MULTIPLE CHOICE

ECHO - MIXED EXAM - ANSWER KEY

1. Which chamber typically appears most posterior on a parasternal long-axis echocardiographic view, lying just anterior to the descending thoracic aorta?

A. Right ventricle
B. Left atrium
C. Right atrium
D. Left ventricle

2. Which Doppler finding supports the diagnosis of cardiac tamponade?

A. Reduced respiratory variation in mitral and tricuspid inflow
B. Persistent diastolic forward flow in the pulmonary artery
C. Exaggerated respiratory variation in mitral and tricuspid inflow velocities
D. Holosystolic flow reversal in the hepatic veins

3. The suprasternal notch long-axis view is primarily used to evaluate which structure?

A. Left ventricular apex
B. Aortic arch and descending thoracic aorta
C. Pulmonary veins entering the left atrium
D. Coronary sinus

4. A normally functioning bileaflet mechanical aortic prosthesis is expected to have what type of forward flow pattern by spectral Doppler?

A. Peak velocity less than 1 m/s identical to a normal native aortic valve
B. Slightly elevated peak velocity, typically 2 to 3 m/s, with a brief acceleration
C. Peak velocity greater than 5 m/s indicating obstruction in all patients
D. A continuous diastolic flow pattern with no systolic peak

5. Which imaging modality is preferred for evaluating suspected prosthetic mitral valve dysfunction or paravalvular leak?

A. Transesophageal echocardiography
B. M-mode of the mitral prosthesis
C. Contrast-enhanced transthoracic echo with agitated saline
D. Transthoracic echocardiography from the apical 4-chamber view alone

6. Cardiac output is best defined as which of the following?

A. End-diastolic volume multiplied by heart rate
B. Stroke volume divided by heart rate
C. Ejection fraction multiplied by heart rate
D. Stroke volume multiplied by heart rate

7. Which two-dimensional echocardiographic finding is most suggestive of pulmonary hypertension and right ventricular pressure overload?

A. Flattening of the interventricular septum only in early diastole
B. Flattening of the interventricular septum in systole producing a D-shaped left ventricle in short axis
C. Concentric left ventricular hypertrophy with small chamber size
D. Left atrial enlargement with normal right heart chambers

8. Which feature most reliably identifies the morphologic right ventricle on echocardiography?

A. Presence of a moderator band and more apically displaced atrioventricular valve
B. Direct connection to the pulmonary veins

C. Two papillary muscles and smooth interventricular surface
D. Smooth-walled chamber with thicker free wall than the systemic ventricle

9. In hypertrophic obstructive cardiomyopathy, systolic anterior motion (SAM) of the mitral valve produces which associated finding?

A. Mitral stenosis with diastolic doming
B. Mitral regurgitation directed posteriorly
C. Mitral regurgitation directed anteriorly
D. Aortic regurgitation with reverse doming

10. Acoustic shadowing on transthoracic echocardiography of a mechanical prosthetic mitral valve most commonly obscures which structure?

A. The aortic valve leaflets
B. The right ventricular outflow tract
C. The left atrium during evaluation for paravalvular regurgitation
D. The descending thoracic aorta

11. The shunt ratio Qp/Qs is calculated by:

A. Dividing pulmonary peak velocity by aortic peak velocity
B. Dividing pulmonary stroke volume by systemic stroke volume
C. Dividing right atrial pressure by left atrial pressure
D. Dividing aortic VTI by mitral VTI

12. Pulmonary regurgitation end-diastolic velocity is used to estimate which pressure?

A. Pulmonary artery end-diastolic pressure
B. Pulmonary artery systolic pressure
C. Left ventricular end-diastolic pressure
D. Mean right atrial pressure

13. Which continuous-wave Doppler peak velocity across the aortic valve is most consistent with severe aortic stenosis?

A. 2.0 to 2.9 m/s
B. 3.0 to 3.9 m/s
C. Less than 2.0 m/s
D. Greater than 4.0 m/s

14. Which mitral inflow pattern is most consistent with impaired LV relaxation (grade I diastolic dysfunction)?

A. E/A ratio less than 0.8 with prolonged deceleration time
B. Fused E and A waves at fast heart rates
C. E/A ratio between 0.8 and 1.5 with normal deceleration time
D. E/A ratio greater than 2 with short deceleration time

15. Which echocardiographic finding suggests perivalvular extension of infection in aortic valve endocarditis?

A. Trace mitral regurgitation
B. An echolucent space adjacent to the aortic root consistent with a perivalvular abscess
C. A small central aortic regurgitation jet
D. Mild concentric LV hypertrophy

16. Bicuspid aortic valve is most commonly associated with which of the following aortic abnormalities?

A. Aortic arch hypoplasia at the isthmus only
B. Dilation of the abdominal aorta below the renals
C. Aortic root and ascending aorta dilation (aortopathy)
D. Saccular aneurysm of the descending thoracic aorta

17. How many papillary muscles are typically present in the normal left ventricle?

A. Three
B. Two
C. One
D. Four

18. Which Doppler measurement is the foundation of nearly all volumetric flow calculations in echocardiography (stroke volume, cardiac output, continuity equation, Qp/Qs)?

A. Deceleration time
B. Velocity-time integral (VTI)
C. Pressure half-time
D. Peak instantaneous velocity

19. The left anterior descending coronary artery primarily supplies which region of the left ventricle?

A. Inferior wall and posterior septum
B. Lateral wall
C. Right ventricular free wall
D. Anterior wall and anterior interventricular septum

20. From which view is the inferior vena cava diameter and respiratory variation routinely measured for right atrial pressure estimation?

A. Subcostal long-axis view
B. Suprasternal notch view
C. Apical four-chamber view
D. Parasternal short-axis view

21. Adding anterior angulation to the apical four-chamber view to bring the left ventricular outflow tract and aortic valve into the image creates which view?

A. Apical five-chamber view
B. Subcostal four-chamber view
C. Apical two-chamber view
D. Apical three-chamber (apical long-axis) view

22. Tissue Doppler imaging of the mitral annulus is primarily used to evaluate which property?

A. Aortic valve gradient
B. Pulmonary vein flow direction
C. High-velocity transmitral blood flow
D. Myocardial relaxation and longitudinal motion

23. A mosaic, multicolored pattern in a color Doppler jet most commonly indicates which finding?

A. Absence of flow
B. Turbulent, high-velocity flow with aliasing
C. Tissue motion artifact
D. Laminar flow at normal velocity

24. Pulsus paradoxus, defined as an exaggerated inspiratory drop in systemic systolic pressure, is most closely associated with which condition?

A. Restrictive cardiomyopathy
B. Cardiac tamponade
C. Constrictive pericarditis
D. Hypertrophic cardiomyopathy

25. Which of the following is the approximate upper limit of normal for LV internal diameter at end-diastole (LVIDd) indexed appropriately, in an average-sized adult male measured from PLAX?

A. 5.8 cm
B. 6.8 cm
C. 3.5 cm
D. 7.5 cm

26. Small, narrow regurgitant jets seen within the sewing ring of a mechanical bileaflet aortic prosthesis on color Doppler most likely represent which finding?

A. Prosthetic endocarditis with leaflet destruction
B. Normal built-in closing or washing jets of the prosthesis
C. Paravalvular leak that requires reoperation
D. Pannus ingrowth into the prosthesis

27. Which cardiac chamber has the thickest myocardial wall in a normal adult heart?

A. Right atrium
B. Left ventricle
C. Right ventricle
D. Left atrium

28. An aortic regurgitation jet width-to-LVOT width ratio greater than 65 percent on color Doppler in the parasternal long-axis view most likely indicates which severity?

A. Moderate
B. Severe
C. Mild
D. Trace

29. Stroke volume across the LVOT is calculated using which equation?

A. Stroke volume equals LVOT area divided by LVOT VTI
B. Stroke volume equals LVOT VTI times heart rate
C. Stroke volume equals LVOT cross-sectional area times LVOT VTI
D. Stroke volume equals LVOT diameter times LVOT peak velocity

30. Which condition makes the Teichholz (M-mode) method of estimating left ventricular ejection fraction unreliable?

A. Mild concentric LV hypertrophy with normal wall motion
B. Mild mitral annular calcification
C. Sinus tachycardia at 110 beats per minute
D. Regional wall motion abnormalities such as those after a myocardial infarction

31. On color Doppler, a mitral regurgitation jet that is eccentric and directed away from the prolapsing leaflet most likely indicates which mechanism?

A. Restricted motion of both leaflets due to ischemia
B. Symmetric annular dilation
C. Systolic anterior motion of the anterior leaflet
D. Prolapse or flail of the leaflet opposite the jet direction

32. Which view is best suited for measuring the tricuspid annular plane systolic excursion (TAPSE) by M-mode?

A. Subcostal four-chamber with the cursor through the septal annulus
B. Parasternal short-axis at the aortic-valve level
C. Parasternal long-axis with the cursor through the tricuspid valve
D. Apical four-chamber view with the M-mode cursor through the lateral tricuspid annulus

33. Where is a left atrial myxoma most commonly attached?

A. Posterior mitral annulus
B. Left atrial appendage tip
C. Interatrial septum at the fossa ovalis
D. Lateral wall of the left atrium

34. Which morphologic finding is most suggestive of chronic constrictive pericarditis?

A. Echo-dense mass within the left ventricular apex
B. Thickened and brightly echogenic pericardium
C. Bright endocardial speckling of the left ventricle
D. Discrete pedunculated mass attached to the atrial septum

35. Which physiologic change most directly increases left ventricular afterload?

A. A decrease in heart rate
B. An increase in myocardial contractility
C. An increase in systemic vascular resistance
D. An increase in venous return

36. Which Doppler modality is limited by aliasing when interrogating high velocities?

A. Pulsed-wave Doppler
B. B-mode
C. M-mode
D. Continuous-wave Doppler

37. In the parasternal short-axis view at the mitral valve level, the anterior leaflet appears as which feature during diastole?

A. A fish-mouth opening anterior to the smaller posterior leaflet
B. An immobile linear echogenicity in the LA
C. A single thin echo posterior to the aortic root
D. A coaptation line perpendicular to the septum

38. From which sinus of Valsalva does the left main coronary artery normally arise?

A. Non-coronary sinus
B. Left coronary sinus
C. Right coronary sinus
D. Posterior sinus

39. In most patients, the posterior descending artery (PDA) arises from which vessel, defining right coronary dominance?

A. Left main coronary artery
B. Left anterior descending artery
C. Left circumflex artery
D. Right coronary artery

40. Which window is preferred for visualizing the right ventricular outflow tract and pulmonic valve in adults?

A. Apical three-chamber view
B. Parasternal short-axis at the level of the aortic valve
C. Apical two-chamber view
D. Suprasternal long-axis view

41. Left ventricular thrombus is most commonly seen in association with which finding?

A. Isolated right ventricular infarction
B. Hyperdynamic basal lateral wall with normal apex
C. Akinetic or dyskinetic apical segment after anterior myocardial infarction
D. Concentric left ventricular hypertrophy with preserved function

42. How many cusps does a normal aortic valve have?

A. Three
B. One
C. Four
D. Two

43. Which view is preferred for measuring tricuspid regurgitation peak velocity to estimate pulmonary artery systolic pressure?

A. Parasternal long-axis with pulsed-wave Doppler
B. Suprasternal notch with continuous-wave Doppler
C. Subcostal short-axis with color M-mode
D. Apical four-chamber (or RV-focused) view with continuous-wave Doppler

44. On color Doppler, which vena contracta width is most consistent with severe aortic regurgitation?

A. Less than 3 mm
B. 3 to 4 mm
C. Greater than 6 mm
D. 4 to 6 mm

45. Which Doppler finding in the descending aorta below the diaphragm is most suggestive of significant aortic coarctation?

A. Continuous antegrade diastolic flow with delayed upstroke (loss of normal early diastolic flow reversal)
B. Holodiastolic flow reversal
C. Triphasic flow with prominent reverse diastolic component
D. Sharp systolic upstroke with brisk early diastolic flow reversal

46. Color Doppler displays moving blood by which property?

A. Mean velocity and direction within each pixel, encoded as color
B. Tissue motion velocity within each pixel
C. Signal amplitude without directional information
D. Peak velocity along the entire beam, encoded as a spectral trace

47. Which PISA-derived effective regurgitant orifice area is most consistent with severe primary mitral regurgitation?

A. 0.20 to 0.39 cm squared
B. Greater than or equal to 0.40 cm squared
C. 0.10 to 0.19 cm squared
D. Less than 0.10 cm squared

48. An IVC of 1.5 cm that collapses more than 50 percent with sniff corresponds to which estimated right atrial pressure category?

A. Normal (approximately 3 mmHg)
B. Intermediate (approximately 8 mmHg)
C. High (approximately 15 mmHg)
D. Markedly high (greater than 20 mmHg)

49. A segment that bulges outward during systole rather than thickening inward is described as:

A. Hypokinetic
B. Akinetic
C. Dyskinetic
D. Hyperkinetic

50. Which echocardiographic feature defines Ebstein anomaly?

A. Subvalvular pulmonary stenosis with infundibular hypertrophy
B. Cleft in the anterior mitral leaflet with primum ASD
C. Apical displacement of the septal tricuspid leaflet with atrialization of the right ventricle
D. Apical displacement of the anterior mitral leaflet with atrialization of the left ventricle