# Myocarditis and Pericarditis

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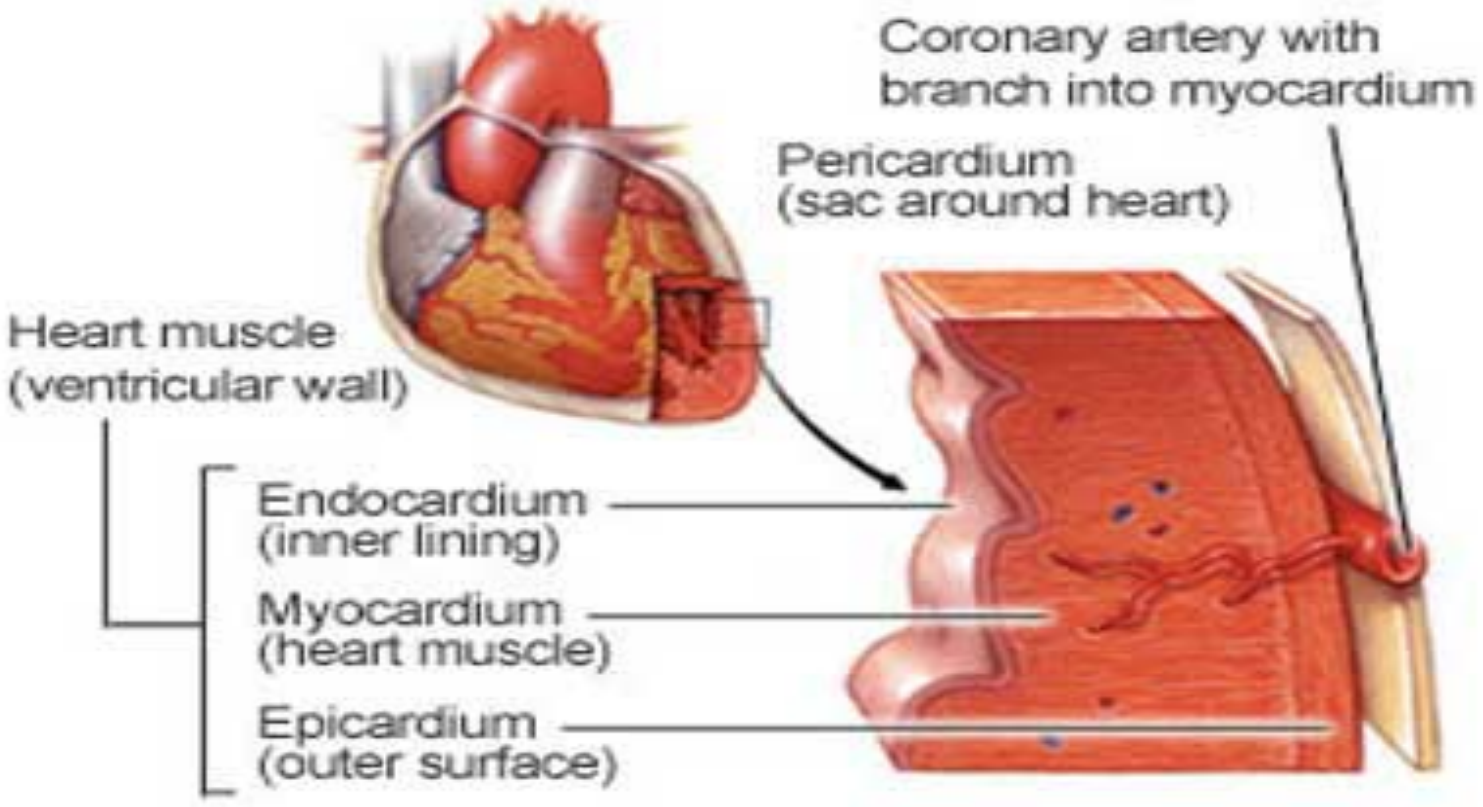
# Objectives

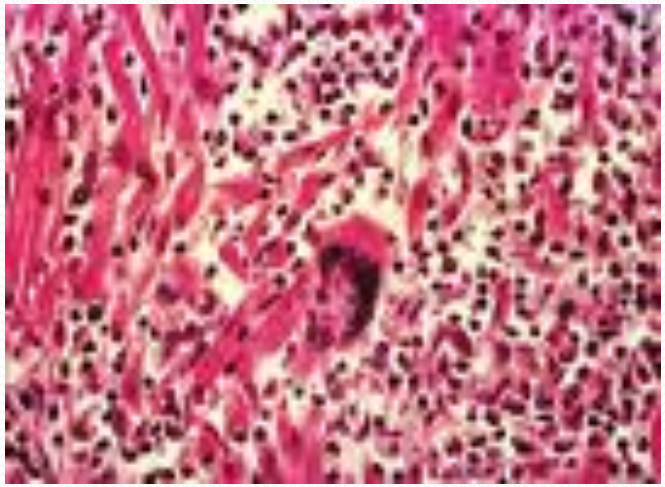
- Describe the epidemiology, risk factor for myocarditis.
- Explain the pathogenesis of myopericarditis.
- Differential between the various types of myocarditis and pericarditis.
- Name various etiological agents causing myocarditis and pericarditis.
- Describe the clinical presentation and differential diagnosis of myocarditis and pericarditis.
- Discuss the microbiological and non microbiological methods for diagnosis of myocarditis and pericarditis.
- Explain the management ,complication and prognosis of patient with myocarditis and/or pericarditis.

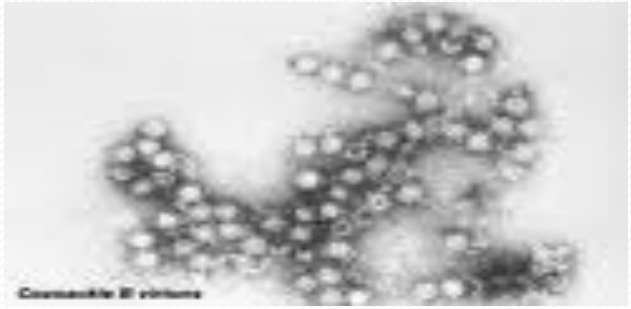
# Myocarditis

- **Myocarditis** : an inflammatory disease of the heart muscle.
- Mild & self-limited with few symptoms **OR** severe with progression to congestive heart failure & dilated cardiac muscle.
- localized **or** diffuse
- Myocarditis can be due to a variety of **infectious** and **non infectious** causes eg. toxins, drugs and hypersensitivity immune response.
- **Viral infection is the most common cause**



# Myocarditis





# Epidemiology ,Etiology and Risk Factors

- **Epidemiology** : no accurate estimate of incidence as many cases are mild & brief and diagnosis is not made.
- **Etiology : Coxsackie virus B** is the most common cause of myocarditis.

**Other virus** : Coxsackie virus A, Echoviruses, Adenoviruses ,Influenza, EBV, Rubella, Varicella, Mumps, Rabies, Hepatitis viruses and HIV.

**Bacterial causes** include *Corynebacterium diphtheriae*, Syphilis ,Lyme disease or as a complication of bacterial endocarditis .

# **Etiology**-continue

- Parasitic causes includes Chagas diseases, *Trichinella spiralis*, *Taxoplasma gondii* and *Echinococcus*.
- **Others organisms include: *Rickettsiae*, Fungi, *Chlamydia*, enteric pathogens, *Legionella* and *Mycobacterium tuberculosis***.

- **Giant cell myocarditis** due to Thymoma, SLE (*systemic lupus erythromatosis* ) or Thyrotoxicosis.

| Infectious | Noninfectious |
| --- | --- |
| Viruses<br>1. Coxsackie B<br>2. HIV | Systemic Diseases<br>1. SLE<br>2. Sarcoidosis<br>3. Vasculities(Wegener's disease)<br>4. Celiac disease |
| Bacterial<br>1. *Corynebacterium diphtheriae* (diphtheria) | Neoplastic infiltration |
| Protozoan<br>1. *Trypanosoma cruzi* (Chagas disease) | Drugs & Toxins<br>1. Ethanol<br>2. Cocaine<br>3. Radiation<br>4. Chemotherapeutic agents - Doxorubicin |
| Spirochete<br>1. *Borrelia burgdorferi* ( Lyme disease) | |

# Clinical presentation of myocarditis

- **Highly variable** :may occur days to weeks after onset of acute febrile illness or with heart failure without any known antecedent symptoms .
- Fever, headache, muscle aches, diarrhea, sore throat and rashes similar to most viral infections
- **Chest pain, arrhythmias ,sweating , fatigue and may present with congestive heart failure.**

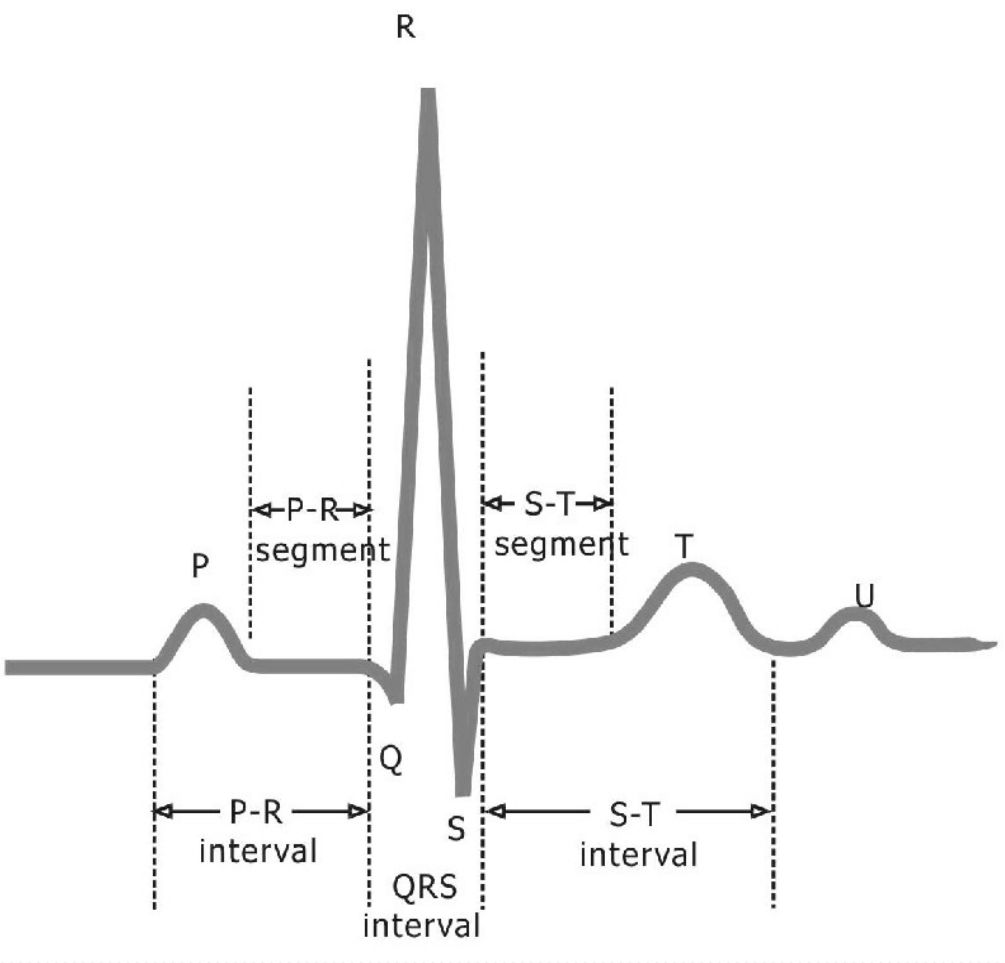
# Differential Diagnosis

- Acute Myocarditis
- Vasculitis
- Cardiomyopathy ( due to drugs **or** radiation)

# Diagnosis of myocarditis

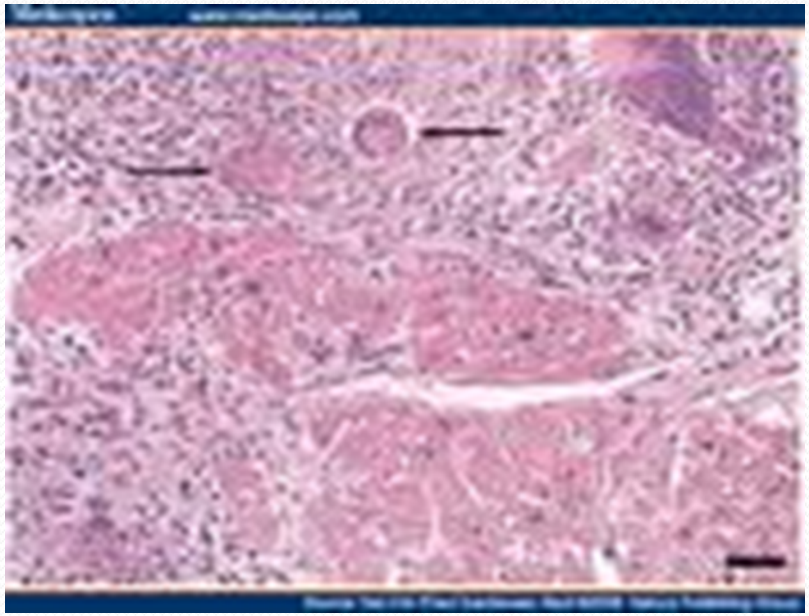
- WBCs, ESR, Troponin and CK-MB usually **elevated**
- **ECG** (nonspecific ST-T changes and conduction delays are common)
- **Blood culture**
- **Viral serology** and **other specific tests** for Lyme disease, diphtheria and Chagas disease may be indicated on a case by case basis.
- **Chest X-rays** : show cardiomegaly
- Radiology : **MRI** and **Echocardiogram**
- Heart muscle **biopsy** (for some cases)

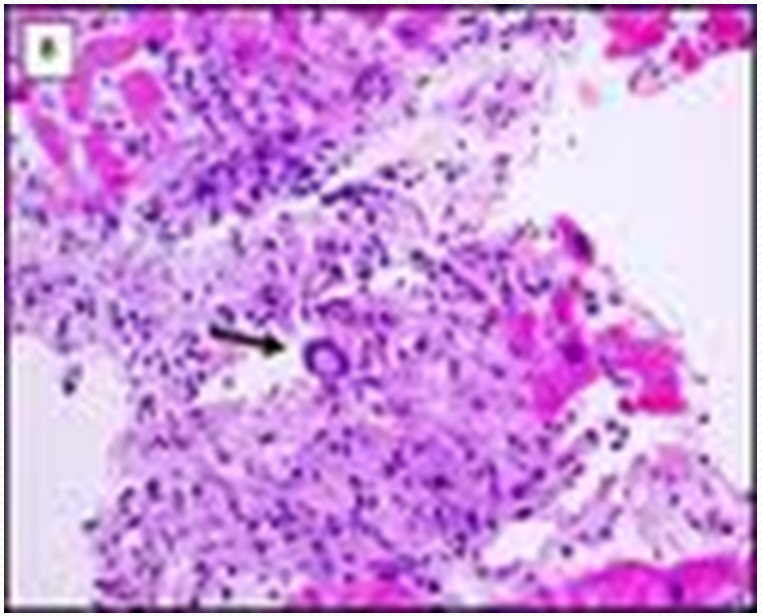
# ECGs of normal heart



# Endomyocardial diagnosis

Pathologic examination is not sensitive . It may reveal lymphocytic inflammatory response with necrosis. "**Giant cells" may be seen**.





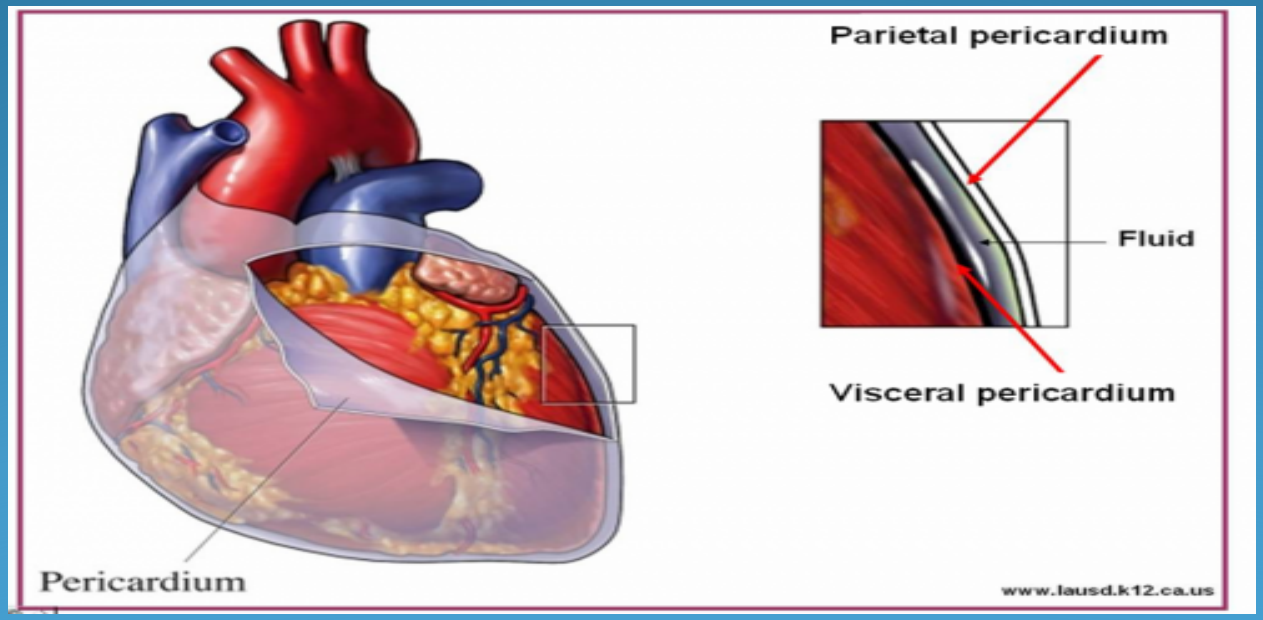
# Management of myocarditis

- **Often supportive:** restricted physical activity in heart failure.
- Specific antimicrobial therapy is indicated when an infecting agent is identified.
- Treatment of heart failure arrhythmia
- Other drugs indicated in special situations like anticoagulant, NSAID (non-steroidal anti-inflammatory drugs) , steroid or immunosuppressive immunomodulatory agents.
- Heart transplant

# Management of myocarditis

- Most cases of viral myocarditis are self limited.
- One third of the patients are left with lifelong **complications**, ranging from mild conduction defects to severe heart failure.
- Patient should be followed regularly every 1-3 months.
- **Sudden death may be the presentation of myocarditis in about 10% of cases.**

# Acute Pericarditis



# Pericarditis

- **Pericarditis** is an inflammation of the pericardium usually of infectious etiology ( viruses, bacterial, fungal or parasitic)
- **Etiology :** (infectious and non-infectious).

**Infectious causes :**

**Viral Pericarditis:**

- Coxsackie virus A and B, Echovirus are the most common causes.
- Other viruses includes Herpes viruses, Hepatitis B , Mumps, Influenza, Adenovirus ,Varicella and HIV.

- **Bacterial Pericarditis** usually a complication of pulmonary infections (e.g. pneumonia ,empyema):

**organisms** :*S. pneumoniae*, ***M. tuberculosis***, *S. aureus, H. influenzae, K. pneumoniae , Legionella pneumophila,* ***Mycoplasma pneumoniae*** *& Chlamydia pneumoniae* .

HIV patients may develop pericardial effusions caused by: *M.tuberculosis* or *M. avium* complex.

- **Disseminated fungal infection** caused by **:** *Histoplasma*, *Coccidioides*.
- **Parasitic infections** eg. disseminated **toxoplasmosis**, contagious spread of *Entamoeba histolytica* - are rare causes.

**Non-infectious pericarditis:**

**Causes:**

- Immune mediated : rheumatic fever & SLE
- Miscellaneous : due to myocardial infarction , malignancy and uremia.

# Pathophysiology

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

# Pathophysiology

- Inflammation provokes 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.

# Types of Pericarditis

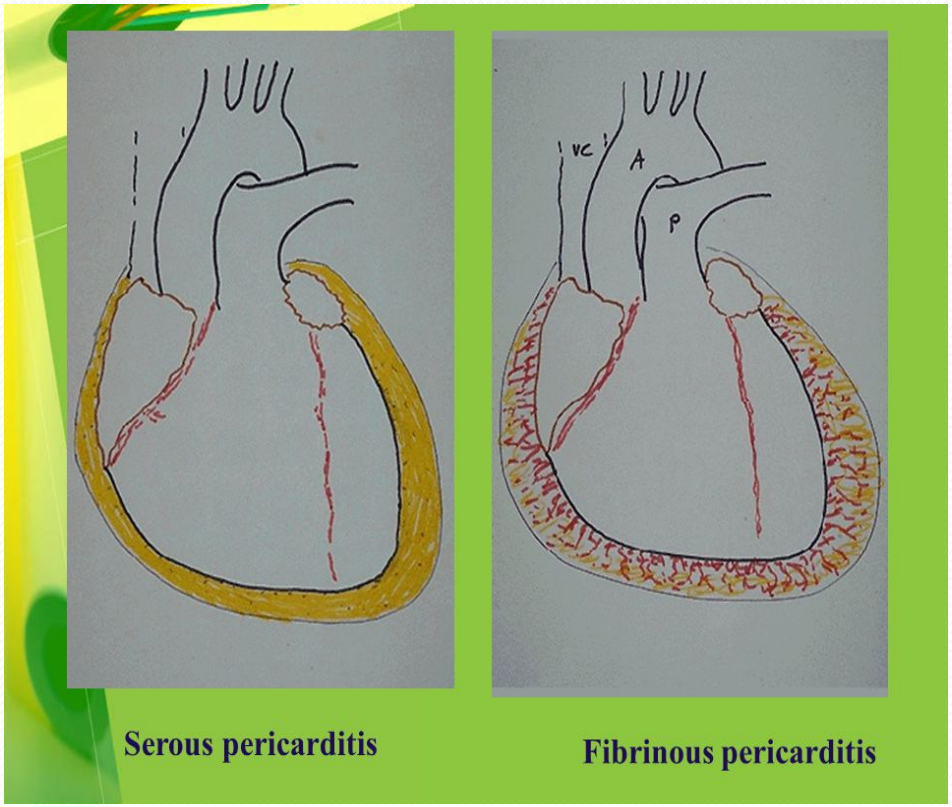
- **Caseous Pericarditis** commonly **tuberculous** in origin.
- **Serous Pericarditis** due to **autoimmune** diseases (rheumatoid arthritis, SLE), **viral** infections
  - Transudative serous fluid
- **Fibrinous Pericarditis** due to acute MI, uremia, radiation
  - Fibrinous exudative fluid

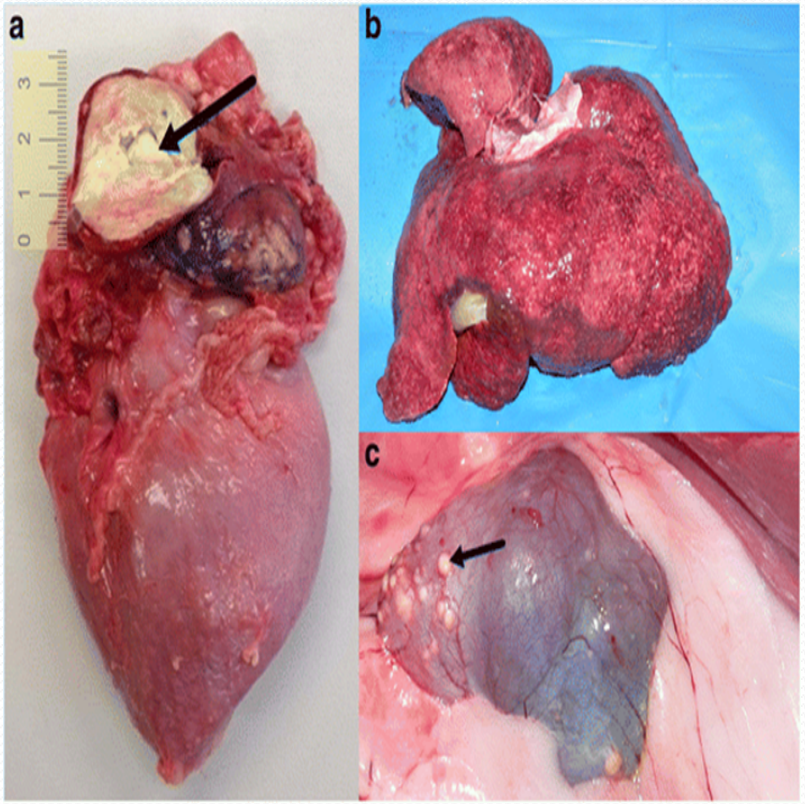
# Types of Pericarditis

- **Purulent/Suppurative pericarditis** due to bacteria, fungi or parasites.
  - Purulent exudative fluid

- **Hemorrhagic pericarditis** usually caused by infection (e.g. TB) or malignancy
  - blood mixed with a fibrinous or suppurative effusion

# Types of pericarditis:



# Constrictive Pericarditis

## causes:

- Idiopathic
- Radiotherapy
- Cardiac surgery
- Connective tissue disorders
- Dialysis
- **Bacterial infection** ( viral, TB, fungal)

# Clinical presentation of pericarditis

**Acute pericarditis**:

- **Sudden** pleuritic chest pain which is positional retrosternal l(relieved by setting forward)
- Dyspnea
- Fever
- **On examination** : Pericardial rub, exaggerated pulses , paradoxus JVP (*jugular venous pressure*) and tachycardia.
- As the pericardial pressure increases, palpitations , presyncope or syncope may occur.

**Chronic pericarditis:**

- Tuberculous pericarditis has **insidious** onset .

# Tuberculous Pericarditis

- Incidence of pericarditis in patients with pulmonary TB ranges from 1 – 8 %
- Clinical findings:  fever, pericardial friction rub, hepatomegaly
- Tuberculin skin test usually positive
- Fluid smear for acid fast bacilli (**AFB** ) often negative
- Pericardial **biopsy** more definitive

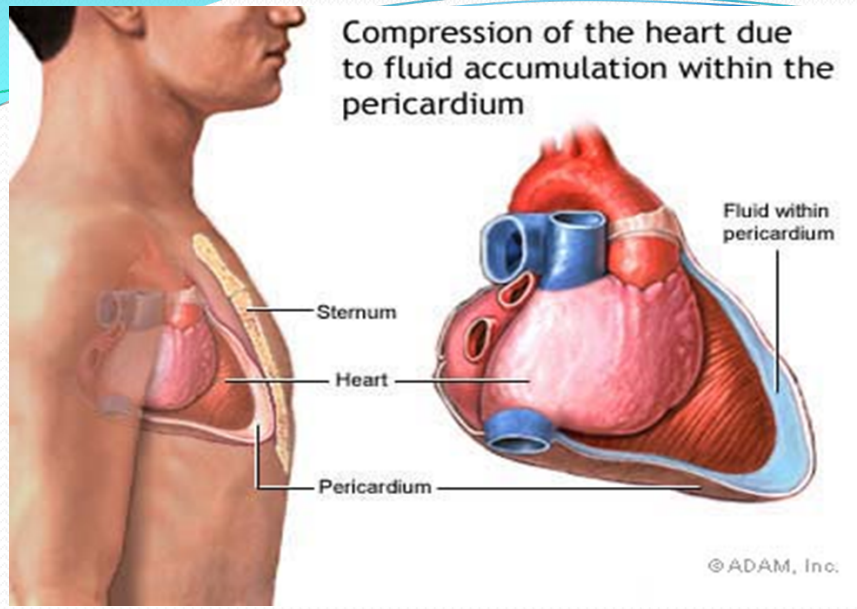
# Acute Pericarditis

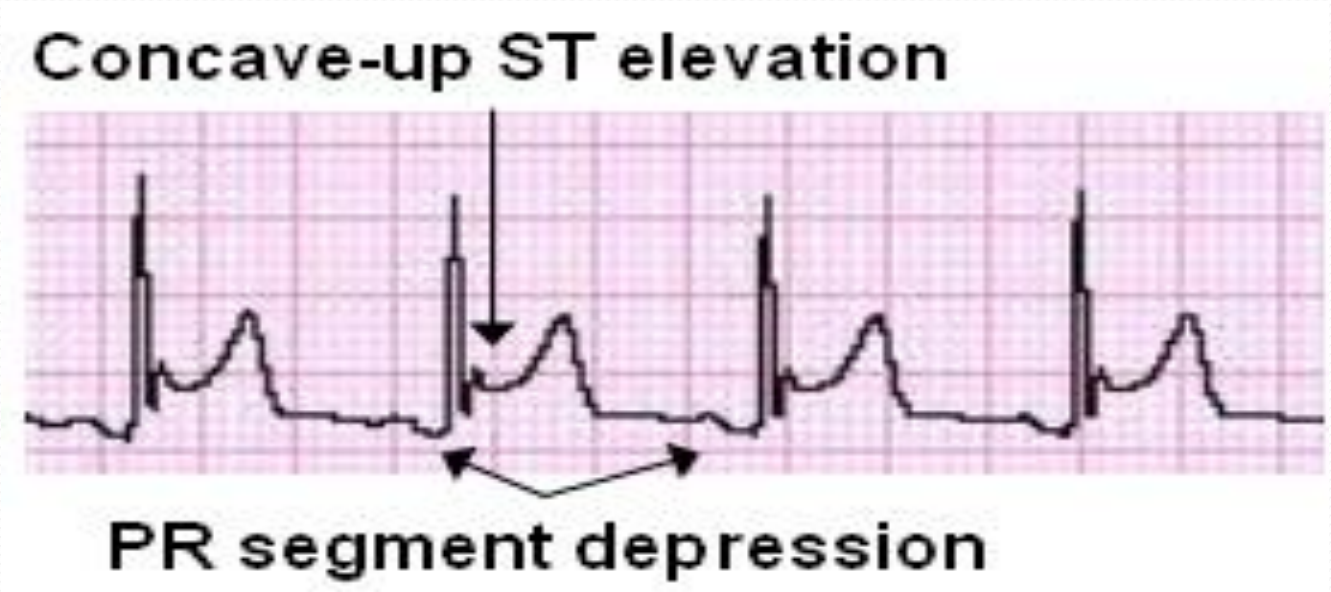
## Differential Diagnosis

- Acute myocardial infarction
- Pulmonary embolism
- Pneumonia
- Aortic dissection

# Investigations & Diagnosis

- **ECG** will show ST elevation, PR depression and T-wave inversion may occur later.
- Blood culture
- **Leukocytosis** and an elevated **ESR** are typical
- Other routine testing : **urea** and **creatinine**.
- **Tuberculin skin** test is usually positive in tuberculous pericarditis cases.
- **Chest x-ray** may show enlarged cardiac shadow or calcified pericardium and **CT** scan show pericardial thickening >5mm.
- Pericardial fluid or pericardial **biopsy** specimens for fungi.
- **Immunology /Serology** : Antinuclear antibody tests and Histoplasmosis complement fixation indicated in endemic area.


Compression of the heart due to fluid accumulation within the pericardium
Fluid within pericardium
Sternum
Heart
Pericardium
©ADAM, Inc.

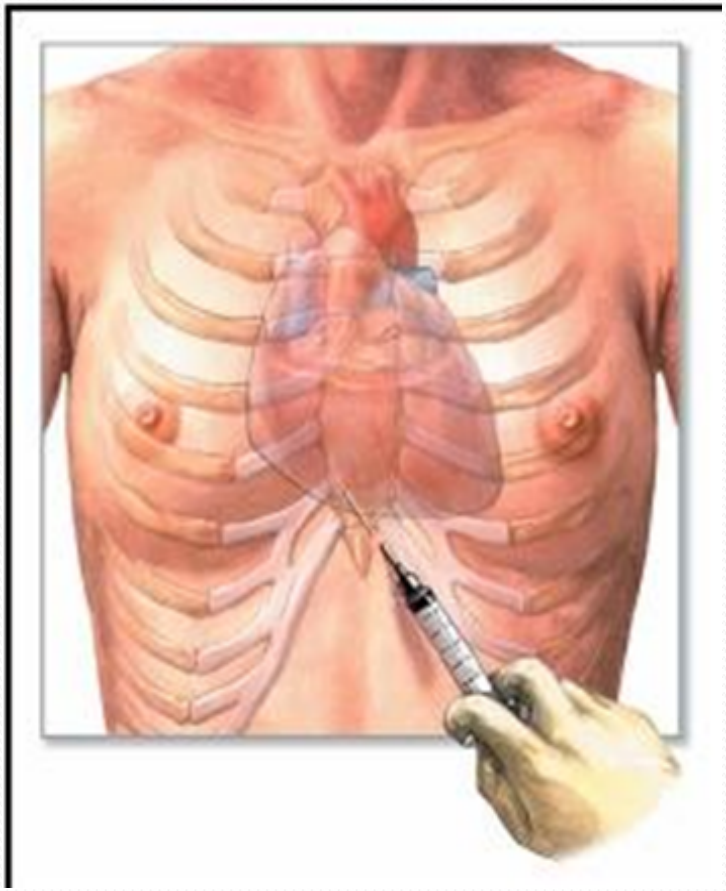

Concave-up ST elevation
PR segment depression

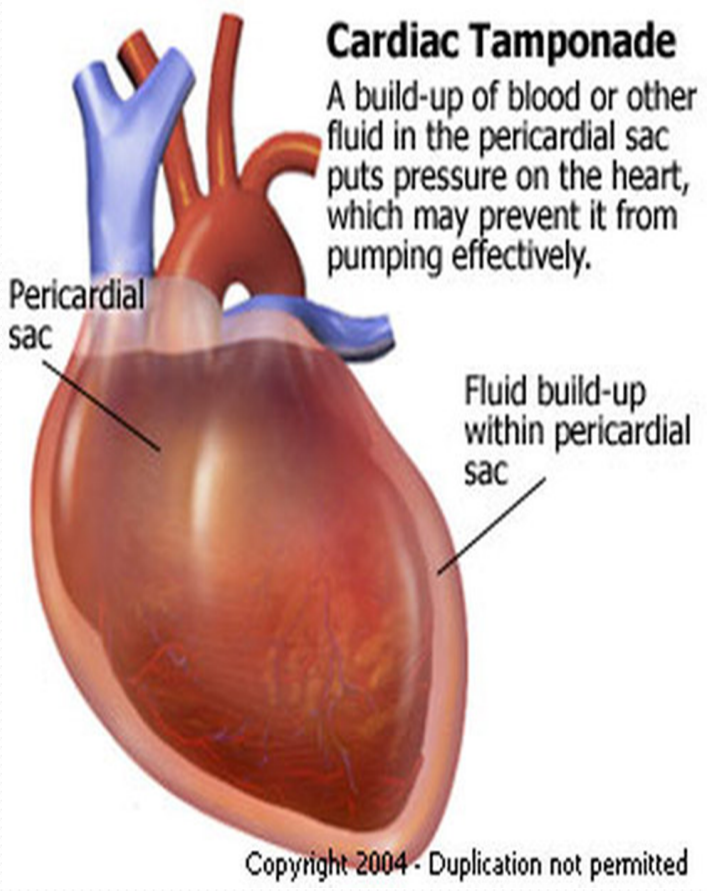
# Management of pericarditis

- Management is largely supportive for cases of idiopathic and viral pericarditis including bed rest , NSAIDS and Colchicine.
- Corticosteroid use is controversial and anticoagulants usually contraindicated.
- Specific antibiotics must include activity against *S. aureus* and respiratory bacteria.
- **Antiviral:**

**Acyclovir** for *Herpes simplex* or *Varicella* . **Ganciclovir** for CMV .

# Pericardiocentesis





# Management of pericarditis

- **Pericardiocentesis** : a therapeutic procedure to remove fluid from the pericardium (to relief Tamponade) in severe cases with pericardial effusion.
- Patients who recovered should be observed for recurrence.
- Symptoms due to viral pericarditis usually subsided within one month.

# Reference book

Ryan, Kenneth J. Sherris Medical Microbiology. Latest edition.

Mc Graw –Hill education