

## **Myocarditis**

Myocarditis is a process characterized by inflammatory infiltrate of the myocardium with necrosis and/or degeneration of adjacent myocytes not typical of the ischemic damage associated with coronary artery disease. This definition does not take into account .the underlying cause

## **Pathology**

The principal mechanism of cardiac involvement in viral. 1 myocarditis is believed to be a cell-mediated immunologic reaction, not merely myocardial damage from viral replication. Isolation of .virus from the myocardium is unusual at autopsy

The inflamed myocardium is soft, flabby, and pale, with areas of. 2 scarring on gross examination. Microscopic examination reveals patchy infiltrations by plasma cells, mononuclear leukocytes, and some eosinophils during the acute phase and giant cell infiltration in .the later stages

## Causes

viruses are probably the most common causes of myocarditis.. 1

Among viruses, adenovirus, coxsackievirus B, and echoviruses are the most common agents. Many other viruses (e.g., poliomyelitis, mumps, measles, rubella, cytomegalovirus [CMV], HIV, arboviruses, influenza) .can cause myocarditis

Immune-mediated diseases, including acute rheumatic fever and. 2

.Kawasaki's disease, may be the cause

.Collagen vascular diseases can cause myocarditis. 3

Toxic myocarditis (from drug ingestion (Sulfonamides,. 4

Cyclophosphamide, diphtheria exotoxin, and anoxic agents)

## **Clinical Manifestations**

### **History**

.Older children may have a history of an upper respiratory infection. 1  
The illness may have a sudden onset in newborns and small infants,. 2  
.with anorexia, vomiting, lethargy, and occasionally circulatory shock

### **Physical Examination**

The presentation depends on the patient's age and the acute or. 1  
chronic nature of the infection. In neonates and infants, signs of CHF  
may be present; these include poor heart tone, tachycardia, gallop  
,rhythm  
tachypnea, and (rarely) cyanosis. In older children, a gradual onset of  
.CHF and arrhythmia are commonly seen  
A soft, systolic heart murmur and irregular rhythm caused by. 2  
.supraventricular or ventricular ectopic beats may be audible  
.Hepatomegaly (evidence of viral hepatitis) may be present. 3

## **Electrocardiography**

Any one or a combination of the following may be seen: low QRS voltages, ST-T changes, PR prolongation, prolongation of the QT interval, and arrhythmias (especially premature contractions)

## **Radiography**

Cardiomegaly of varying degrees is the most important clinical sign of myocarditis

## **Echocardiography**

Echocardiography reveals cardiac chamber enlargement and impaired left ventricle (LV) function, often regional in nature. Occasionally, increased wall thickness and LV thrombi are found

## **Laboratory Studies**

Cardiac troponin levels (troponin I and T) and myocardial enzymes. 1 may be elevated) creatine kinase [CK], MB isoenzyme of CK [CK-MB](  
.Myocarditis can be confirmed by an endomyocardial biopsy 2

## **Natural History**

The mortality rate is as high as 75% in symptomatic neonates. 1  
.with acute viral myocarditis

The majority of patients, especially those with mild inflammation,. 2  
.recover completely

Some patients develop subacute or chronic myocarditis with. 3  
persistent cardiomegaly (with or without signs of CHF) and ECG  
evidence of left ventricular hypertrophy (LVH) or biventricular  
.hypertrophy (BVH)

Clinically, these patients are indistinguishable from those with  
dilated cardiomyopathy. Myocarditis may be a precursor to  
.idiopathic dilated cardiomyopathy in some cases

Angiotensin-converting enzyme inhibitors, such as captopril,. 5  
.may prove beneficial in the acute phase

Arrhythmias should be treated aggressively and may require. 6  
.the use of IV amiodarone

The role of corticosteroids is unclear at this time except in the. 7  
.treatment of severe rheumatic carditis

Specific therapies include antitoxin in diphtheritic myocarditis. 8

## Management

One should attempt virus identification by viral cultures from the. 1  
.blood, stool, or throat washing

Bed rest and limitation in activities are recommended during the. 2  
acute phase (because exercise intensifies the damage from  
.myocarditis)

:Anticongestive measures include the following. 3

a. Rapid-acting diuretics (furosemide or ethacrynic acid, 1 mg/kg,  
each one to three times a day)

b. Rapid-acting inotropic agents, such as dobutamine or dopamine,  
are

.useful in critically ill children

.c. Oxygen and bed rest are recommended

d. Digoxin may be given cautiously using half of the usual digitalizing  
dose because some patients with myocarditis are exquisitely  
.sensitive to the drug

Recently, beneficial effects of high-dose gamma globulin (2 g/kg. 4  
.over 24hours) have been reported