Chapter 5
Acute Pericarditis

Charles V. Pollack, Jr., Richard M. Cantor, and Victoria G. Riese

Name and Synonyms

Acute pericarditis

Incidence/Epidemiology

- Acute pericarditis is the admitting diagnosis in 0.1 % of hospital admissions. Acute pericarditis accounts for 1 % of cases of ST-segment elevation seen in the emergency department.
- Acute pericarditis occurs more commonly in men than in women. There are no known geographic predilections. There is a very rare familial form (Mulibrey nanism)

C. V. Pollack, Jr. (✉)
Department of Emergency Medicine, Thomas Jefferson University, Philadelphia, PA, USA

R. M. Cantor
Department of Emergency Medicine and Pediatrics, State University of New York Upstate Medical University, Syracuse, NY, USA

V. G. Riese
Librarian Consultant, Eldersburg, MD, USA

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Differential Diagnosis

- Acute pericarditis has many causes (see Pathophysiology and Etiology below), and often the differential exploration focuses on determining an etiology for the disease. This involves a search for co-morbidities as diverse as malignancy, renal failure, recent myocardial infarction, adverse effects of certain drugs, and collagen vascular diseases. Because the primary clinical manifestation of acute pericarditis is chest pain, the differential is broad.

Pathophysiology and Etiology

- The pathophysiology of acute pericarditis, regardless of etiology, is inflammation of the pericardium, a double (serous and parietal) membrane separated normally by 15-50 mL of fluid that is an ultrafiltrate of plasma.
- The function of the pericardium is to prevent sudden overdistention of the cardiac chambers and to help maintain the anatomic position of the heart and great vessels. By definition, acute pericarditis is present and symptomatic for less than 6 weeks; pericarditis for 6 weeks to 6 months is termed subacute, and beyond 6 months, chronic.
    - This inflammation may result from a myriad of potential causes:
        - Infectious:
            - Viral (Coxsackie, echovirus, adenovirus, HIV)
            - Tuberculous
            - Pyogenic (pneumococcal, streptococcal, staphylococcal)
            - Fungal (histoplasmosis, coccidioidomycosis, blastomycosis, *Candida*)
        - Noninfectious:
            - Post–myocardial infarction (Dressler's syndrome)
            - Uremia/renal failure
            - Neoplastic (primary or metastatic [lung, breast, lymphoma, Hodgkins])
            - Myxedema
            - Trauma (penetrating or nonpenetrating)
            - Aortic dissection into pericardium
            - Post–radiation therapy
            - Rheumatic fever
            - Collagen vascular disease (lupus, rheumatoid arthritis, scleroderma, Wegener's granulomatosis)
            - Drug-induced (procainamide, hydralazine, INH, phenytoin, doxorubicin, rifampin, methyldopa)
            - Idiopathic (most common)

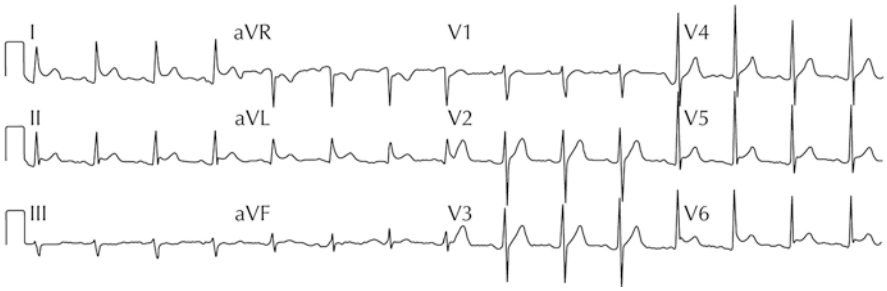
Presentation

Typical/"Classic"

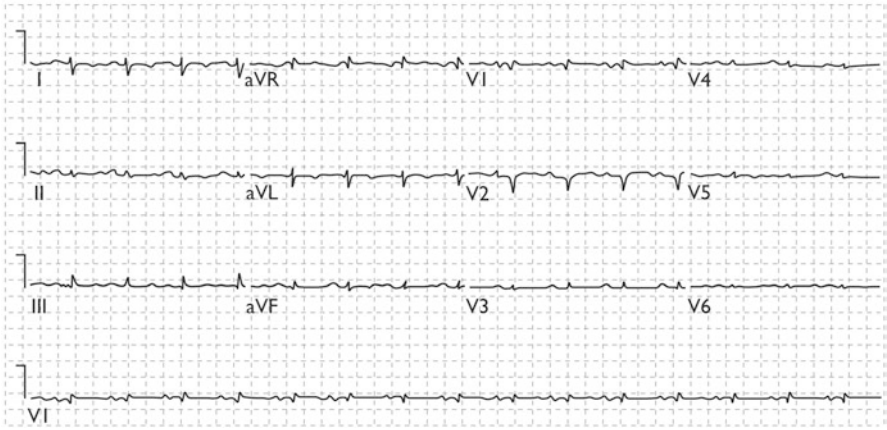
- Chest pain and a pericardial friction rub are most the common findings.

http://www.easyauscultation.com/acute-pericarditis
[Acute Pericarditis Page; Easy Auscultation; copyright 2015, MedEdu LLC]

- On electrocardiography, there are electrical changes suggesting acute pericarditis, and if there is also an effusion there is generalized low voltage.



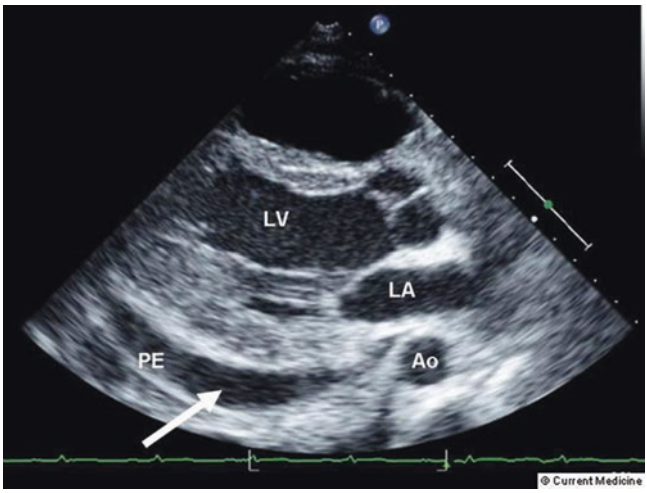
ECG finding in acute pericarditis [Oh J, Espinosa R. Pericardial disease. In: Vannan MA, Lang RM, Rakowski H, Tajik AJ, editors. Atlas of echocardiography. Philadelphia: Current Medicine; 2005 (Braunwald E, editor. Atlas of heart diseases; vol. 16).] *Caption from original*



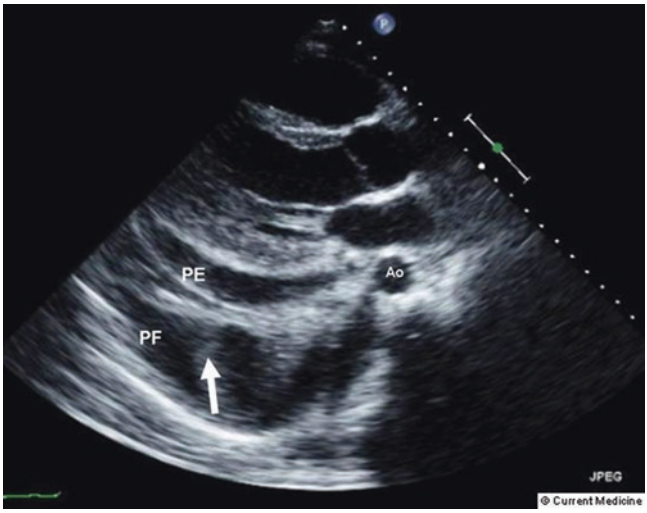
Typical amyloid ECG with diffuse low voltage [Wellens H, Subramaniam K. The electrocardiogram in heart failure. In: Shivkumar K, Weiss JN, Fonarow GC, Narula J, editors. Atlas of electrophysiology in heart failure. Philadelphia: Current

Medicine; 2005 (Braunwald E, editor. Atlas of heart diseases; vol. 15).] *Caption from original*

- On echocardiogram, an effusion may be visible but is not required for a diagnosis of acute pericarditis.



Echocardiogram of pericardial effusion. Arrow indicates descending thoracic aorta. [Aurigemma G, Tighe D, Oh J, Espinoza R. Pericardial disease and cardiac masses. In: Solomon SD, editor. Atlas of echocardiography. 2nd ed. Philadelphia: Current Medicine; 2008.] *Caption adapted from original*



Echocardiogram of pericardial effusion. Arrow indicates lung parenchyma. [Aurigemma G, Tighe D, Oh J, Espinoza R. Pericardial disease and cardiac masses.

In: Solomon SD, editor. Atlas of echocardiography. 2nd ed. Philadelphia: Current Medicine; 2008.] *Caption adapted from original*

- If the effusion is large (>250 mL), the heart takes on a "water bottle" appearance on plain chest x-ray.

Chest X-ray in pericardial effusion: water bottle shaped heart. [Tissot C, Phelps CM, Cruz EM, Miyamoto SD. Pericardial diseases. In: Munoz R, Morell V, Cruz E, Vetterly C, editors. Critical care of children with heart disease. London: Springer; 2010. p. 521-41. https://doi.org/10.1007/978-1-84882-262-7_47; 2009-01-01] *Caption from original*

- Cardiac tamponade may develop, and the patient may have pulsus paradoxus.

http://www.youtube.com/watch?feature=player_embedded&v=jTsjCZ9QxW8
Stanford 25 video on pulsus paradoxus. Provides definition, guidance on testing, sound clip.

- The pain is often severe. It is most often substernal and left-sided. It often radiates to the back and to the trapezius ridge.

Trapezius ridge: the lower border of trapezius, 1; the rhomboids, 2. [Birch R. Surgical disorders of the peripheral nerves. London: Springer; 2010. Chapter 5, Clinical aspects of nerve injury; p. 145-90] *Caption adapted from original*

- The pain is often pleuritic in nature, so it is aggravated by deep inspiration, cough, and lying down as opposed to sitting up.
- The friction rub is the most important physical sign of acute pericarditis. It is often described as "scratching" or "grating," and it may be evanescent. It is best heard with the diaphragm of the stethoscope along the lower left sternal border, with the patient sitting up, during exhalation.
- The classic ECG findings of acute pericarditis are diffuse, mild ST-segment elevation across the precordium. Depression of the PQ segment is common. With large effusions, the overall voltage on the ECG is reduced. Occasionally, atrial fibrillation occurs with acute pericarditis. The ST-segment elevation associated with acute pericarditis can be differentiated from simple early repolarization, and from left ventricular hypertrophy with strain, by considering the ratio of the amplitude of ST segment to the amplitude of the T wave in leads I, V4, V5, and V6.

Atypical

- The most common form of pericarditis is idiopathic, and the diagnosis is one of exclusion. Patients with acute pericarditis and no effusion may present with chest pain and no audible friction rub, with limited to no ECG changes. In this case, acute pericarditis is just one of many differential considerations in the chest pain syndrome presentation. As in other etiologies of chest pain syndrome, the pain may occur in non-substernal locations.

- Pain may be mostly absent in slowly developing pericarditis (neoplastic, uremic, postradiation). Worsening exercise intolerance may be a clue to the diagnosis in these patients.

Primary Differential Considerations

- The initial differential elements to be considered in a patient with a presentation consistent with acute pericarditis are angina, aortic dissection, pulmonary embolism, and distal esophageal pain.

History and Physical Exam

Findings That Confirm Diagnosis

- A full classic presentation (substernal and/or left-sided pleuritic chest pain, a friction rub, and diffuse mild ST-segment elevation on ECG) should be considered confirmatory and should prompt a search for an etiology other than idiopathic.

Factors That Suggest Diagnosis

- Any of the classic findings in isolation should elevate acute pericarditis in the differential diagnosis of the chest pain patient.
- Onset of pain within 2–4 days of acute myocardial infarction (Dressler's syndrome) or after thoracic surgery should elevate acute pericarditis in the differential diagnosis of the chest pain patient.
- A presentation consistent with both acute pericarditis and an apparent cause of pericarditis (such as uremia, myxedema, acute infection, immunocompromise, collagen vascular disease, post chest irradiation) should elevate acute pericarditis in the differential diagnosis of the chest pain patient.
- Uremic pericarditis is most often seen in patients on hemodialysis (HD). A history of HD therefore is suggestive of the diagnosis. It should be noted that chest pain is often minimal or absent in uremic pericarditis, but a friction rub is common.

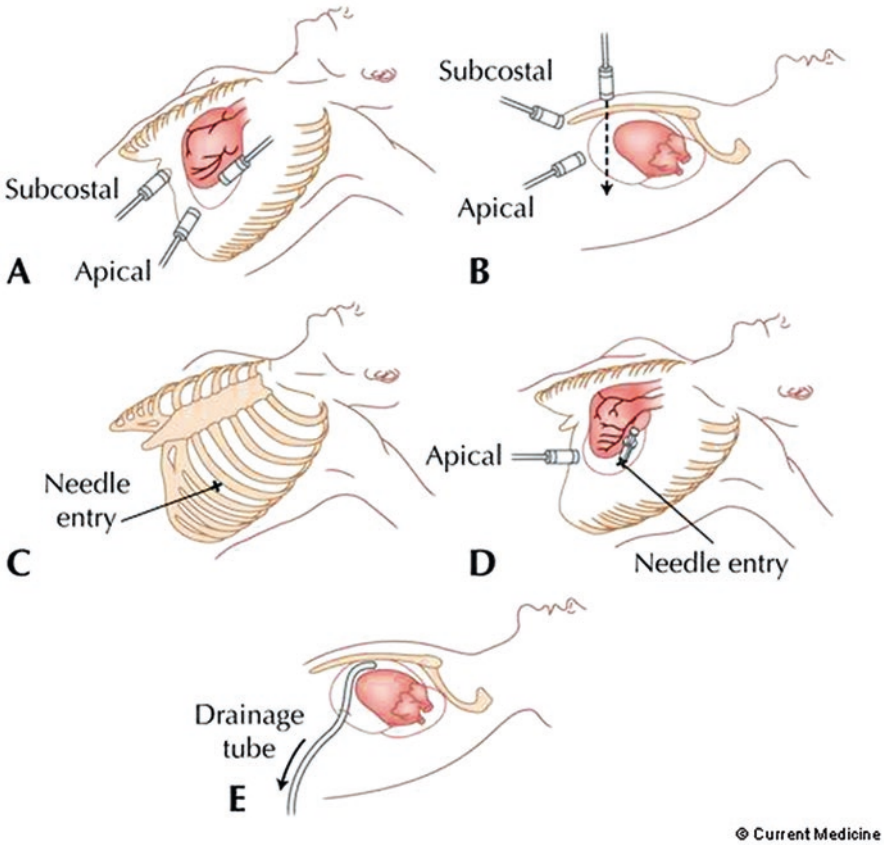
Factors That Exclude Diagnosis

- A normal echocardiogram excludes pericardial effusion and tamponade but not acute pericarditis.

Ancillary Studies

Laboratory

- Lab tests should include CBC; serum electrolyte, blood urea nitrogen (BUN), and creatinine levels; and erythrocyte sedimentation rate (ESR) and/or C-reactive protein (CRP) levels. In the evaluation of chest pain syndrome, cardiac biomarker measurements are often indicated.
- The ESR and CRP levels are elevated in acute pericarditis, consistent with the underlying inflammation. These tests also are abnormal in patients with collagen vascular diseases, which may be an etiology of acute pericarditis.
- Other laboratory tests may be pertinent to the evaluation of the etiology of the pericarditis:
  - Assessment of renal function in possible uremic pericarditis
  - Assessment of thyroid function in possible myxedema
  - An antistreptolysin O (ASO) titer is indicated if rheumatic fever is suspected.
  - If a pericardial effusion is sampled via pericardiocentesis, the fluid should be tested for cell count, glucose and protein, and culture growth. Other specialized tests may be needed, and fluid should be retained for “unusual” requests by consultants.



Echocardiographically guided pericardiocentesis procedure [Aurigemma G, Tighe D, Oh J, Espinoza R. Pericardial disease and cardiac masses. In: Solomon SD, editor. Atlas of echocardiography. 2nd ed. Philadelphia: Current Medicine; 2008.] *Caption from original*

https://www.youtube.com/watch?feature=player_embedded&v=BQTVqUPimdk

Video from The New England Journal of Medicine on pericardiocentesis. Covers indications, risk factors, contraindications, equipment, preparation, procedure (ultrasound-guided, electrocardiographic monitoring, and blind approaches), aftercare, and complications.

https://www.youtube.com/watch?v=y0-K2RcThi0

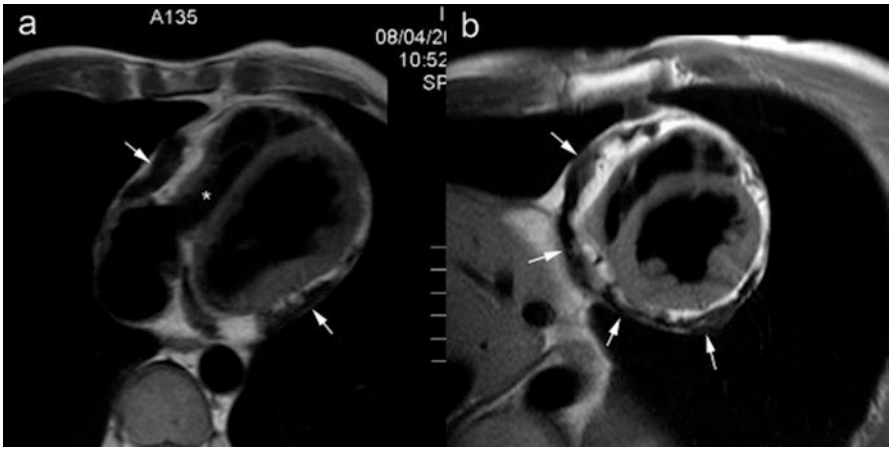
Video from MD Anderson Cancer Center explaining the anterior chest approach to pericardiocentesis.

Imaging

- There are no diagnostic imaging findings of acute pericarditis. When a pericardial effusion is present, transthoracic echocardiography will demonstrate an echo-free space between the visceral and parietal layers of the pericardium.
- Echocardiography should be performed in all cases of pericarditis, because any form of pericardial inflammation may induce pericardial effusion. It is important to note that in the absence of effusion, the pericardium may have a normal appearance in pericarditis.
- With large effusions, a "swinging heart" may be seen on echocardiography, as the heart "floats" in the effusion fluid.

https://www.youtube.com/watch?feature=player_embedded&v=huXuWp_eOKQ
Brief clip of cardiac tamponade with swinging heart echocardiogram.

- Plain chest radiographs are usually normal in acute pericarditis. If there is an effusion of 250 mL or more fluid, the cardiac silhouette will take on an enlarged, "water bottle" appearance.
- Smaller effusions may be detected by MRI, which can also assess the thickness of the pericardium (normal, 4 mm). In acute pericarditis, the pericardium may be globally or locally thickened.



Classic presentation of constrictive pericarditis on T1-weighted fast spin-echo CMR, axial view (a), and short-axis view (b) [From article: Cardiovascular magnetic resonance in pericardial diseases. J Cardiovasc Magn Reson. 2009; 11(1):14. https://doi.org/10.1186/1532-429X-11-14, at http://link.springer.com/article/10.1186%2F1532-429X-11-14; by Jan Bogaert, Marco Francone, © Bogaert and Francone; licensee BioMed Central Ltd. 2009; licensed under Creative Commons Attribution License BY 2.0 http://creativecommons.org/licenses/by/2.0] *Caption from original*

Special Populations

Age

- Acute pericarditis is more common in adults than in children, but adolescents are more commonly affected than young adults
- The most common presenting complaint in children with pericarditis is chest pain, accompanied by the typical findings seen in patients of any age.
- In children, the clear majority of cases are viral in etiology, since autoimmune diseases usually present no earlier than late adolescence.

Co-morbidities

- Review of the etiologies of acute pericarditis will indicate co-morbidities of interest. Uremia, malignancy, and immunocompromise are the most worrisome of these.

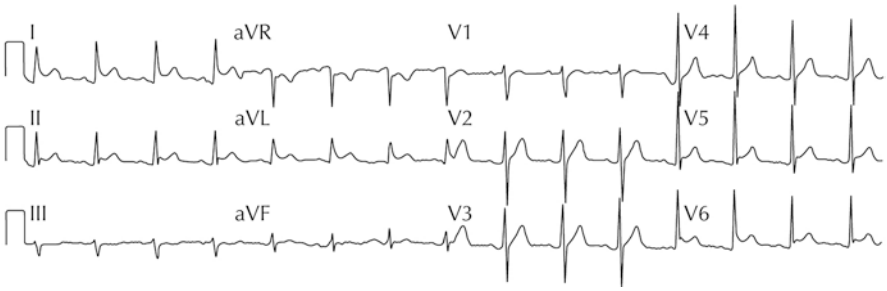
Pitfalls in Diagnosis

Critical Steps Not to Miss

- Consideration of the diagnosis is the first critical step. In patients with hemodynamic compromise, an echocardiogram should be performed early to assess for effusion, or even tamponade, and to measure the pumping ability of the heart.
- Acute pericarditis is one of the few diagnoses in which an ESR and CRP are actually very helpful.

Mimics

- The entire constellation of diagnoses that underlies chest pain syndrome can mimic the pain and overall presentation of acute pericarditis.
- Because acute pericarditis is often associated with diffuse ST-segment elevation on ECG, acute coronary syndrome must be always considered as an alternative diagnosis. PR-segment depression usually is also seen in patients with acute pericarditis who have ST-segment elevation.



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Time-Dependent Interventions

- Time-dependent interventions in acute pericarditis are necessary only when cardiac function is compromised, which is usually the case only when there is a large pericardial effusion. In such patients, pericardiocentesis may be a life-saving procedure.

Overall Principles of Treatment

- Because acute pericarditis is an inflammatory disease, the primary treatment in idiopathic pericarditis comprises anti-inflammatory agents (such as corticosteroids [e.g., prednisone] and nonsteroidal anti-inflammatory drugs [NSAIDs]). Resistant cases may require a surgical pericardiectomy, pericardiotomy, or pericardial window.
- Patients with an identified underlying cause of their pericarditis generally benefit from better control/specific treatment of the disease.

Disease Course

- Idiopathic pericarditis generally resolves within 1-2 weeks with anti-inflammatory therapy. The recurrence rate may reach 33 %.
- The course of secondary pericarditis typically follows control of the underlying disease.

Related Evidence

Papers of particular interest have been highlighted as:
*** Of key importance*

Practice Guideline

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Use PubMed Clinical Queries to find the most recent evidence. Use this search strategy:“acute pericarditis” OR (“acute” AND (“Pericarditis”[Mesh] OR “pericarditis”)