Cardiac Radiology
In-Training Test Questions
for Diagnostic Radiology Residents

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Commission on Education
Committee on Residency Training in Diagnostic Radiology

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1. 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:
Glockner JF, Johnston DL, McGee KP. Evaluation of cardiac valvular disease with MR imaging: qualitative and quantitative techniques. *RadioGraphics.* 2003; 23(3): 686.
Romero RC, Boxt LM. Plain-film evaluation of valvular heart disease. *Semin Roentgenol.* 1999; 34(3): 216-27.

2. 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.

Citations:

May LE, Litwin SB, Tweddell JS, Jaquiss RDB. Pediatric Heart Surgery, Third ed. Milwaukee: Maxicare, 2005:92Bonow RO, Braunwald E. Valvular Heart Disease.

In: Zipes DP, Libby P, Bonow RO, Braunwald E, eds. Braunwald's Heart Disease. Philadelphia: Elsevier Saunders, 2005:1553-1632.

3. 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.

Citations:

Pannu HK, Flohr TG, Corl FM, Fishman EK. Multi-Detector Row CT Evaluation of the Coronary Arteries: Principles, Techniques and Anatomy. Radiographics 2003;23:S111-S125.

4. Regarding atrial morphology, which one of the following is the MOST reliable indicator of the morphologic right atrium?

    A. Connection with the superior vena cava
    B. Connection with the inferior vena cava
    C. Presence of a thin appendage with a narrow neck
    D. Presence of a tricuspid atrioventricular valve

Rationales:
A. *Incorrect*. Bilateral superior vena cavae may be present, which can drain into the coronary sinus or either atria.
B. **Correct**. Connection with the inferior vena cava is a reliable indicator of right atrial morphology. This can be a useful tool to establish the cardiac anatomy in cases of situs abnormalities and atrioventricular discordance.
C. *Incorrect*. A thin appendage with a narrow neck is characteristic of the morphologic left atrium. The right atrial appendage is triangular in shape with a broad neck. The characteristic appearance of the right atrial appendage is also a reliable indicator of the morphologic right atrium.
D. *Incorrect.* In cases of atrioventricular discordance, the atrioventricular valves follow the morphologic ventricles, not the morphologic atria.

Citations:
Miller SW. *Cardiac Imaging: The Requisites.* 2nd ed. Mosby, Inc., Philadelphia, PA. 2005.

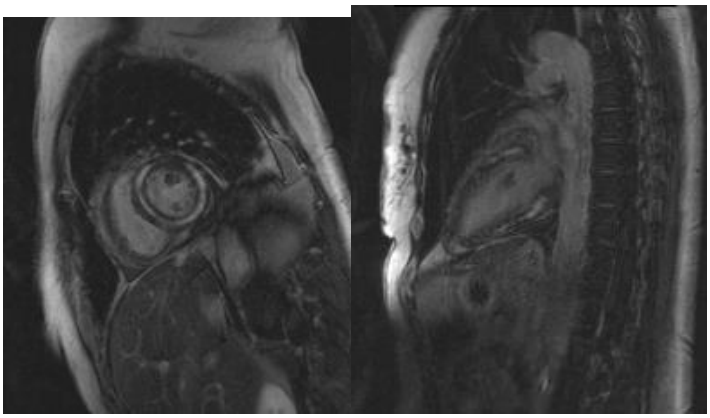
5. Which of the following findings is associated with constrictive pericarditis?

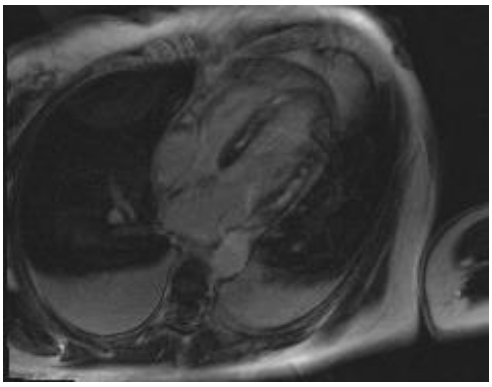
    A. Small ventricles
    B. Small atria
    C. Small superior vena cava

Rationales:

A. **Correct**. Constrictive pericarditis alters the morphology of the heart causing cone-like compressed ventricles or waist-like deformity at the atrioventricular groove.
B. *Incorrect*. The atria are typically dilated in patients with constrictive pericarditis due to high ventricular filling pressures.
C. *Incorrect*. The superior and inferior vena cava are typically dilated in the setting of constrictive pericarditis due to elevated intracardiac filling pressures.

6. What is the most likely diagnosis?





A. Myocardial infarction
B. Hypertrophic cardiomyopathy
C. Myocarditis
D. Arrhythmogenic right ventricular dysplasia

Rationales:

A. Incorrect. The provided images demonstrate diffuse mid-myocardial enhancement, sparing the endocardial surface. This effectively excludes myocardial infarction, which always involves the endocardial surface.
B. Incorrect. Hypertrophic cardiomyopathy may result in patchy myocardial enhancement. However this is seen in the presence of myocardial hypertrophy, which is absent in this case.
C. **Correct**. The provided images demonstrate diffuse mid-myocardial enhancement, sparing the endocardial surface. Myocarditis may have various imaging findings. However it frequently results in abnormal enhancement of the mid-myocardium or the epicardial surface.
D. *Incorrect*. Arrhythmogenic right ventricular dysplasia is a congenital cardiomyopathy that may result in pathologic myocardial enhancement. As the name implies, this condition almost exclusively involves the right ventricle, which is not the case on the provided images.

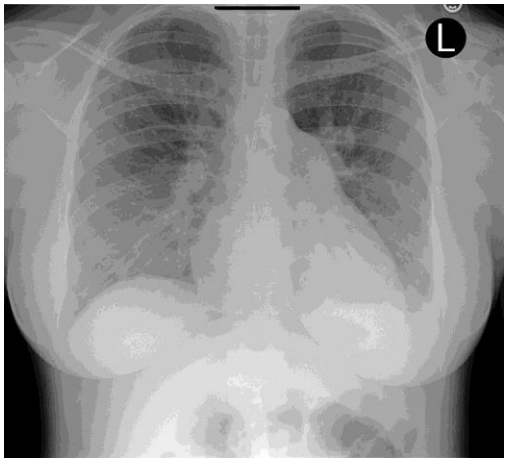
7. What is the most likely cause for the enlargement of the pulmonary arteries in this patient?

A. Intracardiac shunt
B. Primary pulmonary hypertension
C. Pulmonary valve stenosis
D. Mitral valve stenosis

Rationales:

A. **Correct**. PA and lateral chest radiographs show dilated central pulmonary arteries and a relatively normal appearing cardiac silhouette. The images also show a percutaneous transvenous septal occlusive device overlying the atria, indicating this patient has undergone repair of an atrial septal defect (ASD). The presence of the septal occlusive device indicates that the likely etiology of the findings is an ASD. After correction of an ASD, central pulmonary artery enlargement may persist, although typically diminished when compared with presurgical radiographs.
B. *Incorrect*. Primary pulmonary hypertension results in enlarged central pulmonary arteries with diminished size of peripheral vessels. The diagnosis of primary pulmonary hypertensionis a diagnosis of exclusion. The presence of the septal occlusive device indicates that the likely etiology of the findings is an intracardiac shunt.
C. *Incorrect*. Pulmonary valve stenosis typically results in dilatation of the main pulmonary artery and the left pulmonary artery, which is thought to be due to post-stenotic dilation. Both the right and left pulmonary arteries are enlarged in this patient.
D. *Incorrect*. Severe mitral valve stenosis and its accompanying pulmonary venous hypertension may eventually lead to post-capillary pulmonary artery hypertension and enlargement of the pulmonary trunk. The images in this case do not show pulmonary venous congestion or a dilated left atrium.

8. What is the most likely diagnosis in this patient?



A. Atrial septal defect
B. Ventricular septal defect
C. Tetralogy of Fallot
D. Pulmonary hypertension with Eisenmenger physiology

Rationales:

A. **Correct**. There is evidence of a left-to-right shunt. ASD is four times as common in women as in men.
B. *Incorrect*. Most common congenital heart disease but no sex predilection.
C. *Incorrect*. Pulmonary vasculature should be decreased in this condition.
D. *Incorrect*. No rapid tapering of pulmonary arteries or other evidence of pulmonary arterial hypertension.