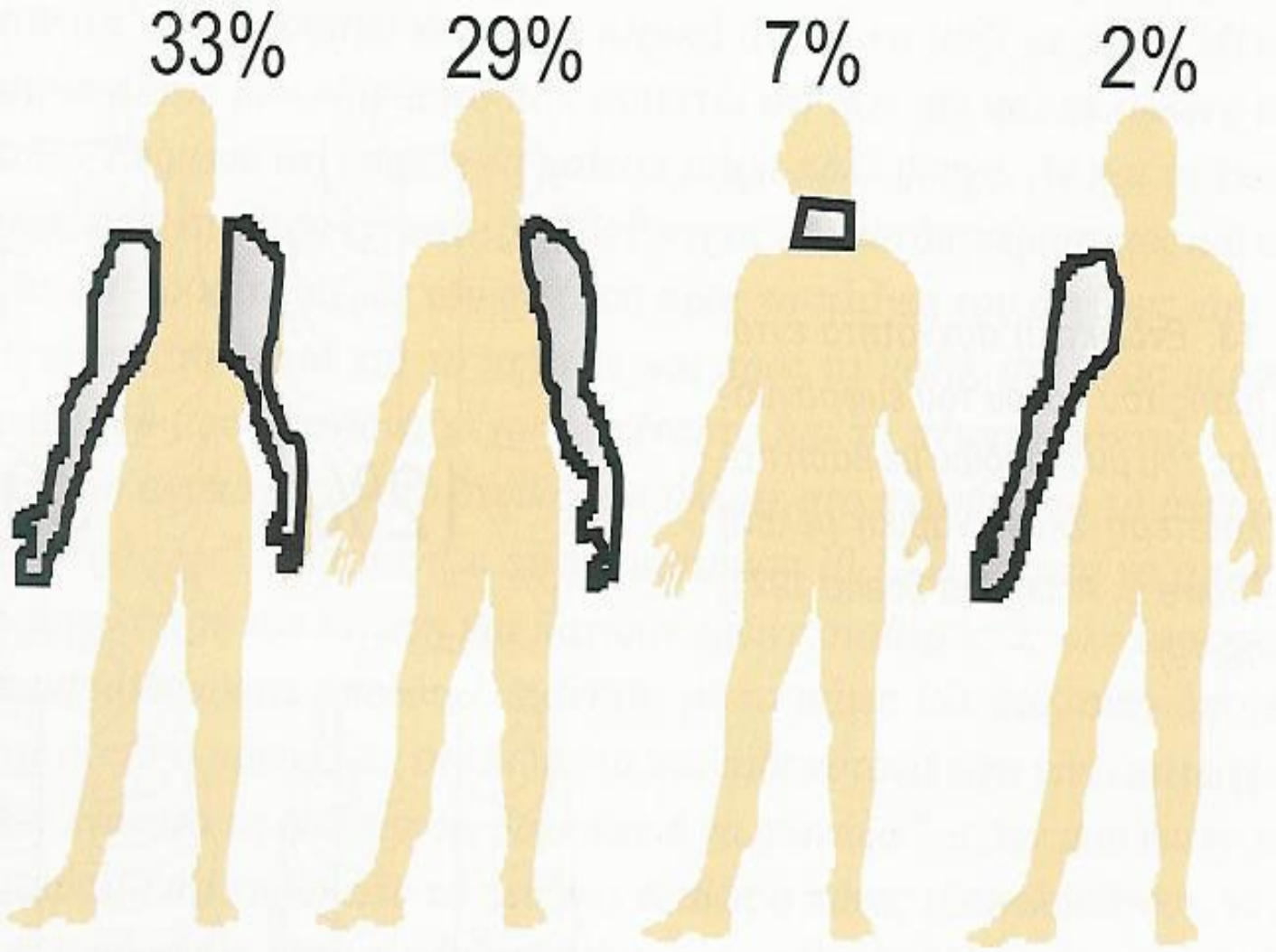


FIGURE 3–2. Pain patterns with myocardial ischemia. The usual distribution is referral to all or part of the sternal region, the left side of the chest, and the neck and down the ulnar side of the left forearm and



ΣΧΗΜΑ 14. *Συχνότητα ακτινοβολίας του πόνου του εμφράγματος, σύμφωνα με την ίδια μελέτη (ΣΧΗΜΑ 13). Στο υπόλοιπο ποσοστό (29%) δεν υπήρχε ακτινοβολία του πόνου.*

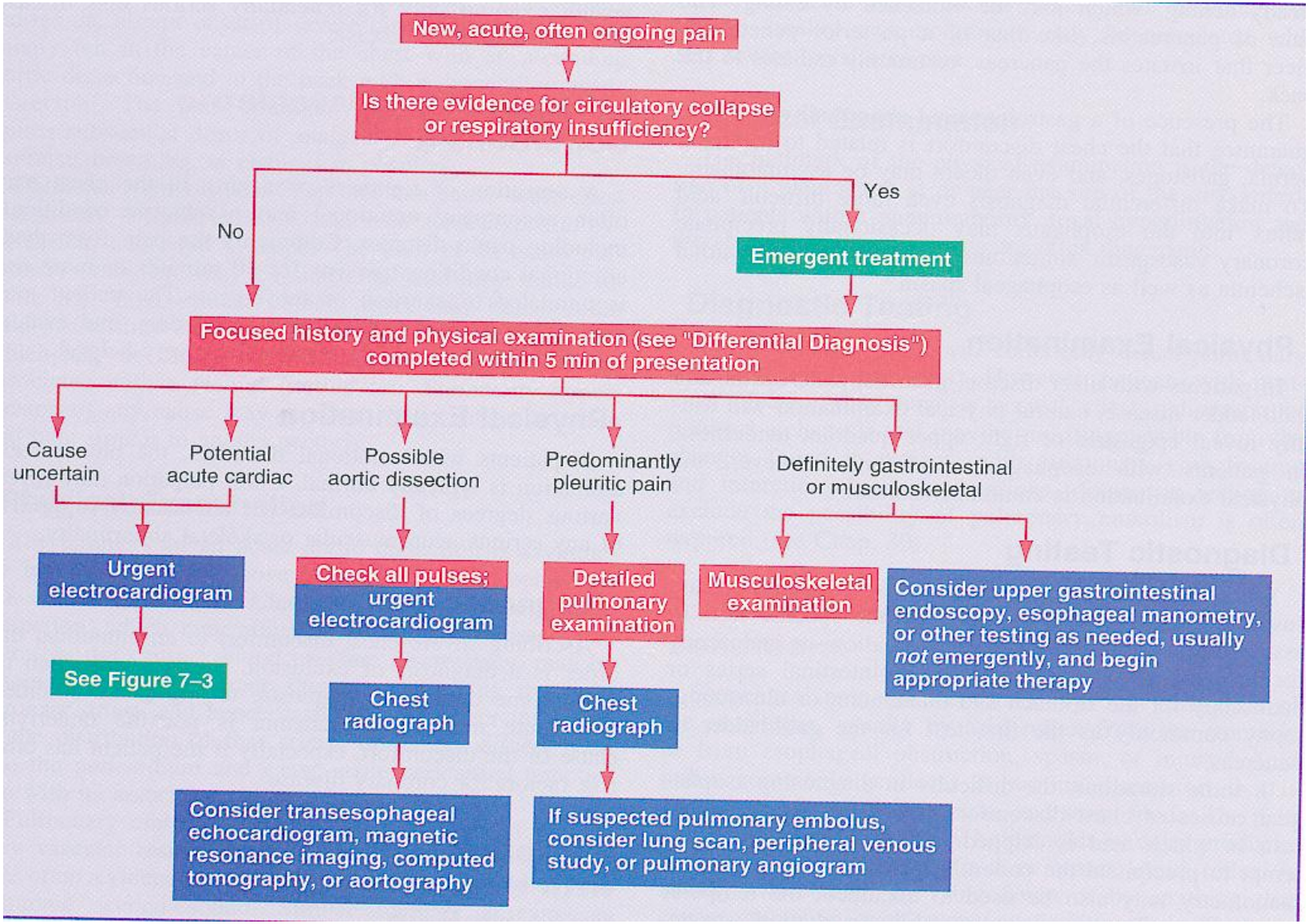
Canadian Cardiovascular Society Classification of Angina

Class	Activity Provoking	Limitation
I	Prolonged Exertion	none
II	Walking >2 Blocks	slight
III	Walking <2 Blocks	marked
IV	Minimal/Rest	severe

CAD Risk Factors

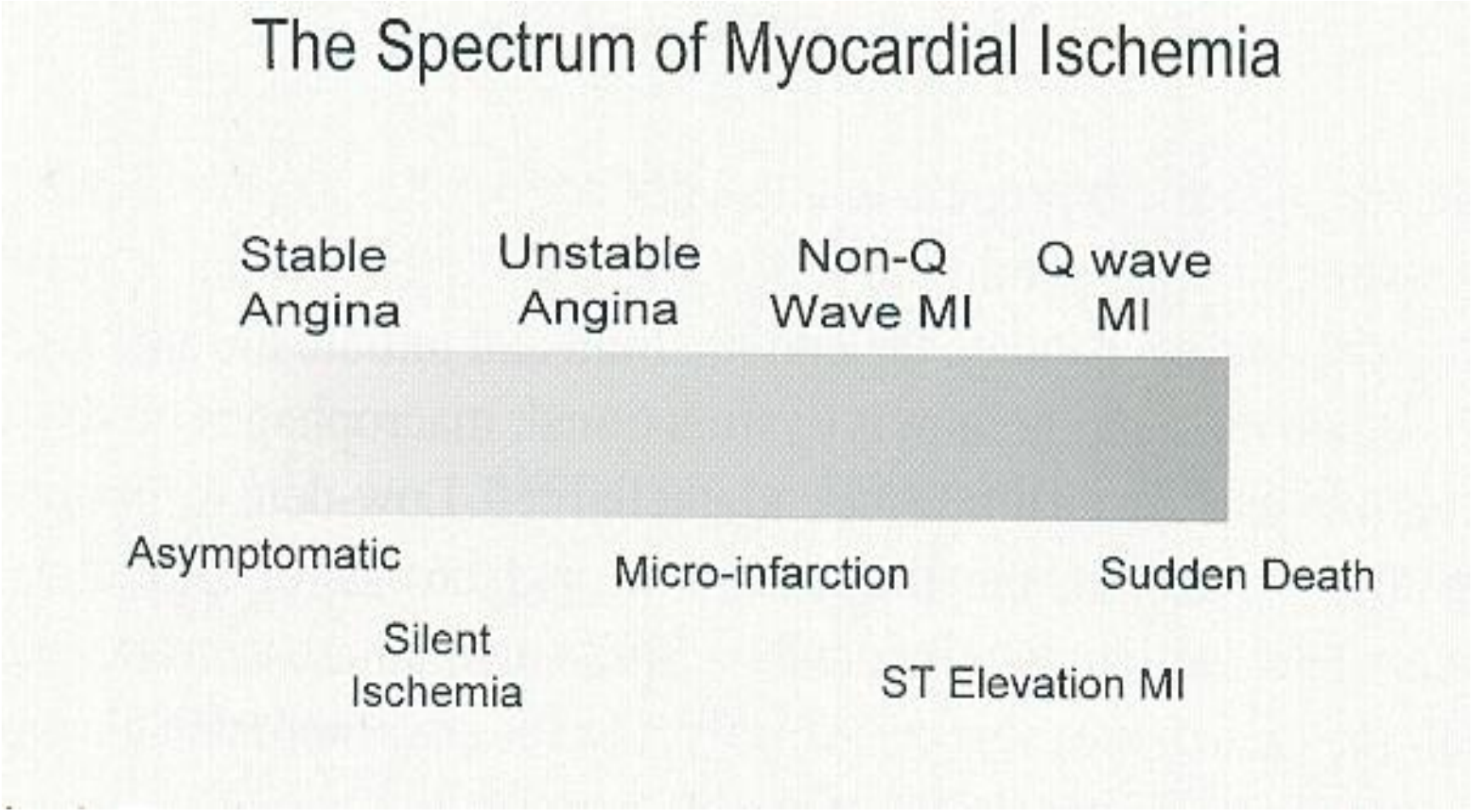
Important CAD Risk Factors

- Smoking
- High Cholesterol
- High Blood Pressure
- Diabetes
- Family History of CAD



Goldman and Braunwald p 92

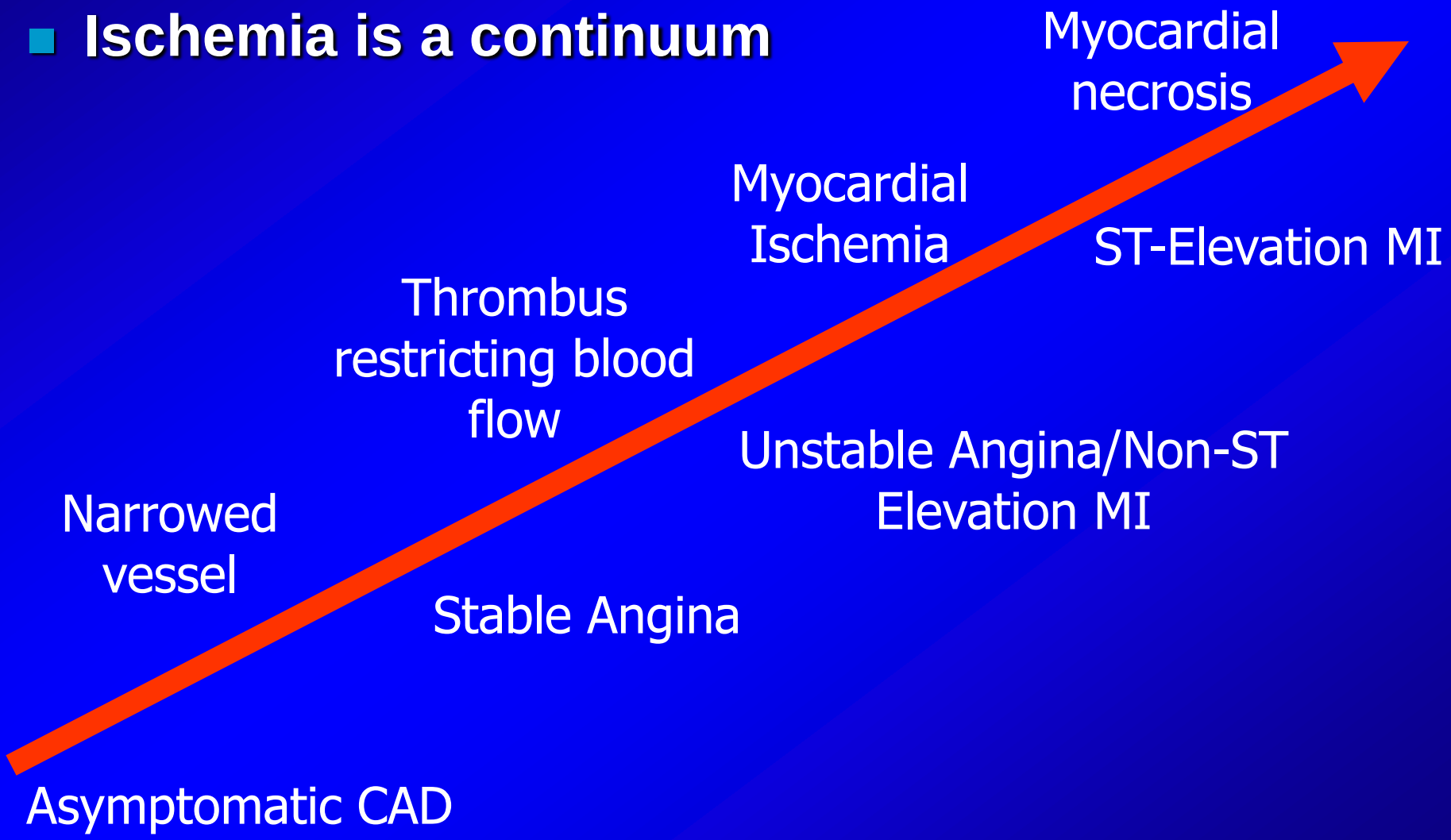
Acute Coronary Syndrome



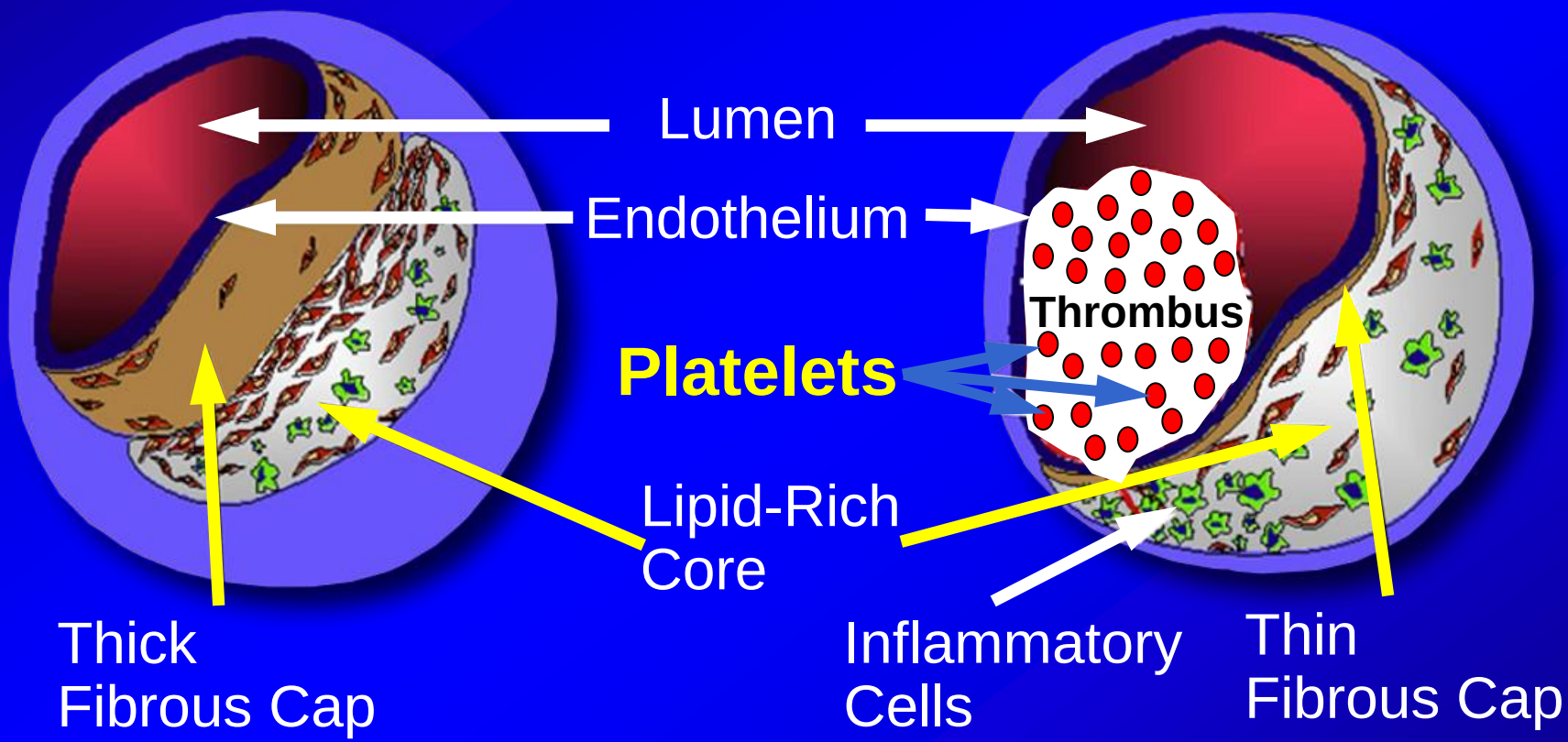
Cannon p5

Myocardial Ischemia

- **Ischemia is a continuum**



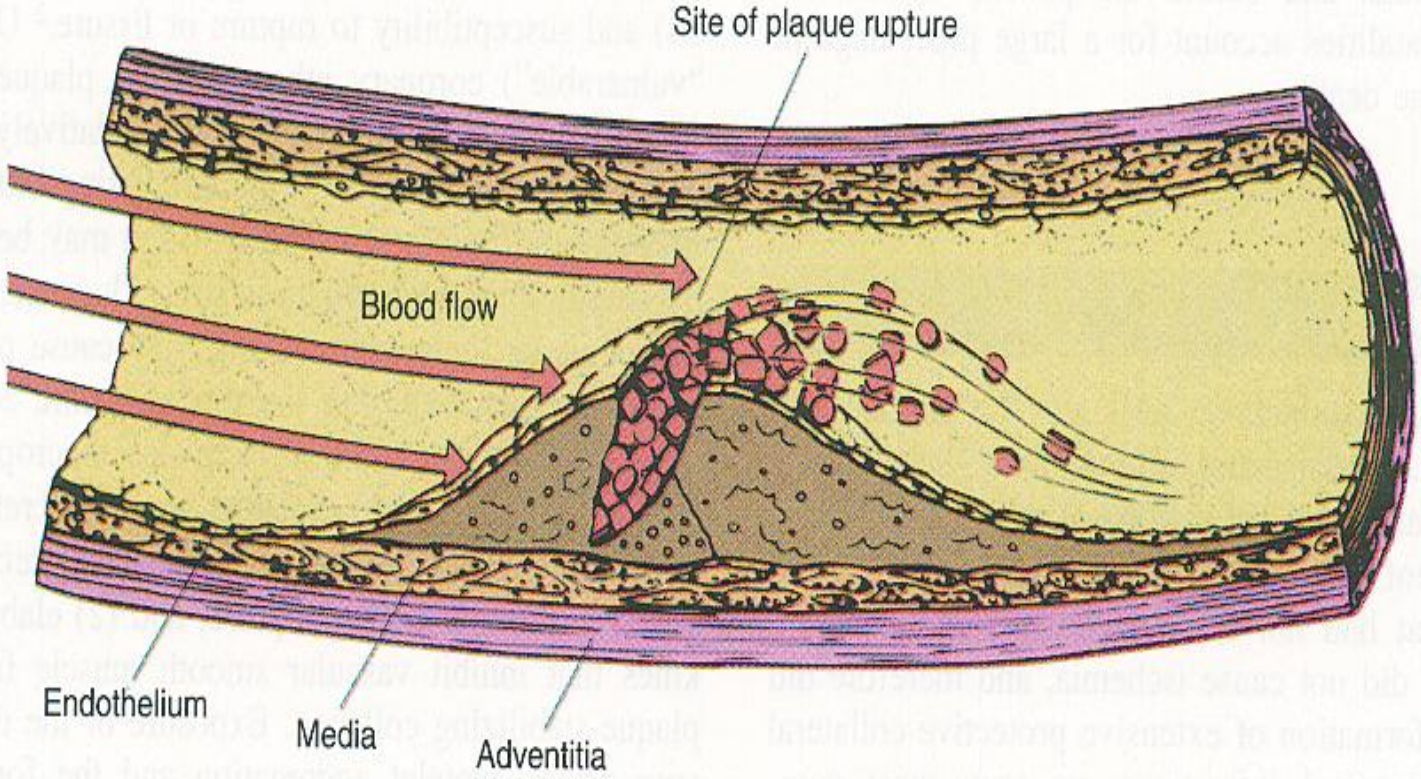
What Types of Atherothrombotic Lesions Cause MI?

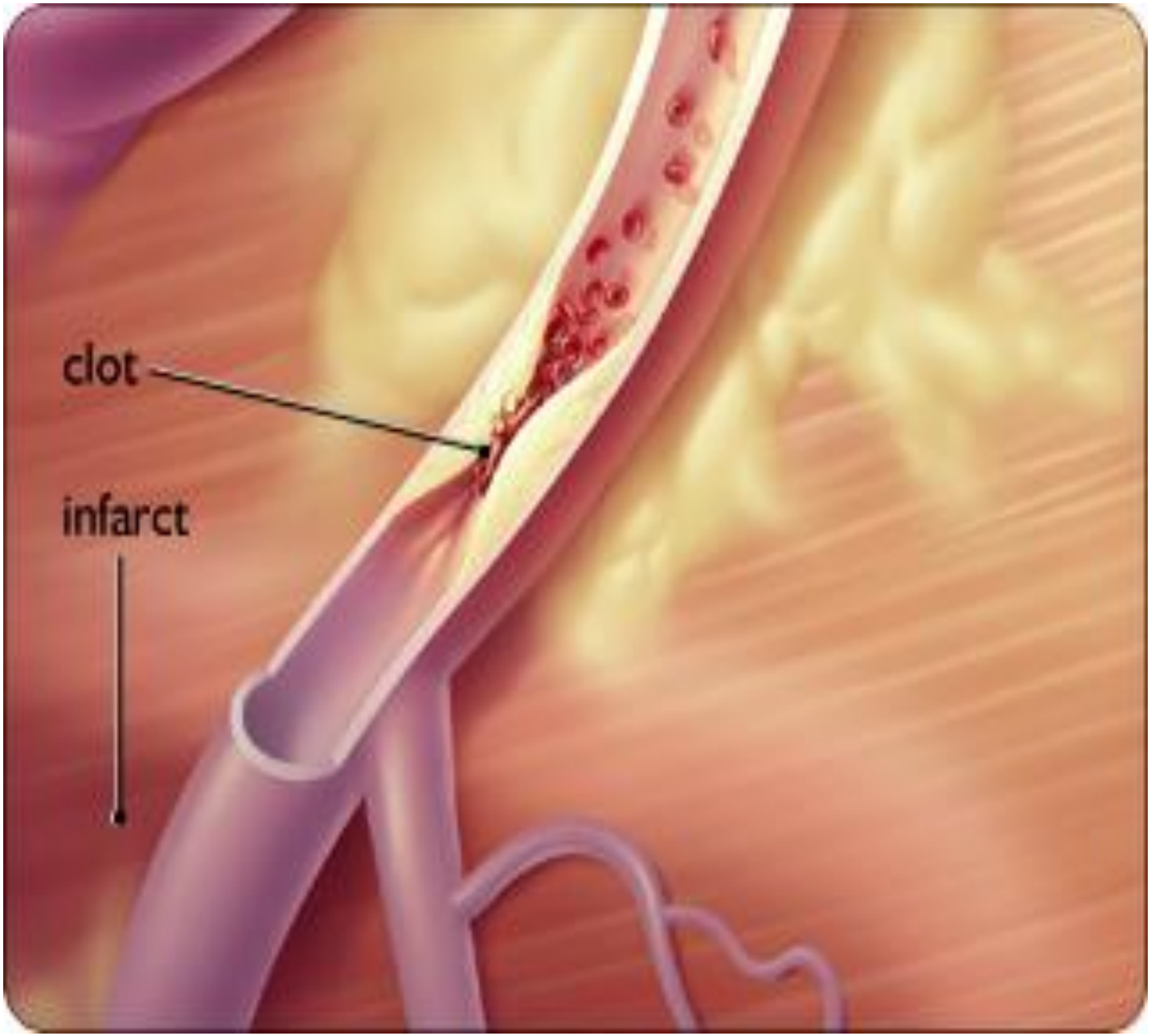


MI = myocardial infarction.

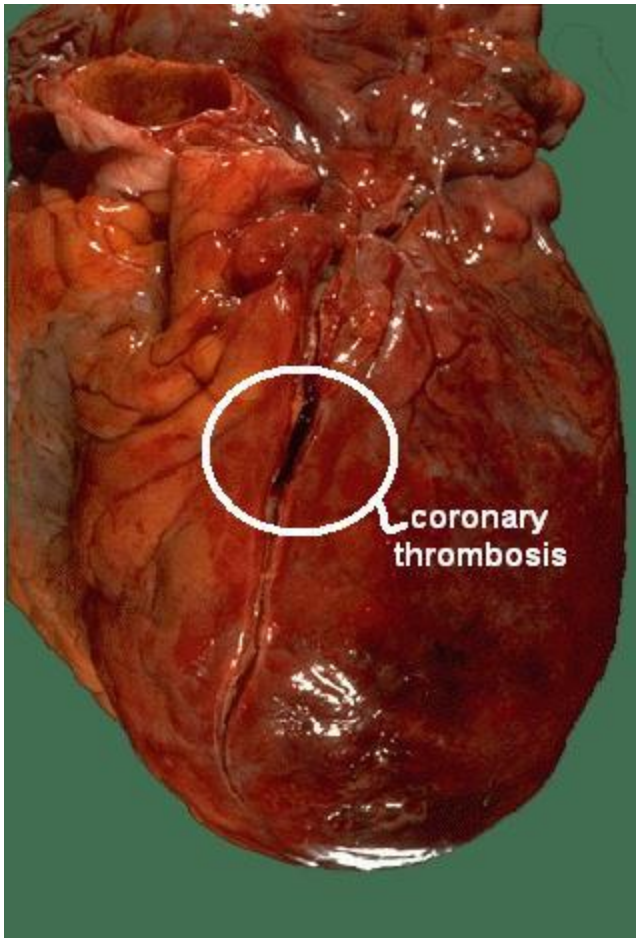
Adapted with permission from Falk E, et al. *Circulation*. 1995;92:657-671.

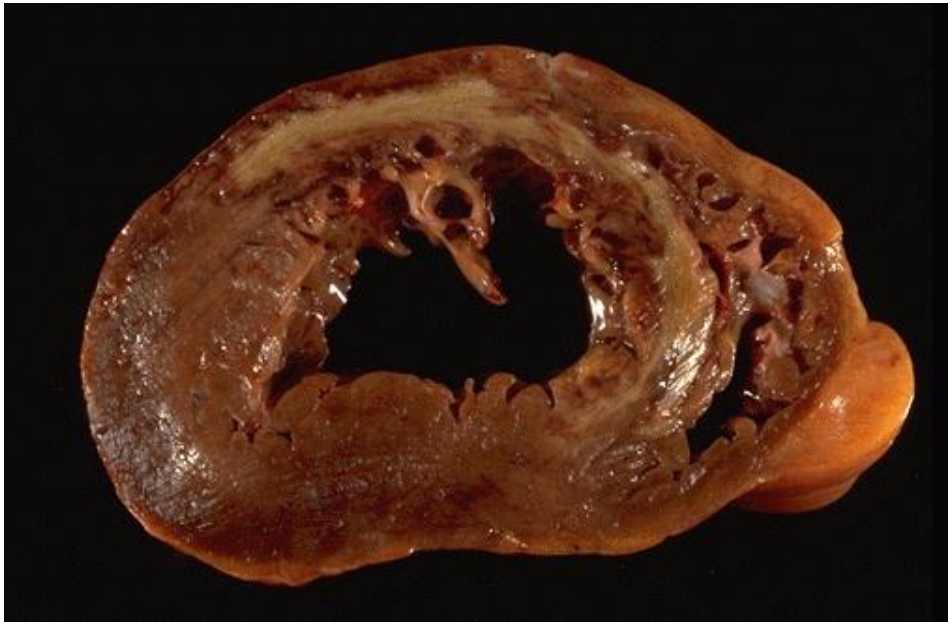
Acute Coronary Syndrome




clot
infarct

Myocardial infarction





Acute myocardial ischemia

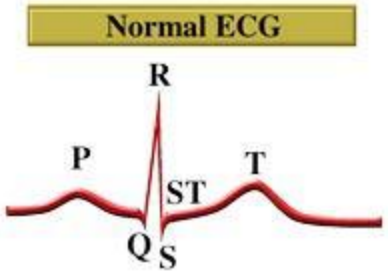
- History:
  - Sudden sub-sternal crushing chest pain with radiation to the left arm/jaw
  - Worse with exercise (history of worsening)
  - Associated with shortness of breath, profuse sweating, and nausea/vomiting
  - Cardiac risk factors: high blood pressure, diabetes, high cholesterol, family history, tobacco use, and cocaine use
  - Past history of CAD/MI

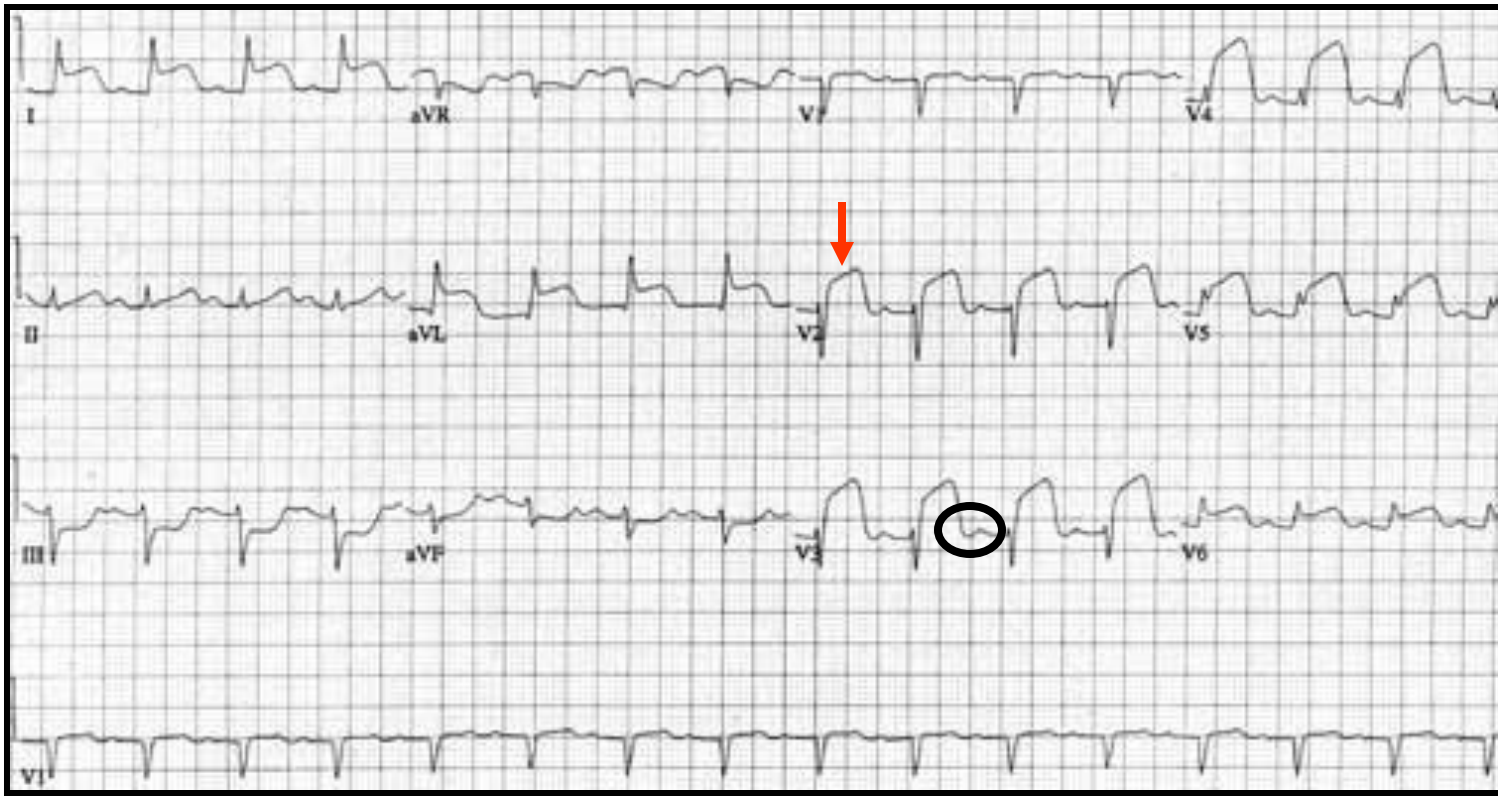
Acute myocardial ischemia

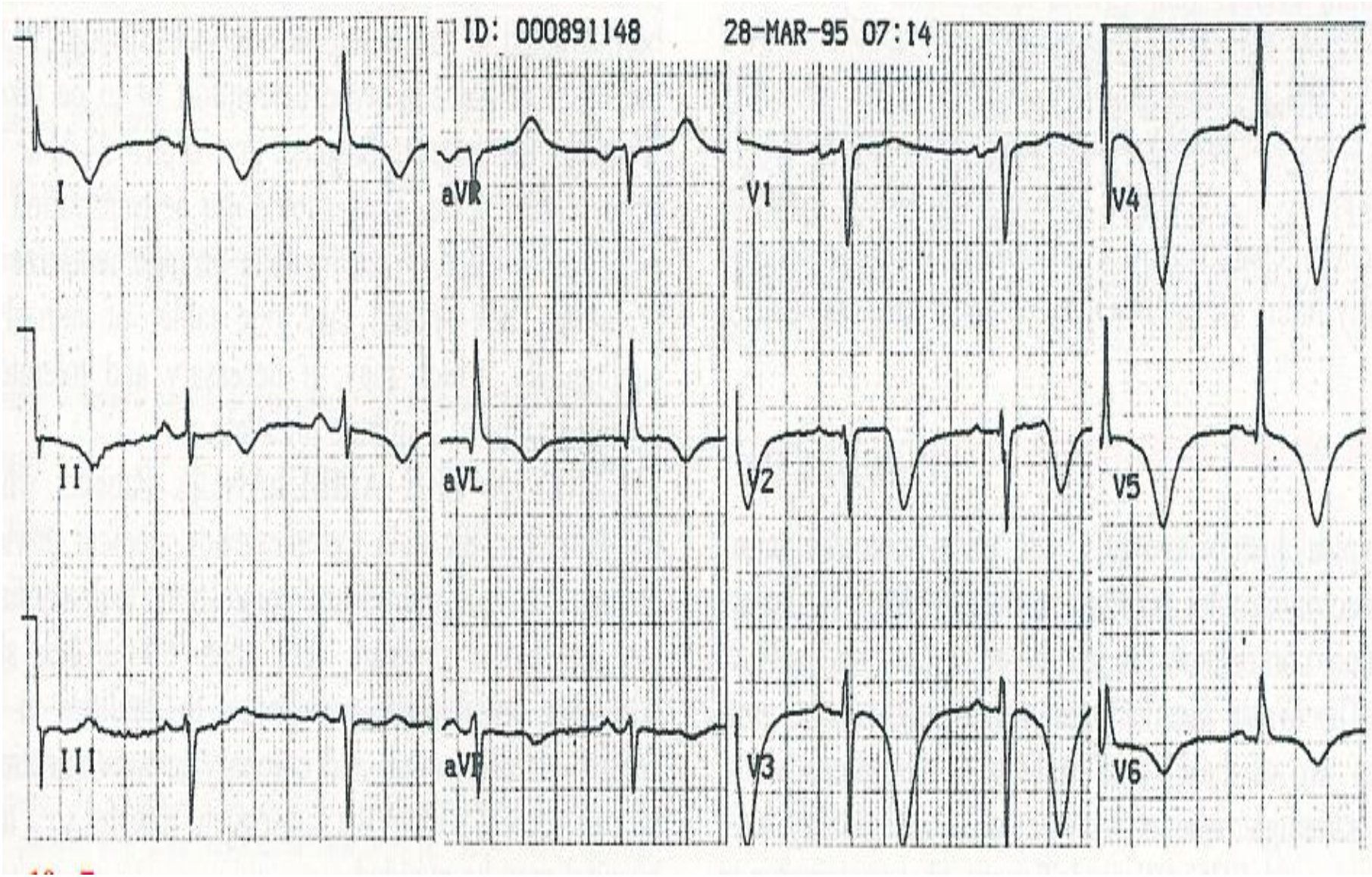
- Exam:
  - New murmur, heart sounds, elevated neck veins
  - Very limited utility
- Testing
  - ECG Changes
  - Elevated cardiac markers
  - Positive stress test, cardiac cath, coronary CT angiogram

Acute myocardial ischemia

- ECG Changes



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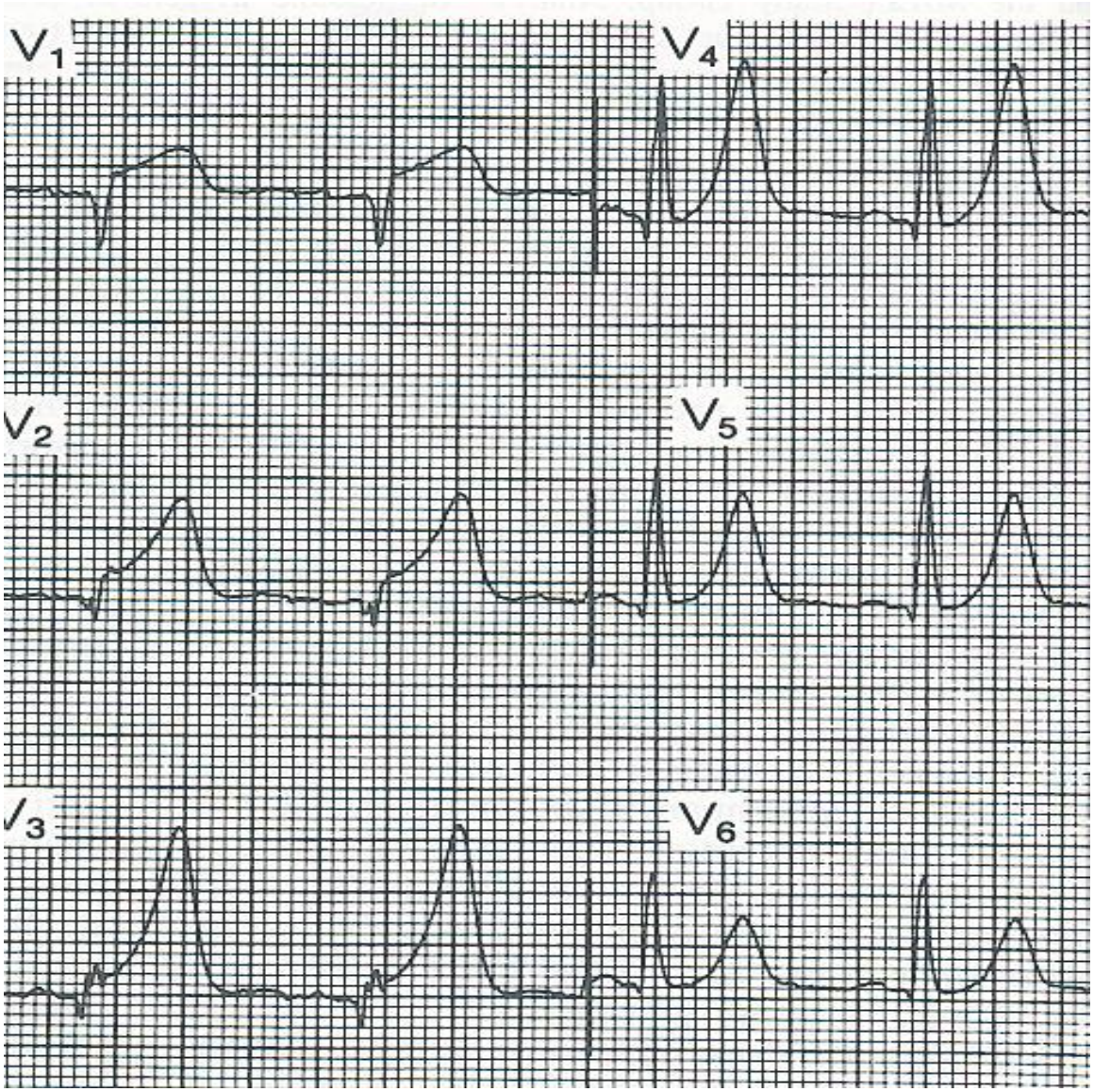
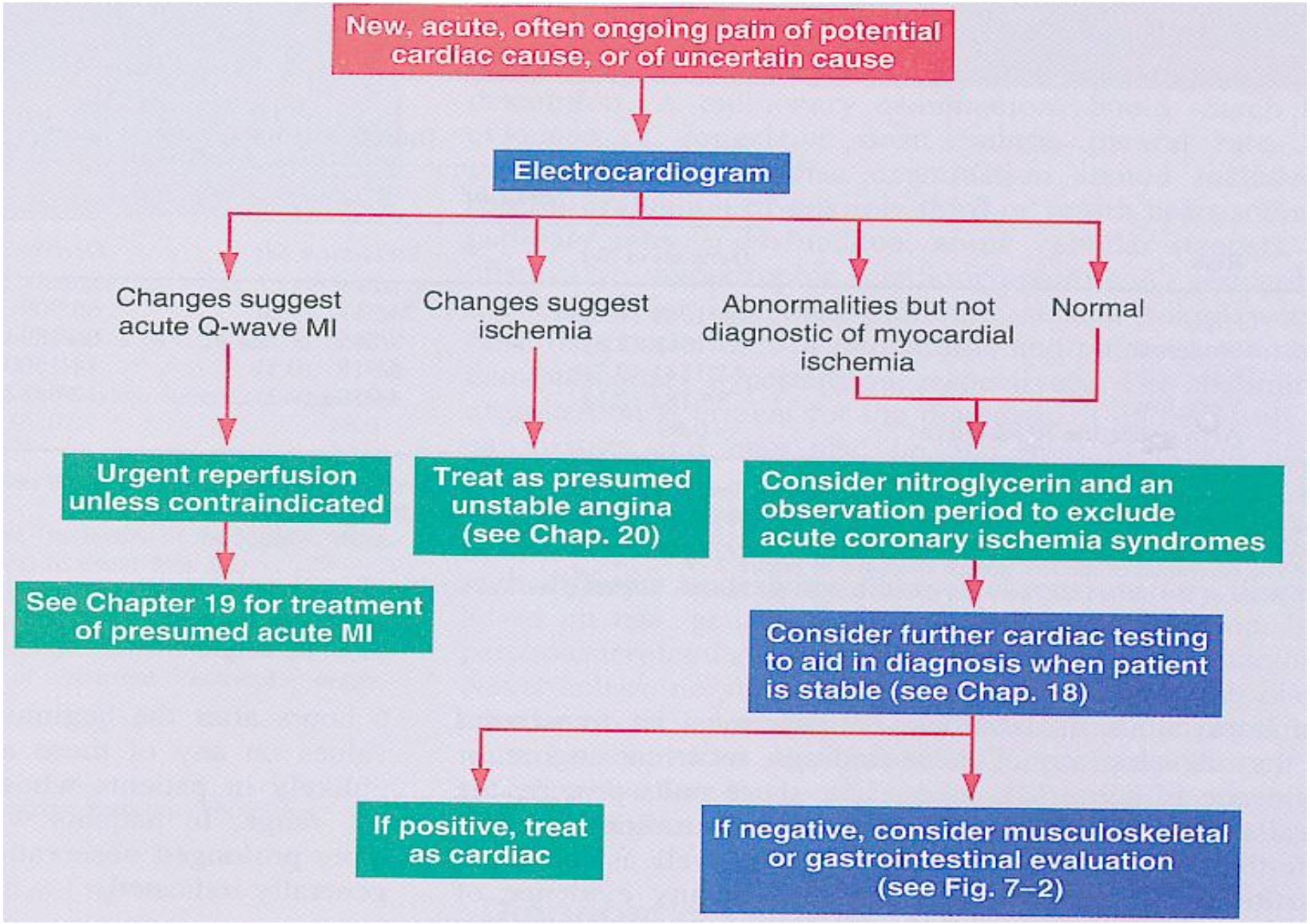
28-MAR-95 07:14
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6


V1
V4
V2
V5
V3
V6

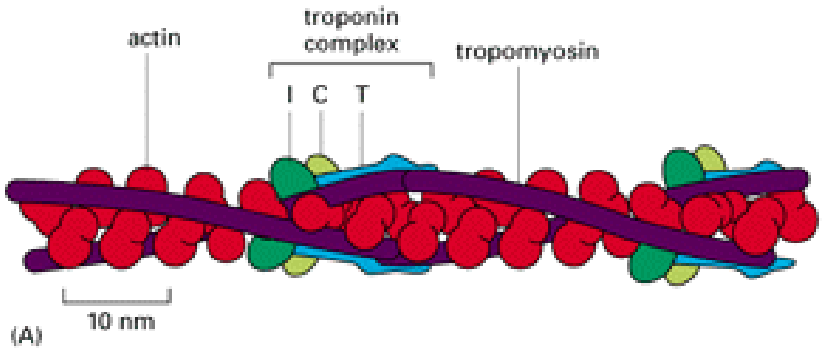


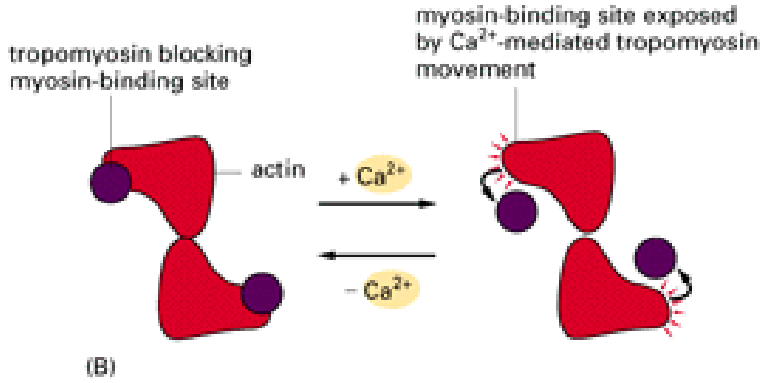
Goldman and Braunwald p 93

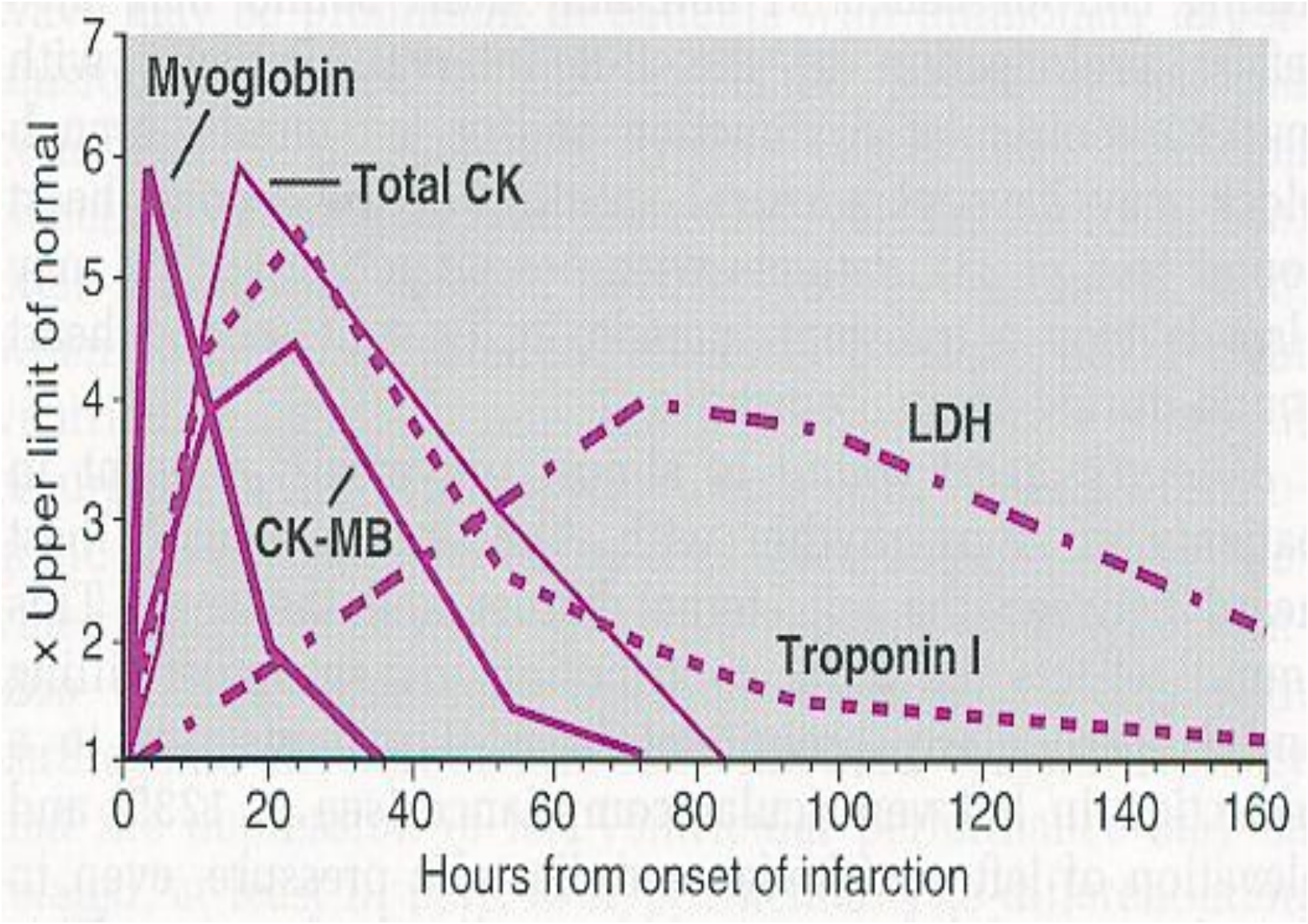
What Should You Do?

- Labs to be ordered
  - CK with MB
  - Troponin
  - CBC
  - PT/PTT within that admission
  - BMP and LFT if not known in last 24 hours
  - Fasting Lipid panel with AM labs
  - Chest X-Ray

Troponin

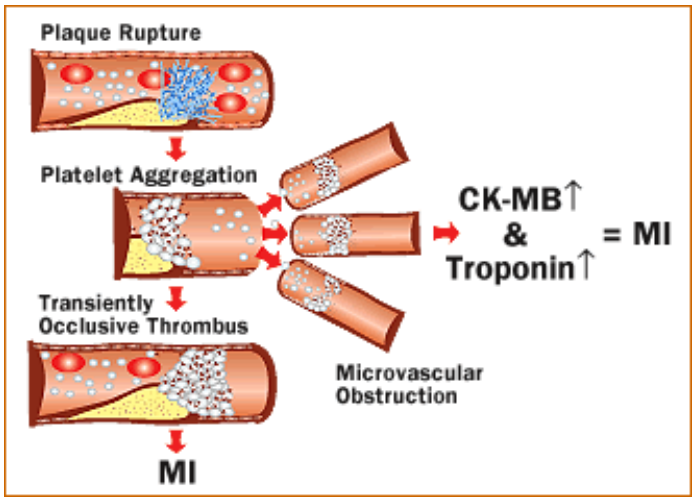

actin
troponin complex
I C T
tropomyosin
10 nm
(A)


tropomyosin blocking myosin-binding site
actin
+ Ca2+
– Ca2+
myosin-binding site exposed by Ca2+-mediated tropomyosin movement
(B)



Braunwald 1202

Myocardial Ischemia



Cell Death

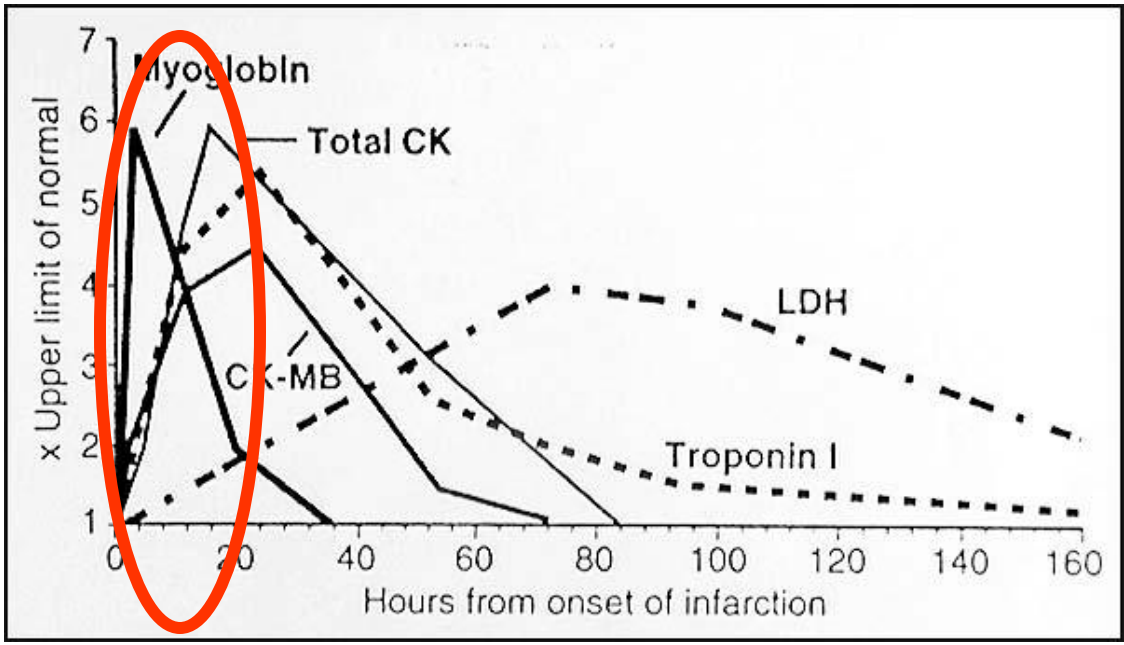


TABLE 37–2 MOLECULAR MARKERS USED OR PROPOSED FOR USE IN THE DIAGNOSIS OF ACUTE MYOCARDIAL INFARCTION

MARKER	MW (D)	RANGE OF TIMES TO INITIAL ELEVATION (h)	MEAN TIME TO PEAK ELEVATIONS (NONTHROMBOLYSIS)	TIME TO RETURN TO NORMAL RANGE	MOST COMMON SAMPLING SCHEDULE
hFABP	14,000–15,000	1.5	5–10 h	24 h	On presentation, then 4 h later
Myoglobin	17,800	1–4	6–7 h	24 h	Frequent; 1–2 h after CP
MLC	19,000–27,000	6–12	2–4 d	6–12 d	Once at least 12 h after CP
cTnI	23,500	3–12	24 h	5–10 d	Once at least 12 h after CP
cTnT	33,000	3–12	12 h–2 d	5–14 d	Once at least 12 h after CP
MB-CK	86,000	3–12	24 h	48–72 h	Every 12 h × 3*
MM-CK tissue isoform	86,000	1–6	12 h	38 h	60–90 min after CP
MB-CK tissue isoform	86,000	2–6	18 h	Unknown	60–90 min after CP
Enolase	90,000	6–10	24 h	48 h	Every 12 h × 3
LD	135,000	10	24–48 h	10–14 d	Once at least 24 h after CP
MHC	400,000	48	5–6 d	14 d	Once at least >2 d after CP

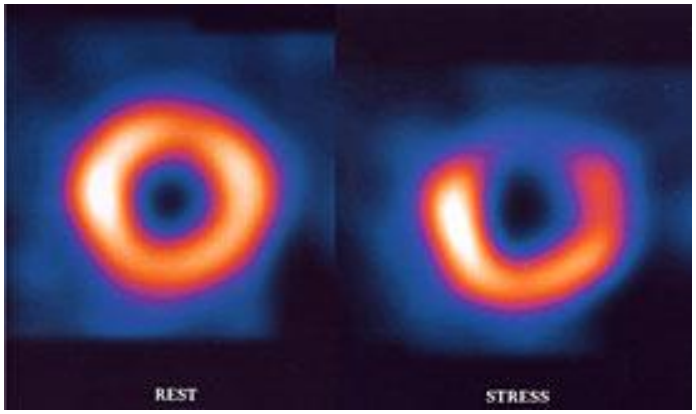
hFABP = heart fatty acid binding proteins; MLC = myosin light chain; cTnI = cardiac troponin I; cTnT = cardiac troponin T; MB-CK = MB isoenzyme of creatine kinase (CK); MM-CK = MM isoenzyme of CK; LD = lactate dehydrogenase; MHC = myosin heavy chain; CP = chest pain.

* Increased sensitivity can be achieved with sampling every 6 or 8 h.

Braunwald 1202

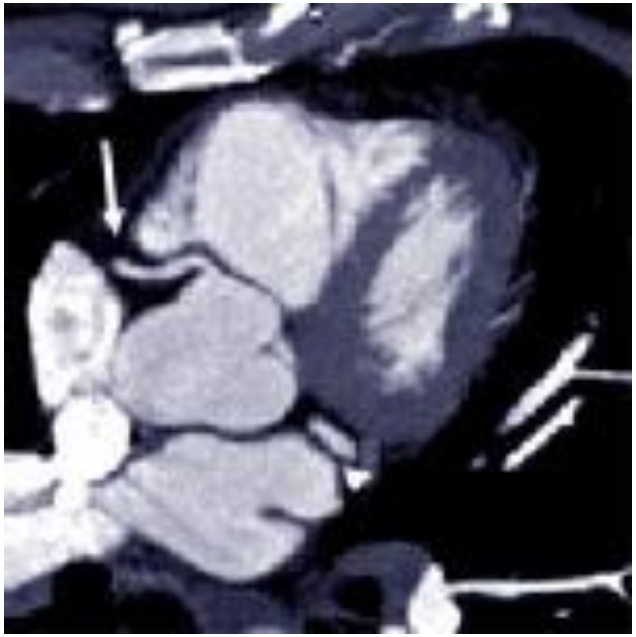
Imaging – Stress Test

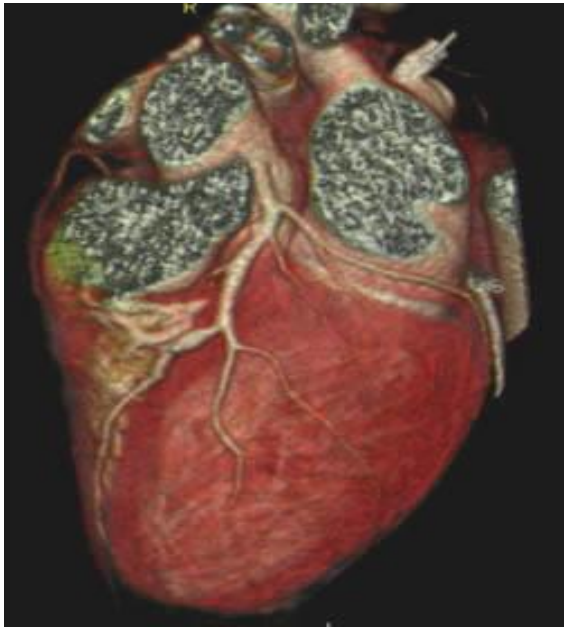
- Identifies changes in perfusion using a radioactive tracer at rest and during exercise



Imaging – CT Coronary Angiogram

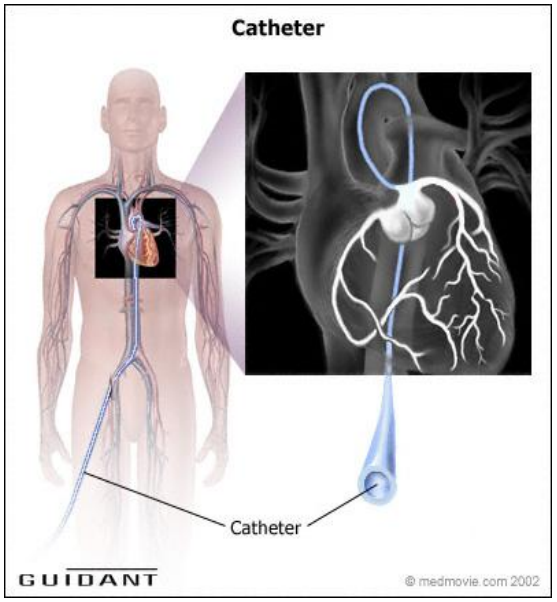
- Timed administration of contrast dye to look at coronaries

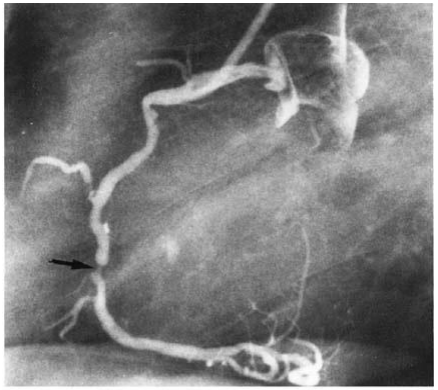




Imaging – Cardiac Catheterization

- Higher risk
- Patient must be admitted into the hospital
- Can view degree of blockage *and* intervene





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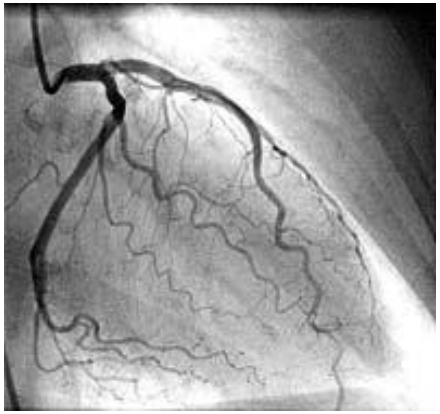
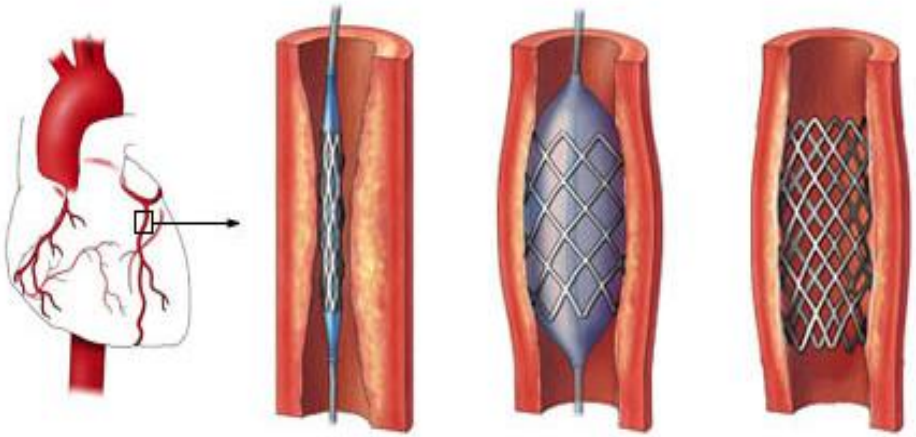
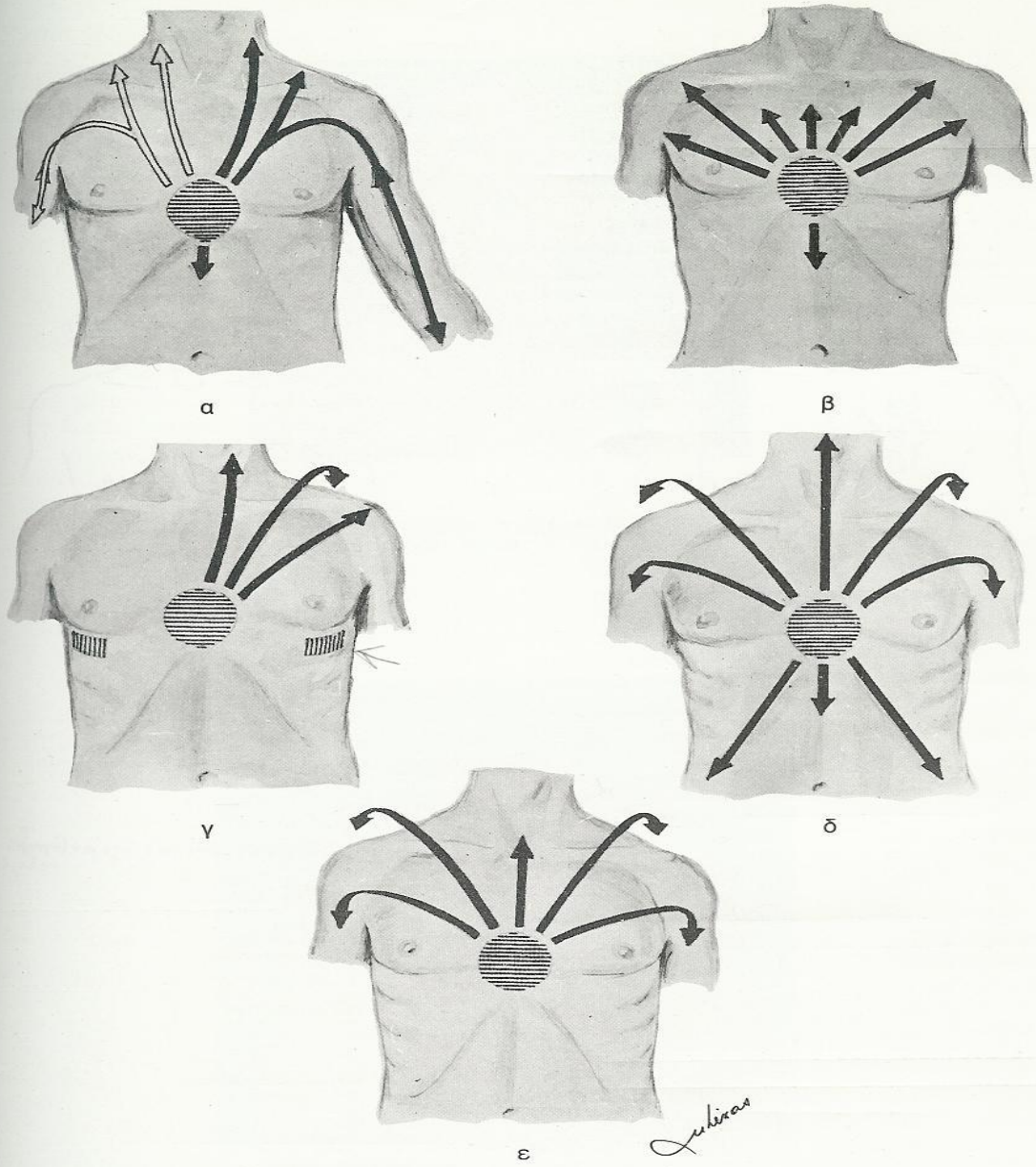


Myocardial ischemia: Treatment



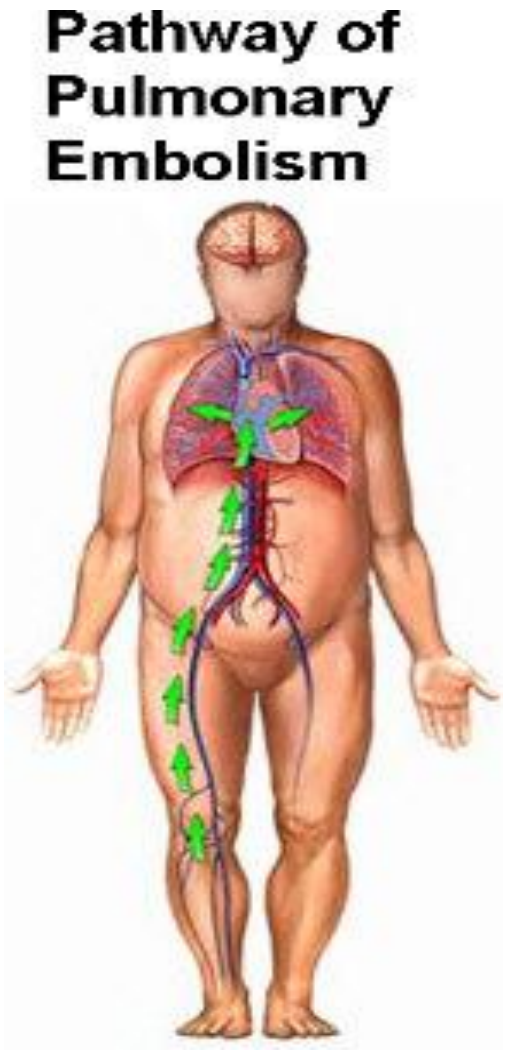
http://www.mayoclinic.com/health/coronary-angioplasty/MM00048



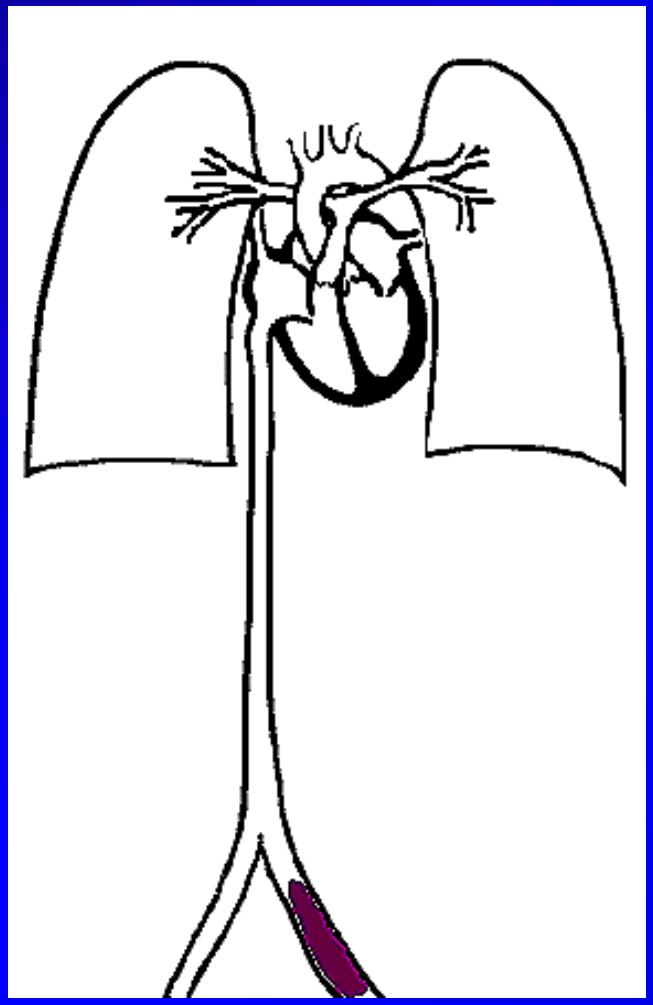
Σχ. 93 – Ἐντόπισις καὶ ἀντανακλάσεις τῶν κυριωτέρων θωρακικῶν ἀλγῶν
α. Ἰσχαιμία μυοκαρδίου
β. Πνευμονικὴ ἐμβολὴ
γ. Περικαρδῖτις
δ. Διαχωριστικὸν ἀνεύρυσμα
ε. Οἰσοφαγῖτις

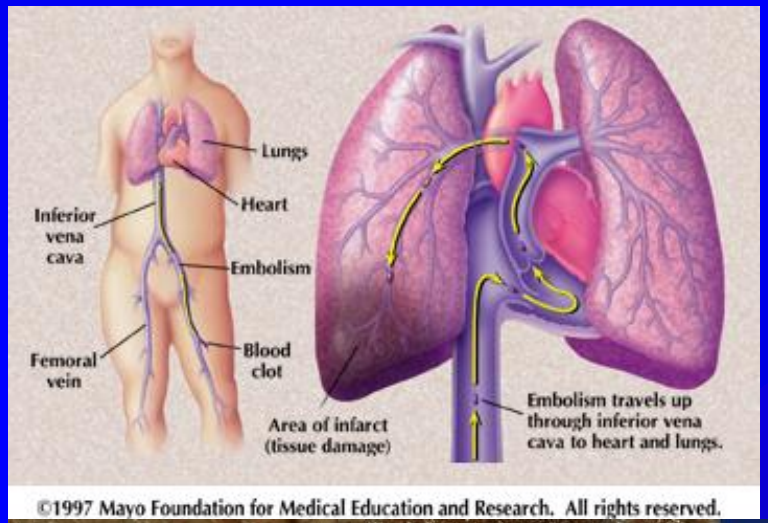
Pulmonary Embolism

- Clot in the arteries leading to the lungs
- Usually forms in the venous system in legs or pelvis
- Approximately 500,000 patients are diagnosed with PE annually in the US, resulting in 200,000 deaths
- Estimated that half of all patients with PE remain undiagnosed
- Without treatment, 30% mortality rate; with proper treatment, mortality decreases to 2-8%



Pulmonary Embolism





Pulmonary Embolus Risk Factors

- Hypercoaguability
  - Malignancy, pregnancy, estrogen use, factor V Leiden, protein C/S deficiency
- Venous stasis
  - Bedrest > 48 hours, recent hospitalization, long distance travel
- Venous injury
  - Recent trauma or surgery

Pulmonary Embolism

- History: Pleuritic chest pain (pain is worse when taking a deep breath), sudden onset, difficulty breathing, history of stasis, past clots, or leg swelling/pain
- Exam: wheezing in the lung, rapid heart rate, low blood pressure, usually normal oxygen saturation, leg swelling (unilateral often)
- Test: D-dimer, V/Q scan, chest CT
- Treatment: anti-coagulation (“blood thinners”); consider thrombolytics (“clot-busters”) or surgical removable if severe

PE Diagnosis

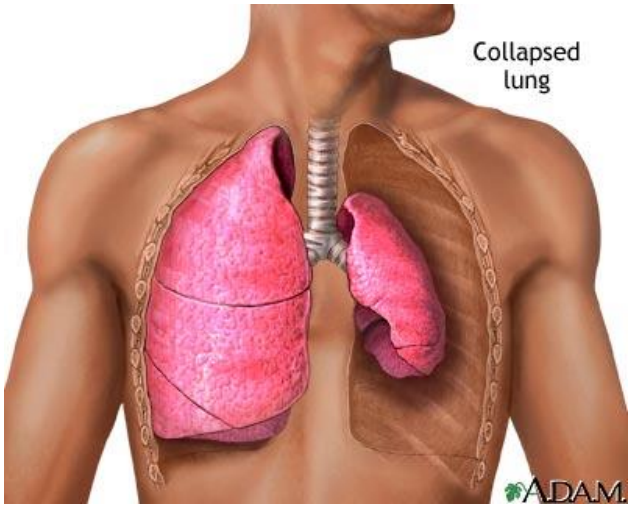
- D-dimer
  - Very sensitive in low to moderate probability
  - Not sensitive enough for high probability
  - Not specific (Lots of false positives)
- Spiral CT
  - Current gold standard
  - Quick and available
  - Caution if impaired creatinine clearance
- V/Q
  - Many studies will be “Indeterminate”

.

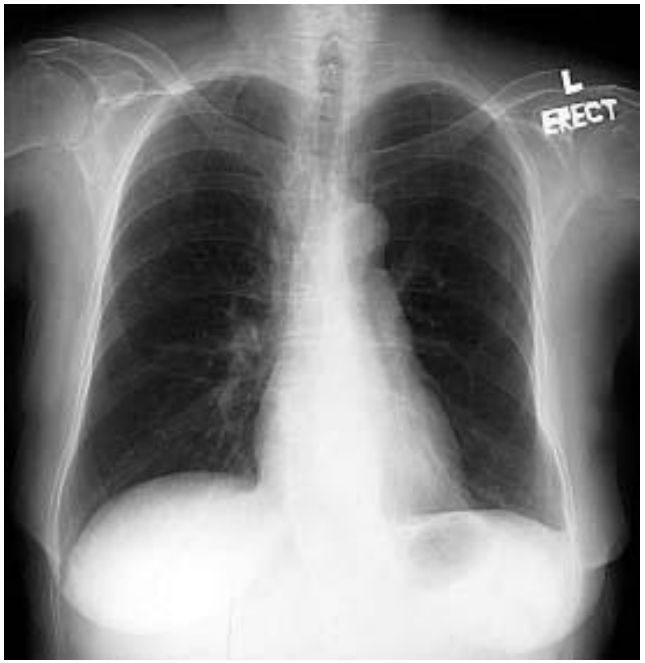
Pulmonary Embolism

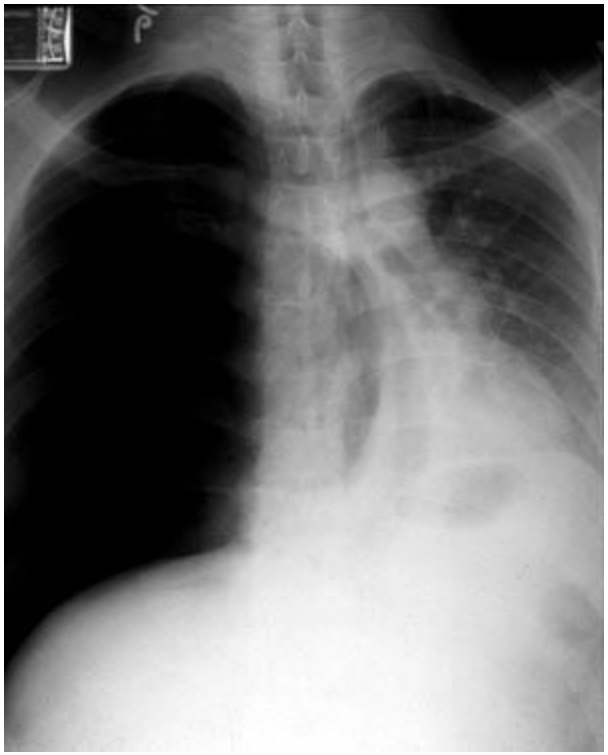
Tension Pneumothorax

- Occurs when air can get into chest but can’t get out
- Collapses lung and puts pressure on vessels/heart leading rapidly to dangerously low blood pressure
- Clinical Diagnosis: sudden onset of shortness of breath, low blood pressure, and rapid heart rate; absent breath sounds over affected hemithorax; seen in young and old
- Treatment: immediate needle thoracostomy to relieve pressure followed by chest tube

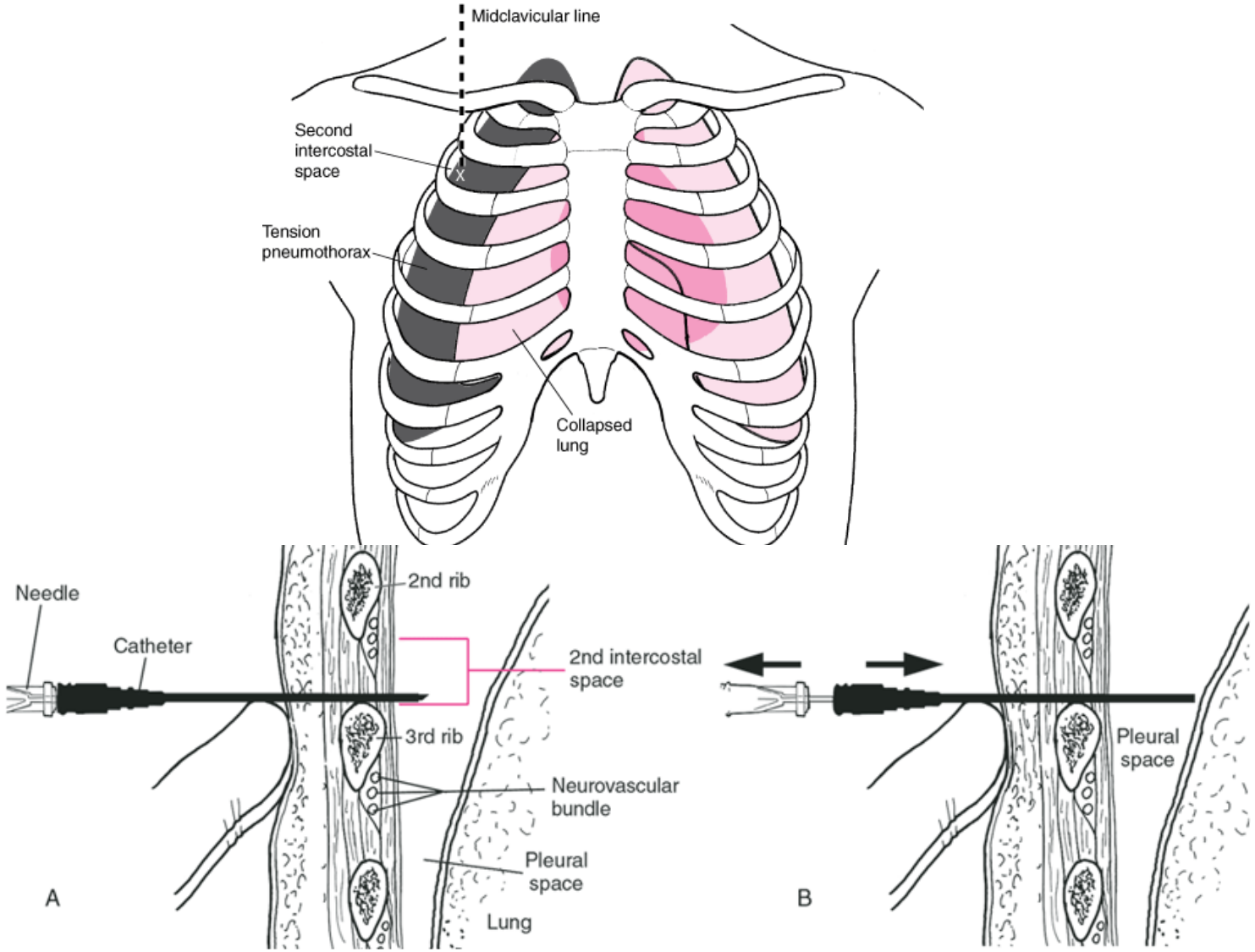


Tension Pneumothorax

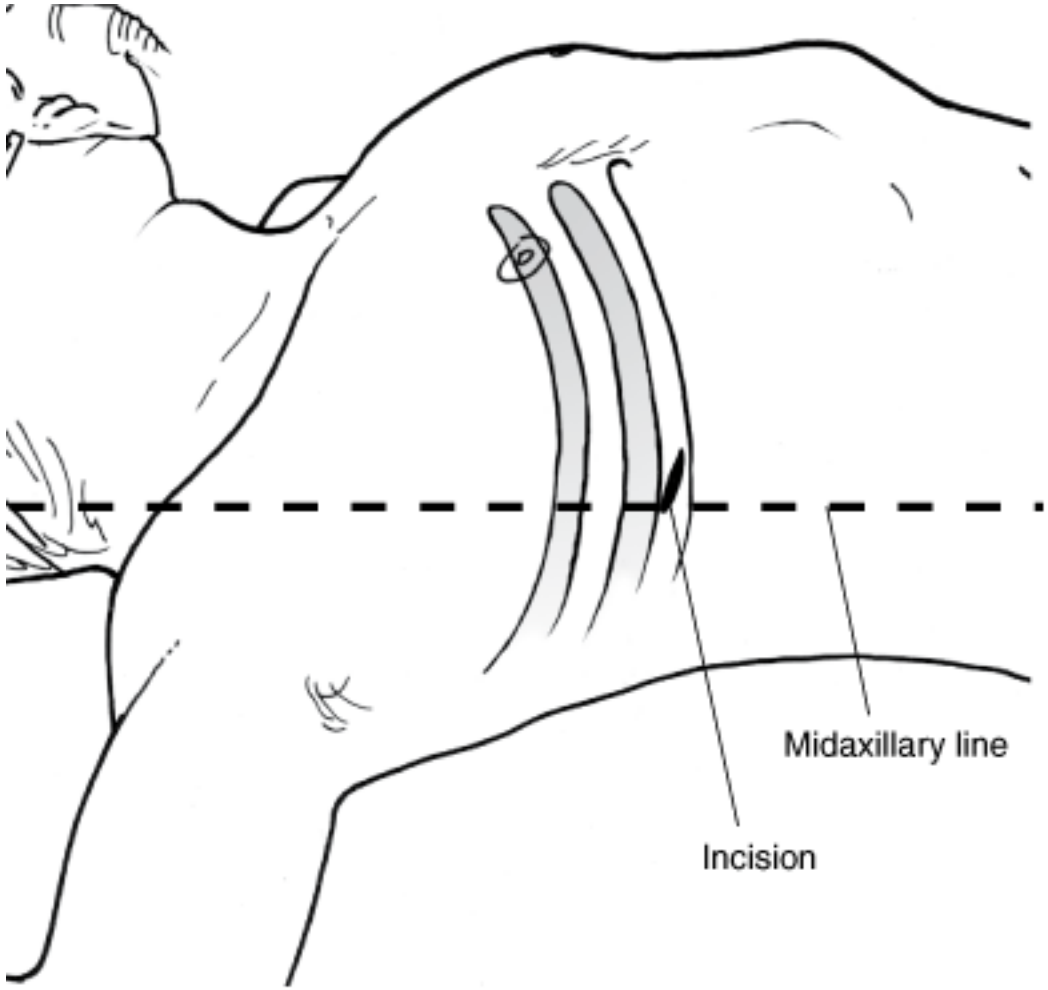




Needle Decompression



Source: Reichman EF, Simon RR: *Emergency Medicine Procedures*: http://www.accessemergencymedicine.com.

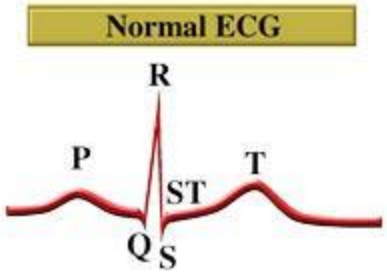


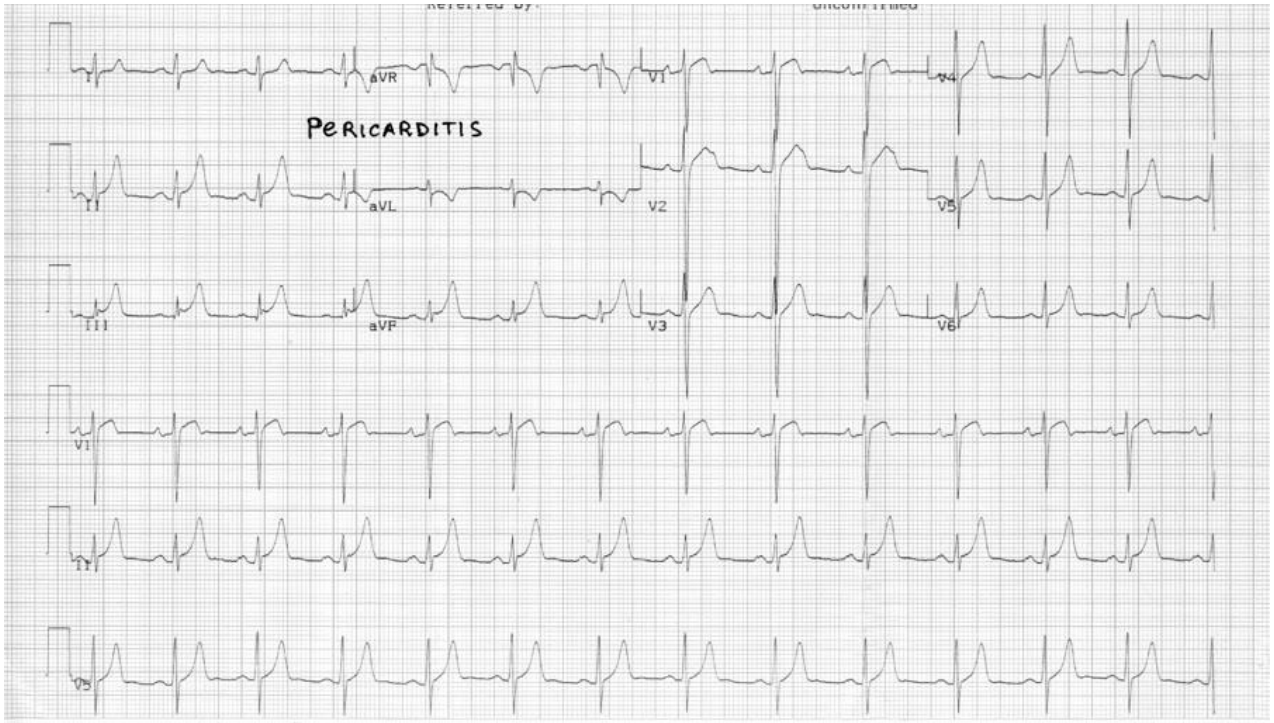
Source: Reichman EF, Simon RR: *Emergency Medicine Procedures*: http://www.accessemergencymedicine.com.

Pericarditis with tamponade

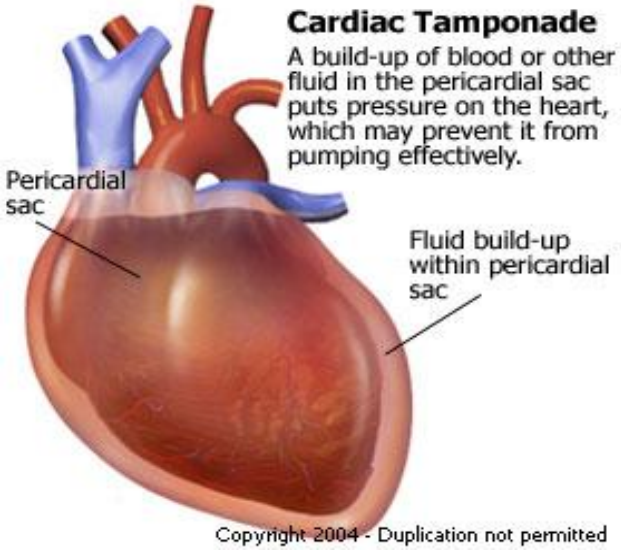
- Pericarditis is an infection of the tissues surrounding the heart
- Inflammation causes build-up of fluid in the closed space around the heart
- History: hours to days of sharp chest pain, often positional (better when leaning forward), shortness of breath
- Exam: rapid heart rate, low blood pressure, friction rub
- Tests: Diffuse ECG ST segment elevation, chest x-ray, echocardiography, chest CT
- Treatment: treat underlying cause, NSAIDS, drain fluid with pericardiocentesis

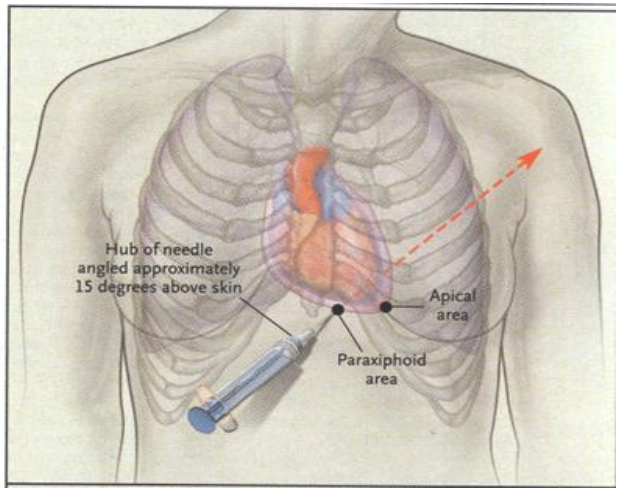
Pericarditis





Tamponade

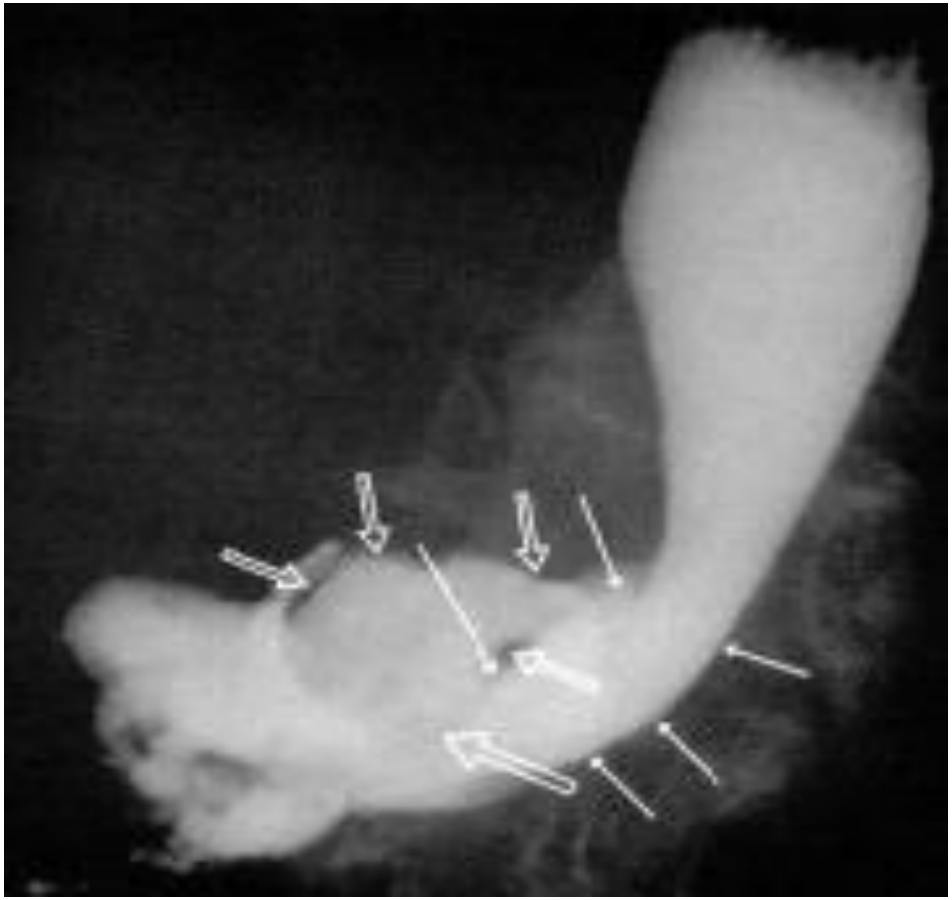

Cardiac Tamponade
A build-up of blood or other fluid in the pericardial sac puts pressure on the heart, which may prevent it from pumping effectively.
Pericardial sac
Fluid build-up within pericardial sac
Copyright 2004 - Duplication not permitted


Hub of needle angled approximately 15 degrees above skin
Apical area
Paraxiphoid area

Esophageal rupture

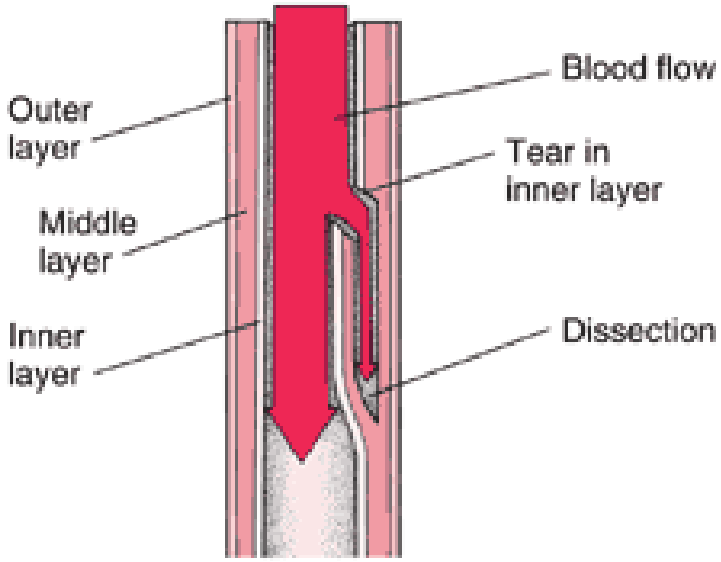
- Tear through the wall of the esophagus, allowing GI contents to leak into the mediastinum; usually occurs after significant vomiting or caustic ingestion
- Older individual with known gastrointestinal problems.
- History: Often recent violent emesis, foreign body, caustic ingestion, blunt trauma, alcoholism, esophageal disease; acute onset of localized pain
- Exam: subcutaneous air (air in the soft tissue beneath the skin), decreased lung sounds
- Tests: Chest x-ray, contrast esophagram, chest CT
- Treatment: immediate antibiotics and surgery
- 90% mortality if not treated within 24 hours

Esophageal Rupture



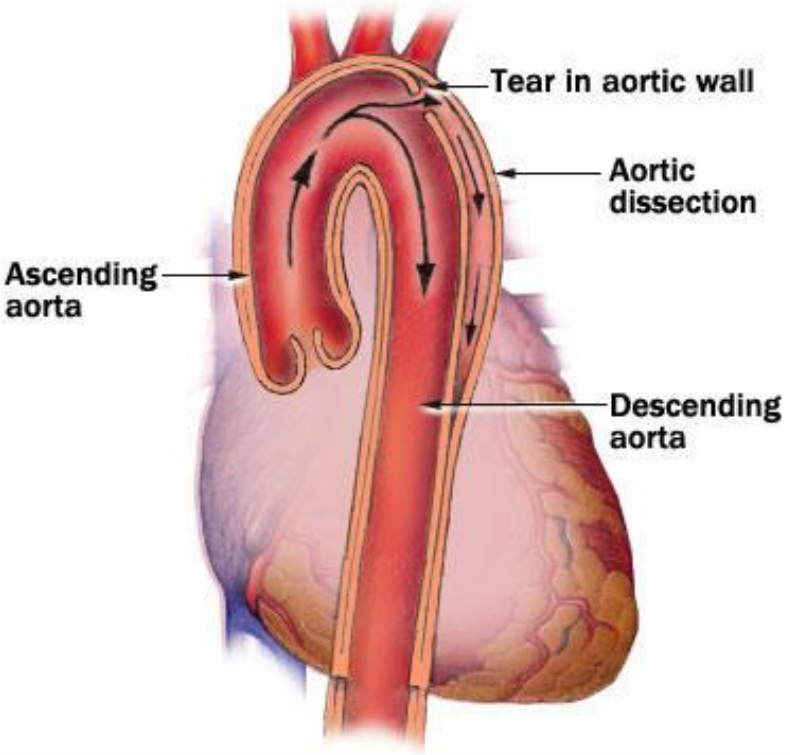
Aortic Dissection

- Blood violates aortic intimal and adventitial layers
- False lumen is created
- Dissection may extend proximally, distally, or in both directions

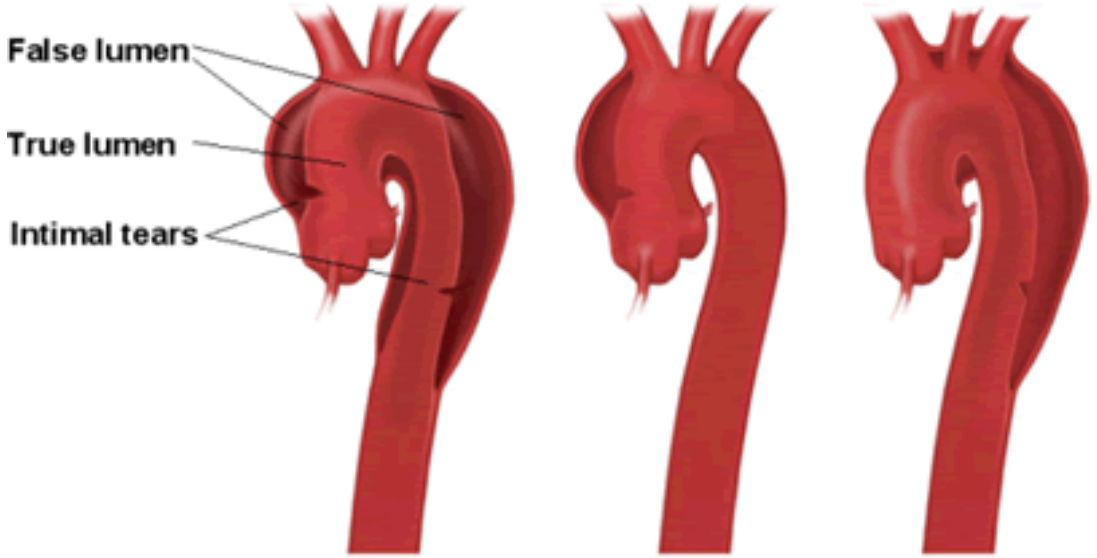


Aortic Dissection

- 1 per 100,000 population with a mortality rate exceeding 90% if misdiagnosed
- Large arteries have three layers
  - If a tear occurs in the inner vessel wall, blood can track between the layers
  - Artery can rupture and dissection can progress
  - Decreased perfusion and massive bleeding
- Location determines severity



Anatomy and Classification of Aortic Dissection



Aortic Dissection

- Bimodal distribution
  - Young: Connective tissue (Marfan) or pregnancy
  - Older: Most commonly > 50 (mean age 63)
- Risk factors
  - Male: 66% of patients
  - Hypertension: 72% of patients
  - Connective tissue disease
    - 30% of Marfan's patients get dissections
  - Cocaine Use
  - Syphilis

Aortic Dissection

- Presentation (Difficult clinical diagnosis)
  - 85% have chest or back pain
  - “Ripping” or “tearing” in 50%
  - Neurologic symptoms in 20%
  - Hematuria
  - Asymmetric pulses

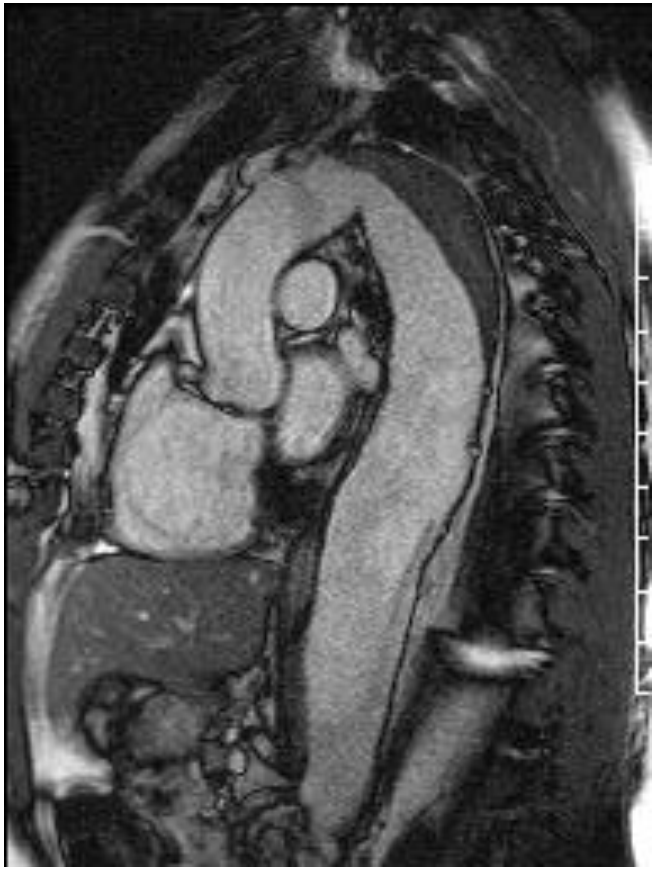
Aortic Dissection

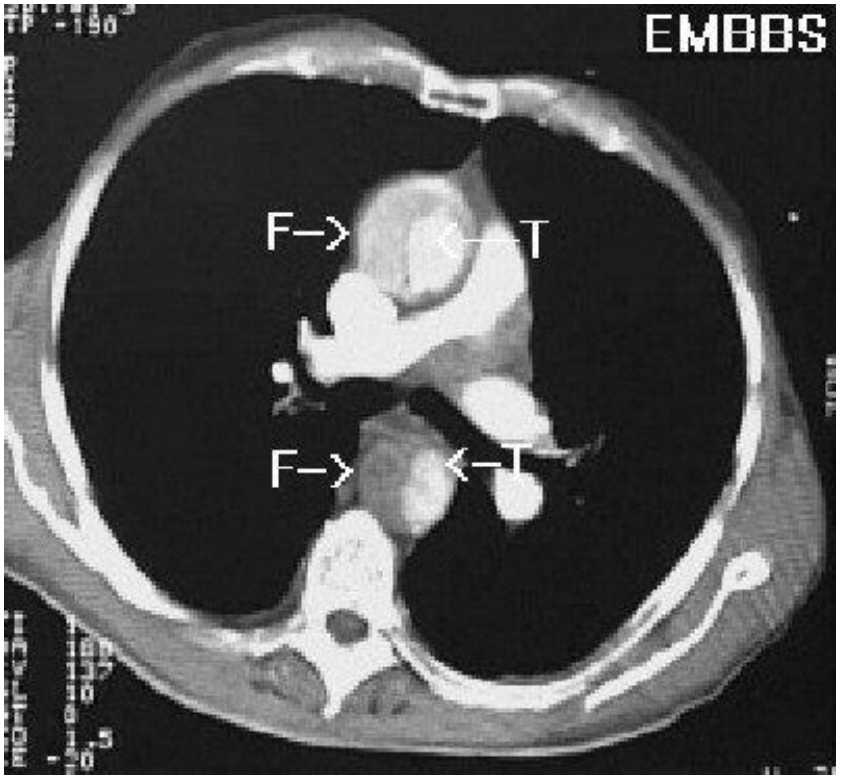
- History: Ripping/tearing chest/back pain radiating to the shoulder blade, may migrate, middle aged, high blood pressure, arterial disease
- Physical: signs of blood loss (low BP, rapid heart rate), high blood pressure, ischemia, new murmur
- Test: looking for markers, chest x-ray, and CT angiogram
- Treatment: Medical management or surgery, depending on location and severity

Aortic Dissection Diagnosis

- CXR- Widened mediastinum, abnormal aortic knob, pleural effusions
  - Not sensitive (25% have wide mediastinums)
- Chest CT- Very sensitive and specific
  - Quickly obtained
  - Must think about kidney + contrast
- Angiography- Gold standard
  - Most reliable anatomy of dissection
- *Bedside US* – evaluate aorta and look at heart to r/o tampanode.

Aortic Dissection





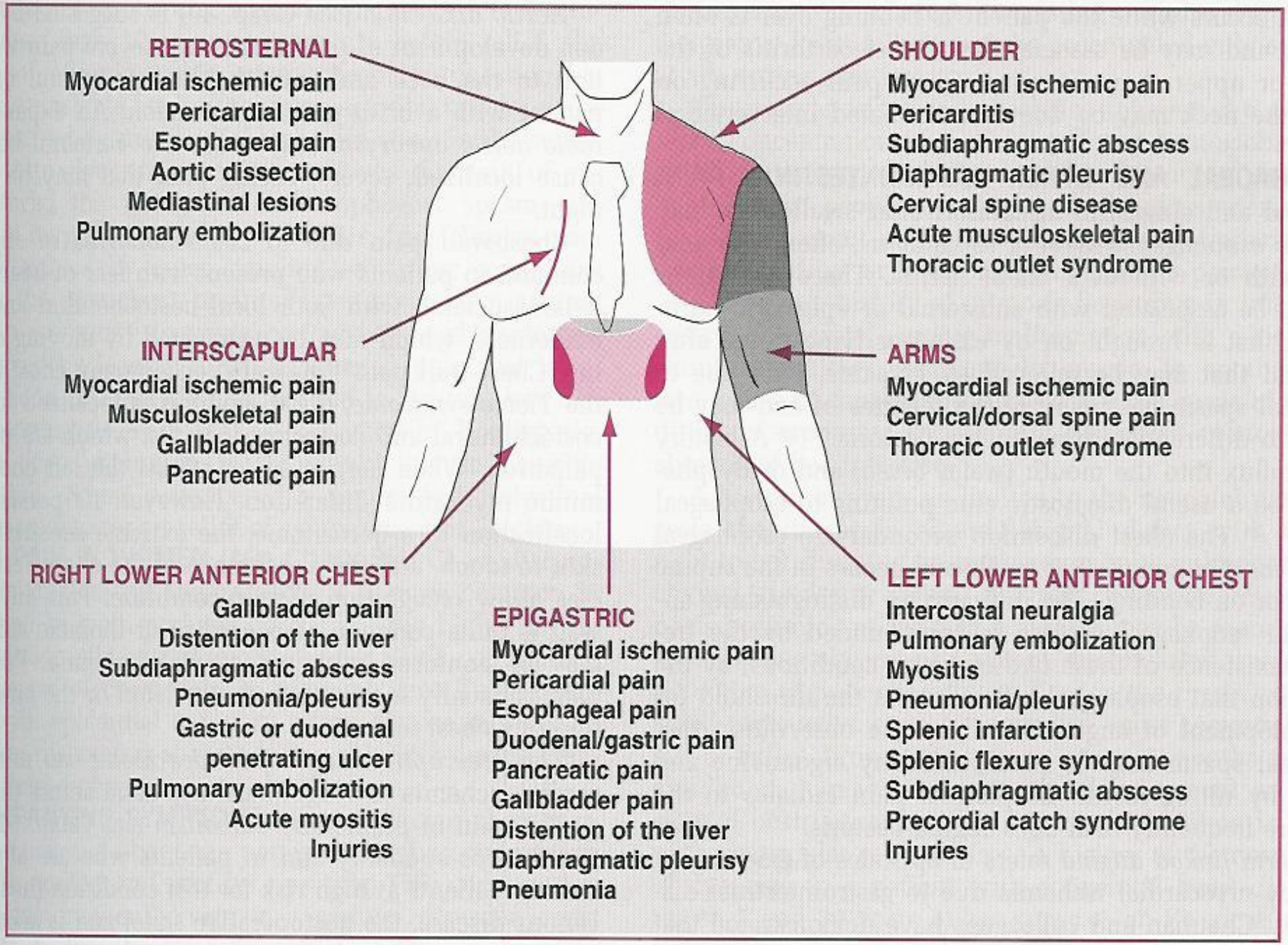


FIGURE 3–3. Differential diagnosis of chest pain according to location where pain starts. Serious intratho-