Cardiac Radiology
In-Training Test Questions
for Diagnostic Radiology Residents

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Sponsored by:
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1891 Preston White Drive -- Reston, VA 20191-4326 -- 703/648-8900 -- www.acr.org
1. You are shown two contrast-enhanced chest CT images from a man with chest pain and dyspnea. What is the MOST likely diagnosis?

A. Pulmonary vein thrombosis with passive venous congestion
B. Invasion of the pulmonary vein by lung cancer
C. Left atrial myxoma
D. Left atrial thrombus

Findings:
The left lower lobe consolidation and mild volume loss has heterogeneous attenuation with associated loss of adjacent mediastinal tissue planes. A contiguous filling defect in the left inferior pulmonary vein extends into the left atrium. Left atrial size is normal.

Rationales:
A. Incorrect. Thrombosis of a pulmonary vein is rare. Resultant passive pulmonary venous congestion does not typically exhibit mass-like consolidation or obliteration of mediastinal tissue planes.
B. Correct. Lung cancer may invade vital mediastinal structures, to include the heart, pulmonary veins and left atrium, and represents T4 tumor staging. Heterogeneous consolidation of the left lower lobe is due to large central neoplasm and concomitant bronchial obstruction.
C. Incorrect. Atrial myxomas typically arise within the left atrium, usually from the inter-atrial septum or atrial free wall. Myxomas rarely arise within or obstruct a pulmonary vein.
D. Incorrect. Left atrial thrombus formation typically arises within the appendage, is usually associated with left atrial enlargement, and rarely has isolated involvement of a pulmonary vein. Lobar consolidation and volume loss should not typically be present.

Citations:
2. Following surgical repair of aortic coarctation, what is the MOST reliable MRI finding of significant re-stenosis?

A. Turbulent flow across the repair site on gradient-echo images
B. Narrowing of the repair site on T1-weighted spin-echo images
C. Narrowing of the repair site on gradient-echo images
D. Presence of collateral vessels on flow-sensitive images

Rationales:
A. Correct. Turbulent flow is usually a better indicator of restenosis than is isolated narrowing.
B. Incorrect. Spin-echo images may underestimate the amount of stenosis, which may be quite thin and difficult to detect.
C. Incorrect. Gradient-echo images are subject to significant artifacts from surgical clips and may overestimate the degree of narrowing.
D. Incorrect. Not all patients with significant coarctation have detectable collateral vessels, and residual collateral vessels may persist following successful repair.

Citations:

3. Concerning valvular heart disease, which one of the following is TRUE?

A. Mitral stenosis is most commonly congenital.
B. Isolated aortic valve disease is common in rheumatic heart disease.
C. A primarily insufficient valve frequently calcifies.
D. Aortic stenosis is associated with a bicuspid aortic valve.

Rationales:
A. Incorrect. Rheumatic heart disease is the most common etiology of mitral stenosis.
A. Incorrect. Rheumatic valvular heart disease affects the mitral valve in almost all cases and concomitantly affects the aortic valve in approximately 50% of cases. Rheumatic heart disease rarely destroys only the aortic valve. Isolated aortic valve disease is typical of a bicuspid aortic valve.
B. Incorrect. Valvular calcification typically reflects valvular stenosis. A primarily insufficient valve rarely calcifies.
D. Correct. The congenitally deformed bicuspid aortic valve faces abnormal stress and pressure, which cause fibrosis, calcification, and stenosis.
Citations:

4. You are shown two images from a non-enhanced CT scan in a 77-year-old woman who has undergone pacemaker placement (arrow) and mitral valve replacement (arrowhead). The calcifications are related to which one of the following?

A. Pericarditis
B. Pulmonary hypertension
C. Rheumatic heart disease
D. Coronary atherosclerosis

Rationales:
A. Incorrect. The calcifications are located in the wall of the left atrium.
B. Incorrect. Calcification of the pulmonary arteries may occur in patients with longstanding, severe pulmonary arterial hypertension. The calcifications in this case are located in the wall of the left atrium.
C. Correct. The calcifications are secondary to endocarditis from rheumatic heart disease. Other causes of endocarditis can also cause calcification of the left atrial wall.
D. Incorrect. The areas of calcification do not correspond with the anatomic location of the coronary arteries.
5. Item Number: 105

Which one of the following structures directly communicates with the transverse sinus?

A. Oblique sinus  
B. Postcaval recess  
C. Superior aortic recess  
D. Posterior pericardial recess

Rationales:
A. Incorrect. The oblique sinus is separated from the transverse sinus by a pericardial reflection.  
B. Incorrect. The postcaval recess arises from the pericardial cavity proper and is separated from the transverse sinus by a pericardial reflection.  
C. Correct. The superior aortic recess arises from the transverse sinus and extends superiorly to surround the posterior, right lateral and anterior aspect of the ascending aorta.  
D. Incorrect. The posterior pericardial recess is a superior extension of the oblique sinus, which does not communicate directly with the transverse sinus.

6. Concerning the Ross procedure, which one is TRUE?

A. It is suitable for children because the pulmonary autograft grows with the child.  
B. Patients undergoing the Ross procedure require lifelong anticoagulation.  
C. It is preferred because it is technically easier to perform than standard valve replacement.  
D. The procedure is performed to correct pulmonary valve stenosis.

Rationales:
A. Correct. The Ross procedure replaces the aortic valve with the patient’s pulmonary valve and replaces the pulmonary valve with a cryopreserved pulmonary valve homograft. Follow-up studies have shown interval growth of the aortic valve graft in children and infants.  
B. Incorrect. The Ross procedure replaces the aortic valve with the patient’s pulmonary valve and replaces the pulmonary valve with a cryopreserved pulmonary valve homograft. Because a homograft is used, anticoagulation is not necessary.  
C. Incorrect. The Ross procedure replaces the aortic valve with the patient’s pulmonary valve and replaces the pulmonary valve with a cryopreserved pulmonary valve homograft. Because both the pulmonary and aortic valves are replaced, the Ross procedure is a more extensive operation compared to conventional aortic valve replacement.  
D. Incorrect. The Ross procedure is performed to correct aortic valve disease.
7. Concerning cardiac neoplasms, which of the following is TRUE?

A. Myxoma is the most common benign cardiac tumor.
B. Metastases to the heart are most commonly caused by renal cell carcinoma.
C. Primary cardiac malignancies are more common than metastases to the heart.
D. Malignant primary cardiac neoplasms are more common than benign neoplasms.

RATIONALES:
A. Correct. Myxoma accounts for half of all primary cardiac tumors.
B. Incorrect. Metastases to the pericardium and epicardium are most commonly from lung cancer. This is in part related to proximity to the heart and in part because of the prevalence of lung cancer. Metastases to the myocardium are most commonly from melanoma and the mode of spread is thought to be hematogenous. Myocardial metastases are less frequent than pericardial or epicardial metastases.
C. Incorrect. Primary cardiac malignancies are rare. Metastases to the heart are 20 to 40 times more common than primary tumors.
D. Incorrect. Only 25% of primary cardiac tumors are malignant.

References:

8. Concerning the coronary circulation, which of the following statements is TRUE?

A. Dominance is determined by which vessel gives rise to the posterior descending artery and posterior left ventricular branches.
B. Left dominant circulation is more common than right dominant circulation.
C. The left coronary artery supplies the sinoatrial node in most individuals.
D. The diagonal branches arise from the right coronary artery.

RATIONALES:
A. Correct. Most patients are right dominant with the right coronary artery giving rise to the posterior descending artery and posterior left ventricular branches
B. Incorrect. Right dominant circulation is seen in 85% of individuals. The coronary circulation is left dominant in only 8% of individuals. In left dominant circulation, the posterior descending artery and posterior left ventricular branches arise from the left circumflex artery. In the remaining 7% there is a co-dominant system in which the posterior descending artery arises from the right coronary artery and the posterior left ventricular branches arise from the left circumflex coronary artery.
C. Incorrect. The right coronary artery supplies the sinoatrial node in 60% of individuals. The sinus node artery arises from the proximal right coronary artery. In 40% of individuals, the sinus node artery arises from the proximal left circumflex artery.

D. Incorrect. The diagonal branches arise from the left anterior descending coronary artery and supply the anterior free wall of the left ventricle. The acute marginal branch arises from the right coronary artery and supplies the right ventricle. The obtuse marginal branches arise from the circumflex coronary artery and supply the lateral left ventricle.

References:

9. In regards to constrictive pericarditis, which of the following statements is TRUE?

A. The normal pericardium measures up to 5mm in thickness.
B. Tuberculosis is the most common cause of constrictive pericarditis in the United States.
C. The degree of pericardial calcification correlates with the degree of constriction.
D. Pericardial thickening and calcification can occur in the absence of constrictive pericarditis.

RATIONALES:
A. Incorrect. The pericardium normally measures 2mm in thickness or less.
B. Incorrect. Most cases of constrictive pericarditis are secondary to idiopathic pericarditis or pericarditis following cardiac surgery and radiation therapy.
C. Incorrect. Although calcification is associated with constriction, the observation of calcification does not imply constriction. In order to make the diagnosis of constrictive pericarditis, the patient must have physiologic changes in association with pericardial thickening or calcification. This includes impaired diastolic filling and equalization of diastolic pressures in the right and left ventricles. The most common causes of calcific pericarditis include infection (tuberculosis), uremia and trauma.
D. Correct. Pericardial thickening or calcification may be present without physiologic impairment, although constrictive physiology is usually present when there is extensive pericardial calcification.

References:
10. Regarding coronary artery aneurysms, which one of the following statements is CORRECT?

A. Aneurysmal dilatation is defined as an increase in vessel diameter twice that of the normal adjacent artery.
B. Most coronary aneurysms are secondary to infection.
C. Small aneurysms (<4mm) seen in the setting of Kawasaki disease (mucocutaneous lymph node syndrome) tend to regress.
D. Aneurysms due to atherosclerosis have a high frequency of rupture.

RATIONALES:
A. Incorrect. A coronary artery aneurysm is defined as an increase in diameter by 50%, not 100%.
B. Incorrect. Most coronary aneurysms are secondary to atherosclerosis.
C. Correct. Kawasaki disease has multiple manifestations in the heart, including coronary aneurysm formation. Large aneurysms (>8mm) are frequently complicated by thrombosis and subsequent myocardial infarction. They may also rupture. Small aneurysms tend to regress to normal caliber over time.
D. Incorrect. Rupture of atherosclerotic coronary aneurysms is rare.

References: