

## Pericardial Disease: Review Questions

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### QUESTIONS

Choose the single best answer for each question.

Questions 1 and 2 refer to the following case study.

A 19-year-old college student presents with chest pain. One week previously, she had a self-limited upper respiratory infection. The chest pain is central in location, with radiation to the neck and trapezius ridge. The discomfort intensifies with recumbency and inspiration and improves with sitting upright.

1. Which of the following physical findings/laboratory tests would be most specific in making a diagnosis of acute pericarditis?
  - (A) Elevated erythrocyte sedimentation rate
  - (B) Leukocytosis
  - (C) Low grade fever
  - (D) Pericardial friction rub
  - (E) Tachycardia
2. Physical examination reveals tachycardia (heart rate, 106 bpm), blood pressure of 120/70 mm Hg, no pulsus paradoxus, clear lung fields, a flat jugular venous pulse, and a loud 3-component pericardial friction rub. Which examination would offer the most information regarding the presumed diagnosis of acute pericarditis?
  - (A) Arterial blood gas
  - (B) Cardiac enzymes
  - (C) Chest radiograph
  - (D) Electrocardiogram (ECG)
  - (E) Transthoracic echocardiogram

Questions 3 and 4 refer to the following case study.

A 67-year-old woman presents to her primary care

physician with complaints of progressive dyspnea, fatigue, generalized malaise, and lower extremity edema. Three weeks previously, she had undergone mitral valve replacement with a St. Jude's mechanical prosthesis for mitral stenosis/mitral regurgitation. She is on chronic anticoagulant therapy with warfarin. Cardiac catheterization preoperatively had revealed pulmonary hypertension and no evidence of significant epicardial coronary artery disease. Physical examination reveals an afebrile patient with tachycardia (heart rate, 120 bpm), systolic blood pressure of 90 mm Hg with a pulsus paradoxus of 20 mm Hg, respiratory rate of 26 breaths/min, jugular venous pulse to angle of jaw, and diminished breath sounds bilaterally. Cardiac examination reveals muted heart sounds, a 2-component pericardial friction rub, no mitral regurgitation murmur, crisp prosthetic valve sounds, and no S<sub>3</sub>. Extremities are cool with 2+ edema. The ECG reveals sinus tachycardia and diffuse low voltage. She is urgently admitted to the hospital.

3. Which of the following tests would provide the most useful information to arrive at a prompt diagnosis?
  - (A) Chest radiograph
  - (B) Computed tomography
  - (C) Magnetic resonance imaging
  - (D) 2-D echocardiography with Doppler
  - (E) Ventilation/perfusion scan
4. The echocardiogram reveals normal left ventricular systolic function and no evidence of a valvular or perivalvular leak. The prosthetic valve is well seated. There is a very large circumferential pericardial effusion with fibrinous strands and right ventricular and right atrial collapse. Initial therapeutic options would include all of the following EXCEPT:
  - (A) Diuresis
  - (B) Fluid resuscitation
  - (C) Inotropic support
  - (D) Pericardiocentesis
  - (E) Cardiothoracic surgical evaluation

(turn page for answers)

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## ANSWERS AND EXPLANATIONS

1. **(D) Pericardial friction rub.** A pericardial friction rub is detected in the majority of individuals with acute pericarditis. The presence of a pericardial friction rub is pathognomonic for pericarditis; however, its absence does not exclude the diagnosis. The sound typically has 3 components related to (1) atrial systole, (2) ventricular systole, and (3) ventricular diastole. The sound should be differentiated from a pleural rub, which although similar in quality (ie, a to-and-fro, superficially scratchy or squeaking sound), is timed with the respiratory cycle. A pericardial friction rub also must be differentiated from cardiac murmurs and artifactually produced friction of the stethoscope on the skin. Pericardial rubs may vary in intensity and may transiently disappear. Tachycardia, a low grade fever, leukocytosis, and an elevated erythrocyte sedimentation rate are all nonspecific markers associated with inflammation and provide no specific help in making the diagnosis of acute pericarditis.
2. **(D) ECG.** The ECG represents the most useful diagnostic test for acute pericarditis. The electrocardiographic changes in acute pericarditis signify inflammation of the epicardium. There are 4 phases of electrocardiographic changes associated with acute pericarditis. Stage 1, in the first hours to days, is characterized by diffuse ST elevation (typically concave up). Associated atrial injury is reflected by elevation of the PR segment of the aVR lead, depression of the PR segment in other limb leads, and depression in the left chest leads (predominantly V<sub>5</sub> and V<sub>6</sub>). Stage 2 is notable for resolution of the aforementioned stage 1 change and a return to a normal ECG. Stage 3 is characterized by diffuse T-wave inversions, commonly after the ST segments have become isoelectric. Stage 4 is typically a late reversion to a normal ECG.<sup>1</sup> The characteristic ECG findings of acute pericarditis should be differentiated from the ECG changes of an ST-elevation myocardial infarction and an early repolarization pattern. A transthoracic echocardiogram may reveal a small amount of pericardial fluid, a nonspecific finding. A chest radiograph typically reveals a normal cardiac silhouette; an enlarged cardiac silhouette is apparent only with the accumulation of a large amount of fluid. Cardiac enzymes, including cTnI, may be modestly elevated in acute pericarditis.
3. **(D) 2-D echocardiography with Doppler.** Cardiac tamponade is a clinical diagnosis and occurs when the accumulation of fluid in the pericardial space increases pericardial pressure and leads to progressive elevation of (and usually equalization of) intracardiac pressures, with subsequent limitation to ventricular

diastolic filling and a decline in cardiac output.<sup>2</sup> Postoperative tamponade is more frequent after valve surgery than after coronary artery bypass surgery and is more frequent with anticoagulant therapy.<sup>3</sup> 2-D echocardiography with Doppler plays a major role in the identification and assessment of the hemodynamic significance of a large pericardial effusion. Echocardiography is sensitive, specific, and noninvasive. Computed tomography and magnetic resonance imaging often are less readily available and generally are not necessary. The chest radiograph may show an enlarged cardiac silhouette but will not differentiate tamponade from a noncompressive pericardial effusion. Rarely, the echocardiographic findings in tamponade reveal a moderate-to-large pericardial effusion, right atrial and right ventricular collapse, a plethoric vena cava, and, in approximately 25% of patients, the very specific finding of left atrial collapse. The mechanism of pulsus paradoxus, that is, bulging of the interventricular septum into the left ventricle, leading to a reduction in left ventricular volume and, correspondingly, a reduction in cardiac output, may be visible by echocardiogram.

4. **(A) Diuresis.** Tamponade with hemodynamic compromise requires urgent removal of the pericardial fluid. Pericardial fluid removal may be accomplished via catheter pericardiocentesis or surgical drainage. Percutaneous pericardial drainage usually is accomplished with echocardiographic or fluoroscopic guidance using a subxiphoid approach. Surgical drainage typically is reserved for those patients in whom percutaneous drainage was unsuccessful, the pericardial fluid is loculated, if there is a need for biopsy material, or for recurrent accumulation. Percutaneous balloon pericardiotomy has been used in a number of institutions for recurrent malignant effusions. While preparing the patient for pericardiocentesis, cautious fluid resuscitation and inotropic support may be used. Volume depletion with diuretics and positive pressure ventilation should be avoided at all costs.<sup>4</sup>

## REFERENCES

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