

Cardiovascular Imaging

This exam content assesses the candidate's knowledge and skills related to the clinical practice of cardiovascular imaging. (Please note that vascular interventions will be covered under the interventional radiology portion of the exam.) The domain encompasses mostly CT and MR. Radiography of cardiovascular conditions will be covered by thoracic radiology.

Included in this document:

[Domain Critical Concepts](#)

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Domain Critical Concepts

1. Identify imaging findings of myocardial ischemia and infarction
 - a. Coronary artery territories
 - b. Approach to atherosclerosis on CT
 - c. Complications of infarction
2. Diagnose infiltrative cardiomyopathies
3. Recognize the diagnosis and management of acute aortic syndromes on CT/MR
4. Diagnose anomalous coronary arteries
5. Diagnose valvular stenosis or regurgitation

Domain Blueprint

1. Valvular: 10%-15%
 - a. Anatomy
 - b. Regurgitation
 - c. Stenosis
 - d. Endocarditis
 - e. Anomaly
 - f. Prosthesis
2. Pericardial: 10%-15%
 - a. Effusion
 - b. Calcification
 - c. Absence
 - d. Cyst
 - e. Hemorrhage
 - f. Infection
 - g. Pneumopericardium
 - h. Constriction
3. Myocardial: 10%-15%
 - a. Infarct
 - b. Perfusion
 - c. Aneurysm
 - d. Myocarditis

- e. Cardiomyopathy
- f. Dyskinesis
- 4. Great vessels: 5%-10%
 - a. Aorta
 - i. Atherosclerosis
 - ii. Aneurysm
 - iii. Dissection/intramural hematoma
 - iv. Penetrating ulcer
 - v. Vasculitis
 - vi. Trauma
 - b. Systemic veins
 - i. Superior vena cava syndrome
 - ii. Thrombosis
 - c. Pulmonary arteries
 - i. Pulmonary hypertension
 - ii. Arteriovenous malformation
 - iii. Aneurysm
 - iv. Vasculitis
 - d. Pulmonary veins
 - i. Anatomy
 - ii. Ablation
- 5. Coronary: 10%-15%
 - a. Anatomy
 - b. Calcification
 - c. Stenosis
 - d. Aneurysm
 - e. Bridging
 - f. Anomaly
 - g. Bypass graft
 - h. Stent
 - i. Collateral
- 6. Tumor/mass (including pericardial): 10%-15%
 - a. Thrombus
 - b. Metastasis
 - c. Benign tumor
 - d. Primary malignant tumor
- 7. Congenital (preoperative and postoperative): 5%-10%
 - a. Valvular
 - b. Aortic
 - c. Pulmonary vascular
 - d. Shunt
 - e. Cyanotic disease
 - f. Complex anomaly
- 8. Devices, lines, and tubes: 1%-5%
 - a. Central venous catheter
 - b. Pulmonary artery catheter
 - c. Pacemaker
 - d. Defibrillator

- e. Intra-aortic balloon pump
- f. Left ventricular assist device

Domain Overview

Cardiac

1. Normal Anatomy, Including Variants, Encountered on Radiography, CT, and MRI
 1. Heart, including chambers, valves, pericardium, and coronary arteries
 2. Aorta and pulmonary arteries
 3. Venae cava and pulmonary veins
2. Physiological Aspects of Cardiac Imaging as Assessed with Radiography, CT, and MRI
 1. Normal cardiac cycle
 2. Physiological anatomy of cardiac muscle
 3. Mechanics of cardiac contraction
 4. Physical basis for blood flow, pressure, and resistance
 1. Ventricular volume and pressure relationship
 2. Functional cardiac measurements
 1. Ejection fraction
 2. Stroke volume
 3. Left ventricular mass
 4. Flow ($Q = V \times A$)
 5. Pressure gradient (modified Bernoulli equation, $\Delta P = 4v^2$)
 6. Pulmonary-to-systemic flow (Q_p/Q_s) ratio
 7. Regurgitant volume and regurgitant fraction
 8. Diastolic heart function
 3. Normal cardiac and pulmonary pressures
 4. Vascular regions supplied by the coronary arteries
3. Ischemic Heart Disease
 1. Risk factors, primary prevention, and screening
 2. Roles of echocardiography, angiography, SPECT, PET, CT, and MRI in the evaluation of a patient with suspected ischemic heart disease, including the advantages and limitations of each modality
 3. Inducible myocardial ischemia
 4. Acute myocardial infarction
 5. Chronic myocardial infarction
 6. Post-myocardial infarction complications
 1. Cardiac rupture
 2. Left ventricular aneurysm and pseudoaneurysm
 3. Papillary muscle rupture
 4. Congestive heart failure
 5. Dressler syndrome
 7. Myocardial perfusion and viability
 1. Stunned myocardium
 2. Hibernating myocardium
 8. Role of myocardial delayed-enhancement imaging in guiding management of left ventricular dysfunction
 9. Coronary artery stenosis and aneurysm
 10. Role of coronary CT angiography in guiding management of chest pain

11. Therapeutic and interventional options
4. Cardiomyopathy
 1. Hypertrophic
 2. Dilated
 3. Restrictive
 1. Distinguish restrictive cardiomyopathy from constrictive pericarditis
 4. Arrhythmogenic right ventricular dysplasia
 5. Therapeutic and interventional options
5. Cardiac Masses
 1. Thrombus
 1. Distinguish thrombus from tumor
 2. Primary benign tumors
 1. Myxoma
 2. Lipoma
 3. Rhabdomyoma
 4. Fibroma
 5. Lipomatous hypertrophy of the interatrial septum
 3. Primary malignant tumors
 1. Angiosarcoma
 2. Lymphoma
 4. Metastases
 5. Therapeutic and interventional options
6. Valvular Disease
 1. Myxomatous degeneration
 2. Rheumatic heart disease
 3. Infective endocarditis
 4. Congenital valve disease
 5. Specific lesions
 1. Aortic stenosis
 2. Aortic regurgitation
 3. Mitral stenosis
 4. Mitral regurgitation
 5. Mitral annular calcification
 6. Tricuspid regurgitation
 7. Pulmonary stenosis
 8. Pulmonary regurgitation
 6. Therapeutic and interventional options
7. Pericardial Disease
 1. Acute pericarditis
 2. Constrictive pericarditis
 1. Distinguish restrictive cardiomyopathy from constrictive pericarditis
 3. Pericardial effusion
 1. Hemopericardium
 2. Tamponade
 4. Pericardial cyst
 5. Pericardial defect
 6. Pneumopericardium
 7. Therapeutic and interventional options

8. Congenital Heart Disease
 1. Left-to-right shunts
 1. Atrial septal defect
 2. Ventricular septal defect
 3. Partial anomalous pulmonary venous connection
 4. Scimitar syndrome
 5. Patent ductus arteriosus
 2. Eisenmenger syndrome
 3. Admixture lesions (bidirectional shunts)
 1. Transposition of the great arteries
 2. Truncus arteriosus
 3. Total anomalous pulmonary venous connection
 4. Right-to-left shunts
 1. Tetralogy of Fallot and pulmonary atresia with ventricular septal defect
 2. Ebstein anomaly
 5. Great vessel anomalies
 1. Coarctation of the aorta
 1. Distinguish from pseudocoarctation
 6. Double aortic arch
 7. Right aortic arch
 1. Mirror image
 2. Non-mirror image
 8. Pulmonary sling
 9. Persistent left superior vena cava
 10. Coronary artery anomalies
 1. Retroaortic course
 2. Interarterial course
 11. Miscellaneous anomalies
 1. Cardiac malposition, including situs abnormalities
 2. Congenitally corrected transposition of the great arteries
 12. Therapeutic and interventional options
9. Acquired Disease of the Thoracic Aorta and Great Vessels
 1. Aneurysms
 1. Atherosclerotic
 2. Marfan syndrome
 3. Ehlers-Danlos syndrome
 2. Pseudoaneurysms
 1. Mycotic
 2. Post-traumatic and post-surgical
 3. Dissection
 1. Intramural hematoma
 4. Aortitis and arteritis
 5. Atherosclerosis
 1. Plaque
 2. Ulcerated plaque
 3. Penetrating ulcer
 6. Thromboembolism
 1. Acute pulmonary embolism

- 2. Chronic pulmonary embolism
- 7. Pulmonary hypertension
- 8. Pulmonary arteriovenous malformation
- 9. Compression
- 10. Superior vena cava syndrome
- 11. Pulmonary vein complications after radiofrequency ablation
- 12. Therapeutic and interventional options
- 10. Devices and Postoperative Appearance
 - 1. Monitoring and support devices
 - 1. Intra-aortic balloon pump
 - 2. Pacemaker generator and pacemaker leads
 - 3. Implantable cardiac defibrillator
 - 4. Left ventricular assist device
 - 5. Pericardial drain
 - 2. Postoperative chest
 - 1. Coronary artery bypass graft surgery
 - 2. Cardiac valve replacement
 - 3. Transluminal septal closure
 - 4. Aortic graft and aortic stent
 - 5. Heart transplant

Vascular Imaging

- 1. Normal and Variant Anatomy as Depicted by Various Imaging Modalities (US, MRI, CT, and angiography)
 - 1. Arterial (excluding heart and CNS since that content will be covered in neurology and cardiac sections)
 - 2. Venous (again excluding heart and CNS)
- 2. Vascular Anatomy/Pathology before and after Intervention. Examples include:
 - 1. Aortic aneurysms before and after stent graft placement
 - 2. Arterial and venous stenosis/occlusions before and after endovascular procedures, such as angioplasty, stent placement, lysis, or thrombectomy
 - 3. Anatomy and pathology seen before and after open vascular procedures. Procedures include bypass grafts for tissue perfusion and dialysis access.
- 3. Vascular Pathology as Depicted by Various Imaging Modalities. Categories include:
 - 1. Congenital anomalies
 - 2. Inflammatory conditions such as vasculitis
 - 3. Neoplasia
 - 4. Embolic phenomena
 - 5. Trauma – blunt and penetrating
 - 6. Atherosclerosis