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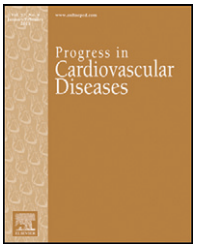

Pericardial Effusions: Causes, Diagnosis, and Management

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ABSTRACT

The presentation of a patient with a pericardial effusion can range from an incidental finding to a life-threatening emergency. Accordingly, the causes of pericardial effusions are numerous and can generally be divided into inflammatory and non-inflammatory etiologies. For all patients with a suspected pericardial effusion, echocardiography is essential to define the location and size of an effusion. In pericardial tamponade, the hemodynamics relate to decreased pericardial compliance, ventricular interdependence, and an inspiratory decrease in the pressure gradient for left ventricular filling. Echocardiography provides insight into the pathophysiologic alterations, primarily through an assessment of chamber collapse, inferior vena cava plethora, and marked respiratory variation in mitral and tricuspid inflow. Once diagnosed, pericardiocentesis is performed in patients with tamponade, preferably with echocardiographic guidance. With a large effusion but no tamponade, pericardiocentesis is rarely needed for diagnostic purposes, though is performed if there is concern for a bacterial infection. In patients with malignancy, pericardial window is preferred given the risk for recurrence. Finally, large effusions can progress to tamponade, but can generally be followed closely until the extent of the effusion facilitates safe pericardiocentesis.

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Abbreviations and Acronyms

CT = computed tomography

MRI = magnetic resonance imaging

MI = myocardial infarction

RV = right ventricle or ventricular

LV = left ventricle or ventricular

PCWP = pulmonary capillary wedge pressure

HU = Hounsfield units

RA = right atrium

IVC = inferior vena cava

With more widespread applications and advances in cardiovascular imaging, pericardial effusions are increasingly recognized. Unfortunately, this increased recognition is often accompanied by subsequent consternation regarding appropriate evaluation and management. Therefore, the purpose of this review is to address the following questions often faced by the practicing clinician:

1. When a pericardial effusion is recognized, what underlying diagnoses should be considered?
2. What are the potential hemodynamic consequences of a pericardial effusion?
3. How can non-invasive imaging – including echocardiography, computed tomography (CT), and magnetic resonance imaging (MRI) – provide insight into the diagnosis and hemodynamics?
4. Finally, integrating this information, how should patients with pericardial effusions be managed?

Causes of pericardial effusion

A fibroelastic sac containing the heart and proximal great vessels, the pericardium fixes the heart to the mediastinum, provides lubrication, and acts as a mechanical barrier against infection and acute chamber distention.[1] The pericardium is composed of two thin layers, a serous visceral and a fibrous parietal layer, typically containing 50 mL or less of serous fluid.[1,2] By definition, a pericardial effusion occurs when the volume of fluid exceeds this normal amount. The causes are numerous as any process that inflames, injures, or reduces lymphatic drainage of the pericardium can result in an effusion. In general, the disparate causes of pericardial effusions can be divided into inflammatory and non-inflammatory causes (Table 1).

Idiopathic pericarditis, usually presumed to be post-viral, is the most common cause of an inflammation-related pericardial effusion in the United States and Western Europe.[3] Even though definitive diagnosis of viral pericarditis requires histologic, cytologic and immunohistologic assessments of the pericardium, including detection of viral DNA/RNA, this approach is rarely necessary. Moreover, routine viral serologies are not recommended. However, further evaluations should be considered when there is a concern for either human immunodeficiency virus or hepatitis C virus.

If the patient is immunocompromised, or if the history suggests a bacterial or fungal infection, culture of the pericardial fluid is essential for guiding treatment. Pericardial effusions caused by bacterial or fungal infections are typically exudative, and in severe cases, may be purulent. Often, these patients will have a more aggressive course and may present with pericardial tamponade.

In the developing world, tuberculosis is the most common cause of a pericardial effusion and is associated with a mortality rate of 17–40% within 6 months of diagnosis.[4] Patients with suspected tuberculous pericarditis should have investigations for active extra-cardiac tuberculosis. In addition, pericardiocentesis or pericardial biopsy with testing for the tubercle bacilli, either by culture or quantitative polymerase chain reaction, should be pursued.

In some cases, a pericardial effusion may be the first manifestation of an underlying malignancy, though nearly two-thirds of patients with malignancy and pericardial effusions do not have malignant cells on cytology of pericardial fluid.[5] Extra-cardiac cancers are much more common than primary cardiac malignancies, and the most common causes

Table 1 – Causes of pericardial effusions.

Inflammatory
Infectious:
Viral: enteroviruses (coxsackie B, echoviruses), adenovirus, herpesviruses (EBV, CMV,VZV), parvovirus B19, HIV, HCV
Bacterial: Mycobacterium (tuberculosis, avium-intracellulare), gram positive cocci (Streptococcus, Staphylococcus), Mycoplasma, Neisseria (meningitides, gonorrhea), Coxiella burnetii
Fungal: Histoplasma species, Candida species
Protozoal: Echinococcus species, Toxoplasma species
Cardiac injury syndromes: post-pericardiotomy, post-myocardial infarction, post-electrophysiology or coronary interventions
Autoimmune: systemic lupus erythematosus, Sjögren syndrome, rheumatoid arthritis, scleroderma, eosinophilic granulomatosis with polyangiitis (Churg–Strauss syndrome), familial Mediterranean fever
Uremic pericarditis
Drug hypersensitivity
Non-Inflammatory
Neoplastic: primary tumors (mesothelioma, sarcoma), secondary (lung and breast cancer, lymphoma)
Metabolic: hypothyroidism (myxedema coma), severe protein deficiency
Traumatic: iatrogenic, direct/indirect pericardial injury (penetrating or blunt chest wall injury, and aortic dissection
Reduced lymphatic drainage: congestive heart failure, cirrhosis, nephrotic syndrome

Abbreviations: CMV = cytomegalovirus; EBV = Epstein Barr Virus; HCV = hepatitis C virus; HIV = human immunodeficiency virus.

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