MED437
KING SAUD UNIVERSITY

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MICROBIOLOGY
437

Myocarditis & Pericarditis

Important!
Doctor's Notes
Only found in females' slides
Only found in males' slides
Extra Notes

لجنة المراجعة
غيداء آل معجم
و
عبدالرحمن الحيسوني

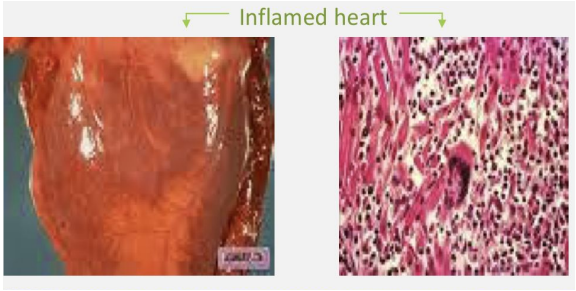
" I'm not telling you it's going to be easy. I'm telling you it's going to be worth it."

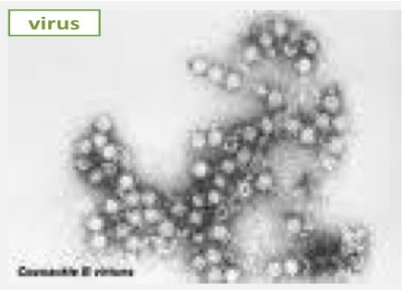
Objectives

- 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** is 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 to the whole heart
- 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





Epidemiology, Etiology and Risk Factors

Epidemiology: no accurate estimate of incidence because many cases are mild and brief and diagnosis is not made.

Etiology:

Most common cause	Coxsackie virus B
Other viruses	Coxsackie virus A, Echovirus, Adenovirus, influenza, EBV, Rubella, Varicella, Mumps, Rabies, Hepatitis virus and HIV
Bacterial causes	- *Corynebacterium diphtheria* - Syphilis (sexually transmitted) - Lyme disease As a complication of bacterial endocarditis

Parasitic causes	- Chagas disease - Trichinella - Spiralis - Toxoplasma gondii (this is common everywhere because it is in cats) - Echinococcus
Other organisms	- *Rickettsiae* - Fungi - *Chlamydia* - Enteric pathogens - *Legionella* - Mycobacterium tuberculosis
Giant cell myocarditis due to thymoma, SLE (systemic lupus erythematosus) or Thyrotoxicosis	

Infectious & Non-Infectious Etiologies of Myocarditis

Infectious

1. **Viruses**
   - ➔ Coxsackie B
   - ➔ HIV
2. **Bacterial**
   - ➔ Corynebacterium diphtheriae (diphtheria)
3. **Protozoan**
   - ➔ Trypanosoma cruzi (Chagas disease)
4. **Spirochete**
   - ➔ Borrelia burgdorferi (Lyme disease)

Non-Infectious

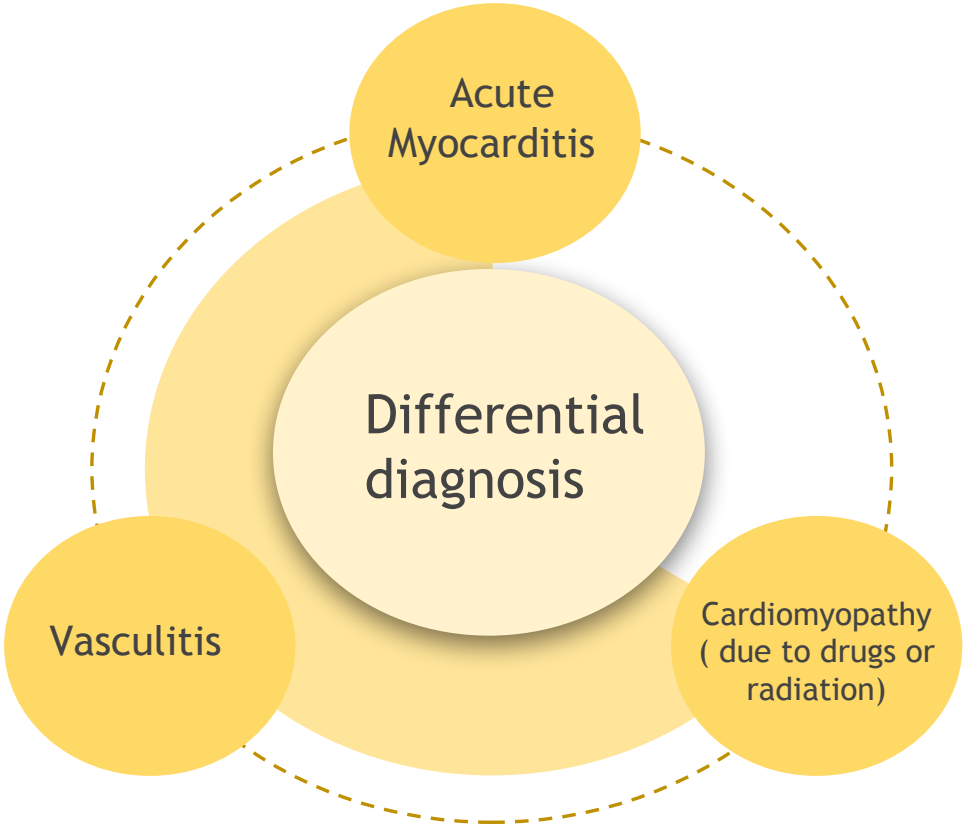
1. **Systemic Diseases**
   - ➔ SLE
   - ➔ Sarcoidosis
   - ➔ Vasculitis (Wegener's disease)
   - ➔ Celiac disease
2. **Neoplastic infiltration** might infiltrare to the heart
3. **Drugs & Toxins**
   - ➔ Ethanol
   - ➔ Cocaine
   - ➔ Radiation
   - ➔ Chemotherapeutic agents - Doxorubicin

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. Flu like symptoms
- Fever, headache, muscle aches, diarrhea, sore throat and rashes <u>similar to most viral infections</u>
- Chest pain, arrhythmias ,sweating , fatigue and may present with congestive heart failure.

صح احنا قلنا انه ال epidemiology won't be accurate؟

لأن بالبدايه الاعراض اللي بتجي المريض اعراض مره خفيفه مثل اعراض الفلو وبعدين بعدها بأسابيع راح يبدأ المريض يحس بالأعراض الثانيه اللي بتخليه يزور المستشفى

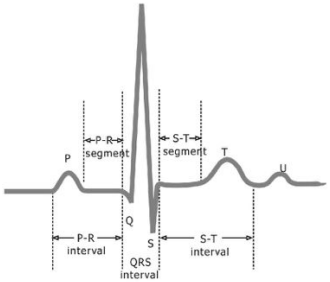

Acute Myocarditis
Differential diagnosis
Vasculitis
Cardiomyopathy (due to drugs or radiation)

Diagnosis of myocarditis

*Troponin:
a protein released from the **heart** cells when they are **damaged**

**CK-MB:
Creatine Kinase - Muscle and Brain.

(both are specific tests for heart disease especially myocarditis)



ECGs of normal heart

WBCs, ESR, Troponin* and CK-MB** usually elevated

ECG (nonspecific ST-T changes and conduction delays are common)

Blood culture

(most likely it will be negative
Because the most common cause is viral)

Viral serology and other specific tests for Lyme disease***, diphtheria and Chagas disease may be indicated on a case by case basis.

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بكتيريال لكن صعب نعمل لها كلتشر في اللاب فيعتمدون على تشخيصها في السيرولوجي

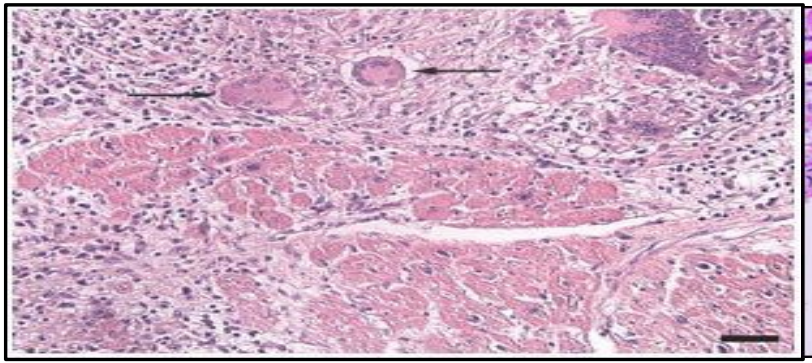
Chest X-rays : show cardiomegaly (shadow enlargement)

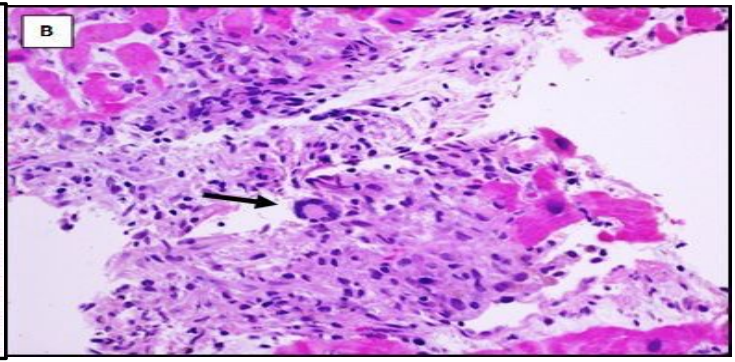
Radiology : **MRI and Echocardiogram**

Heart muscle biopsy (for some cases) late result

Endomyocardial Diagnosis

Pathologic examination is not sensitive . It may reveal lymphocytic inflammatory response with necrosis.
“ Giant cells” may be seen. This isn’t specific because in other diseases you might see some giant cells.





Management of myocarditis

- **Often supportive** (tell the patient to rest most the time) **:** restricted physical activity in heart failure.
- Specific antimicrobial and antiviral therapy is indicated when an infecting agent is identified.
- Treatment of heart failure arrhythmia
- Other drugs indicated in special situations like anticoagulant (e.g aspirin and warfarin), NSAID (non-steroidal anti-inflammatory drugs) , steroid or immunosuppressive immunomodulatory agents.
- Heart transplant (very rare only in severe cases)

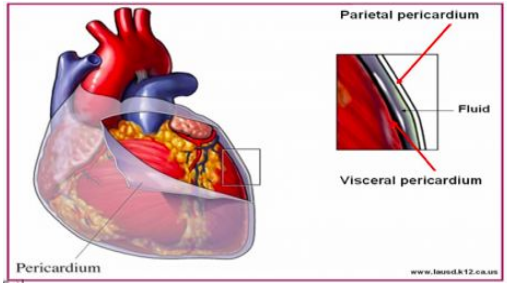
- Most cases of viral myocarditis are self limited. (no need to antiviral therapy)
- One third of the patients are left with lifelong complications, ranging from mild conduction defects to severe heart failure.
- Patient should be followed regularly every 1-3 months.
- Sudden death may be the presentation of myocarditis in about 10% of cases.
  - For example a young healthy man die suddenly. This is why athletes are always tested in case there might be a heart problem.

Acute Pericarditis

Pericarditis is an inflammation of the pericardium usually of infectious etiology like (viruses, bacterial, fungal or parasitic)

1- Infectious causes:

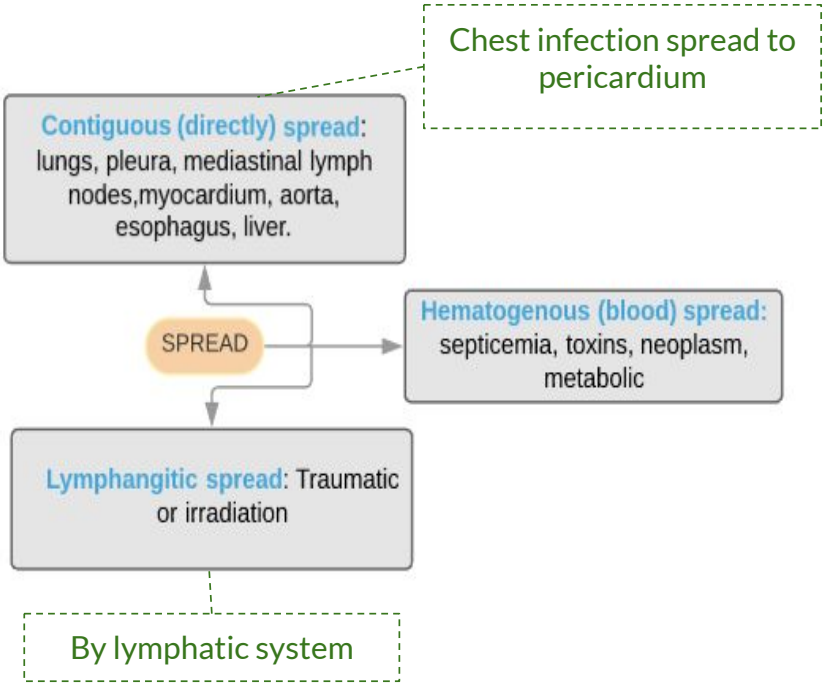
- **Viral Pericarditis:**
  - Coxsackie virus A and B, Echovirus are the most common causes.
  - Other viruses includes Herpes viruses, Hepatitis B , Mumps, Influenza, Adenovirus ,Varicella and HIV.
- **Disseminated fungal infection:**
  - *Histoplasma*, *Coccidioides*.
- **Parasitic infections:**
  - E.g. disseminated **toxoplasmosis**, contagious spread of *Entamoeba histolytica* - are rare causes.
- **Bacterial Pericarditis** -usually a complication of pulmonary infections (e.g. pneumonia ,empyema):
  - *S. pneumoniae*, ***M. tuberculosis***, *S. aureus, H. influenzae, K. pneumoniae & Legionella.*
  - HIV patients may develop pericardial effusions caused by: *M.tuberculosis* or *M. avium* complex.



2- Non-infectious Causes:

- Immune mediated : as in rheumatoid fever & SLE
- Miscellaneous : due to myocardial infarction , malignancy and uremia

Pathophysiology



- 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
- These changes can cause pericardial scarring with adhesions (the heart won't be able to move → can't pump) and fibrosis

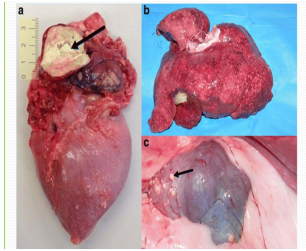
Important!

Types of Pericarditis

The type of fluid may indicate the cause

Caseous Pericarditis

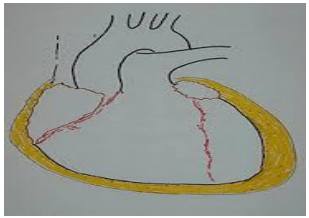
Commonly tuberculous in origin



Serous Pericarditis

It's due to autoimmune diseases (rheumatoid arthritis, SLE), viral infections

Transudative serous fluid



Purulent/ Suppurative Pericarditis

due to bacteria, fungi or parasites.
Purulent exudative fluid

Hemorrhagic Pericarditis

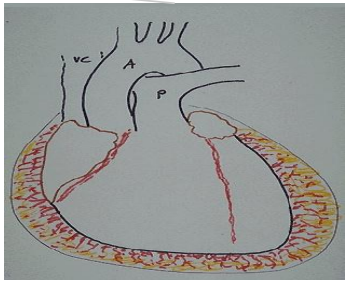
Usually caused by infection (TB) or malignancy

Blood mixed with a fibrinous or suppurative effusion

Fibrinous Pericarditis

It's due to acute MI, uremia, radiation

Fibrinous exudative fluid



Constrictive Pericarditis

The pericarditis will become narrower and won't be able to move due to inflammatory reaction.

Causes:

- Idiopathic (unknown)
- Radiotherapy
- Cardiac surgery
- Connective tissue disorders (SLE)
- 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.

Differential Diagnosis: Those diseases might present like acute pericarditis because they have the same or similar symptoms to it.

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

Chronic pericarditis:

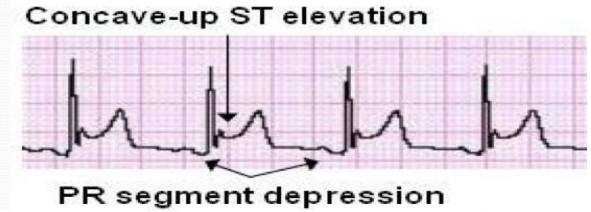
- **Tuberculous pericarditis has insidious onset .**
- Incidence of pericarditis in patients with pulmonary TB ranges from 1 – 8 %
- Clinical findings: fever, pericardial friction rub, hepatomegaly
- Tuberculin skin test usually positive
- Fluid smear for acid fast bacilli (**AFB**) often negative
-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

- Patient that was diagnosed long time ago with TB and after years he's present with dyspnea and chest pain.

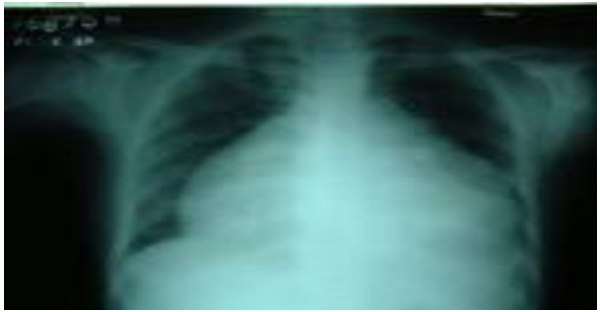
كيف نفرق بين المايوكارديتس والاكيوت بيري كارديتس قبل ما نسوي أي تحاليل؟ المايوكارديتس ما راح تبان عندي الأعراض الا بعد أسابيع بيجي المريض ويقولك والله كان عندي حراره وصداع وبعدها بديت احس بآلام بالصدر اما البيري كارديتس راح تبان الأعراض على طول يعني بيجي المريض يقول فجأه عندي آلام بالصدر

Investigations & Diagnosis

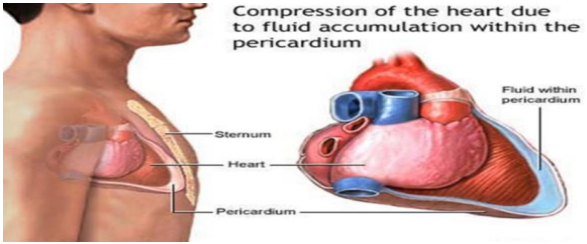
- **ECG** will show ST elevation, PR depression and T-wave inversion may occur later.
- Blood culture (will mostly be negative)
- **Leukocytosis** and an elevated **ESR** are typical (this isn't specific for pericarditis but its indicate that there's something wrong like an infection or inflammation)
- 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.The pericardial thickening is what indicate that this is pericarditis
- Pericardial fluid or pericardial **biopsy** specimens for fungi.
- **Immunology /Serology** : Antinuclear antibody tests and Histoplasmosis complement fixation indicated in endemic area.



Notice the heart enlargement



Notice how the pericardium is thickened b/c of the fluid



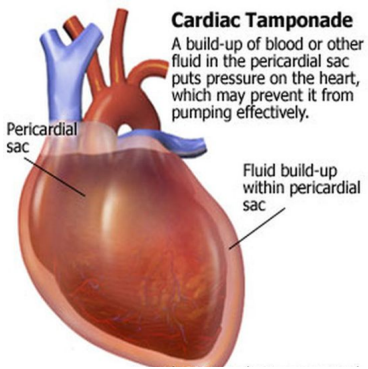
Management of Pericarditis

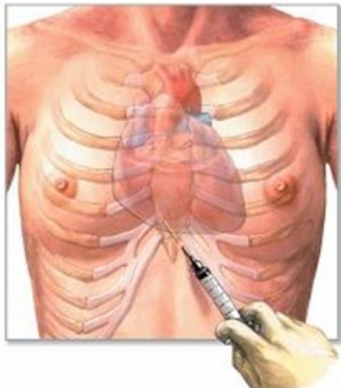
1-Cytomegalovirus
2- only in severe cases.

- 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(1) .
- **Pericardiocentesis**(2): 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.

When there's a build up of fluid around the pericardial sac the heart won't be able to pump effectively we will have to insert a needle to take out the fluid in order to relieve the tamponade

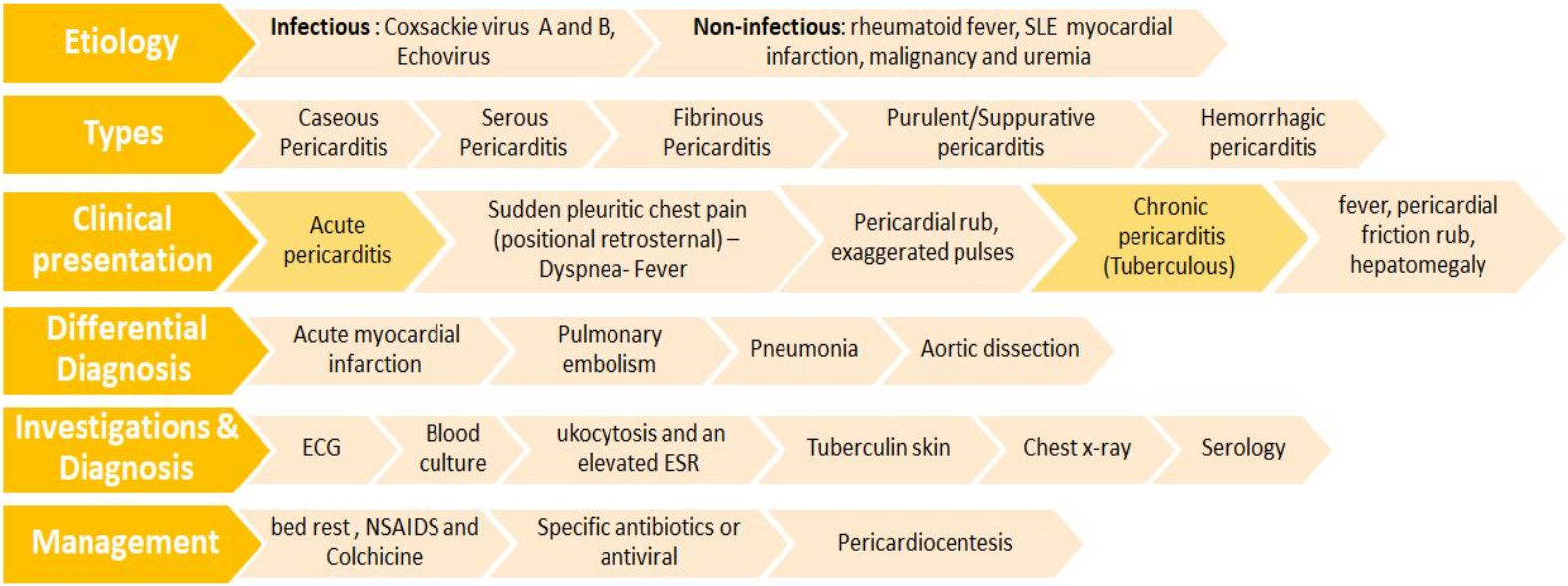




Summary (Myocarditis)

Etiology	**Infectious:** Coxsackie virus B is the most common cause	**non infectious** : SLE –Sarcoidosis - Vasculities
Clinical Presentation	Chest pain, arrhythmias ,sweating , fatigue and may present with congestive heart failure.	
Differential Diagnosis	Acute Myocarditis	Vasculitis / Cardiomyopathy
Diagnosis \ investigation	WBCs, ESR, Troponin and CK-MB usually elevated	Viral serology / ECG / blood culture / Chest X-rays
management	Often supportive	Specific antimicrobial therapy / Treatment of heart failure arrhythmia / Other drugs indicated in special situations like anticoagulant, NSAID / Heart transplant

Summary (Pericarditis)



MCQs

Q1-what is the most common cause of myocarditis?

A. Corynebacterium diphtheriae
B. Echinococcus.
C. Coxsackie virus B
D. Legionella>

Q2- a patient present to the clinic with arrhythmia, chest pain, sweating and fatigue. Which one of the following is NOT possible diagnosis:

A. Vasculitis.
B. Cardiomyopathy.
C. pneumonia .
D. Acute myocarditis.

Q3- how the organism reach the pericardium ?

A. Contiguous spread.
B. Hematogenous spread.
C. Lymphangitic spread.
D. All the above.

Q4- caseous pericarditis commonly ……. In origin:

A. Fibrous.
B. Tuberculous.
C. Serous.

Q5- serous pericarditis is due to:

A. Autoimmune disease.
B. COPD.
C. Injury.
D. Drug abuse.

Q6- fibrinous pericarditis is due to all of the following EXCEPT:

A. Autoimmune disease.
B. Myocardial infarction.
C. Uremia.
D. Radiation

Q7- a patient present to the clinic with Sudden pleuritic chest pain which is positional retrosternal , Dyspnea and Fever. On examination Pericardial rub, exaggerated pulsus , paradoxus JVP and tachycardia. Which one of the following is NOT a possible diagnosis:

A. Acute myocardial infarction.
B. Pulmonary embolism.
C. Acute pericarditis.
D. COPD.

Q 7-D
Q 6-A
Q 5-A
Q 4-B
Q 3-D
Q 2-C
Q 1-C

SAQ

1- What are the diseases that might be present with the same symptoms as Acute Pericarditis?

2- A 56 year old male was diagnosed with TB 15 years ago and now he's complaining from chest pain, dyspnea and fever. What is the most likely diagnosis?

3- Based on your diagnosis from Q2 what are the tests that should be ordered?

4- A pregnant women complained from fever and sore throat. After couple of weeks she started complaining from chest pain, sweating and excessive fatigue? She noted that she has a cat, what's the most likely diagnosis and causative agent?

1- Acute myocarditis, pulmonary embolism, pneumonia, and aortic dissection.
2- Tuberculous pericarditis
3- Tuberculin skin test usually positive and fluid smear for acid fast bacilli.
4- Parasitic myocarditis; toxoplasma gondii

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