Essential Knowledge in Cardiovascular Medicine

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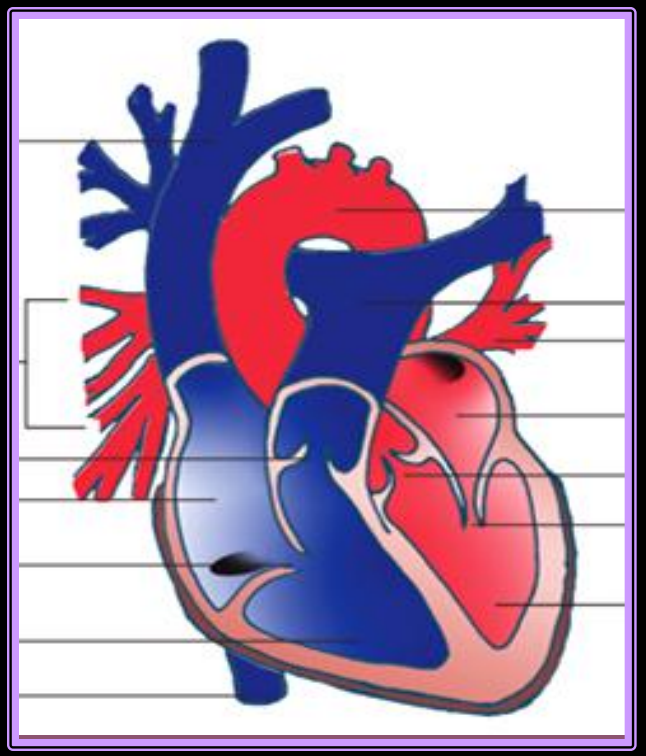
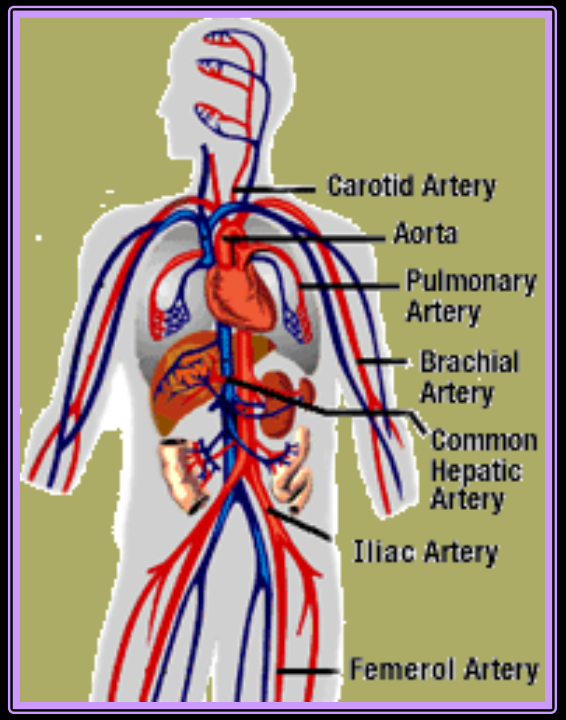
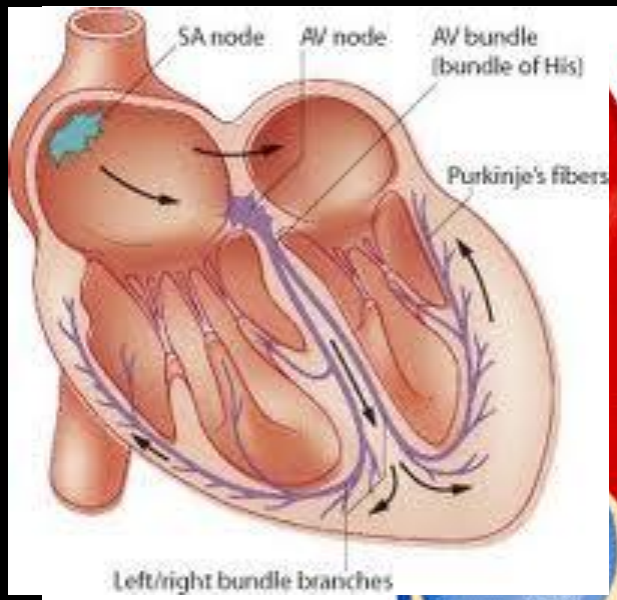


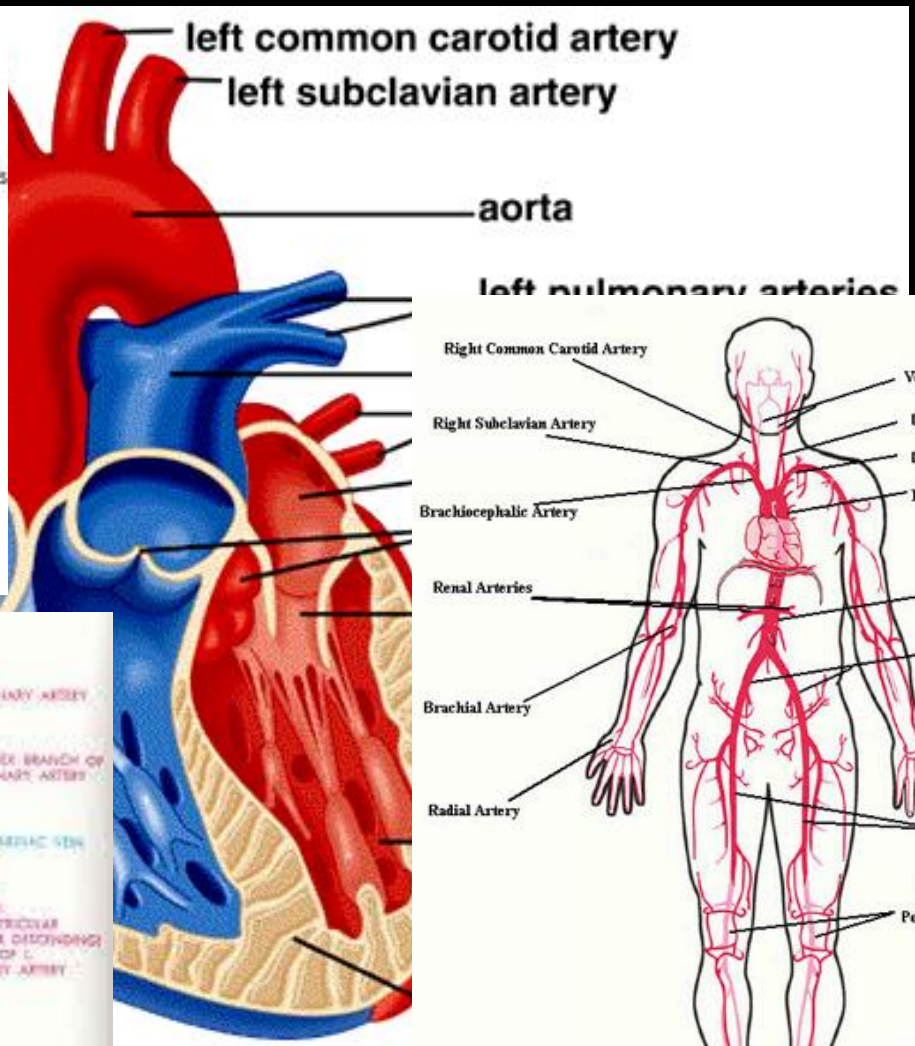
HEART DISEASES

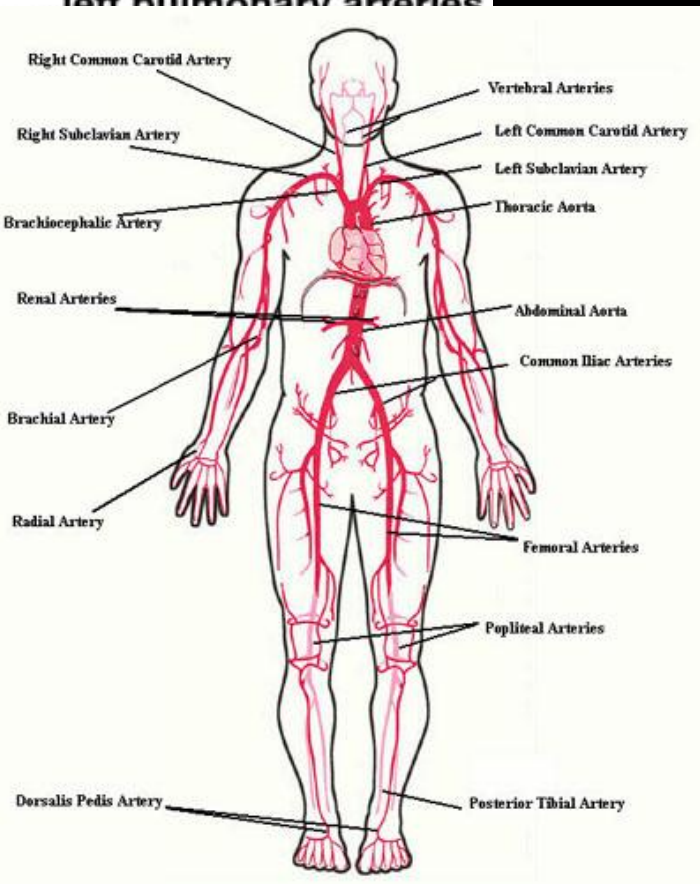


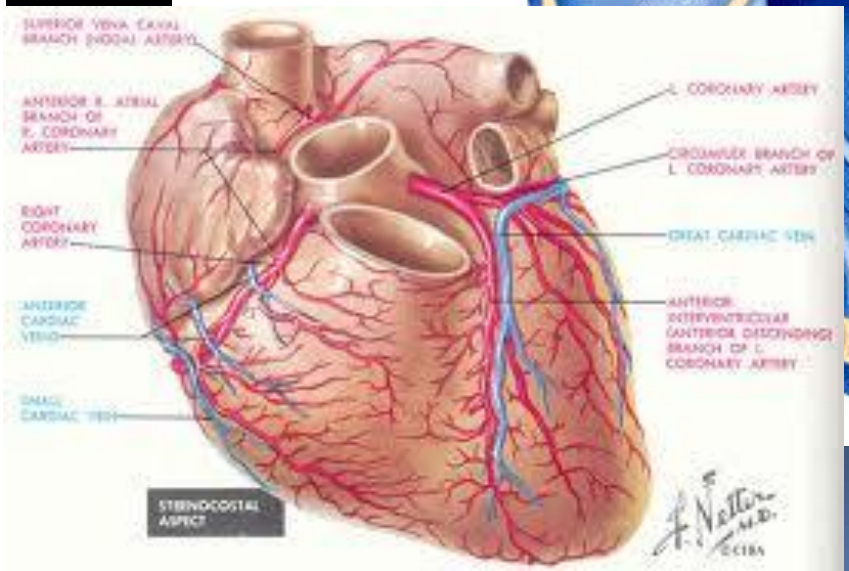
VASCULAR DISEASES

CARDIOVASCULAR DISEASES





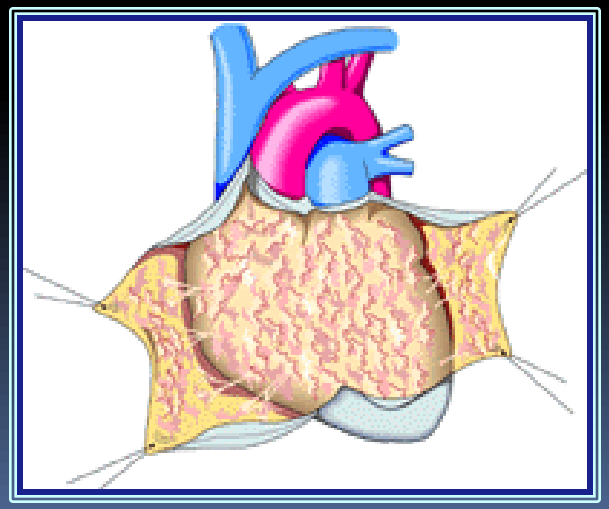




CARDIOVASCULAR DISEASES

- Endocardium:
  - Valvular heart disease
  - Infective endocarditis
- Myocardium:
  - Ischemic heart disease
  - Myocarditis
  - Cardiomyopathy
- Pericardial disease:
  - Pericarditis
  - Pericardial effusion
- Aortic disease :
  - Aortic aneurysm
  - Aortic dissection
- Coronary heart disease
- Congenital heart disease
- Arrhythmias
- Hypertension
- Peripheral arterial disease
  - Carotid artery stenosis
  - Renal artery stenosis
  - Extremity artery stenosis
- Miscellaneous
  - Pulmonary artery embolism
  - Pulmonary arterial hypertension
  - Deep vein thrombosis

Pericardial diseases



- Pericarditis
  - acute
  - chronic / recurrent
- Complication of pericarditis
  - cardiac tamponade
  - constrictive pericarditis
- Pericardial effusion
- Congenital anomaly
  - Absent pericardium

Pericardial diseases

- **Pericarditis** : inflammation of pericardium caused by

1. **Infection :** virus, bacteria, fungus,etc.

2. **Neoplastic :** primary, secondary

3. **Immune-related/imflammatory process :** connective tissue disease, post-MI, post pericardiotomy

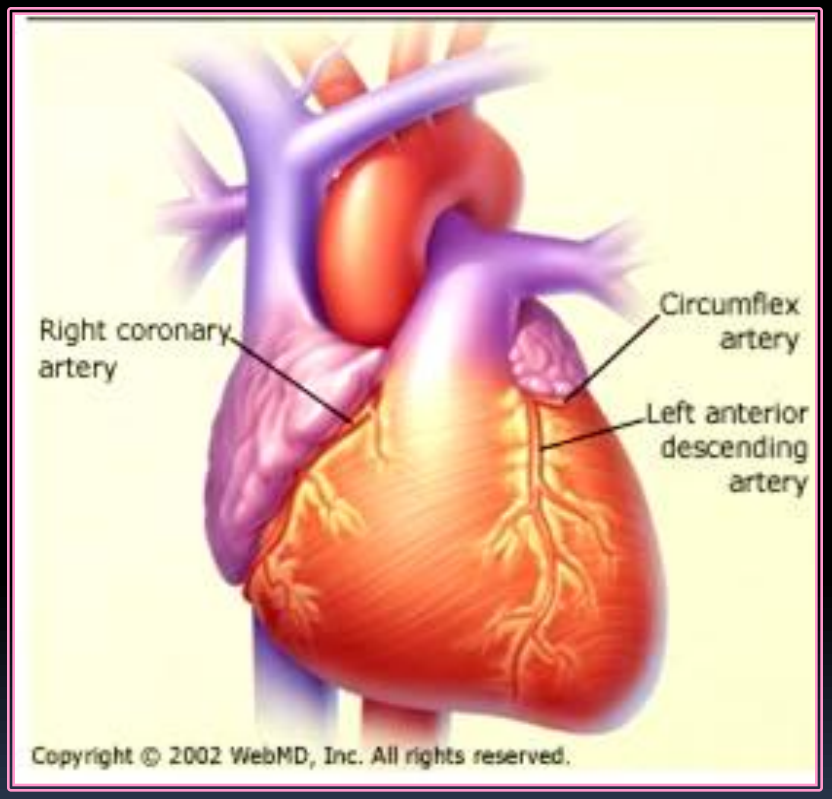
4. **Metabolic :** CRF, hypothyroidism, amyloidosis

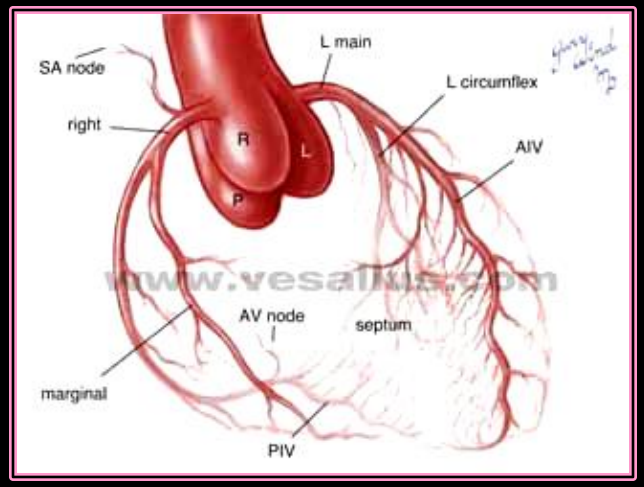
5. **Miscellaneous :** drugs, radiation, trauma

Pericardial diseases

- **Pericardial effusion :**
  - filling of inflammed fluid/blood in pericardial sac
- **Cardiac tamponade :**
  - hemodynamic changes due to increased pericardial pressure (⇧ venous pressure, pulsus paradoxus, ⇩bloodpressure)
- **Constrictive pericarditis :**
  - thickened, calcified pericardium limits diastolic filling of ventricles

Coronary Artery Diseases

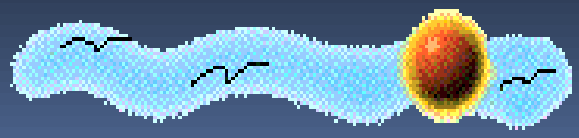




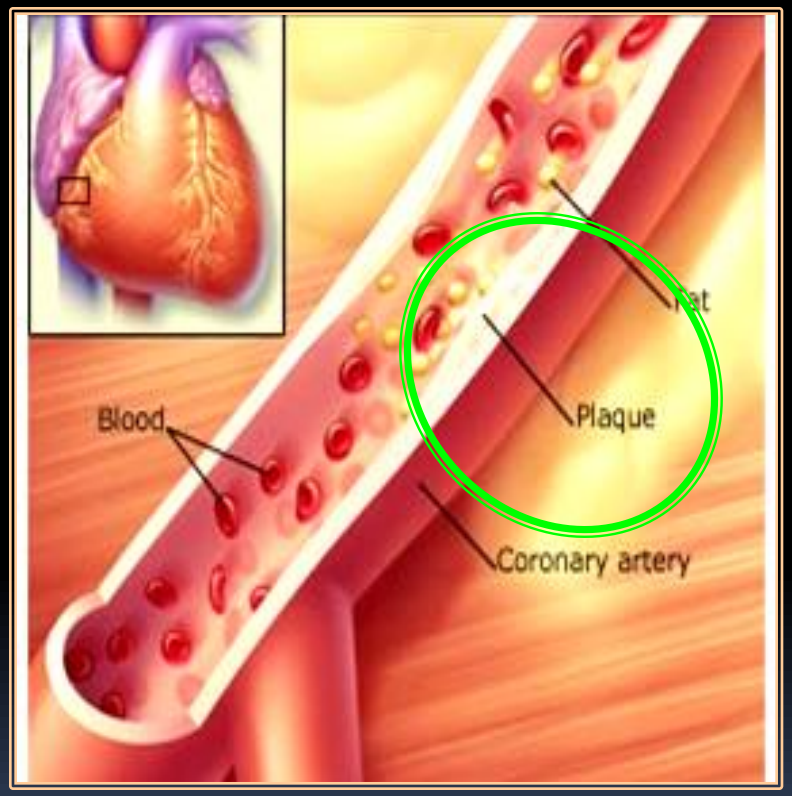
Coronary Artery Diseases

- Atherosclerotic Causes

- Non-atherosclerotic Causes



Atherosclerotic CAD



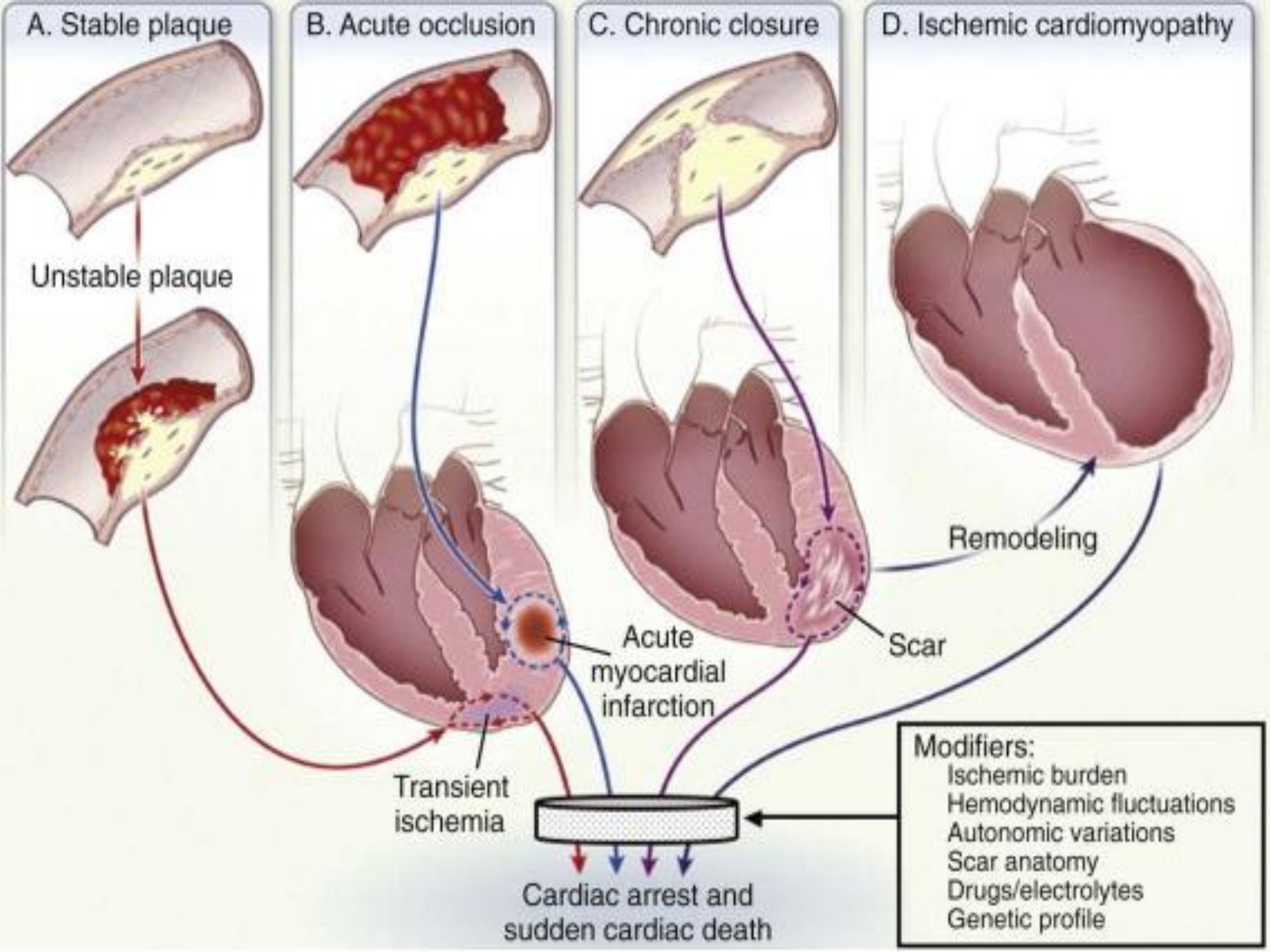
- Acute coronary syndrome (ACS)

1. Acute ST elevation myocardial infarction (STEMI)

2. Acute non-ST elevation myocardial infarction (NSTEMI) / unstable angina (UA)

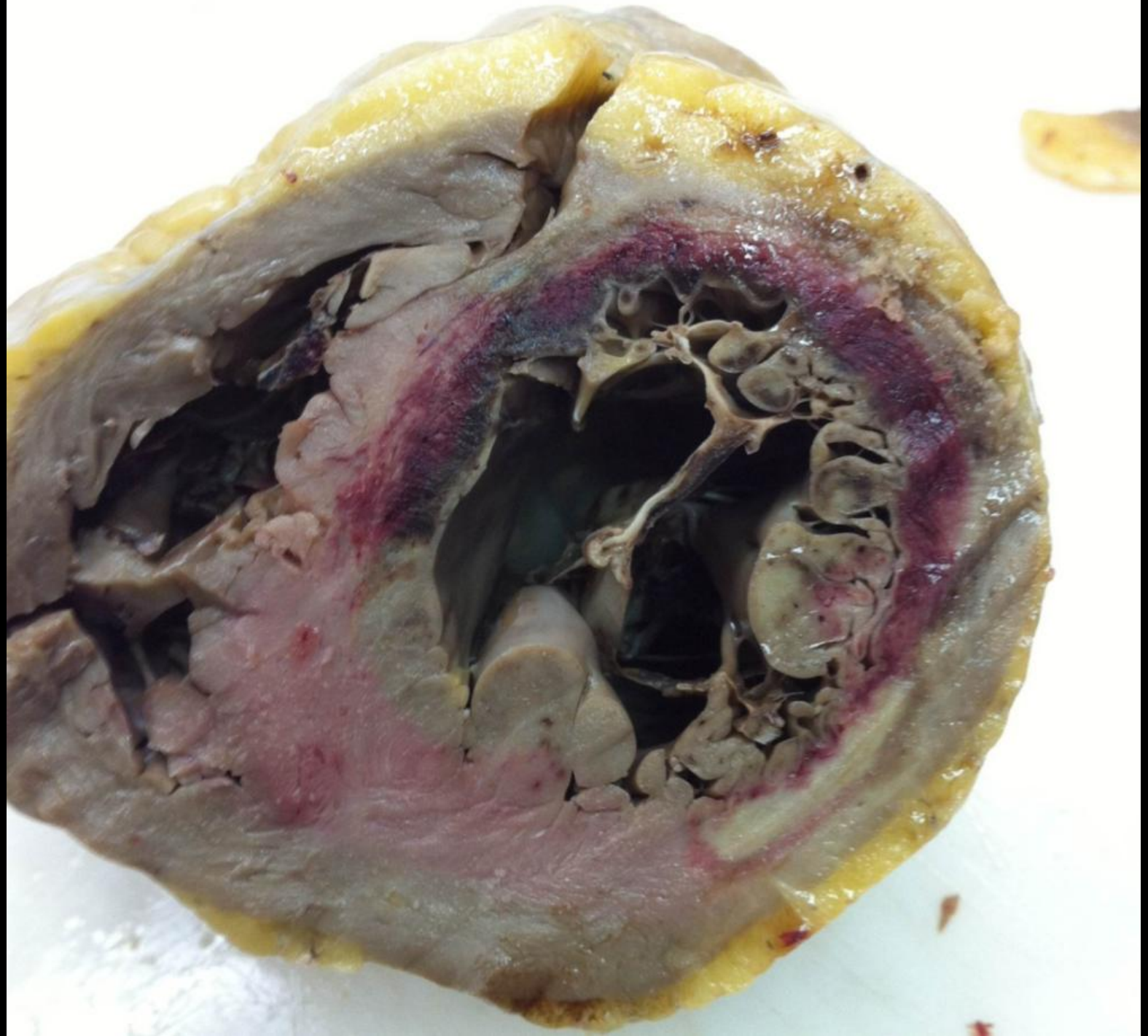
- Chronic stable angina

(chronic ischemic heart disease)

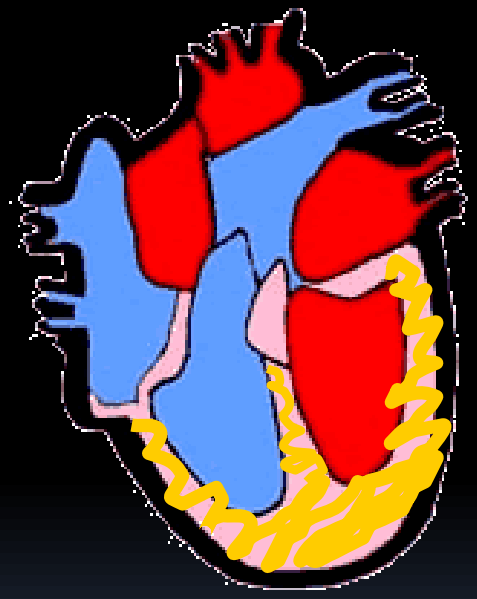

A. Stable plaque
B. Acute occlusion
C. Chronic closure
D. Ischemic cardiomyopathy
Unstable plaque
Remodeling
Acute myocardial infarction
Scar
Transient ischemia
Cardiac arrest and sudden cardiac death
Modifiers:
Ischemic burden
Hemodynamic fluctuations
Autonomic variations
Scar anatomy
Drugs/electrolytes
Genetic profile

Non-atherosclerotic CAD

- Congenital anomalies
- Embolus
- Dissection
- Spasm
- Trauma
- Arteritis
- Metabolic disorder
- Microvascular dysfunction- The cardiac syndrome X
- Intimal proliferation
- External compression – myocardial bridging
- Thrombus without underlying plaque
- Substance abuse
- Disproportion of myocardial O_2 demand-supply



Myocardial Diseases
(Heart Muscle Diseases)



Cardiomyopathy

Disorders of the heart muscle that causes abnormal cardiac performances

☞ **Heart failure**

- systolic failure
- diastole failure
- both

Myocardial Diseases

(Heart Muscle Diseases; Cardiomyopathy*)

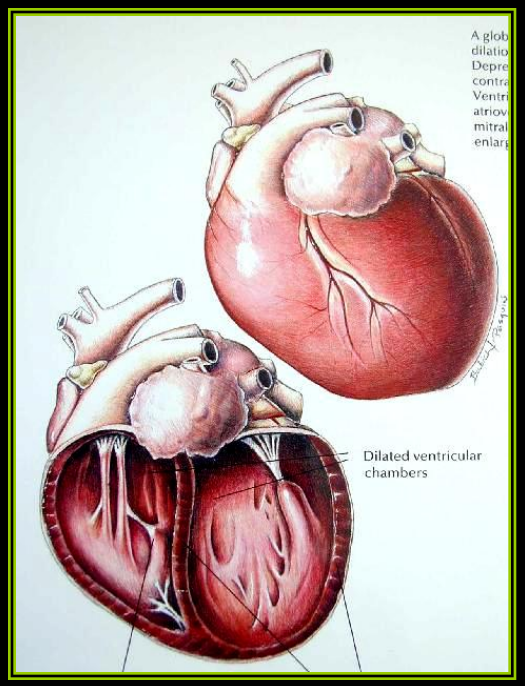
Functional Classification

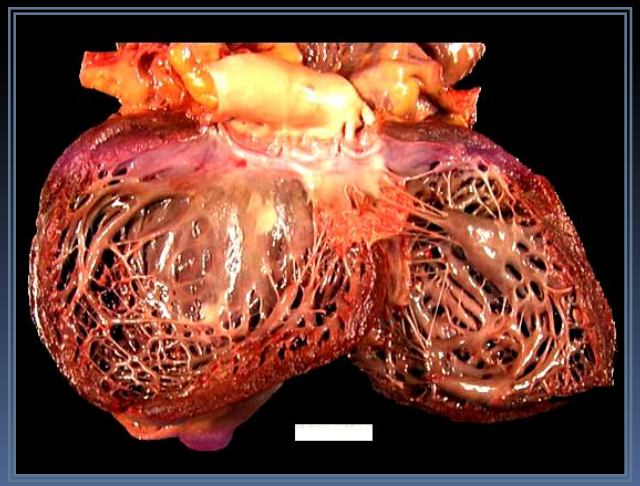
- Dilated CM (DCM)
- Hypertrophic CM (HCM)
- Restrictive CM (RCM)
- ARVC (Arrhythmogenic RV cardiomyopathy) & unclassified CM

Specific cardiomyopathies

- Ischemic CM (⇦ CAD)
- Valvular CM (⇦ VHD)
- Hypertensive CM
- Inflammatory CM (idiopathic, autoimmune, infectious ⇨ myocarditis
- Metabolic CM
- Postpartum CM

Dilated Cardiomyopathy





- Dilated left ventricle

  & poor systolic contraction

  (ejection fraction < 40%)

- **Primary** :

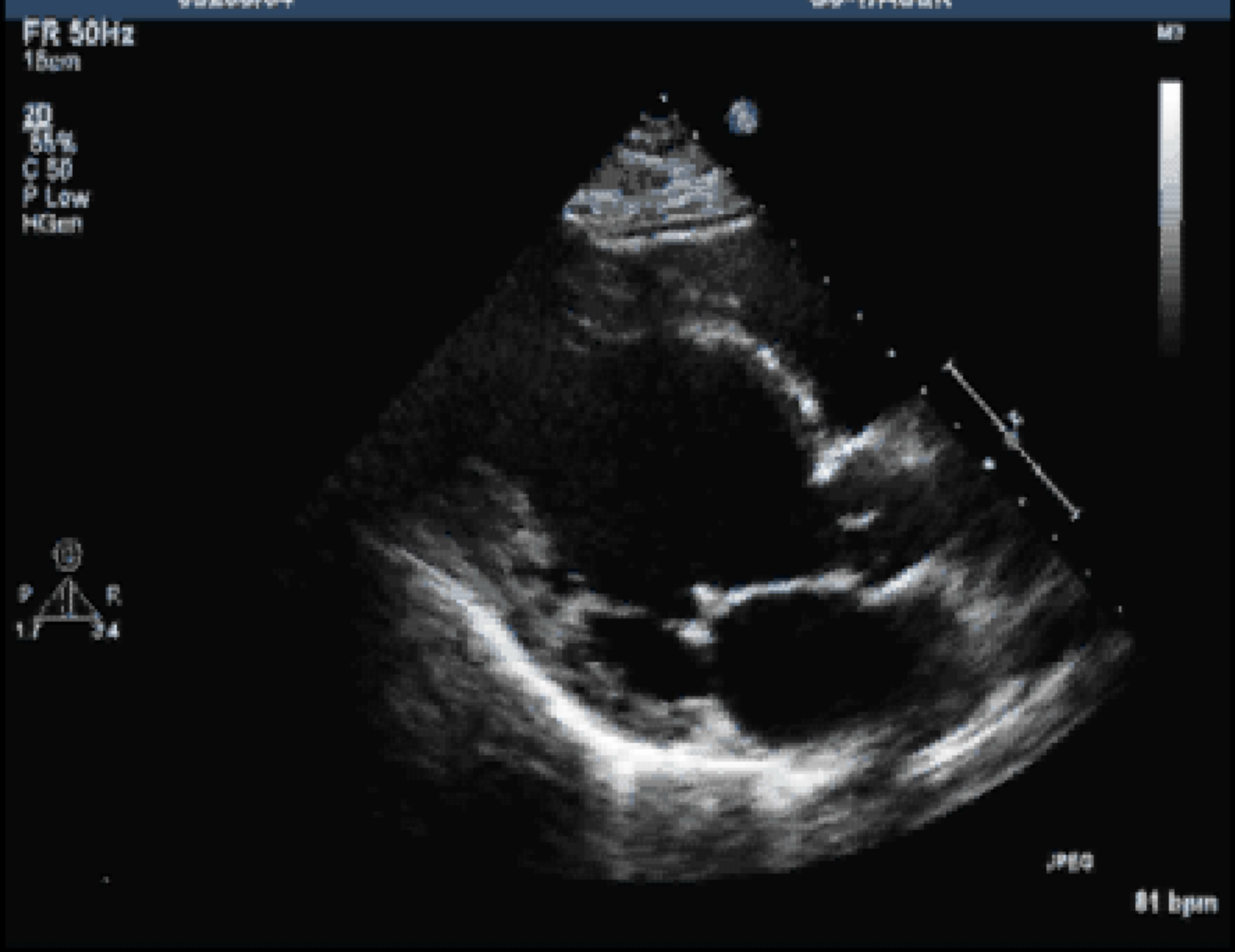
  ⇨ idiopathic DCM

- **Secondary** :

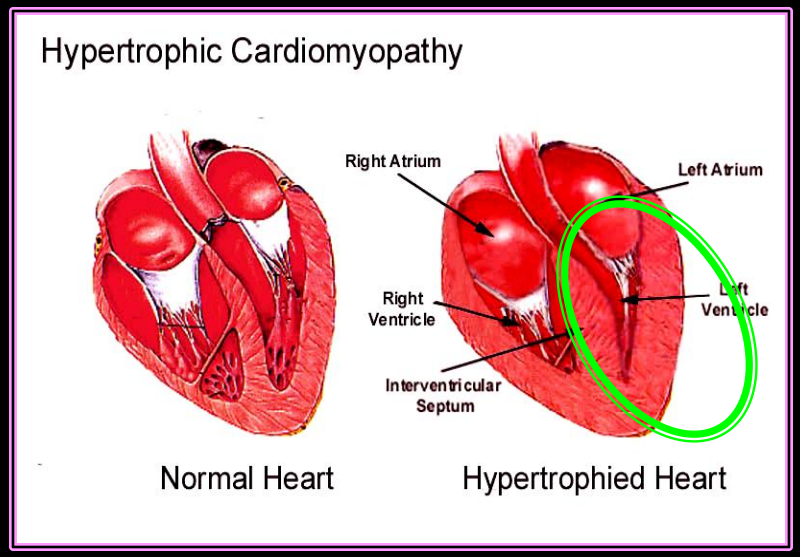
  Ischemia (ICM)

  VHD

  Hypertensive HD, etc.


FR 50Hz
16cm
2D
65%
C 50
P Low
HGain
M2
JPEG
81 bpm

Hypertrophic Cardiomyopathy

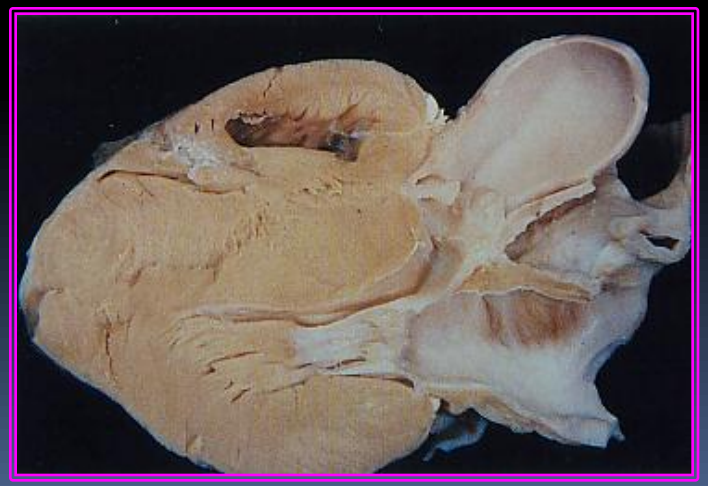


✱ LV hypertrophy

thickening of LV wall

- generalized hypertrophy
- localized septal hypertrophy

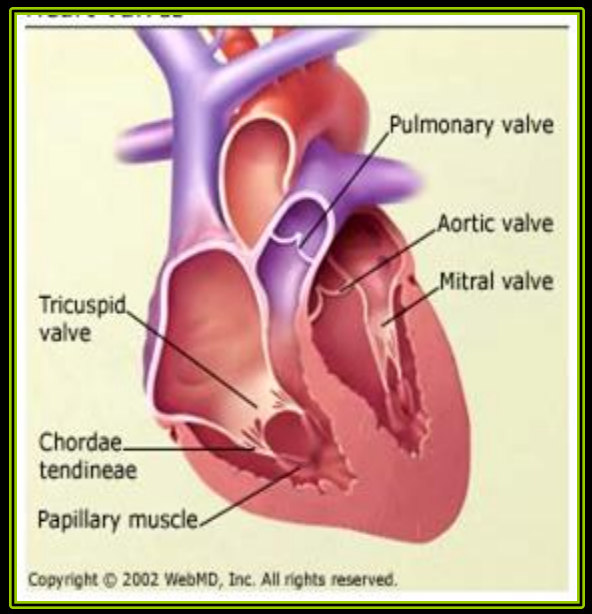
⇨ non-dilated LV cavity

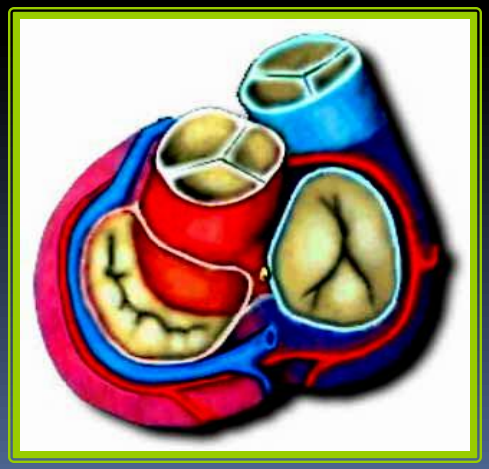


✱ Type

- ◆ obstructive (HOCM)
- ◆ non-obstructive (HCM)

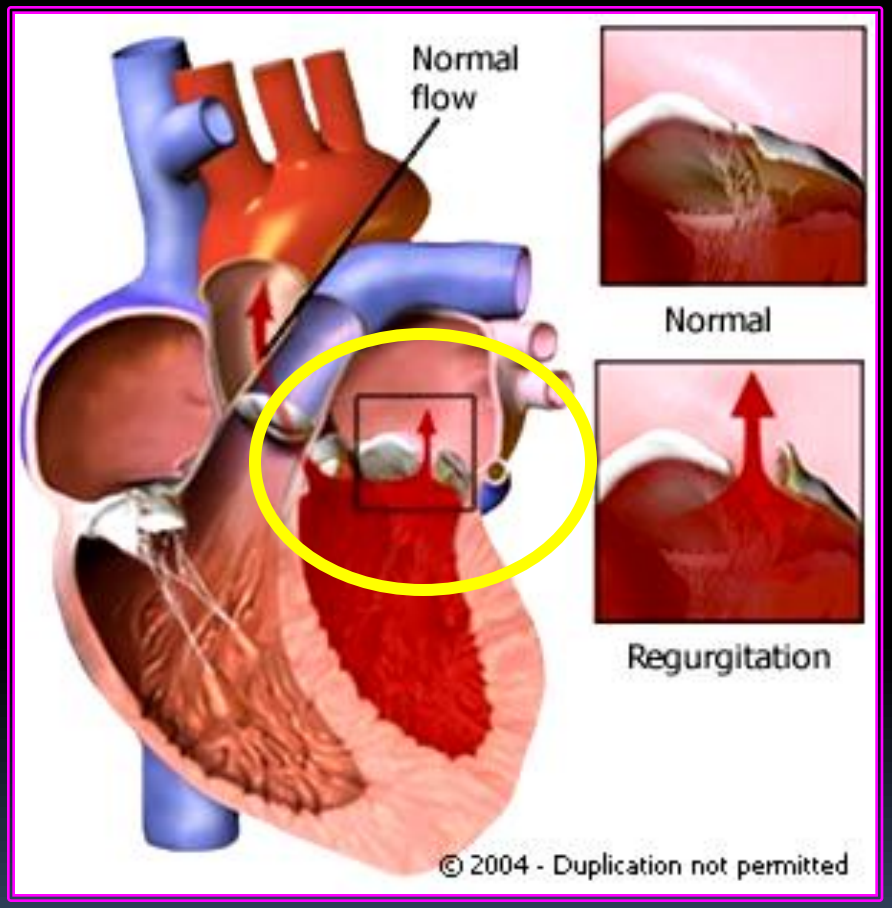
Valvular Heart Diseases

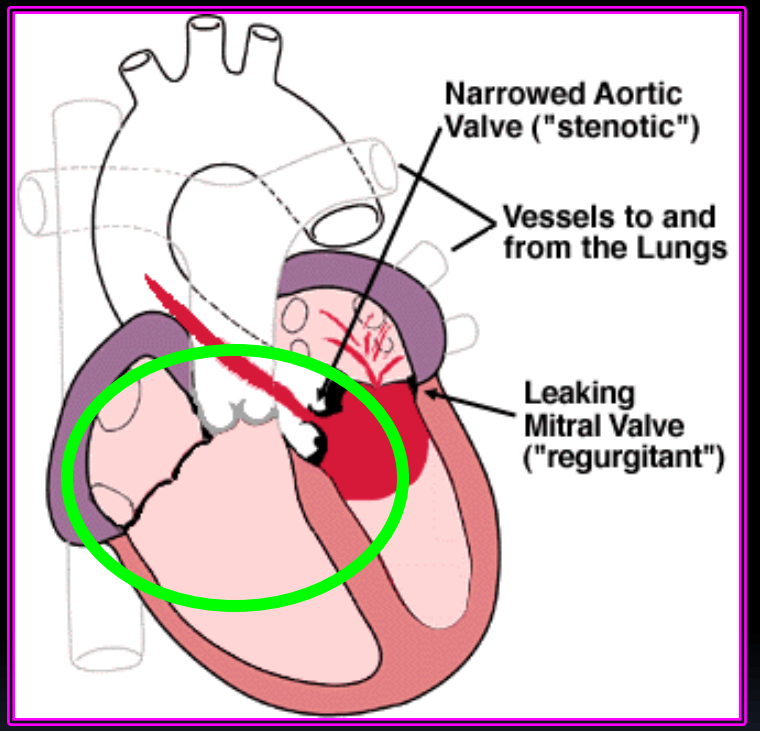


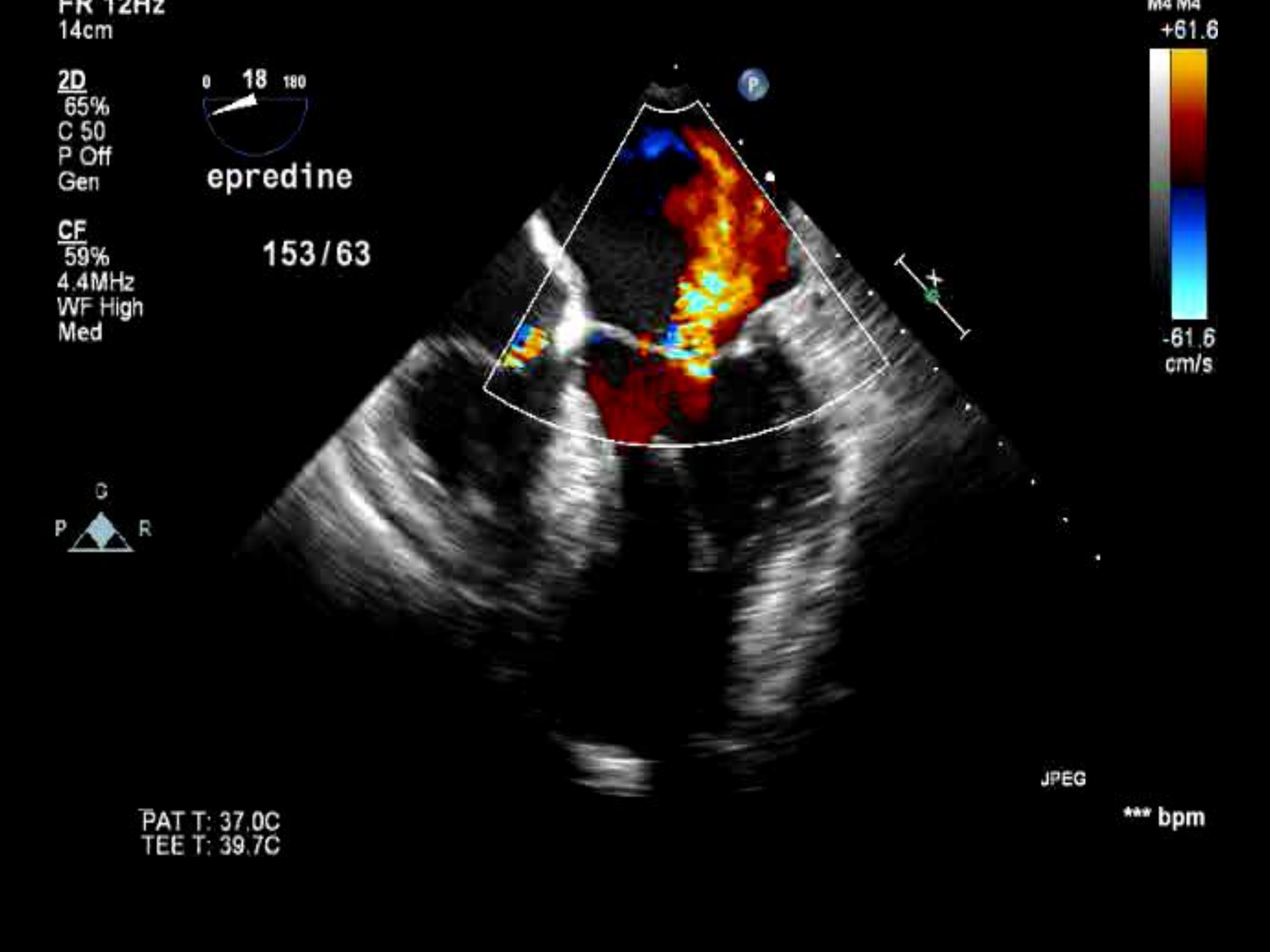


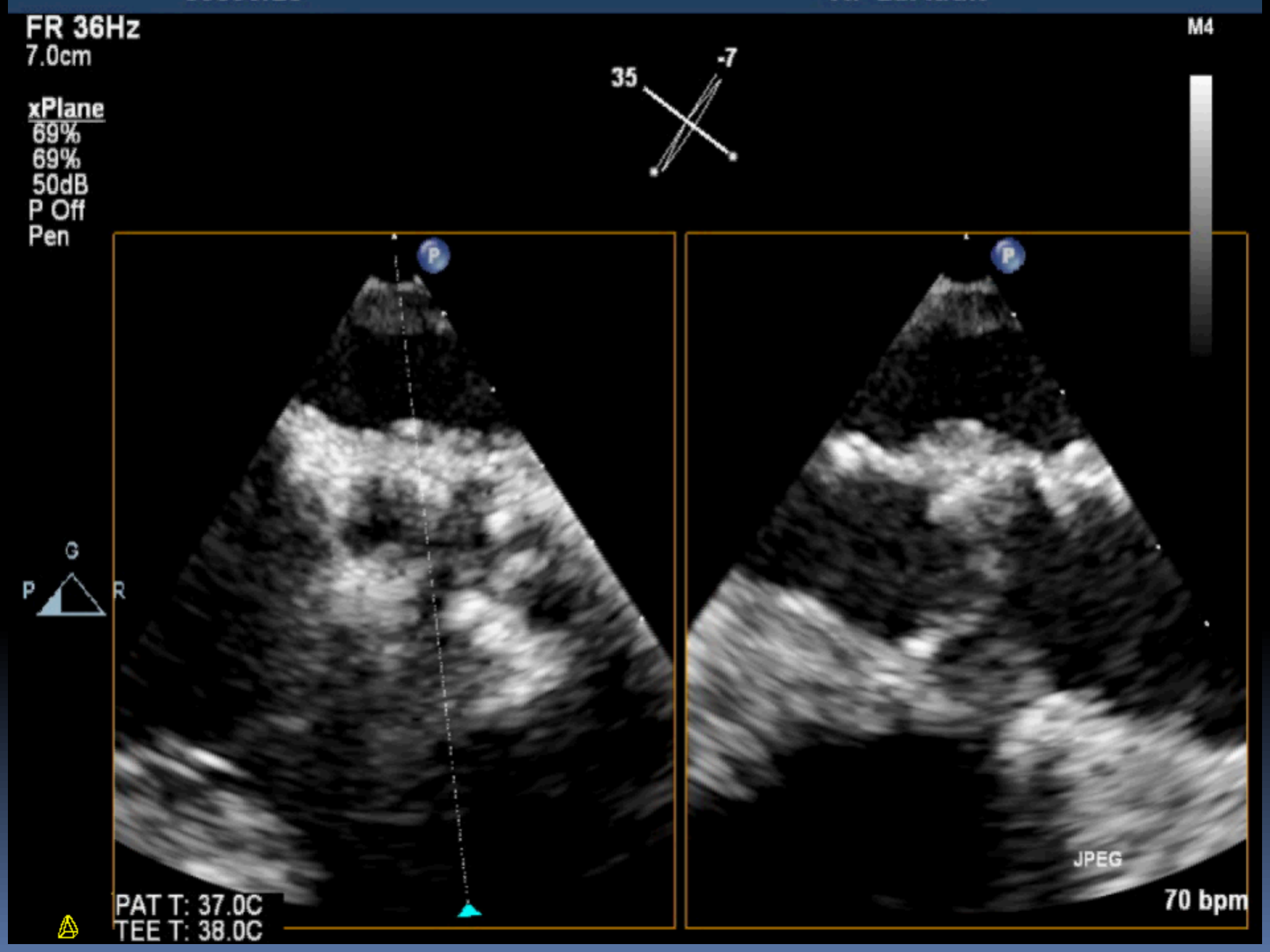
- Mitral valve
  - Mitral Stenosis (MS)
  - Mitral Regurgitation/insufficiency (MR)
  - Mitral Valve Prolapse (MVP)
- Aortic valve
  - AS, AR
- Tricuspid valve
  - TS, TR
- Pulmonic valve
  - PS, PR
- Multivalvular disease

Valvular Heart Diseases






FR 12Hz
14cm
2D
65%
C 50
P Off
Gen
CF
59%
4.4MHz
WF High
Med
0 18 180
epredine
153/63
M4 M4
+61.6
-61.6
cm/s
C
P
R
JPEG
*** bpm
PAT T: 37.0C
TEE T: 39.7C


FR 36Hz
7.0cm
xPlane
69%
69%
50dB
P Off
Pen
35
-7
M4
G
P
R
PAT T: 37.0C
TEE T: 38.0C
JPEG
70 bpm

Causes of Valvular Heart Diseases

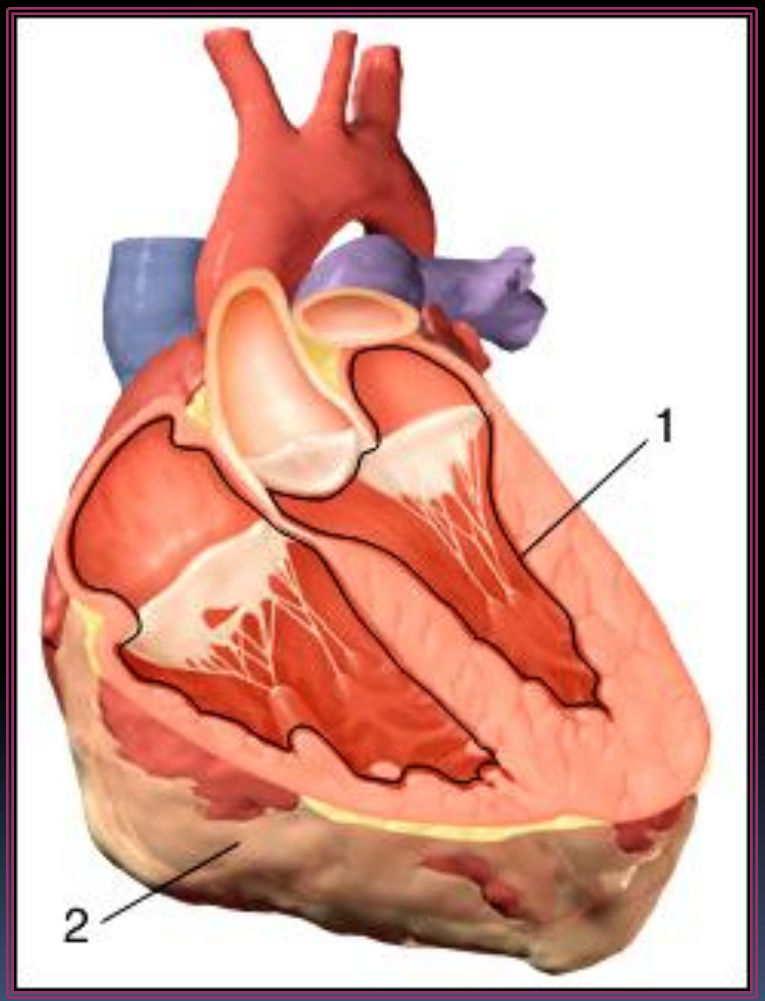
Congenital

- cleft leaflet, bicuspid/tricuspid valve
- single papillary muscle
- supravalvular ridge causing stenosis
- etc.

Acquired

- Rheumatic ***
- Infective endocarditis**
  - active
  - previous
- Calcific (degenerative/ autoimmune)
- Familial
- Miscellaneous ; carcinoid, SLE, rheumatoid arthritis, neoplasm, radiation therapy, anoretic drug, etc.

Endocarditis



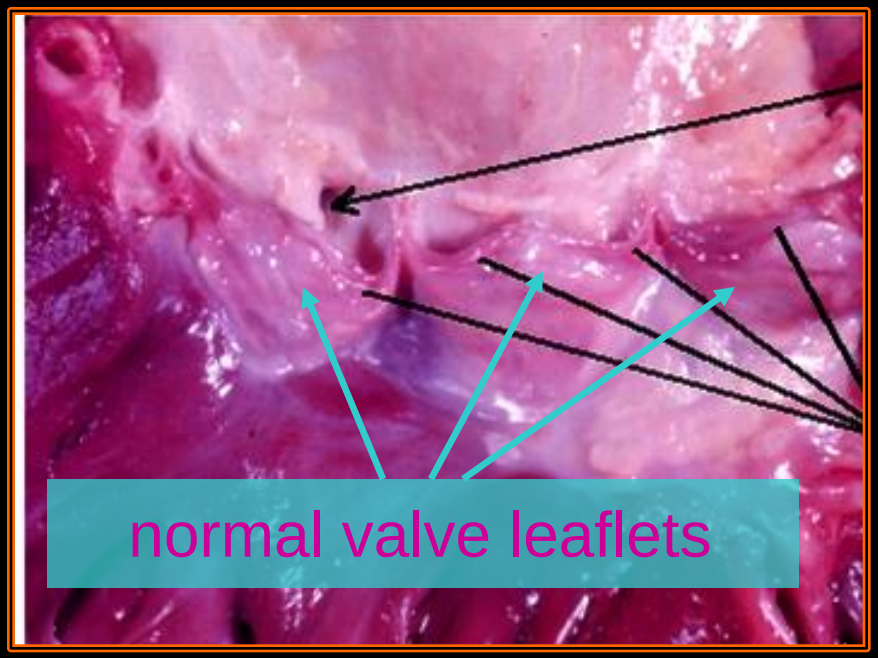
✱ **Infective endocarditis** ✱

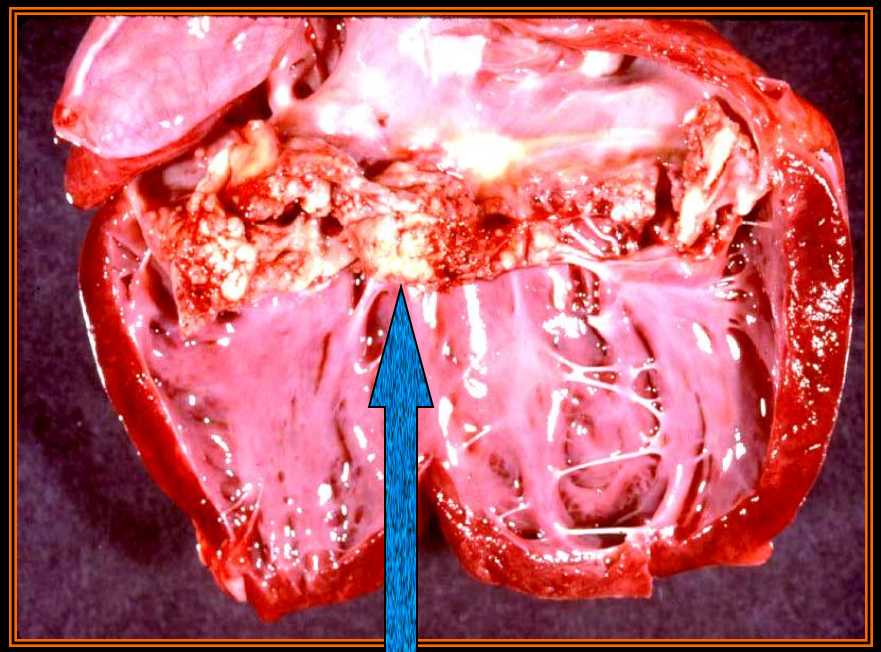
⇨ disease caused by microbial infection of the endothelial lining of the heart especially heart valve

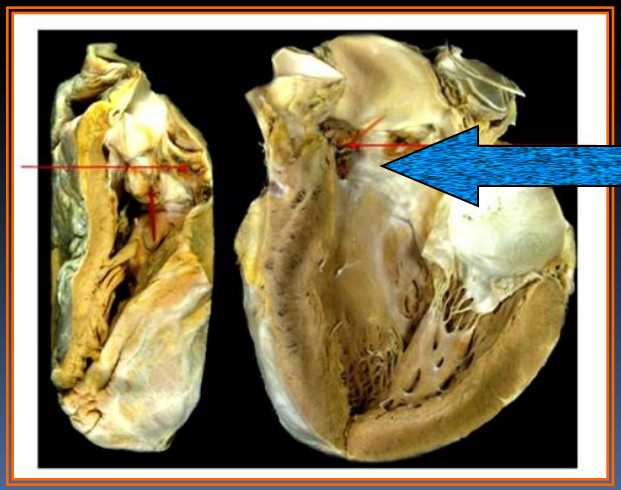
✱ characteristic lesion

- vegetation

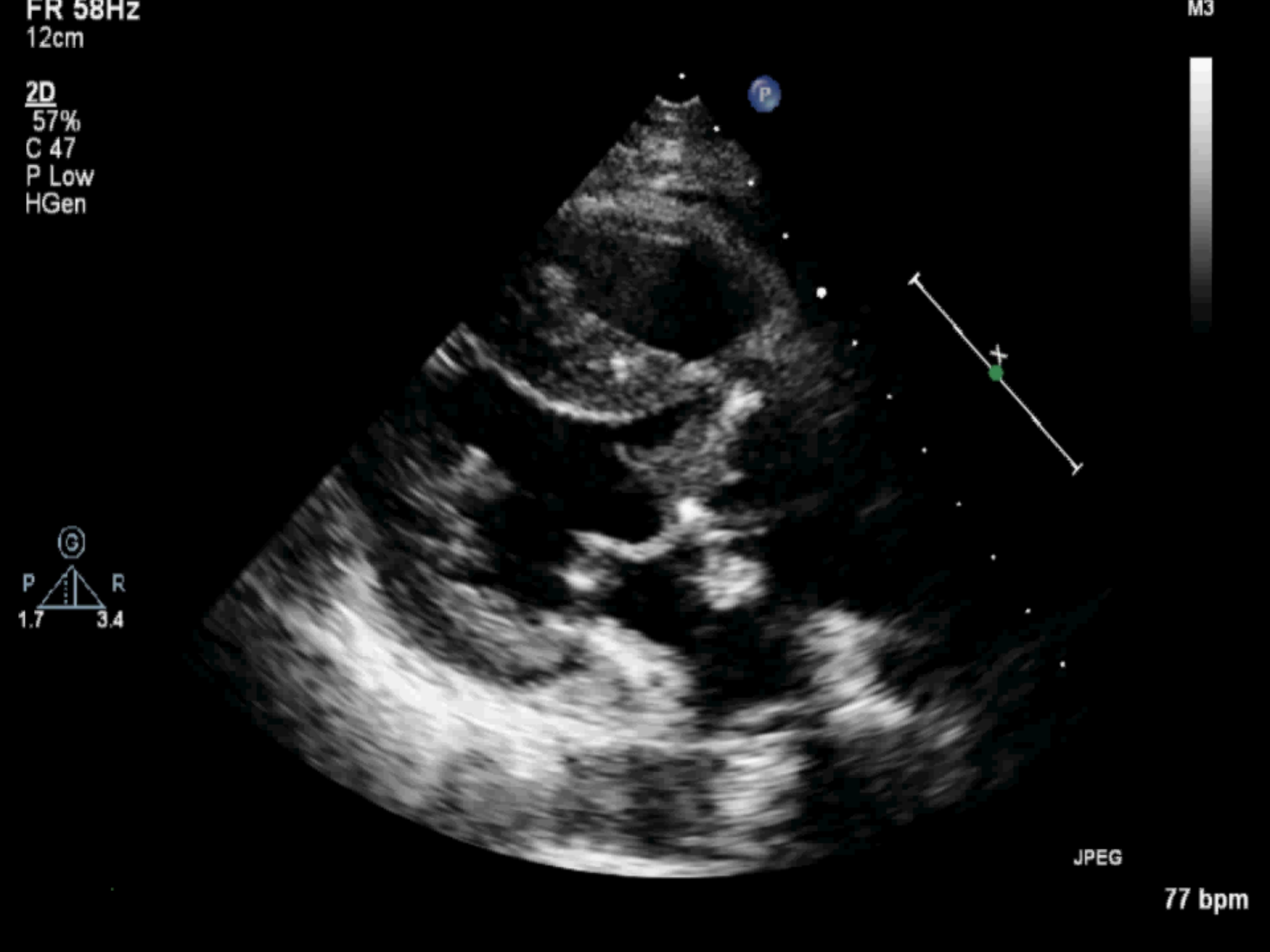
Endocarditis



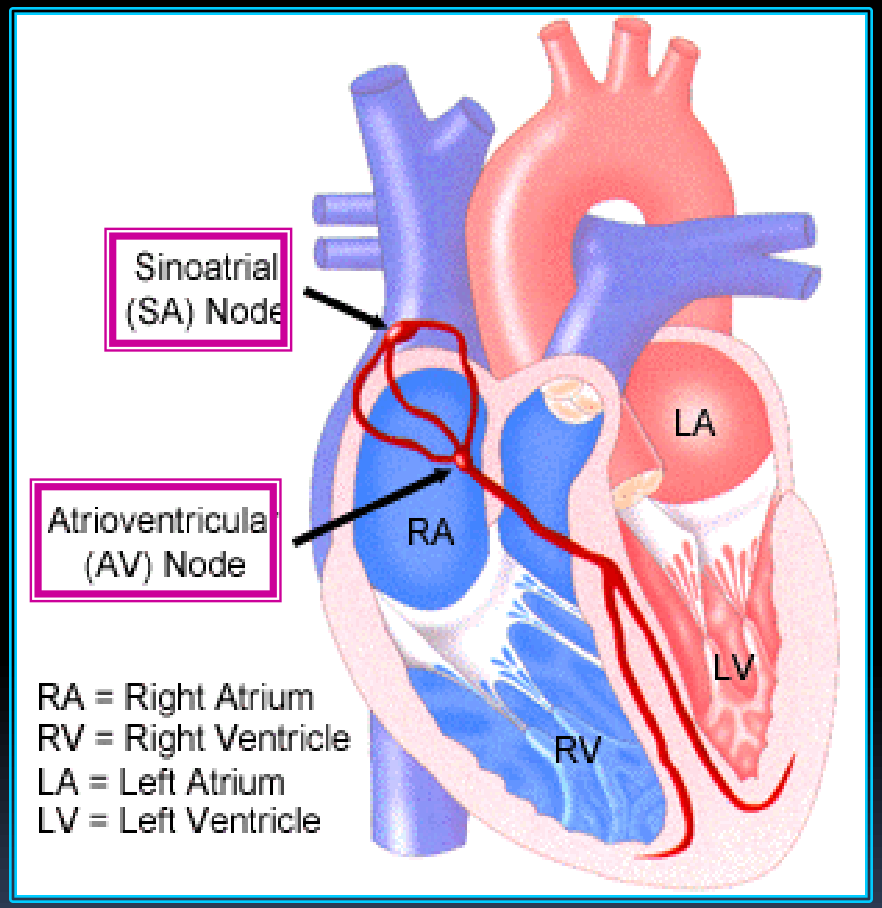




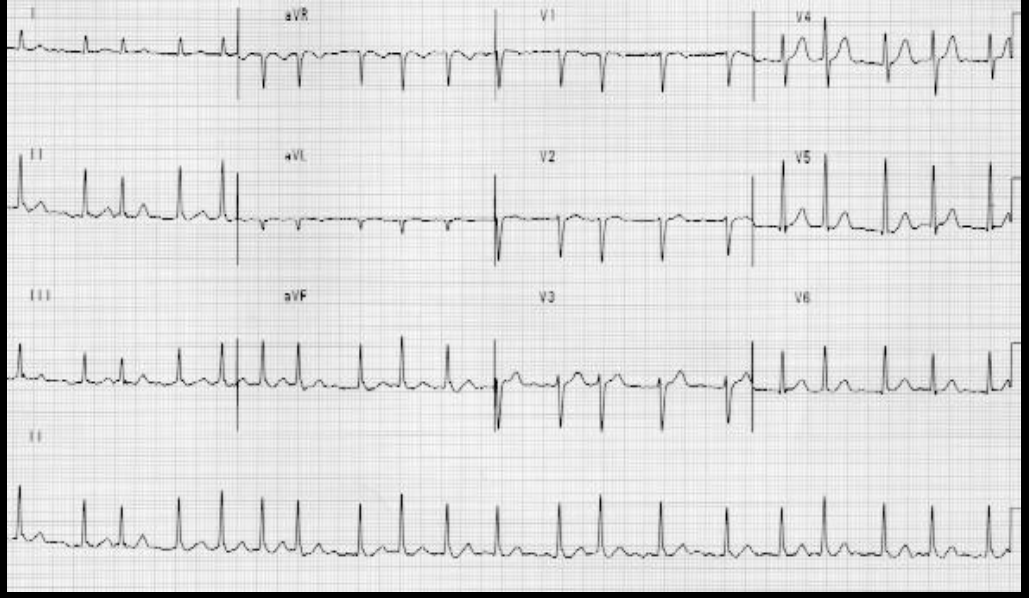
Vegetation

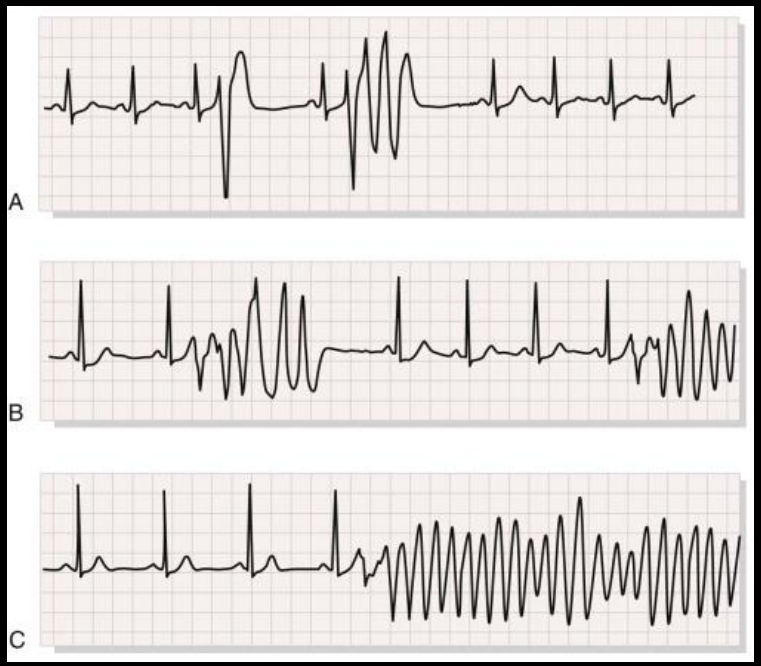

FR 58Hz
12cm
2D
57%
C 47
P Low
HGen
M3
P
R
1.7
3.4
JPEG
77 bpm

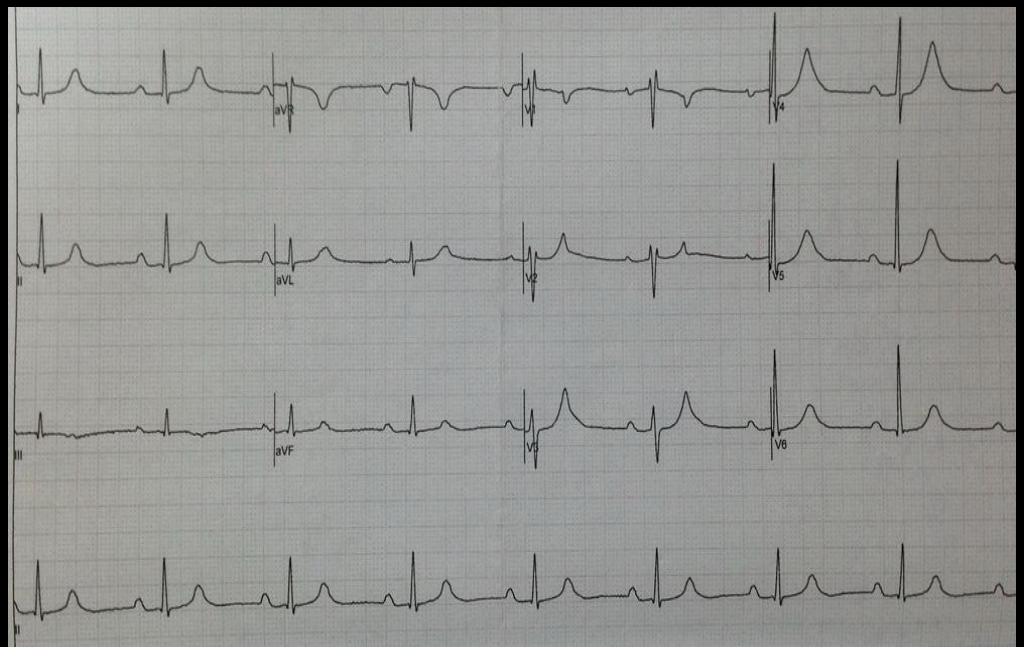
Rhythm & Conduction Disorders



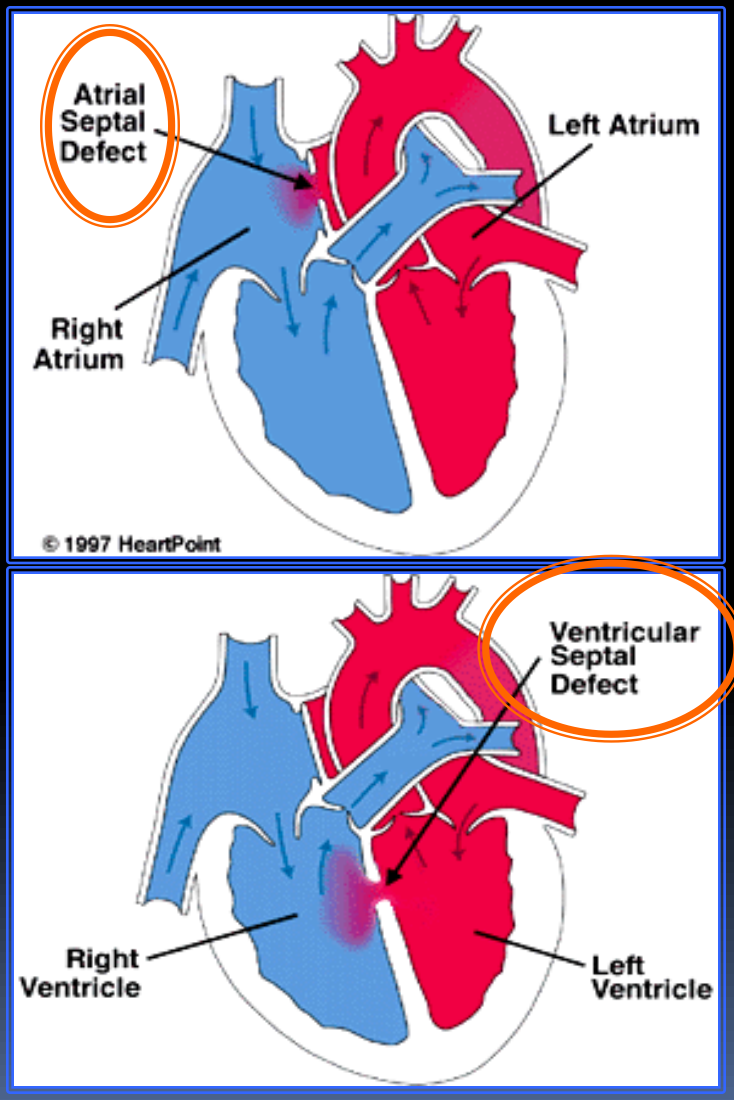
- Arrhythmia
  - Tachyarrhythmia
    - atrium/ventricle
  - Bradyarrhythmia
    - sinoatrial / sinus node
    - atrioventricular node
    - bundle of His
    - left / right bundle branch


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II


A
B
C


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II

Congenital Heart Diseases



- Intracardiac communication
  - ASD, VSD, PAPVC, common AV canal
- Extracardiac communication
  - PDA, Sinus of Valsalva fistula
- Valvular and vascular malformations
  - AS, bicuspid AS, coarctation of aorta
- Abnormalities of pulmonary venous connection
- Malposition of cardiac structure
  - dextrocardia, levocardia, single ventricle
- Anomalies of coronary artery circulation
  - coronary AV fistula, abnormal coro. origin

Heart failure

problem of excessive salt and water retention or
abnormal pumping capacity of the heart
&
neurohormonal activation and LV remodeling: disease progression

Anatomy:

- Pericardium
- Myocardium
- Endocardium

Physiology:

- High vs Low output
- Left vs Right sided
- Reduced vs Preserved LVEF

  (Systolic vs diastolic)

- Acute vs Chronic

Vascular Diseases

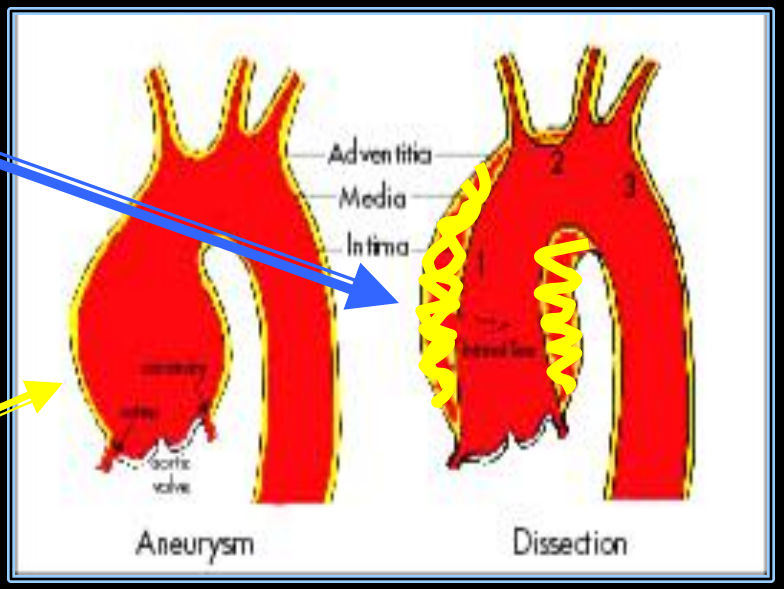
Vascular Diseases

- Great vessel disease
  - Aortitis
    - Aortic aneurysm
    - Aortic dissection
    - Coarctation of aorta
- Peripheral vascular disease
  - Peripheral arterial disease
    - Deep vein thrombosis
- Hypertension

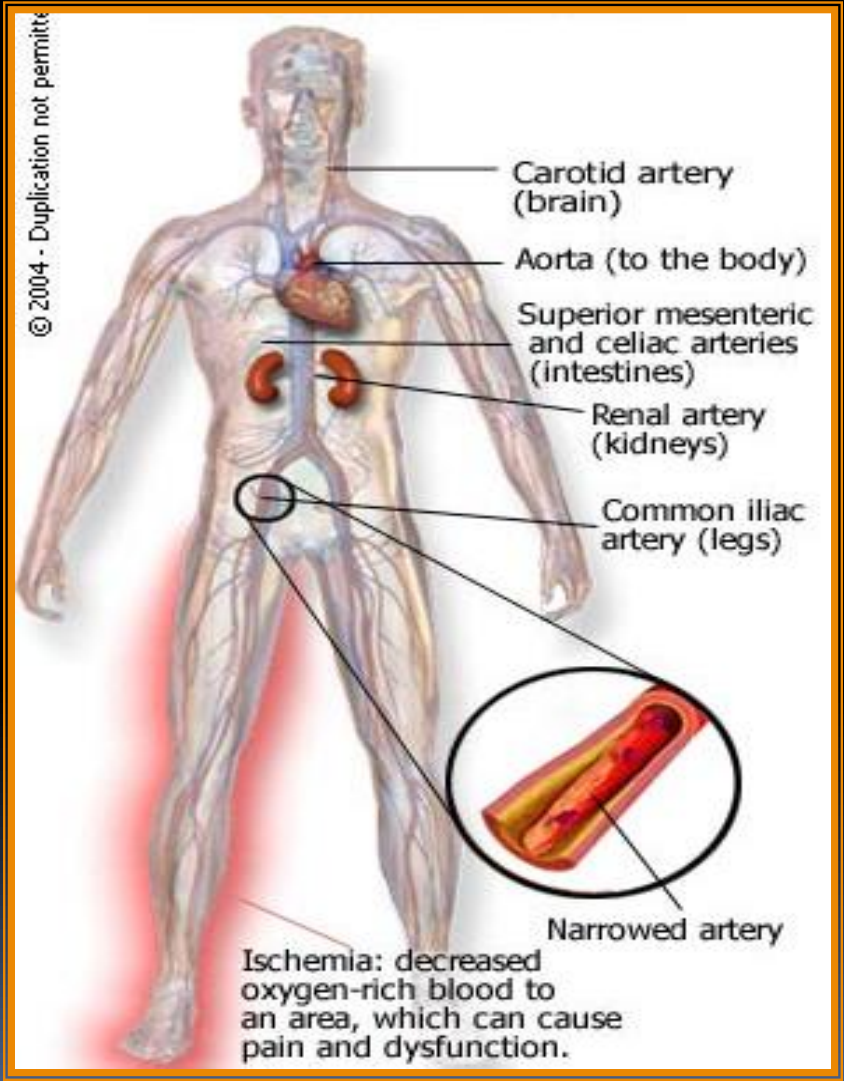
Great Vessel Diseases

Aortic dissection

Aortic aneurysm

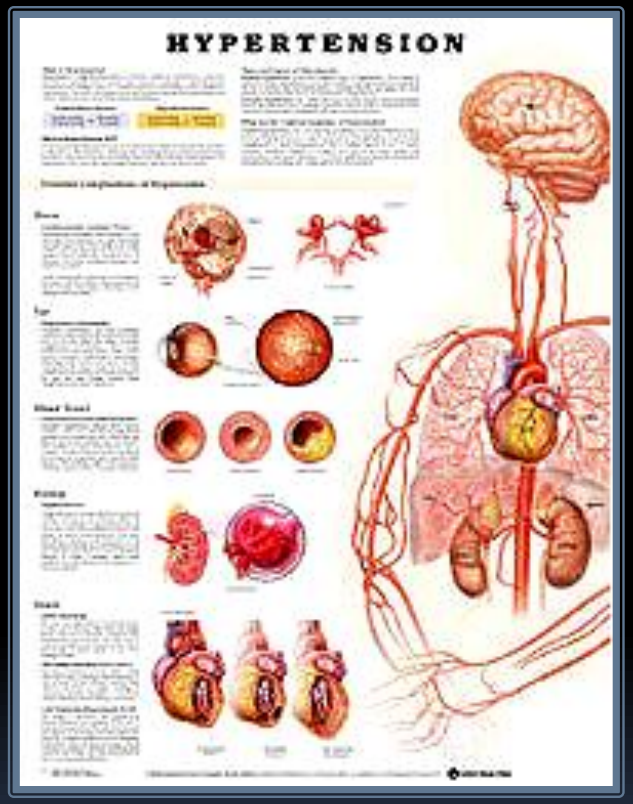


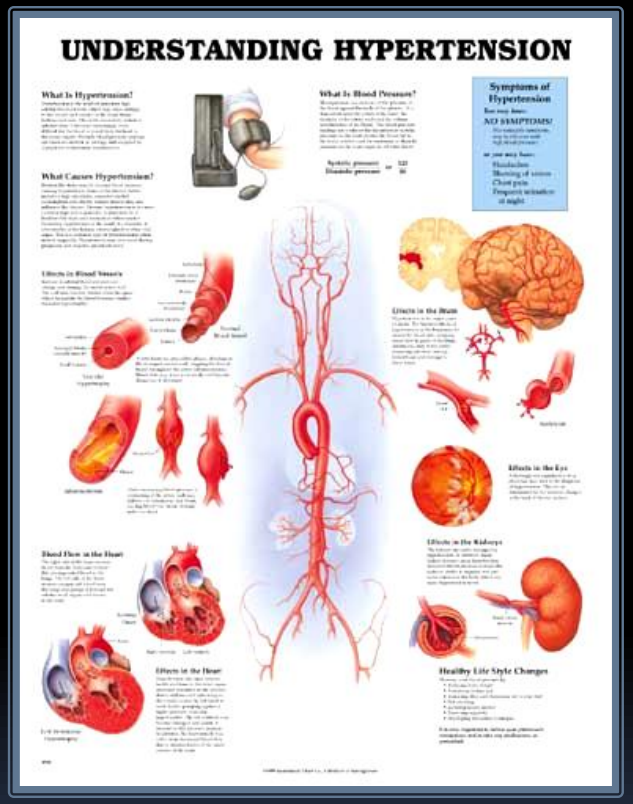
Peripheral Arterial Diseases



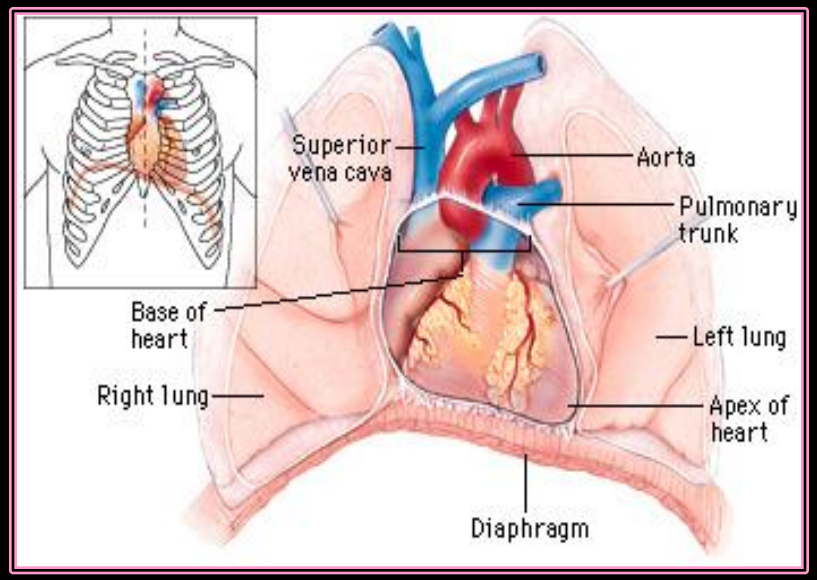
Ischemic ulcer

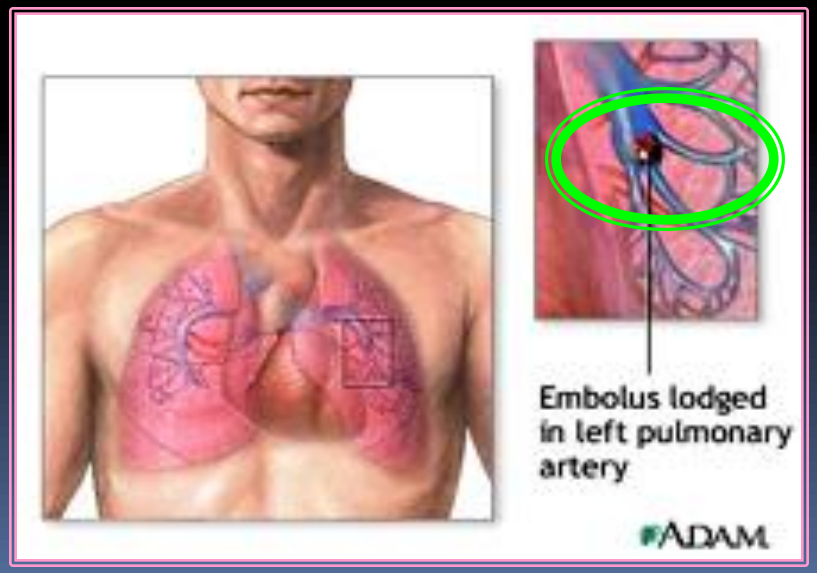
Hypertension





Pulmonary Hypertension & Pulmonary Embolism





- **Pulmonary hypertension**
  - ⇨ increasing in pulmonary arterial or venous pressure of any causes
- **Pulmonary embolism**
  - ⇨ obstruction within any branch of pulmonary artery with emboli

Cardiovascular Investigations

AIMS OF INVESTIGATIONS

- For Diagnosis
  - *History taking*
  - *Physical examination*
  - **Investigation**

- For Assessment of
  - Disease severity
  - Disease prognosis

CARDIAC INVESTIGATIONS

NON-INVASIVE

- Blood pressure measurement
- Oxygen saturation measurement
- Electrocardiogram (ECG)
- Chest X-ray (CXR)
- Echocardiography
  - 2D, 3D Transthoracic echo
  - Transesophageal echocardiography (TEE)
- Exercise stress test (EST)
- Exercise stress- Echocardiographiy
- Dobutamine stress echocardiography
- Holter monitoring
- Tilt table test
- Carotid artery Doppler study
- Ankle-brachial index (ABI), Cardio-ankle vascular incex (CAVI)
- CT-angiography : coronary, pulmonary, aorta, renal artery, peripheral artery
- Cardiac MRI: rest or stress CMR
- Stress cardiac nuclear study

INVASIVE

- Coronary angiography
- Left sided cardiac catheterization
- Right sided cardiac catheterization
- Pulmonary artery, carotid artery, renal artery, extremity artery angiography
- Endomyocardial biopsy
- Electrophysiologic (EP) study

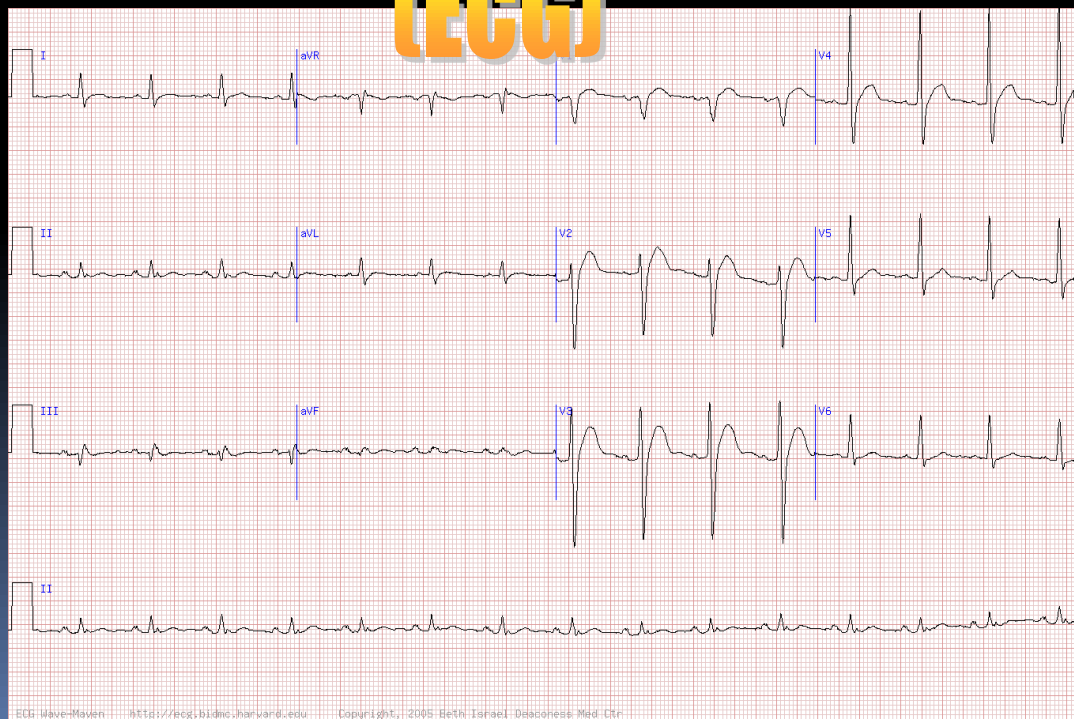
NON-INVASIVE INVESTIGATIONS

Sphygmomanometer

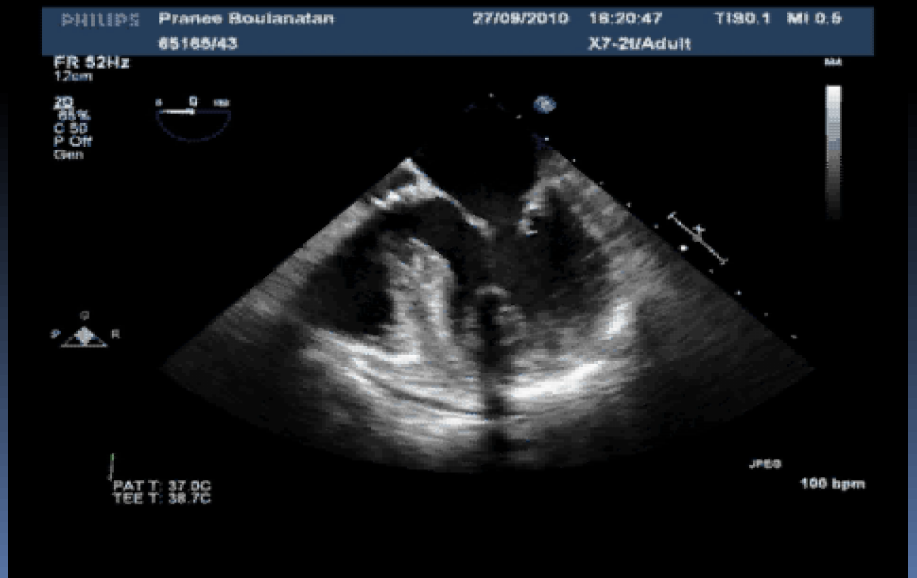
Pulse Oximeter

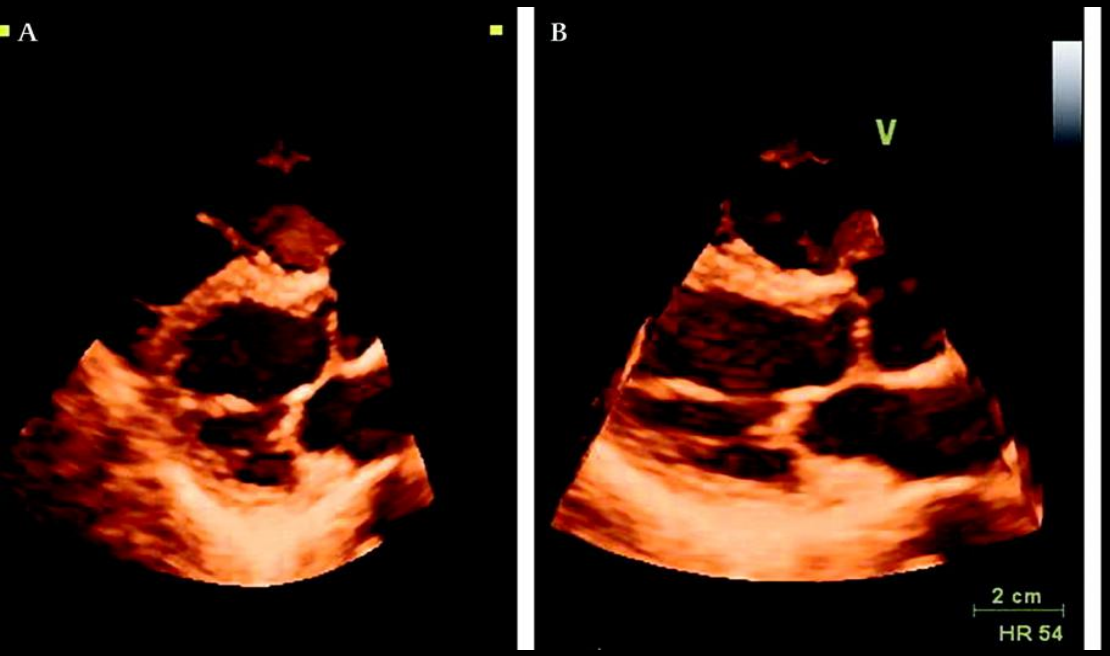
Chest X-ray (CXR)

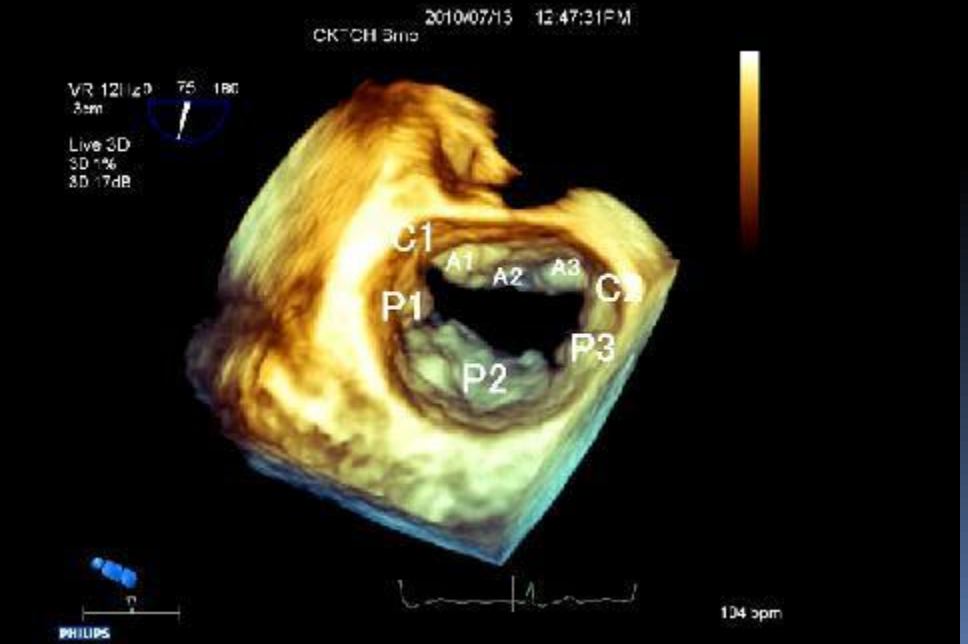
Electrocardiography (ECG)



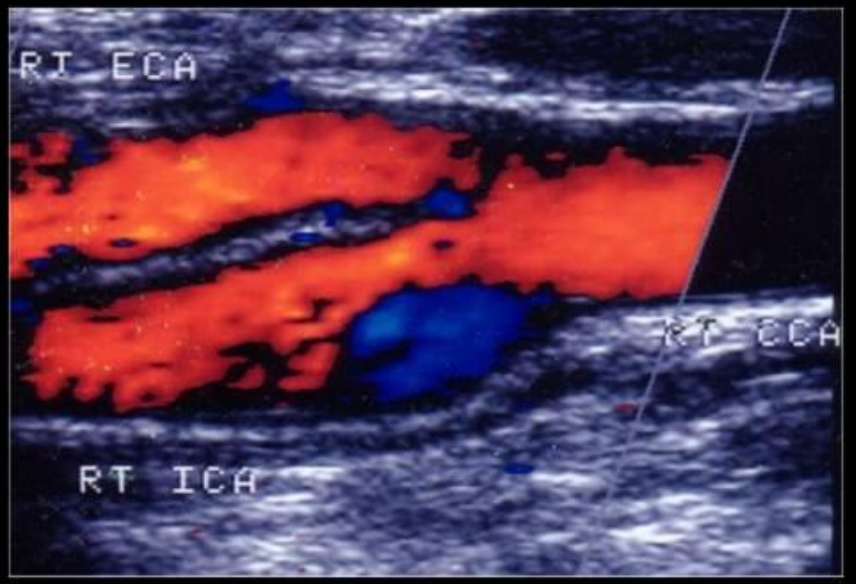
Echocardiography (2D-Echo)

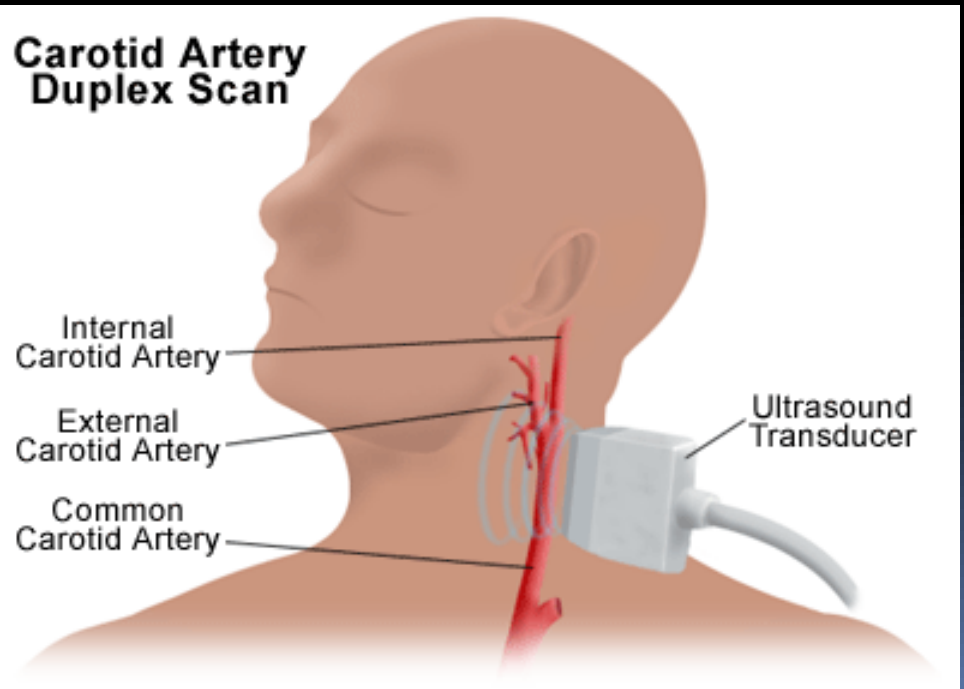




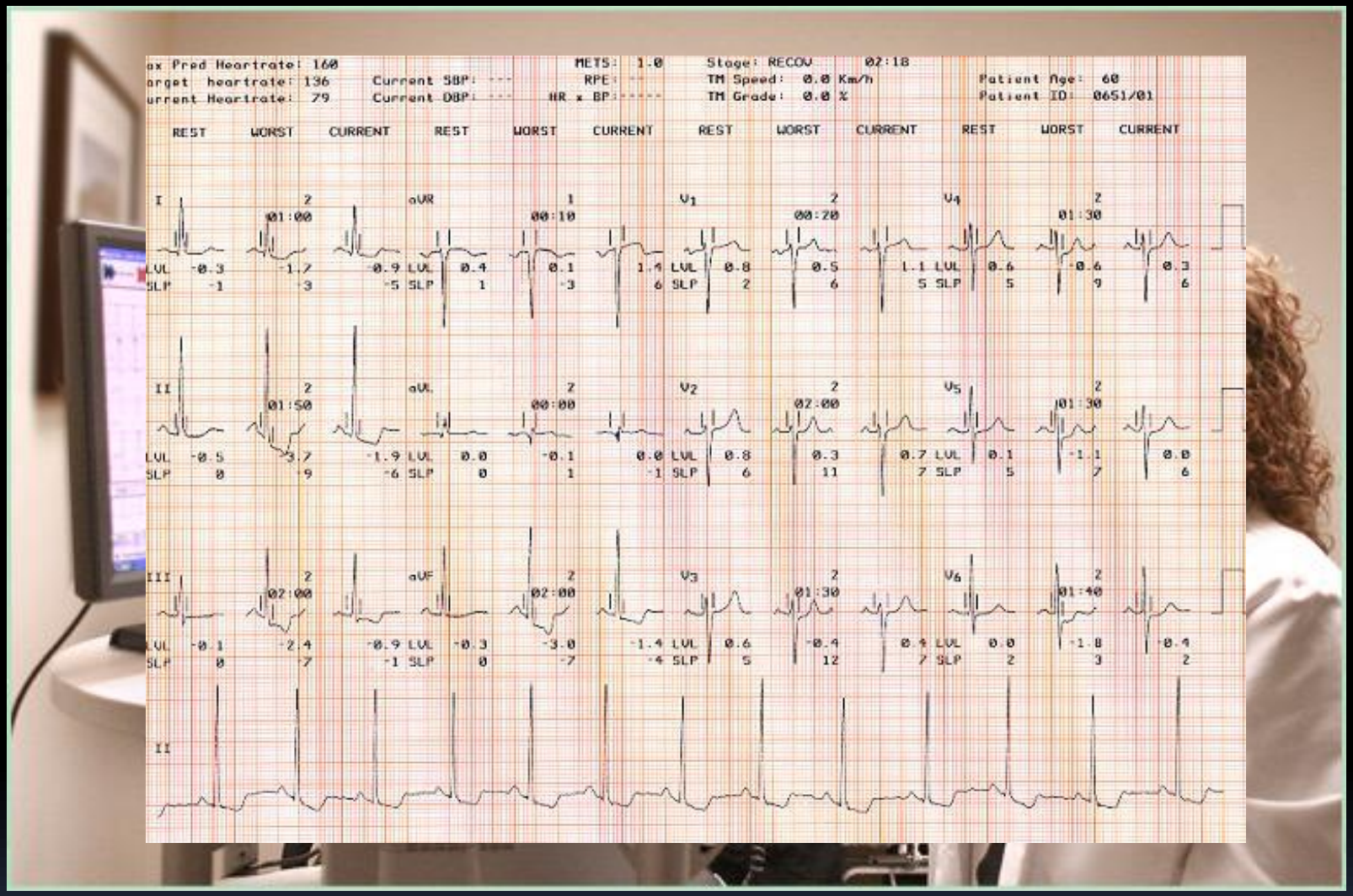


Echocardiography (3D-Echo)





Carotid Doppler Ultrasound



Exercise Stress Test (EST)
Exercise Treadmill Test (ETT)

Uses of Exercise stress test

How the heart responds to exertion.

The following are some of the indications

- To determine if there is adequate blood flow to the heart during increased levels of stress
- To assess the effectiveness of medications to control heart conditions like angina and ischemia, conditions where the blood supply to the heart is reduced
- To identify if the patient has coronary heart disease and further evaluate it
- To assess the effectiveness of procedures done to improve blood circulation in patients with coronary heart disease
- To identify abnormal heart rhythms
- To **develop a safe exercise program**

Stress testing following myocardial infarction (MI)

- Invaluable tool for risk stratification post-MI.
- In the early days post MI (days 3-7), a low level stress test limited to 5 METS, 75% of MPHR or 60% of MPHR on β–blockers, is very helpful in patients who were treated conservatively with no revascularization to assess for ischemia at low workload, arrhythmias, to start cardiac rehabilitation and gaining self confidence.
- Late post-MI (4-6 weeks), symptom limited stress testing is usually performed to assess revascularization, medical therapy or need for any further interventions.

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Exercise-Stress Echocardiographic Study

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Dobutamine-Stress Echocardiographic Study

The six-minute walk test

Simplicity

Excellent tool for assessing heart failure patients

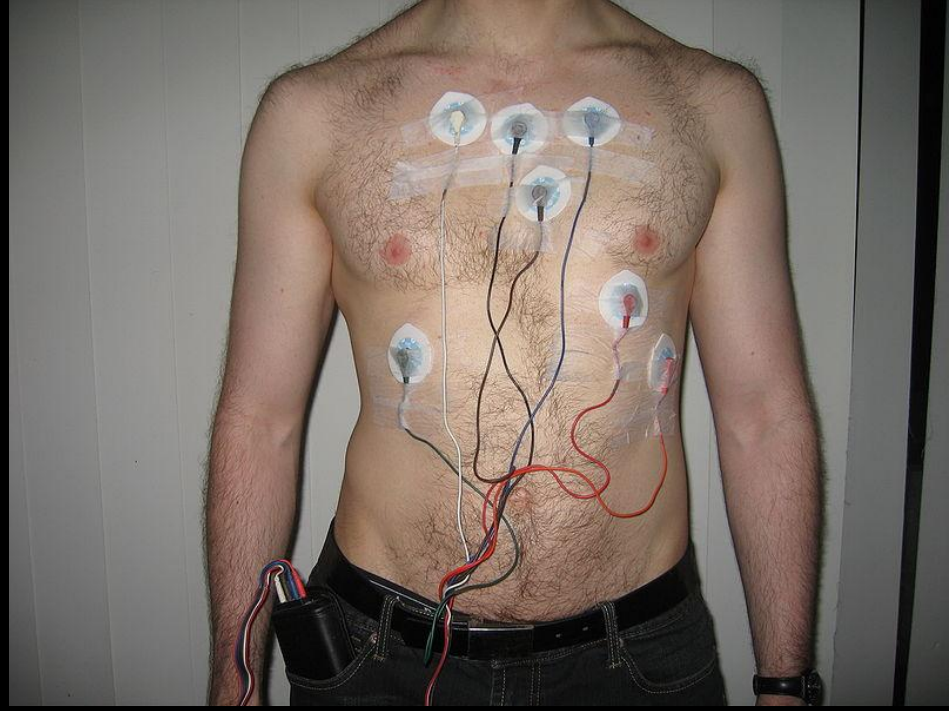
Not discriminate between the causes

Cardiopulmonary exercise testing

More precise information

Better quantification of exercise capacity

determine cause of exercise limitation is cardiac

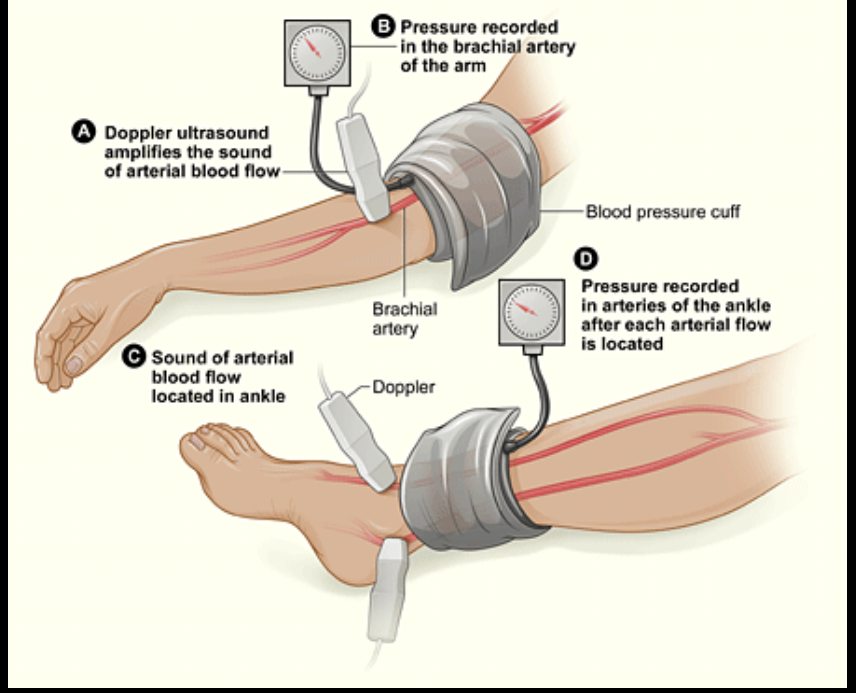


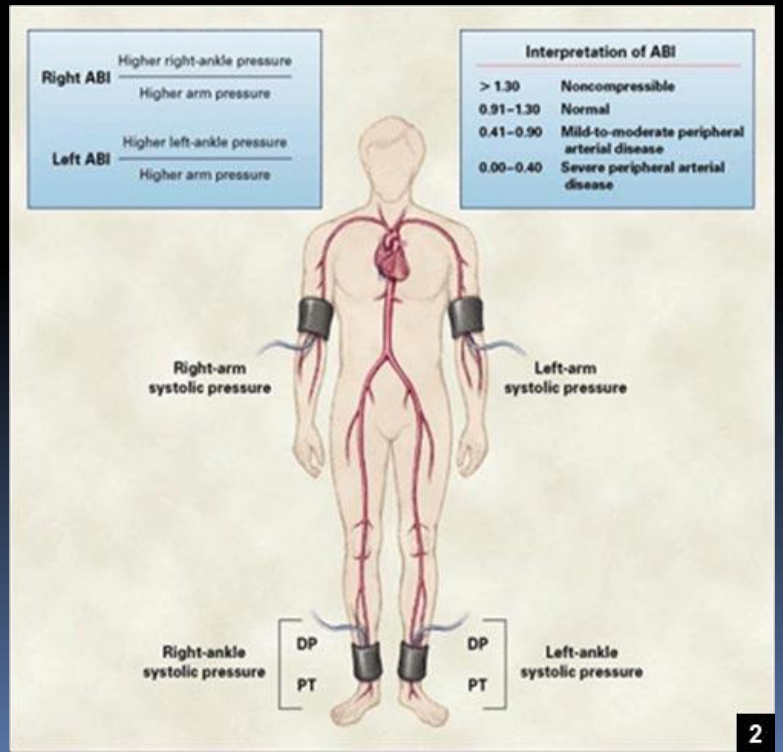
An ECG recording of an irregular heartbeat during an event.

An ECG recording of a regular heartbeat.

Holter Monitoring

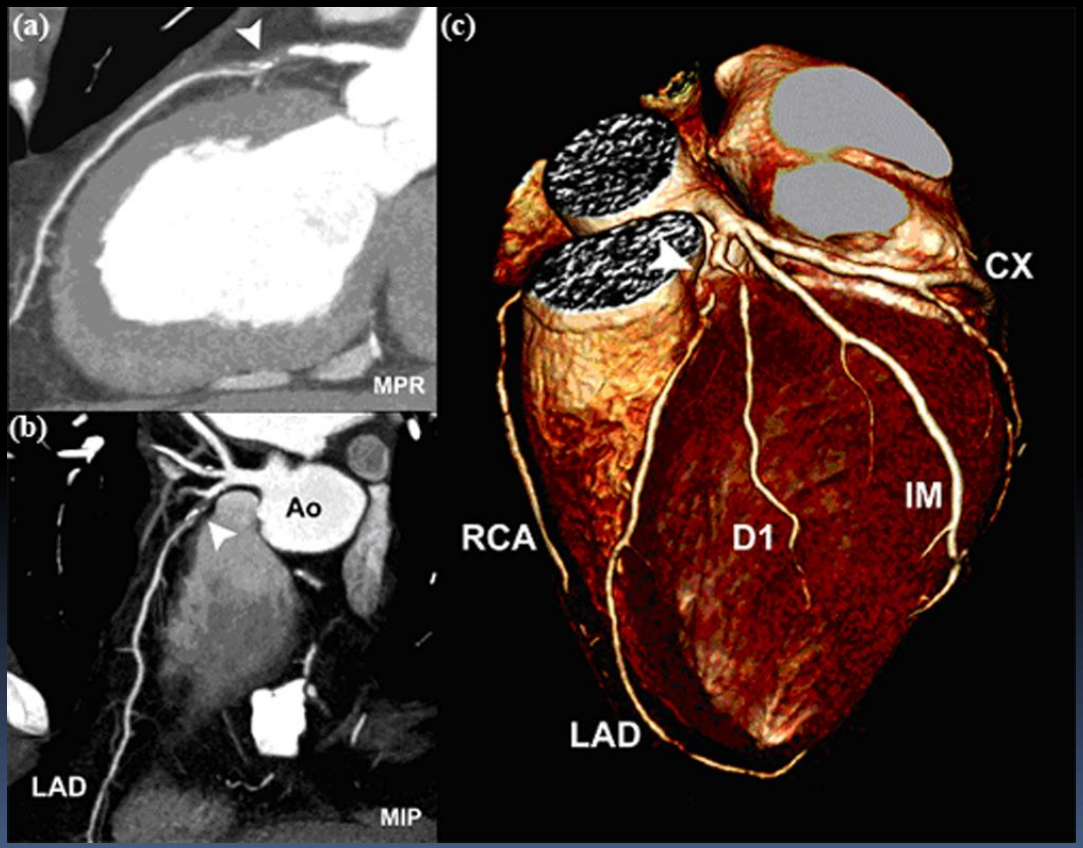
TILT- TABLE TEST



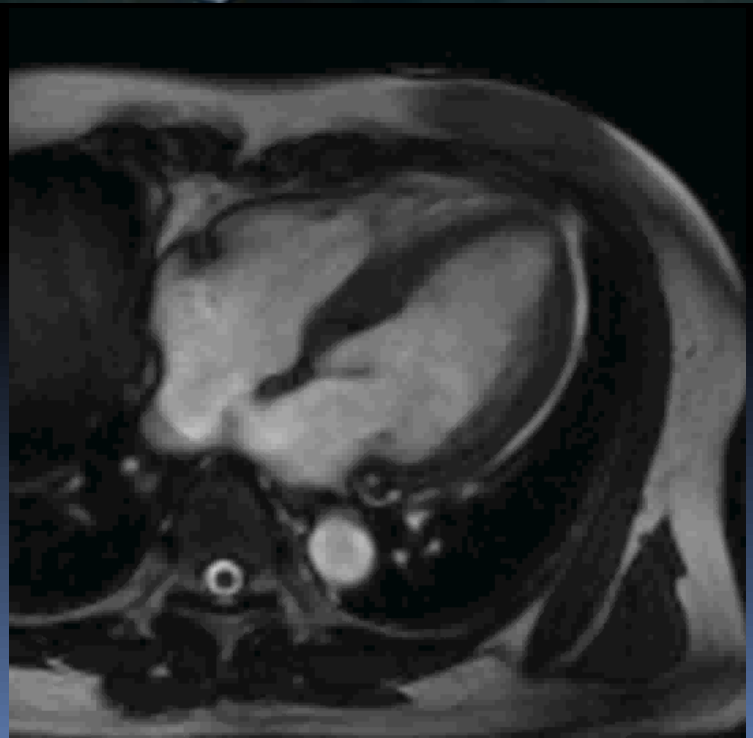


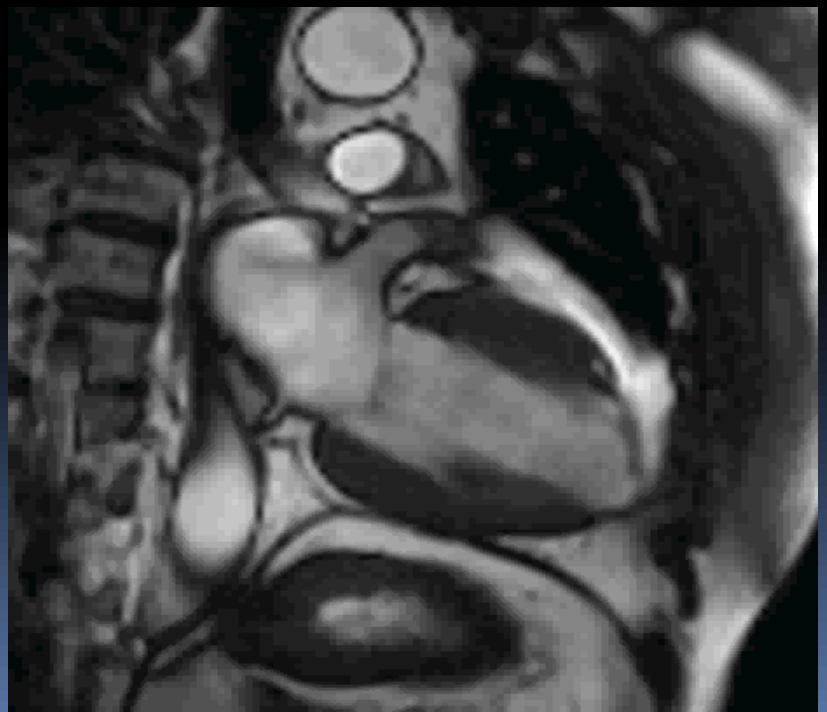
Ankle Brachial Index (ABI)

Computed Tomography Angiography (CTA)

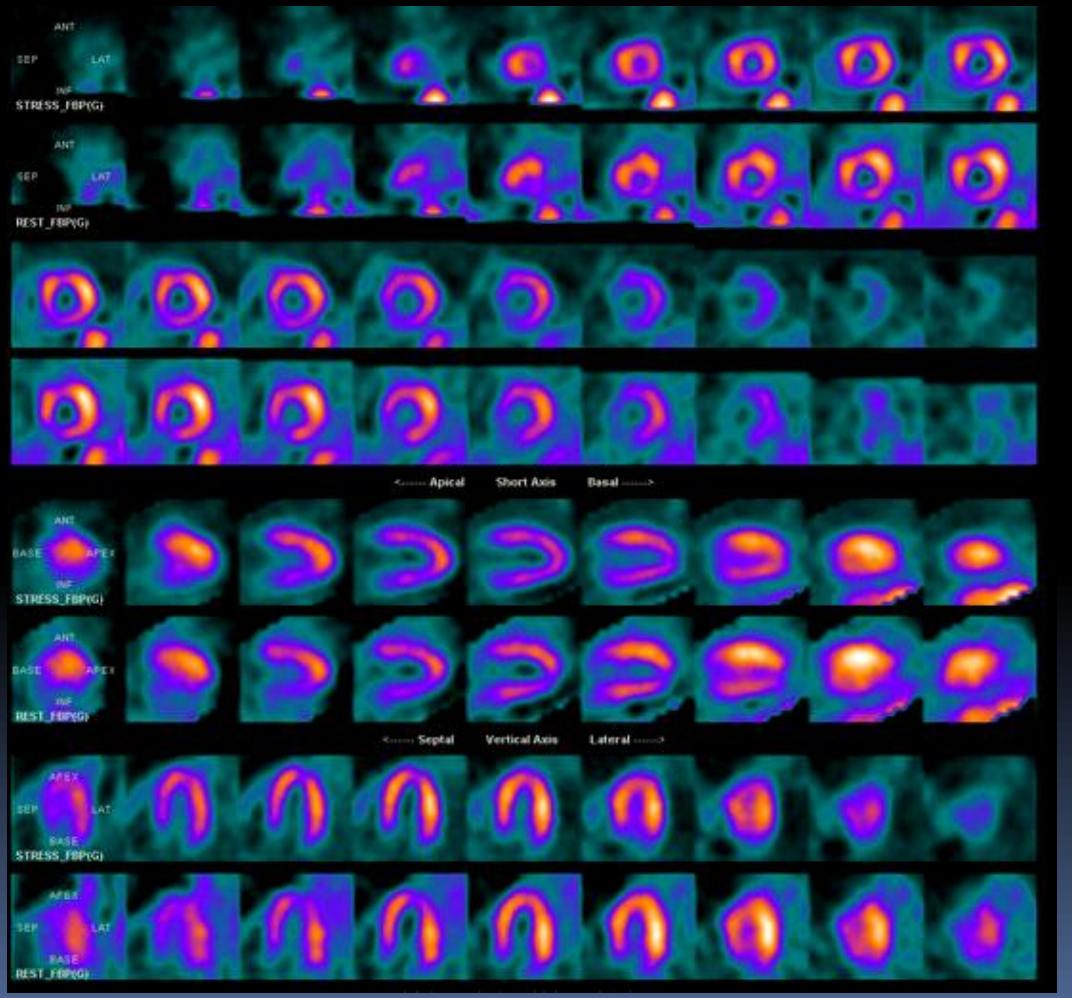


Cardiac MRI

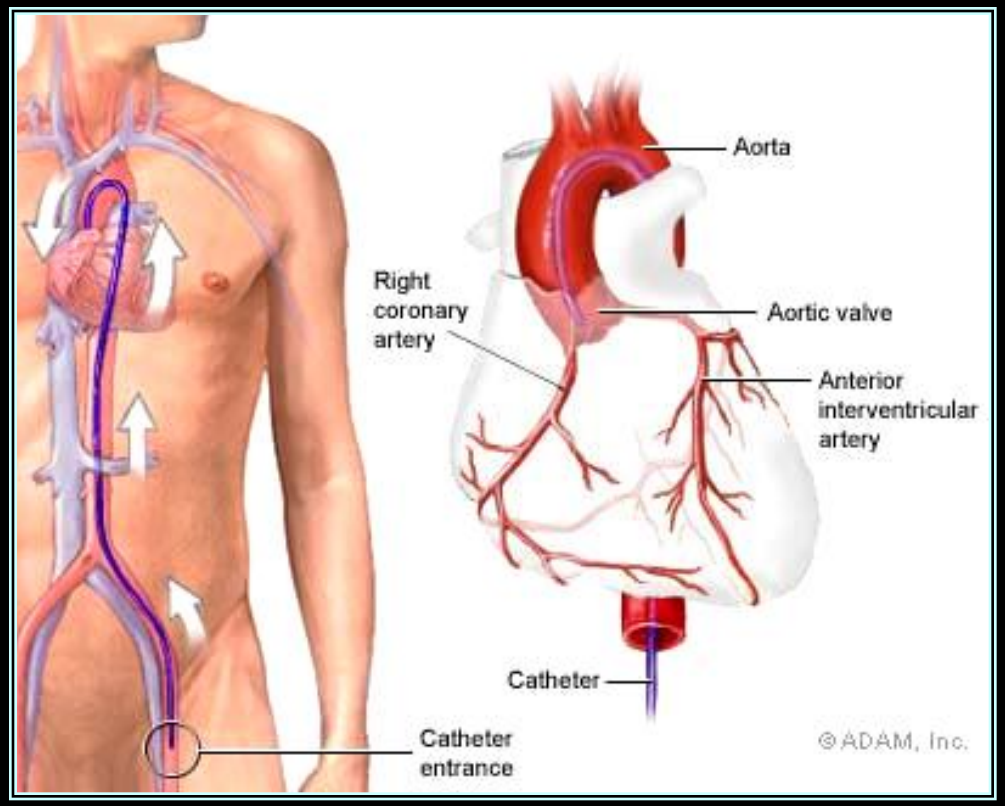


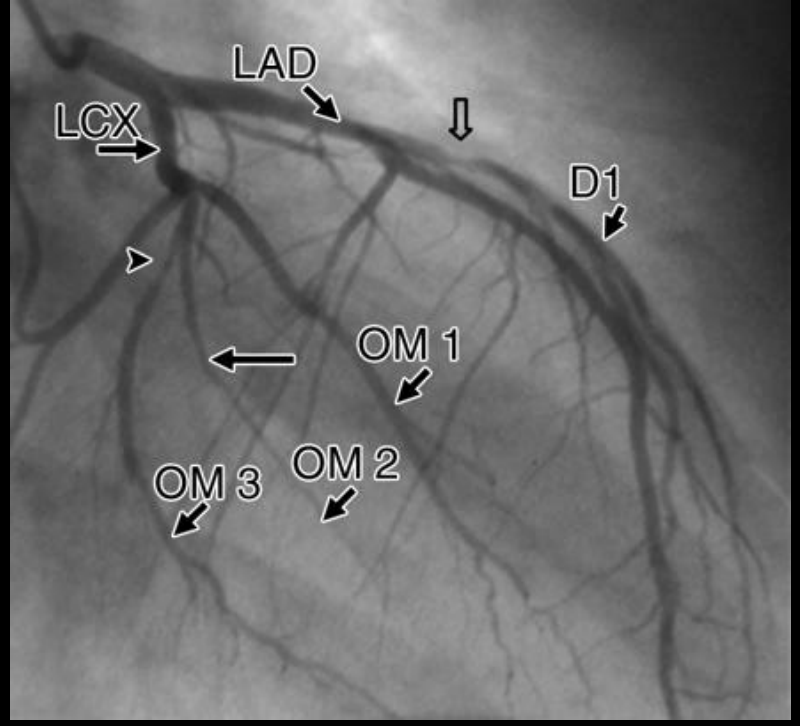


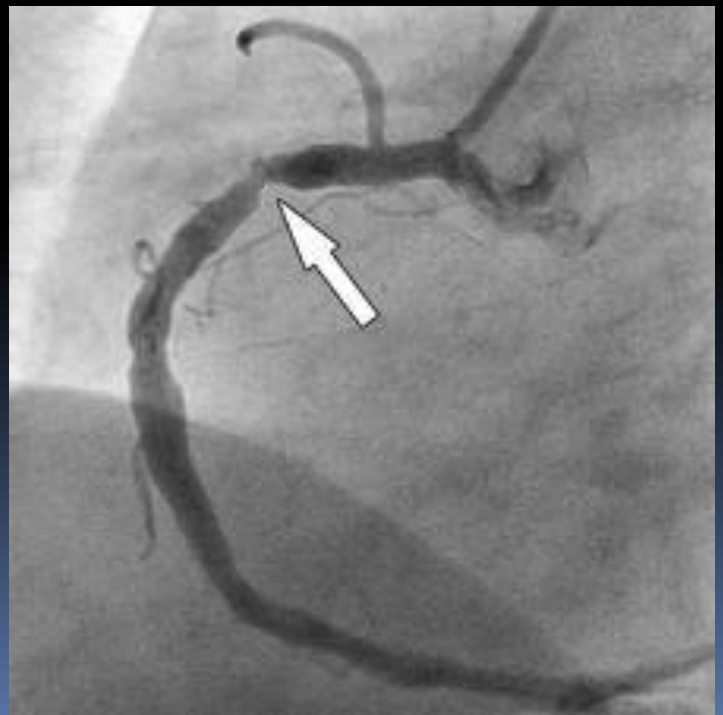
Cardiac Nuclear Study



INVASIVE INVESTIGATIONS

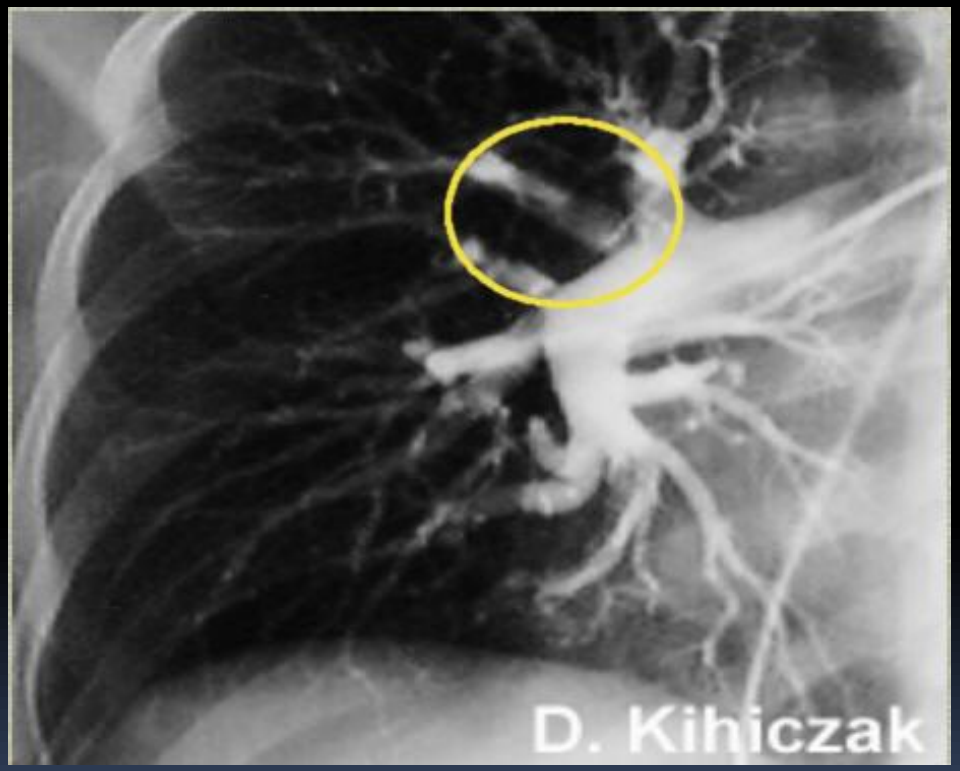






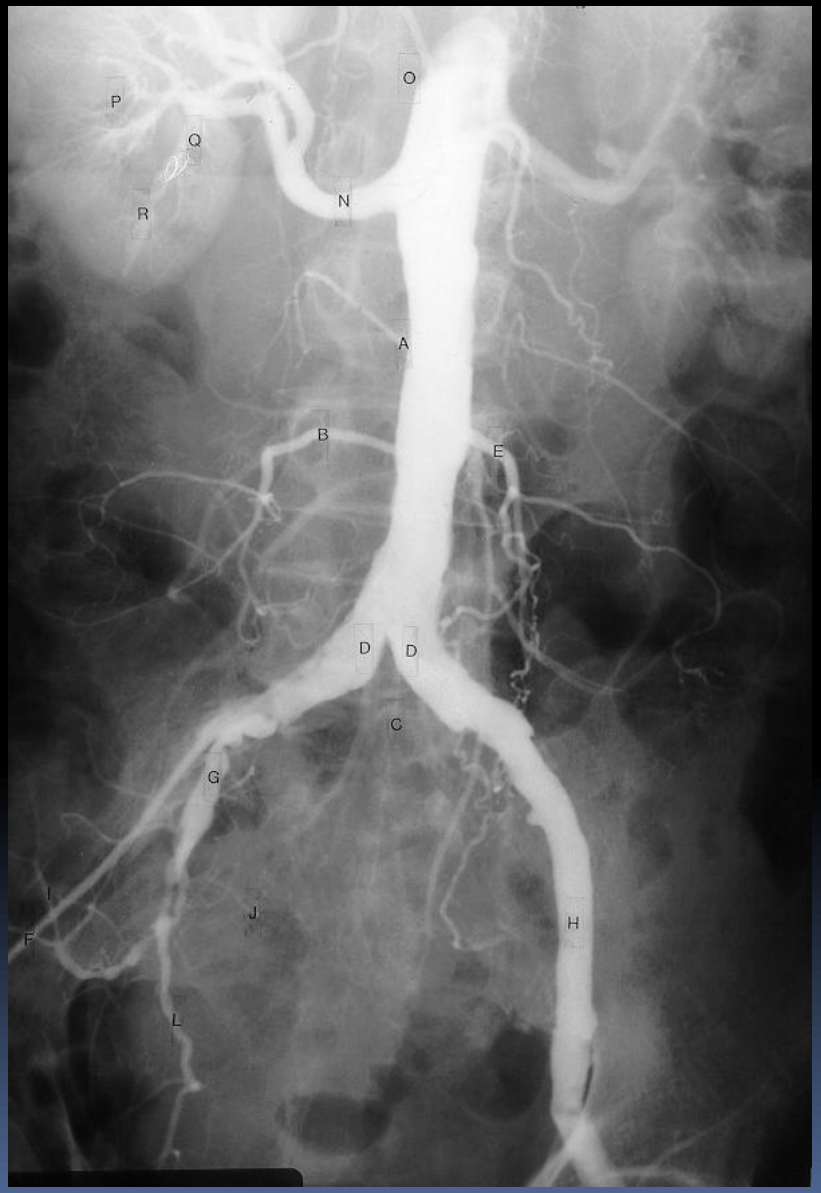
Coronary Angiography (CAG)

Pulmonary Angiography
Pulmonary Arteriogram

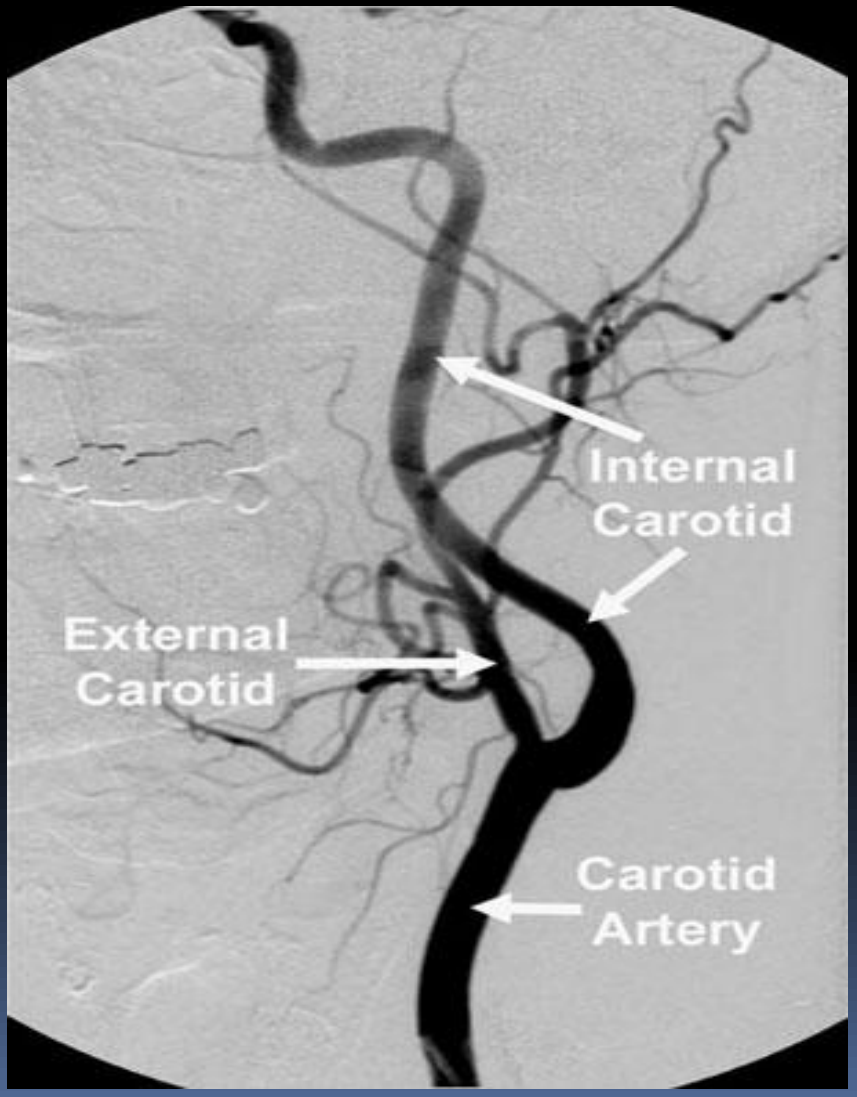


Pulmonary Embolism

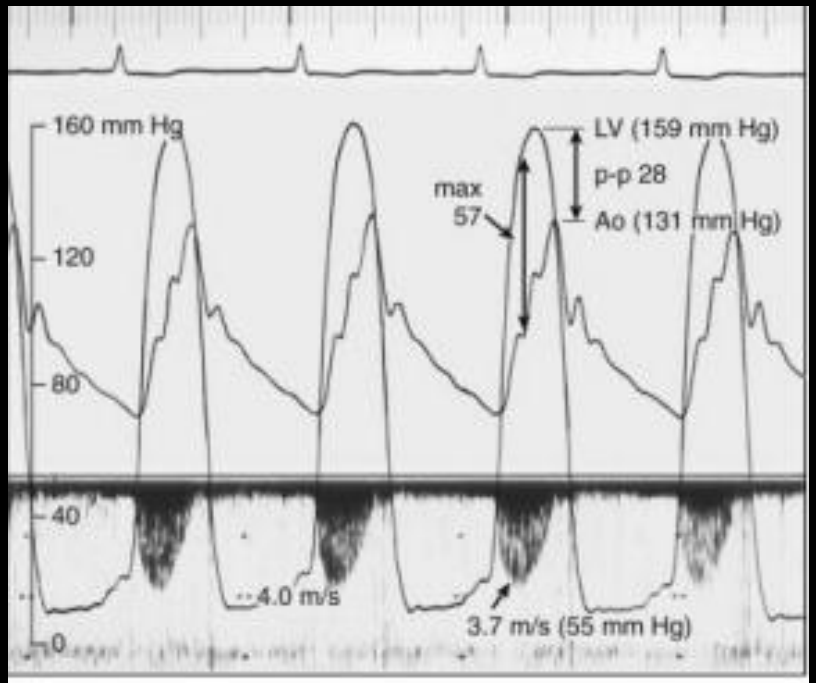
Aortography

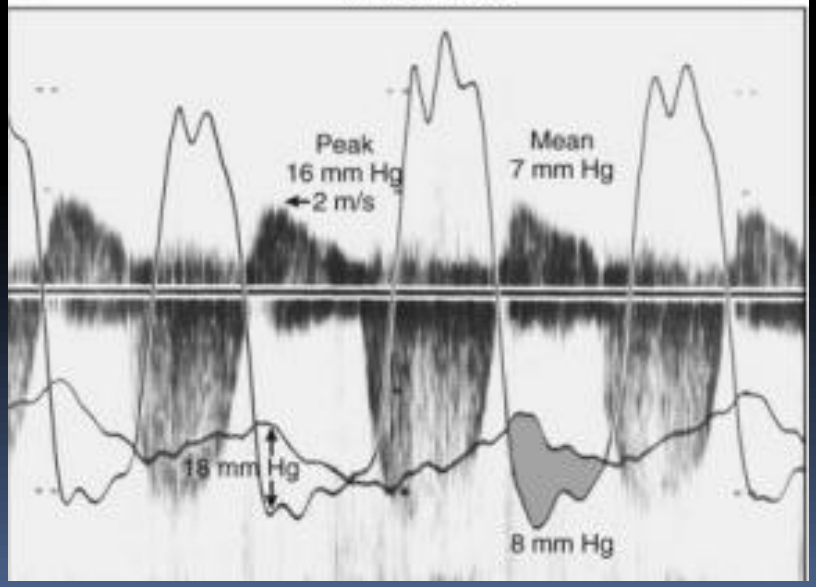


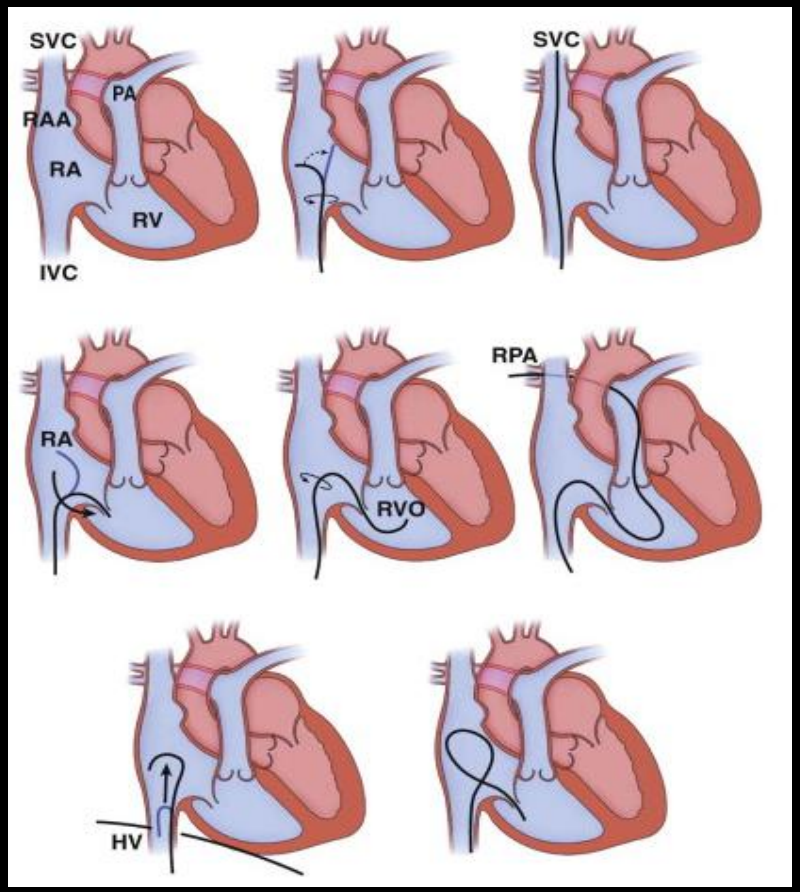
Carotid Angiography



Peripheral Artery Angiography

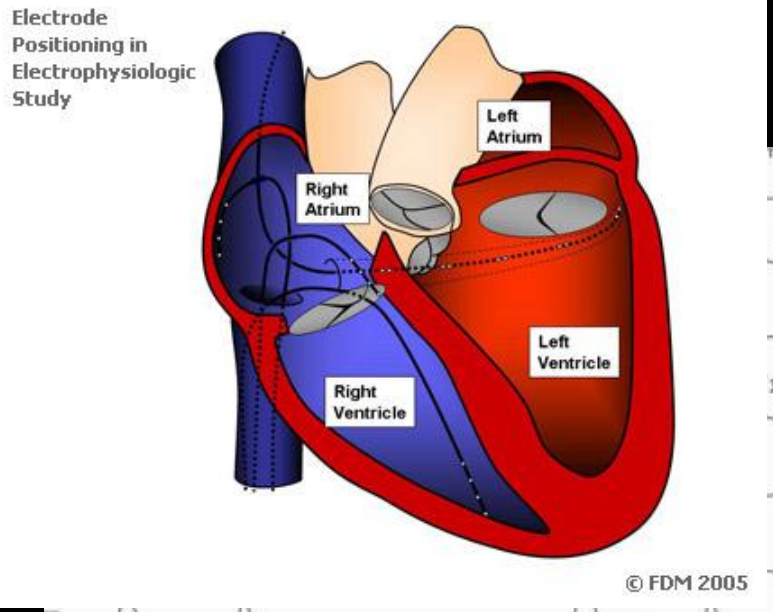


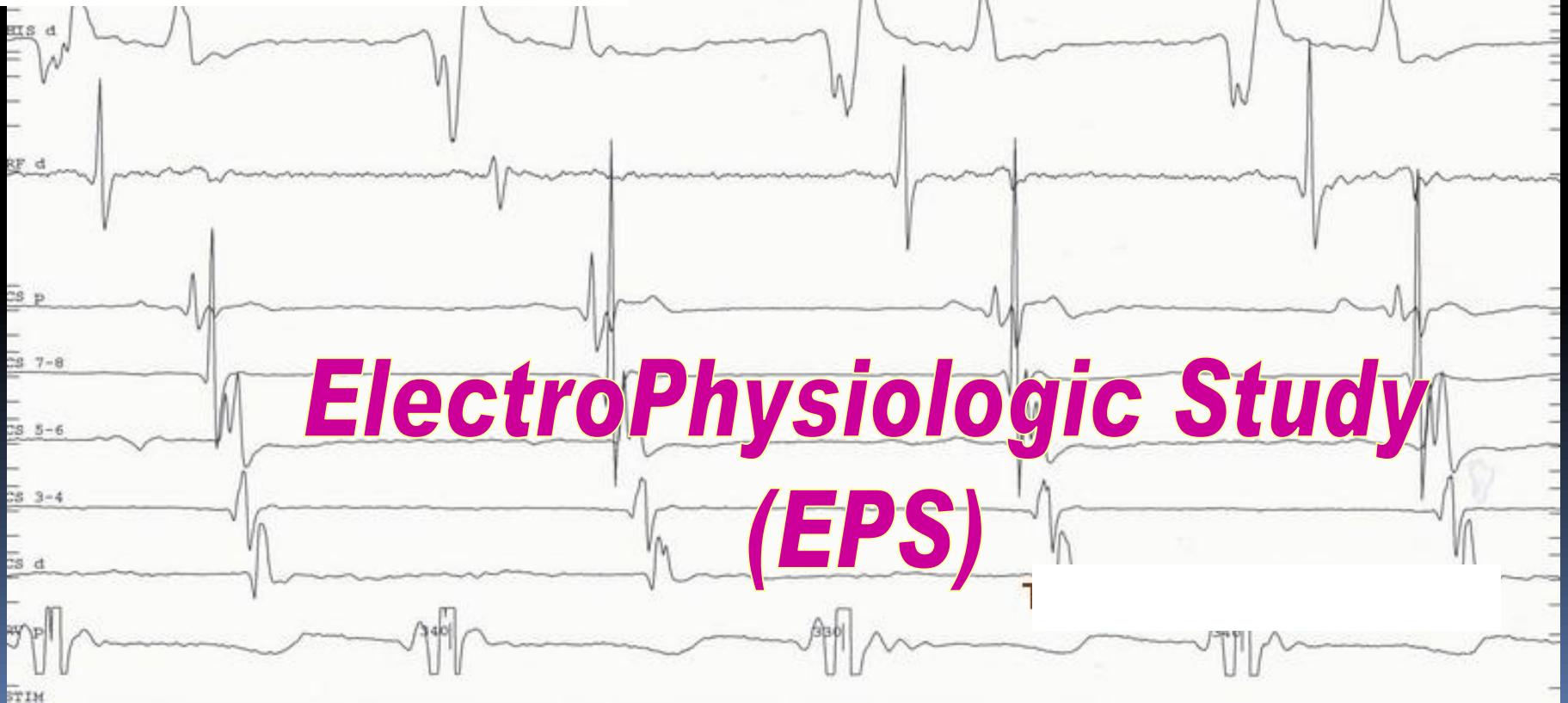




Cardiac catheterization

Intracardiac Electrogram





ElectroPhysiologic Study (EPS)

Thank you
for your attention