Pericardial Disease

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Pericardial Anatomy

- Two major components
  - **serosa** (visceral pericardium)
    mesothelial monolayer
    facilitate fluid and ion exchange
  - **fibroa** (parietal pericardium)
    fibrocollagenous tissue
- Pericardial Fluid
  - 15 - 50 ml of clear plasma ultrafiltrate
- Ligamentous attachments
  - to the sternum, vertebral column, diaphragm

Pericardial Physiology

- not needed to sustain life
- physiologic functions
  - limit cardiac dilatation
  - maintain normal ventricular compliance
  - reduce friction to cardiac movement
  - barrier to inflammation
  - Stabilize the heart in the chest

Acute Pericarditis

Acute Pericarditis

Definition

- Pericarditis is an inflammation of the pericardium, often with fluid accumulation (serous, fibrinous purulant & haemorrhagic)
- May accompany myocarditis

Pericardial Inflammation
Pathogenesis

- **Contiguous spread**
  - lungs, pleura, mediastinal lymph nodes, myocardium, aorta, esophagus, liver
- **Hematogenous spread**
  - septicemia, toxins, neoplasm, metabolic
- **Lymphangetic spread**
- **Traumatic or irradiation**

Pericardial Inflammation
Pathology

- inflammation provokes a fibrinous exudate with or without serous effusion
- the normal transparent and glistening pericardium is turned into a dull, opaque, and “sandy” sac
- can cause pericardial scarring with adhesions and fibrosis

Acute Pericarditis
Causes

- **Idiopathic** – the most common cause
- **Infective** (viral especially coxsakie A&B , bacterial, TB, fungal & other infections) – 7%
- Following MI or cardiac surgery (**Dressler's** synd)
- **Radiation** therapy
- **Neoplastic disease** (commonly lung or breast) – 6%
- **Connective tissue disease**
- **Uraemia**
- **trauma**

Acute Pericarditis
Diagnostic Clues

Patient will almost have 2 or more of the followings:

- **History**

  sudden onset of anterior chest pain that

  is pleuritic and retrosternal
- **Physical exam**

  presence of two- or three-component rub
- **ECG** most important laboratory clue , ST elevation

Chest Pain History
pericarditis vs infarction

- **Common characteristics**
  - retrosternl or precordial with raditaion to the neck, back, left shoulder or arm
- **Special characteristics (pericarditis)**
  - more likely to be sharp and pleuritic
  - ↑ with coughing, inspiration, swallowing
  - worse by lying supine, relieved by sitting and leaning forward

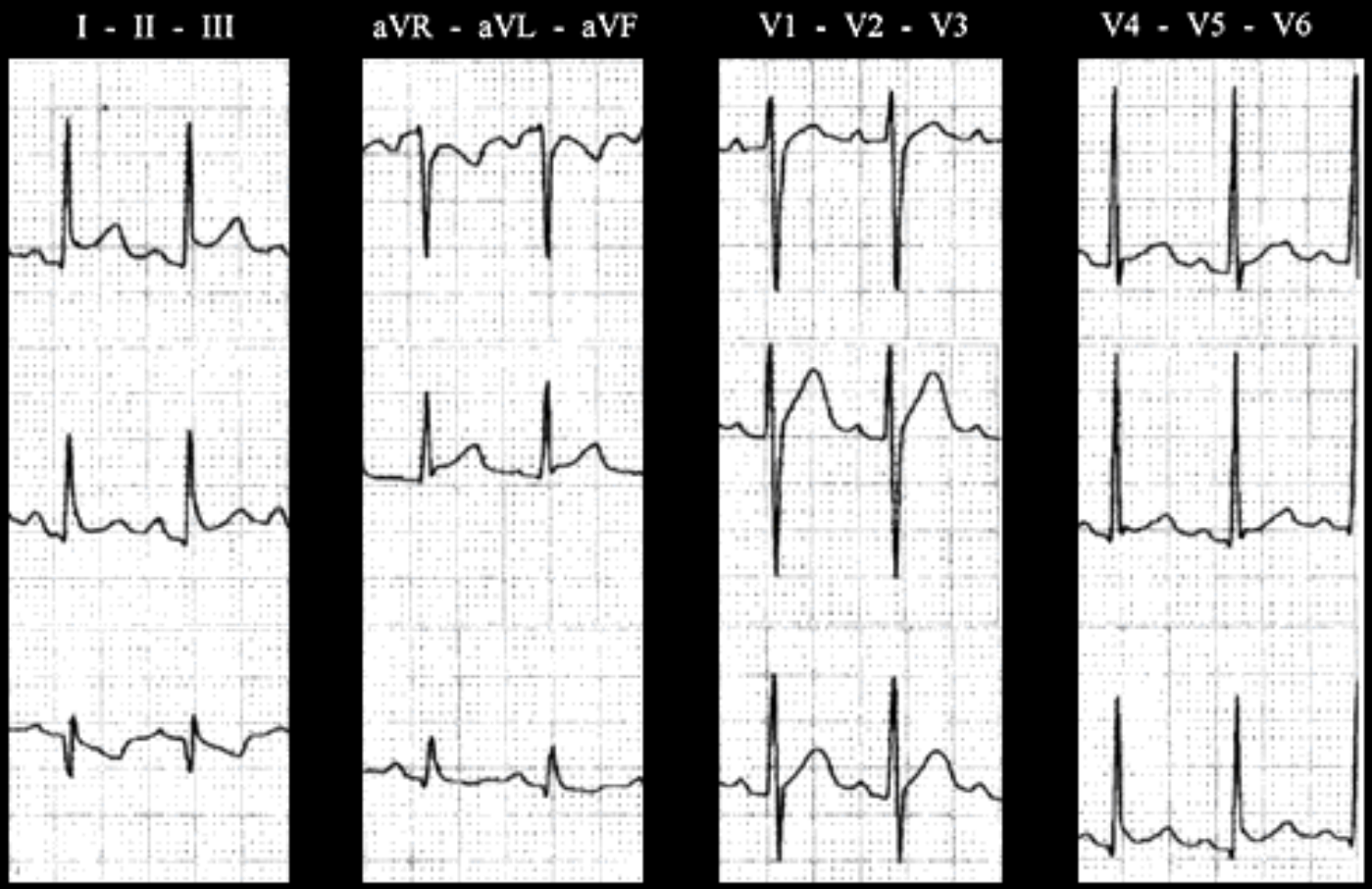
Acute Pericarditis
clinical examination

- **Pericardial friction rub is** pathognomic
- **Scratching or grating** (high pitch)**sound**
- Classically **three components:**
  - presystolic rub during atrial filling
  - ventricular systolic rub (loudest)
  - ventricular diastolic rub (after A2P2)
- **JVP** may be raised
- Low grade **fever**

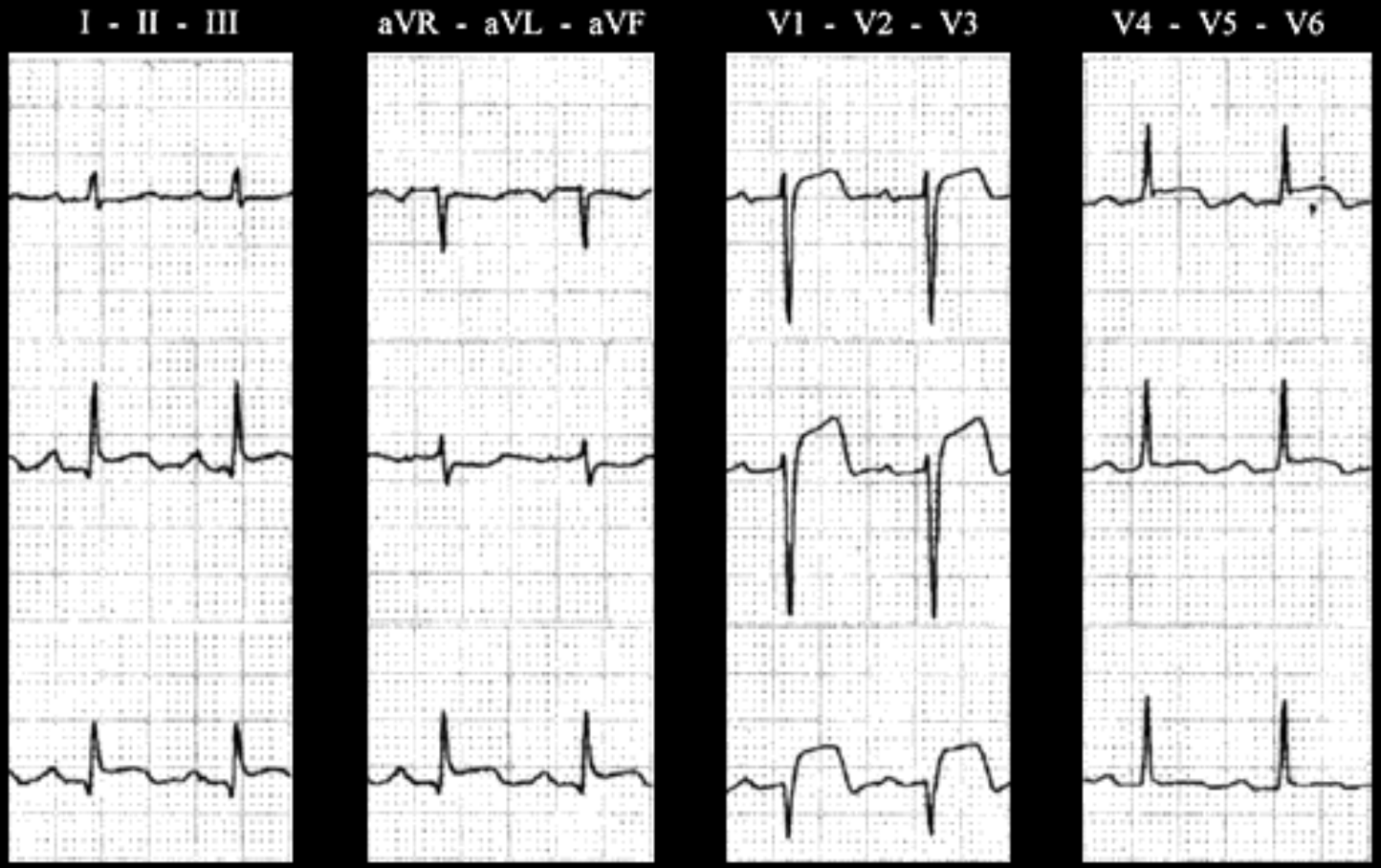
Acute Pericarditis
ECG features

- **ST-segment elevation**
  - Reflecting epicardial inflammation
  - Almost widespread
  - lead aVR usually shows ST depression
- **ST concave upward**
  - ST in AMI concave downward like a “dome”
- **PR segment depression** (early stage**)**
- **T-wave inversion**
  - occurs after the ST returns to baseline

ECG In Acute Pericarditis



Acute Apical Infarction - Simulating Pericarditis



Acute Pericarditis
Management

- **Treat underlying cause**
- **Bed rest**
- **Anti-inflmmatory agents**
  - ASA 648 mg q 3-4 hrs
  - NSAID (indomethacin 25-50 mg qid)
  - Colchicine could be a useful adjunct if patient not responding to NSAID alone
  - Corticosteroids are symptomatically effective , but preferably avoided

Acute pericarditis

Prognosis

- Pericarditis Is usually a benign disorder, but any cause can lead to an effusion and tamponade which could be lethal

- Pericarditis can also progress to pericardial constriction and heart failure

Constrictive Pericarditis

Constrictive Pericarditis

- Rarely develop after an episode of acute idiopathic pericarditis
- More likely to develop after subacute pericarditis with effusion that evolve over several weeks
- More frequent after purulent bacterial or tuberculous pericarditis & postradiation
- Fibrosis, thickining & calcification of the pericardium

Constrictive pericarditis

Clinical Presentation

- Mainly presents with clinical features of heart failure especially RHF
- May needs to be distinguished from RCM when making diagnosis

Constrictive Pericarditis
Physical Findings

- **Paradoxical pulse**
- **Jugular veins**
  - **prominent X and Y descent**
  - **↑ with inspiration (Kussmaul's sign)**
- **Lungs - possible pleural effusion**
- **Heart - diastolic pericardial knock**
- **Abdomen: ascites, pulsatile liver**
- **Extremities: peripheral edema**

Constrictive Pericarditis
investigations

- **ECG:** non specific changes
- **CXR :** may show calcification, effusion
- **Echo :** can identify coexisting effusion and haemodynamic effects on heart
- **MRI/CT scan** can give info about thickness of the pericardium
- **Cath** : elevated and equal diastolic pressures of LV & RV

Constrictive Pericarditis
Treatment

- Treating CHF symptoms as usual
- The only effective treatment is complete surgical resection of pericardium, with
- mortality risk of the procedure 5–16%
- Symptomatic improvement in 90%
- 5 year survival rate of 74-87% depending on co-morbidities pre-op

Pericardial Effusion

Pericardial Effusion

- Accumulation of fluid in the pericardium
- may be acute or chronic, global or localized
- Can coexist with acute pericarditis or with chronic constrictive pericarditis
- Spectrum of causes similar to those of acute pericarditis

Pericardial Effusion

- Gradual accumulation of fluid (chronic) permits progressive stretching of the pericardium, sometimes without significant increase of intrapericardial pressure .
- Rapid accumulation of fluid (acute) leads to critical elevation of intrapericardial pressure

Pericardial Effusion
Pathophysiology

- Significantly elevated intrapericardial pressure impedes diastolic filling of ventricles, therefore in order for ventricles to fill the end-diastolic pressure must exceed the intrapericardial pressure.
- In the global effusion, the pericardial pressure is equal around the heart
- As the effusion getting worse, the EDP of ventricles can not increase significantly to maintain cardiac output

Types of Effusive Fluid

- **serous**
  - transudative - heart failure
- **suppurative**
  - pyogenic infection with cellular debris and large number of leukocytes
- **hemorrhagic**
  - occurs with any type of pericarditis
  - especially with infections and malignancies

Pericardial Effusion

Symptoms and Signs

- Asymptomatic unless they are large enough to compress adjacent organs :
  - Dyspnea, cough, dysphagia, hoarseness, hiccups, abdominal fullness, nausea

- Clinical exam :

  - tachypnea, tachycardia,

  JVP may be elevated in compressing effusion

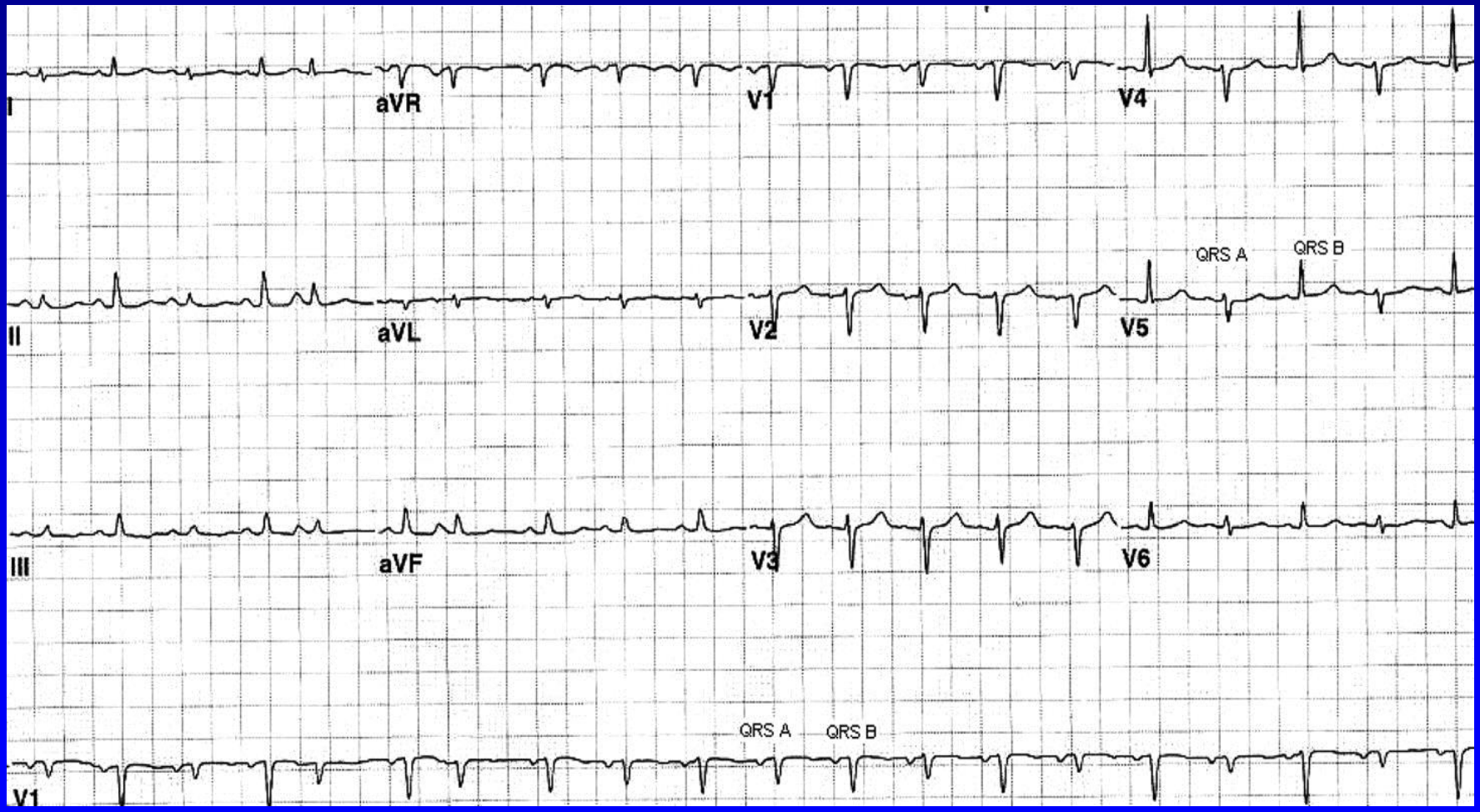
  pericardial rub may disappear, heart sounds muffled

Pericardial Effusion

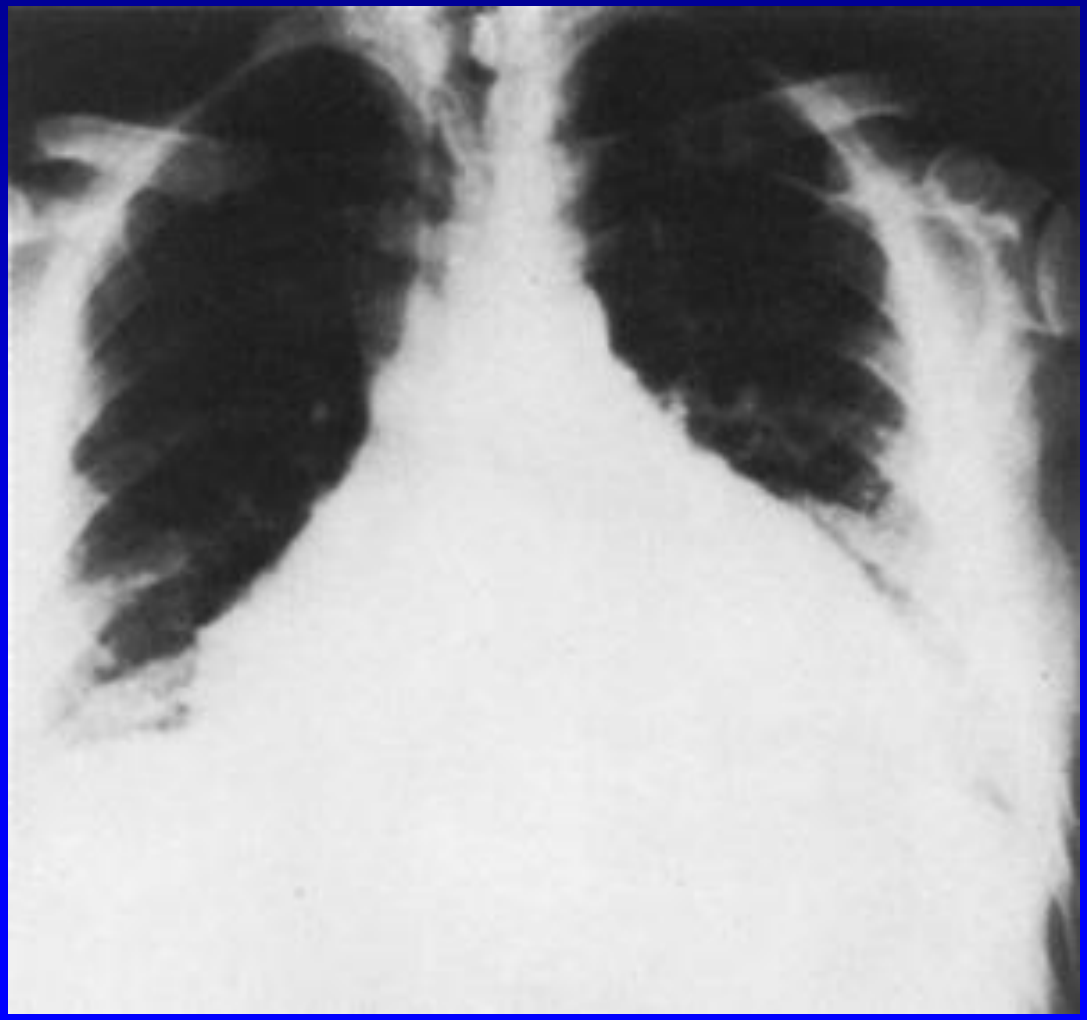
Investigations

- **ECG** - diffuse low voltage
  - electrical alternanse
- **CXR** - increased cardiothoracic ratio, but can not distinguish between cardiomegaly and pericardial effusion
- **Echo** - standard diagnostic tool, show size of effusion and haemodynamic effects of it .

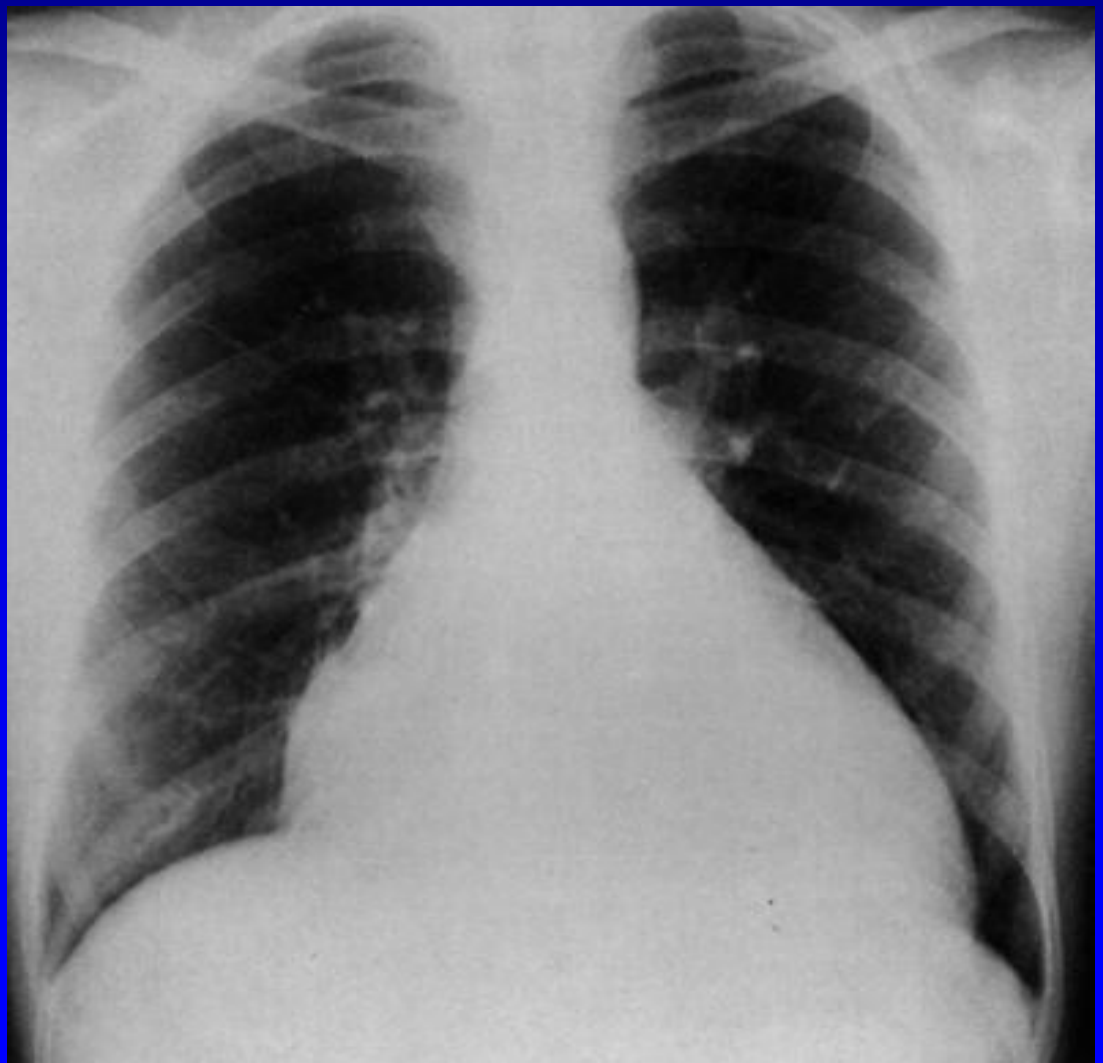
Pericardial Effusion - ECG



Pericardial Effusion - CXR



Pericardial Effusion - CXR



Pericardial Effusion - Echo

Pericardial Effusion
Treatment

- Depends on the clinical picture
- Treat the cause if diagnosed
- In case of haemodynamic compromise, pericardiocentesis may be needed

Pericardial Tamponade

Pericardial Tamponade

- It is a complication of pericardial effusion when rapid accumulation of fluid happens
- It is a clinical diagnosis based on patient's symptoms of acute heart failure
- It is a **medical emergency** should be treated promptly, and the risk of death depends on speed of diagnosis, treatment and underlying cause of tamponade

How much fluid can cause Tamponade

- It is not the quantity but the rate of accumulation and compliance of pericardium that can cause the problem
- A small amount (150 ml) accumulating guickly can cause the problem while large amount (1000 ml) accumulating very slowly may be tolerated well

Pericardial Tamponade
Pathophysiology

- **Early stage**
  - mild to moderate elevation of central venous pressure
- **Advanced stage**
  - ↑ intrapericardial pressure
    ↓ ventricular filling, ↓ stroke volume
  - hypotension
  - impaired organ perfusion

Pericardial Tamponade
Symptoms & Signs

- SOB, rapid breathing
- Orthopnea
- Tachycardia & hypotension
- Cold & clammy extremities
- Raised JVP and Kussmaul's sign
- Paradoxical pulse

Pulsus Paradoxus

- an exaggerated drop in blood pressure with inspiration (>10mmHg)

- pulsus without tamponade
  - COPD, RV infarct, pulmonary embolism

Pericardial Tamponade

Investigations

CXR – 'globular' heart

ECG (findings are suggestive not diagnostic)

- Sinus tachycardia
- Low voltage QRS complexes
- Electrical alternans (not always)

Echo

- Size and location of effusion
- Any evidence of diastolic collapse
- 'Swinging' of the heart
- Decrease of insp. flow across MV

Pericardial Tamponade
Treatment

- Medical emergency – intensive care
- Oxygen
- Volume expansion
- Bed rest
- Inotropic drugs if necessary
- **Pericardiocentesis** :
  the definitive therapy to remove excessive fluids

The End

- **“ Don’t cry because it is over, smile because it happened “**

- Dr. Seuss