MYOCARDITIS & PERICARDITIS

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OBJECTIVES

1. **Myocardial Disease**
   - Myocarditis
   - Cardiomyopathy

2. **Pericardial Disease**
   - Pericardial fluid accumulation
   - Pericarditis

MYOCARDITIS

- Its Inflammation of the heart muscle
- It is a rather common form of heart disease that can occur at any age.
- Its exact incidence is difficult to ascertain as the histological examination has been largely **confined to autopsy material**.
- Reports from different studies have estimated the incidence of myocarditis in **1 to 4% of all autopsies**

CLASSIFICATION OF MYOCARDITIS

1. **General Classification**
   I. Interstitial and parenchymatous type
   II. Specific and non-specific type
   III. Acute, sub-acute and chronic type

2. **Etiologic Classification**
   I. Infective myocarditis
   II. Idiopathic (fiedler's) myocarditis
   III. Myocarditis in connective tissue diseases
   IV. Miscellaneous types of myocarditis

General Classification

I. **Interstitial and parenchymatous type**
   - depending upon whether the inflammation is confined to interstitial tissue or the parenchyma

II. **Specific and non-specific type**
   - depending upon whether the inflammation is granulomatous or non-specific type

III. **Acute, sub-acute and chronic type**
   - depending upon the duration of inflammatory response.

ETIOLOGIC CLASSIFICATION

I). INFECTIVE MYOCARDITIS

1. Viral myocarditis
2. Suppurative myocarditis
3. Toxic myocarditis
4. Infective granulomatous myocarditis
5. Syphilitic myocarditis
6. Rickettsial myocarditis
7. Protozoal myocarditis
8. Helminthic myocarditis
9. Fungal myocarditis

1. VIRAL MYOCARDITIS

- Some of the common examples are influenza, poliomyelitis, infectious mononucleosis, hepatitis, smallpox, chickenpox, measles, mumps, rubella, viral pneumonias, coxsackievirus and HIV infections.
- **Grossly**, the myocardium is pale and flabby with dilatation of the chambers. There may be focal or patchy areas of necrosis.
- **Histologically**, there are changes of acute myocarditis. Initially, there is oedema and infiltration of the interstitial tissue by neutrophils and lymphocytes. Later, there is necrosis of individual myocardial fibres and the infiltrate consists of lymphocytes and macrophages

2. SUPPURATIVE MYOCARDITIS

- **Pyogenic bacteria**, chiefly Staphylococcus aureus or Streptococcus pyogenes, which cause septicaemia and pyaemia

- **Grossly,** There are either abscesses in the myocardium or there is diffuse myocardial involvement.

- **Microscopically**, the exudate chiefly consists of neutrophils, admixed with lymphocytes, plasma cells and macrophages. There may be foci of myocardial degeneration and necrosis with areas of healing by fibrosis.

3. TOXIC MYOCARDITIS.

- A number of acute bacterial infections produce myocarditis by **toxins** e.g. in diphtheria, typhoid fever and pneumococcal pneumonia
- It manifests clinically by **cardiac arrhythmias** or acute **cardiac failure** due to involvement of the conduction system. It may cause sudden death
- **Grossly,** the appearance is similar to that seen in viral myocarditis.
- **Histologically**, there are small foci of coagulative necrosis in the muscle which are surrounded by nonspecific acute and chronic inflammatory infiltrate.

4. INFECTIVE GRANULOMATOUS MYOCARDITIS

- Tuberculosis, brucellosis and tularaemia are some examples of bacterial infections characterized by granulomatous inflammation in the myocardium.

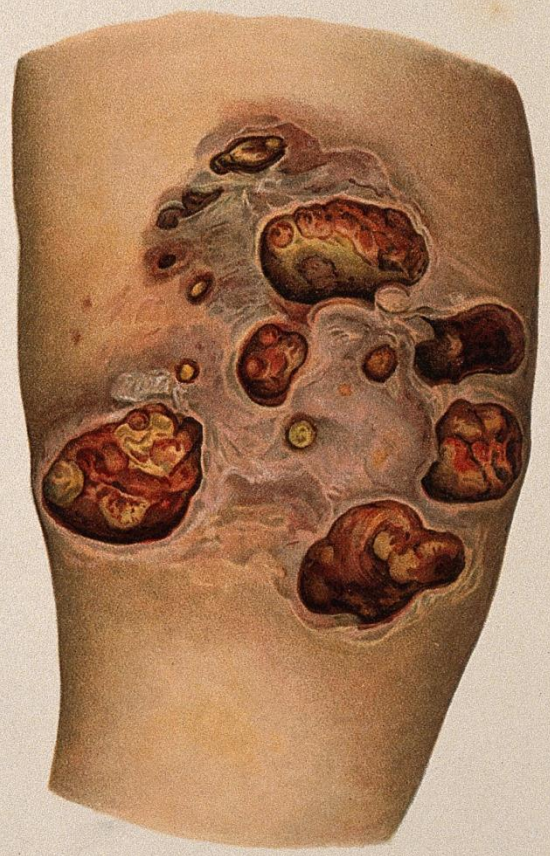
- Sarcoidosis, though not a bacterial infection, has histological resemblance to other granulomatous myocarditis

- Tuberculous myocarditis is rare and occurs either by haematogenous spread or by extension from tuberculous pericarditis.

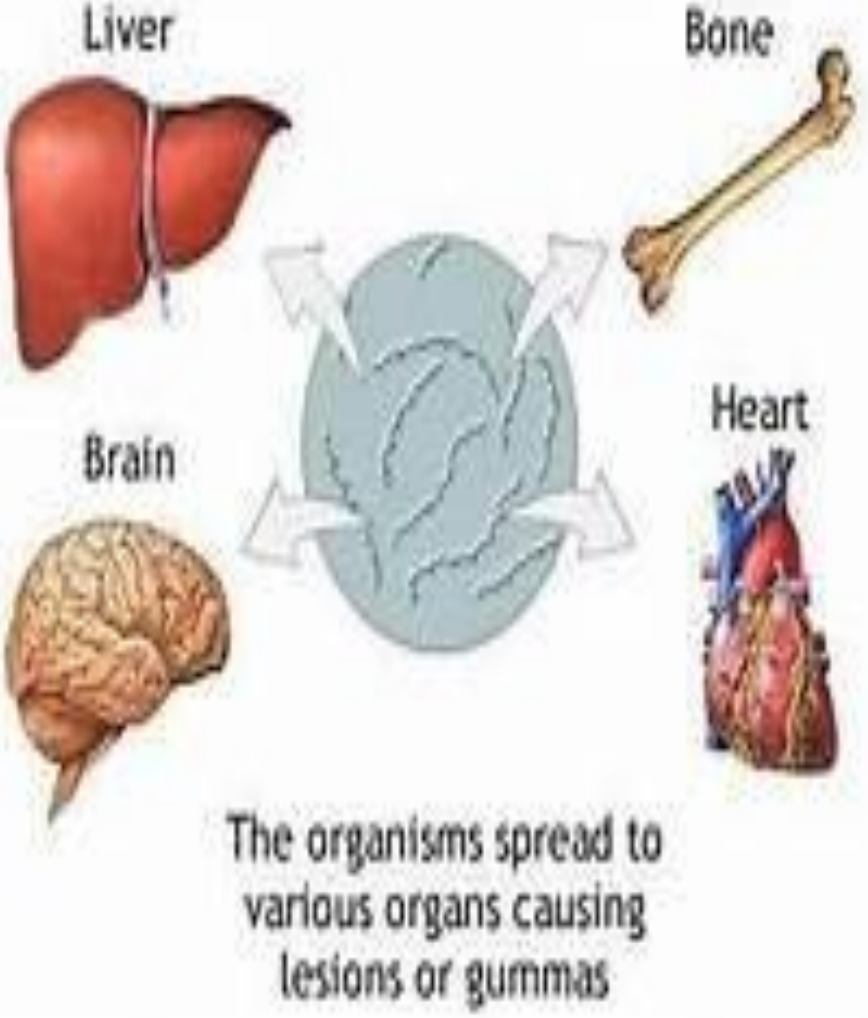
5. SYPHILITIC MYOCARDITIS

- Syphilitic involvement of the myocardium may occur in 2 forms—a **gummatous lesion** consisting of granulomatous inflammation which is more common, and a primary non-specific myocarditis which is rare.
- The syphilitic gummas in the myocardium may be **single or multiple** and may be **grossly discernible.**
- The gummas may affect the **conduction system of the heart**

PLATE XXI.



Gummatous syphiloderm, showing somewhat diffused infiltration and ulcers of right calf (Mracek).



6. RICKETTSIAL MYOCARDITIS

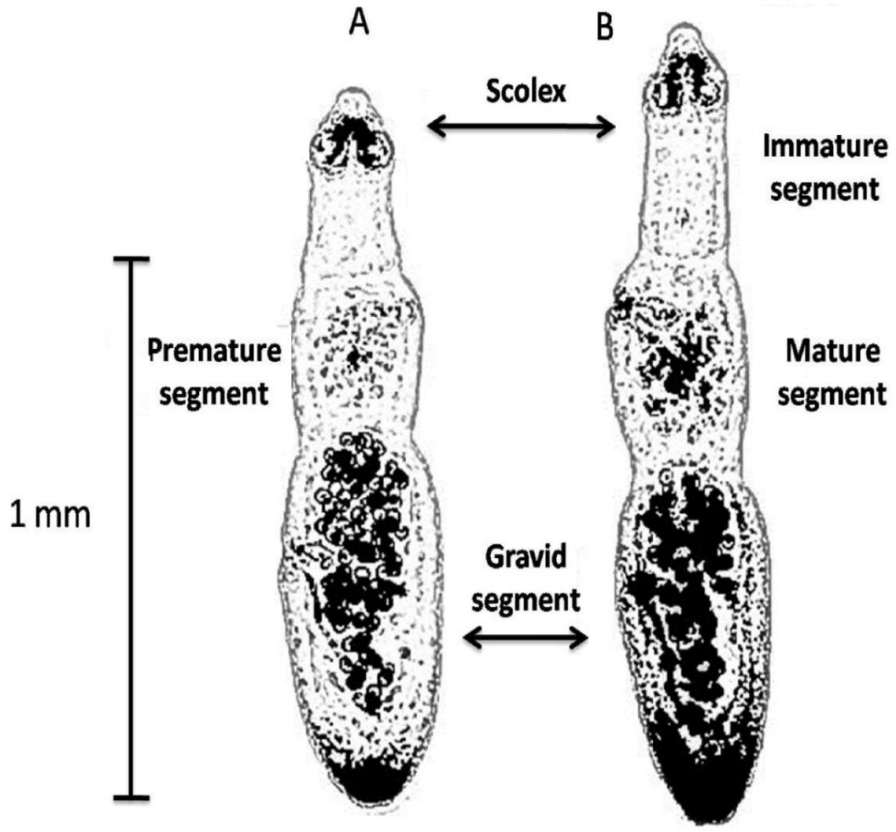
- Myocarditis occurs quite frequently in scrub typhus (R. tsutsugamushi) and Rocky Mountain typhus fever caused by spotted rickettsii
- **Microscopically**, there is interstitial oedema and focal or patchy infiltration by inflammatory cells which include lymphocytes, plasma cells, macrophages, mast cells and eosinophils but necrosis and degeneration are generally not present.

7. PROTOZOAL MYOCARDITIS

- Chagas' disease and toxoplasmosis are the two protozoal diseases causing myocarditis. Chagas' disease caused by Trypanosoma cruzi frequently attacks myocardium besides involving the skeletal muscle and the central nervous system.
- **Microscopically**, both these conditions show focal degeneration and necrosis of the myocardium, oedema and cellular infiltrate consisting of histiocytes, plasma cells, lymphocytes and a few polymorphs.
- The organisms are found in the muscle fibres.

8. HELMINTHIC MYOCARDITIS

- **Echinococcus granulosus** and **Trichinella spiralis** are the two intestinal helminths which may cause myocarditis.



9. FUNGAL MYOCARDITIS.

- Patients with immunodeficiency, cancer and other chronic debilitating diseases are more prone to develop fungal myocarditis.
- They include:
  - candidiasis,
  - aspergillosis,
  - blastomycosis,
  - actinomyosis,
  - cryptococcosis,
  - coccidioidomycosis
  - histoplasmosis.

II). IDIOPATHIC (FIEDLER'S) MYOCARDITIS

- Idiopathic or Fiedler's myocarditis is an isolated myocarditis **unaccompanied** by **inflammatory changes** in the endocardium or pericardium and occurs without the usual apparent causes.

- The condition is rapidly progressive and causes sudden severe cardiac failure or sudden death.

- **Grossly**, the heart is soft and flabby. The cardiac chambers are generally dilated and sometimes show hypertrophy. There are yellow-grey focal lesions throughout the myocardium. Mural thrombi are commonly present.

- **Histologically**, two forms of idiopathic myocarditis are described: diffuse type and giant cell (idiopathic granulomatous) type.

i) Diffuse type

- Its more common of the two and characterised by diffuse non-specific inflammatory infiltrate consisting of lymphocytes, plasma cells, macrophages, eosinophils and a few polymorphs in the interstitial tissue without formation of granulomas.
- Late stage shows healing by fibrosis.

ii) Giant cell type or idiopathic granulomatous type

- characterised by formation of non-caseating granulomas consisting of macrophages, lymphocytes, plasma cells and multinucleate giant cells.

- The giant cells are of foreign body or Langhans' type or of myogenic origin.

III. MYOCARDITIS IN CONNECTIVE TISSUE DISEASES

- Inflammatory involvement of the myocardium occurs in a number of connective tissue diseases such as
  - rheumatoid arthritis,
  - lupus erythematosus,
  - polyarteritis nodosa,
  - dermatomyositis
  - scleroderma.
- The pathologic changes in the heart muscle are similar to the changes seen in other organs in these conditions

IV. MISCELLANEOUS TYPES OF MYOCARDITIS

1. Physical agents
2. Chemical agents
3. Drugs
4. Immunologic agents
5. Metabolic derangements

1. Physical agents

- Physical agents initiate non-specific myocarditis, example of agents are;
  - ❖contusion of the myocardium
  - ❖heat stroke
  - ❖cardiac surgery
  - ❖irradiation
- The features consist of an infiltrate of neutrophils, eosinophils and mononuclear cells and shows contraction-band necrosis of the myocardial fibres

2. Chemical agents

- Toxic chemicals cause focal areas of **degeneration and necrosis** of myocardial fibres and nonspecific inflammatory reaction, chiefly consisting of lymphocytes and macrophages
- Examples are;
  - arsenic,
  - phosphorus
  - carbon monoxide

3. Drugs

- Changes similar to those induced by chemical poisons are produced by certain drugs such as;-
  - ❖phenothiazine compounds,
  - ❖sulfonamides,
  - ❖catecholamines
  - ❖cytotoxic compounds

4. Immunologic agents.

- Myasthenia gravis, Friedreich's ataxia, and progressive muscular dystrophies initiate a state of autoimmunisation against the myocardium resulting in focal myocardial degeneration and necrosis with secondary inflammatory reaction. Later, myocardial fibrosis may occur

5. Metabolic derangements

- **Uraemia**, **hypokalaemia** and **shock** are associated with degeneration and necrosis of the myocardial fibres, oedema of the interstitial tissue and nonspecific inflammatory reaction.

PERICARDIAL DISEASES

I. Pericardial fluid accumulations

II. Pericarditis

PERICARDITIS

- Pericarditis is the **inflammation of the pericardial layers** and is generally secondary to diseases in the heart or caused by systemic diseases.
- Primary or idiopathic pericarditis is quite rare.
- Based on the morphologic appearance, pericarditis is classified into **acute and chronic** types with their subtypes based on the character of the exudate,

Classification of Pericarditis

A. ACUTE PERICARDITIS

1. Serous pericarditis
2. Fibrinous or serofibrinous pericarditis
3. Purulent or fibrinopurulent pericarditis
4. Haemorrhagic pericarditis

B. CHRONIC PERICARDITIS

1. Tuberculous pericarditis
2. Chronic adhesive pericarditis
3. Chronic constrictive pericarditis
4. Pericardial plaques (milk spots, soldiers' spots)

A. ACUTE PERICARDITIS

1. SEROUS PERICARDITIS.

- may be accompanied by accumulation of **serous effusion**
- caused by

  i) **Viral infection** e.g. coxsackie A or B viruses, influenza virus, mumps virus, adenovirus and infectious mononucleosis.

  ii) **Rheumatic fever.**

  iii) **Rheumatoid arthritis.**

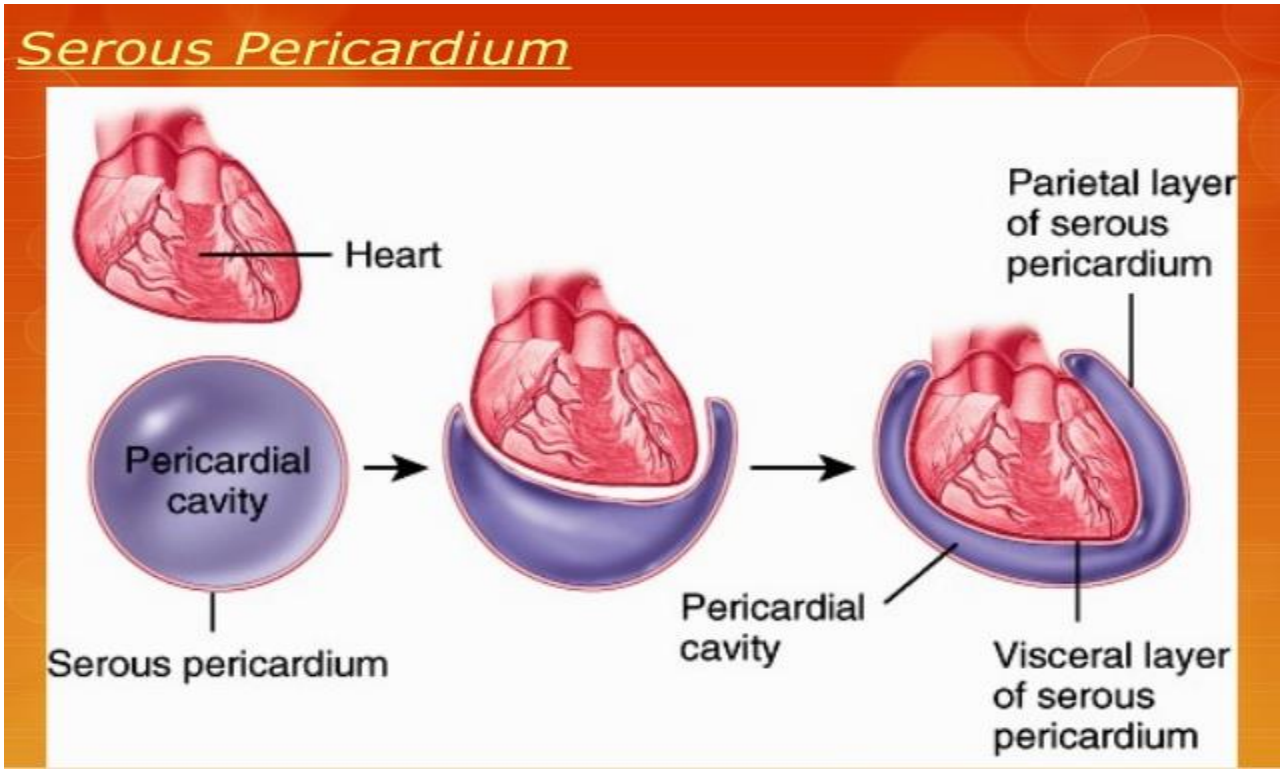
  iv) **Systemic lupus erythematosus.**

  v) **malignant tumour** e.g. carcinoma lung, mesothelioma and mediastinal tumours.

  vi) **Tuberculous** pericarditis in the early stage

Cont..

- **Microscopically**, the epicardial and pericardial surfaces show infiltration by some neutrophils, lymphocytes and histiocytes.
- The fluid usually resorbs with the resolution of underlying disease.



2. FIBRINOUS AND SEROFIBRINOUS PERICARDITIS.

- Quite often, there is admixture of fibrinous exudate with serous fluid.
- The various causes of this type of pericarditis are as follows:

  i) Uraemia

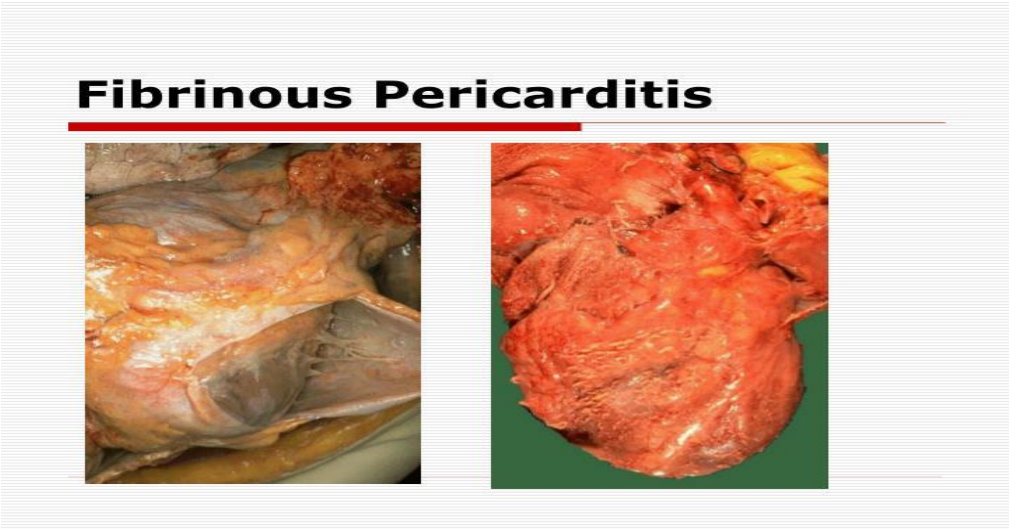
  ii) Myocardial infarction

  iii) Rheumatic fever

  iv) Trauma such as in cardiac surgery

  v) Acute bacterial infections.

- The amount of fluid accumulation is variable. The cardiac surface is characteristically covered by dry or moist, shaggy, fibrinous exudate which gives '**bread and butter**' appearance.
- Clinically, these cases manifest by **friction rub**
- pericarditis heals by organisation and develops fibrous adhesions resulting in **adhesive pericarditis.**



3. PURULENT OR FIBRINOPURULENT PERICARDITIS

- Mainly caused by pyogenic bacteria (e.g. staphylococci, streptococci and pneumococci) and less frequently by fungi and parasites
- The infection may spread to the pericardium by the following routes:
  - i) By direct extension from neighbouring inflammation e.g. in empyema of the pleural cavity, lobar pneumonia, infective endocarditis and mediastinal infections.
  - ii) By haematogenous spread.
  - iii) By lymphatic permeation.
  - iv) Direct implantation during cardiac surgery

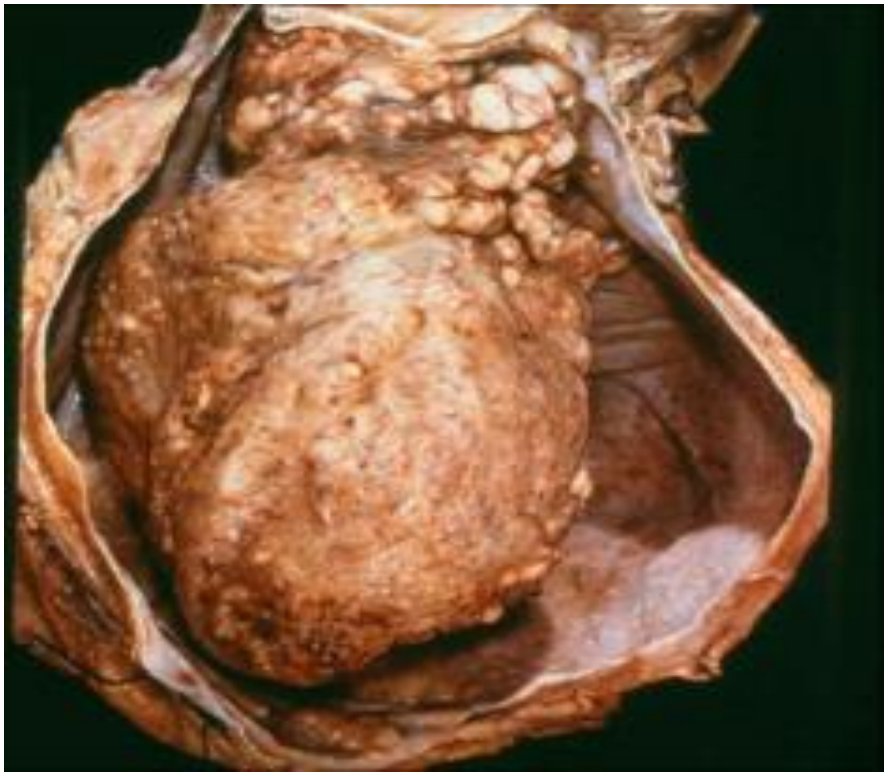
- The amount of exudate is variable and is generally thick, creamy pus, coating the pericardial surfaces
- **Microscopically**, besides the purulent exudate on the pericardial surfaces, the serosal layers show dense infiltration by neutrophils. Purulent exudate generally does not resolve completely but instead heals by organisation resulting in adhesive or chronic constrictive pericarditis

4. HAEMORRHAGIC PERICARDITIS

- One in which the exudate consists of admixture of an inflammatory effusion of one of the foregoing types along with blood.
- The causes are as under:
  - i) Neoplastic involvement of the pericardium
  - ii) Haemorrhagic diathesis with effusion
  - iii) Tuberculosis
  - iv) Severe acute infections

B. CHRONIC PERICARDITIS

- Chronic pericarditis is the term used for tuberculous pericarditis and the healed stage of one of the various forms of acute pericarditis already described



1. TUBERCULOUS PERICARDITIS

- Tuberculous pericarditis is the most frequent form of granulomatous inflammation of the pericardium.
- The lesions may occur by the following mechanisms:
  - i) Direct extension from an adjacent focus of tuberculosis.
  - ii) By lymphatic spread e.g. from tracheobronchial lymph nodes, chronic pulmonary tuberculosis or infected pleura
- The exudate is slightly turbid, caseous or blood-stained with sufficient fibrin.
- Tubercles are generally visible on the pericardial surfaces and sometimes caseous areas are also visible to the naked eye

- **Microscopically,** typical tuberculous granulomas with caseation necrosis are seen in the pericardial wall. The lesions generally do not resolve but heal by fibrosis and calcification resulting in chronic constrictive pericarditis

READ ON

2. CHRONIC ADHESIVE PERICARDITIS.

3. CHRONIC CONSTRICTIVE PERICARDITIS.

4. PERICARDIAL PLAQUES (MILK SPOTS, SOLDIERS' SPOTS)