

Myocarditis

Summary Statement: Inflammation of the myocardium that can lead to necrosis of the cardiac myocyte cells MC caused by a viral etiology (Parvovirus B19 and herpes virus 6 MC)

Clinical Manifestations: Varies from mild inspiratory chest pain to severe cardiogenic shock

Diagnosis: Gold standard → Myocardial biopsy; EKG may show ST changes; + cardiac enzymes

Treatment: Supportive care → Treat the cause, shock, and any arrhythmias that may arise

- Pathophysiology:
 - **Inflammation of the myocardium that can lead to necrosis of the cardiac myocyte cells**
 - The myocardium is the muscular “middle” portion of the heart (pericardium is the sac surrounding the heart and endocardium includes the valves)
 - Etiologies → Autoimmune reaction, **infectious (Parvovirus B19 and herpes virus 6 MC)**, due to a cardiotoxic agent
 - Giant cell myocarditis → Rare cause of myocarditis with unknown etiology that is often fatal
- Clinical manifestations:
 - Similar to pericarditis → Inspiratory chest pain
 - Symptoms of infection if due to a viral etiology → Myalgias, fever, etc.
 - **Symptoms vary from mild (MC) to severe including heart failure and arrhythmias**
 - Heart failure symptoms → Fatigue, edema, shortness of breath, cool extremities (shock)
 - Arrhythmias → Dizziness, sudden cardiac death
- Diagnosis:
 - EKG → Can be normal but can also have **diffuse ST segment elevations** or nonspecific ST-T wave changes; Some patients with have conduction delays or arrhythmias from sinus tachycardia to ventricular fibrillation
 - Labs → **+ Troponin and CK-MB** (elevated cardiac enzymes secondary to necrosis of myocytes)
 - Test for cause (coxsackie, influenza, Lyme, streptococcus, HIV, autoimmune, cultures, etc.)
 - **Endomyocardial biopsy (gold standard) → Inflammatory infiltration of the myocardium with necrosis of myocytes** (negative result does not rule out myocarditis so this is not done unless patients present with very severe symptoms of shock or fatal arrhythmias as risk of the biopsy includes myocardial rupture and potentially death)
 - Cardiac catheterization → To rule out ischemic cause of myocyte necrosis
 - Giant cell → Patients present with cardiogenic shock and possibly have intractable ventricular arrhythmias
 - Biopsy will show multinucleated giant cells
 - Cardiac MRI sometimes performed but not necessary → Can show late gadolinium enhancement
- Treatment:
 - **Treat the underlying cause** → Supportive care for underlying disease/disorder
 - Most of the time, this is all that is indicated as myocarditis is generally a mild disease process
 - Treat the heart failure
 - **Diuretics, inotropes, ACEI, BB**
 - Fulminant heart failure may require intra-aortic balloon pump, LVAD (left ventricular assist device), impella device, or VA-ECMO to help improve cardiac output in setting of cardiogenic shock. Vasopressors such as Norepinephrine may also be indicated
 - Heart transplant in severe, refractory cases
 - Treat the arrhythmias
 - **Antiarrhythmic therapies** such Amiodarone, Lidocaine, etc.
 - Heart block → **Temporary venous pacing (TVP)** +/- permanent pacemaker placement if conduction abnormalities persist
 - **Stop any suspected offending cardiotoxic agents**