

MULTIPLE CHOICE

AE DOPPLER AND HEMODYNAMICS - PRACTICE SET

PROPOSED FOR REVIEW - questions are the author's verbatim Q&A; distractors are auto-selected from other answers in the same bank and must be checked by a subject-matter reviewer (a distractor could coincidentally be correct). Not authoritative assessment content.

1. When calculating the LVOT cross-sectional area for the continuity equation, the LVOT is modeled as which geometric shape?

- A. Ellipse
- B. Triangle
- C. Circle
- D. Square

2. A Q_p/Q_s ratio of 2.0 indicates which type of shunt physiology?

- A. Balanced bidirectional shunt
- B. No shunt
- C. Significant right-to-left shunt
- D. Significant left-to-right shunt

3. A peak transaortic velocity of 4 m/s corresponds to approximately what peak instantaneous gradient by the simplified Bernoulli equation?

- A. 16 mmHg
- B. 64 mmHg
- C. 32 mmHg
- D. 128 mmHg

4. The mitral inflow E wave represents which event?

- A. Atrial contraction filling
- B. Early diastolic passive LV filling
- C. Isovolumic relaxation
- D. Ventricular ejection

5. The continuity equation for aortic valve area is most correctly expressed as which of the following?

- A. AVA equals LVOT area times LVOT VTI divided by aortic VTI
- B. AVA equals aortic VTI divided by LVOT VTI
- C. AVA equals LVOT area divided by aortic peak velocity
- D. AVA equals LVOT area times aortic VTI divided by LVOT VTI

6. To minimize aliasing while assessing a high-velocity color Doppler jet, the operator should:

- A. Decrease the angle to nearly 90 degrees
- B. Increase the color scale (PRF) to a higher Nyquist limit
- C. Increase the color gain until the image speckles
- D. Decrease the color scale (PRF) toward zero

7. Color Doppler displays moving blood by which property?

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

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

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

9. The complete formula for estimating pulmonary artery systolic pressure from the tricuspid regurgitation jet is:

- A. PASP equals 4 times TR velocity squared plus estimated right atrial pressure
- B. PASP equals TR velocity plus right atrial pressure
- C. PASP equals 2 times TR velocity squared plus right atrial pressure
- D. PASP equals 4 times TR velocity squared

10. Mitral valve area by the Hatle pressure half-time method is calculated using which formula?

- A. MVA equals 220 times pressure half-time
- B. MVA equals pressure half-time divided by 220
- C. MVA equals 759 divided by pressure half-time
- D. MVA equals 220 divided by pressure half-time

11. In which clinical situation should the proximal velocity NOT be ignored when applying the Bernoulli equation?

- A. Mild mitral regurgitation with normal LV inflow
- B. Serial obstruction with elevated LVOT velocity proximal to aortic stenosis
- C. Tricuspid regurgitation with a normal RVOT velocity
- D. Pulmonary regurgitation with normal RV diastolic pressures

12. In severe aortic regurgitation, which Doppler finding is expected on continuous-wave interrogation of the regurgitant jet?

- A. Short pressure half-time of the regurgitant signal
- B. Absent diastolic Doppler signal
- C. Prolonged pressure half-time of the regurgitant signal
- D. Late-peaking systolic envelope

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

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

14. Pulmonary vein flow pattern with systolic blunting and dominant diastolic flow most commonly suggests:

- A. Severe aortic stenosis
- B. Normal LV diastolic function
- C. Elevated left atrial pressure
- D. Pulmonary embolism

15. The shunt ratio Q_p/Q_s 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

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

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

17. A 60-degree Doppler angle of insonation will cause the measured velocity to be:

- A. Approximately twice the true velocity
- B. Approximately one-quarter of the true velocity
- C. Equal to the true velocity
- D. Approximately one-half of the true velocity

18. A holosystolic high-velocity continuous-wave Doppler envelope directed away from the transducer in the apical four-chamber view is most consistent with:

- A. Mitral regurgitation
- B. Mitral stenosis
- C. Tricuspid regurgitation
- D. Aortic stenosis

19. Which Doppler modality allows sampling of blood flow velocity from a small, operator-selected sample volume at a specific depth?

- A. Power Doppler
- B. Pulsed-wave Doppler
- C. Continuous-wave Doppler
- D. Color flow Doppler

20. A reduced septal mitral annular e prime velocity is most consistent with which finding?

- A. Severe aortic stenosis with preserved diastolic function
- B. Enhanced LV relaxation
- C. Impaired LV relaxation
- D. Acute pulmonary embolism with right heart strain

21. A pressure half-time of 220 ms across the mitral valve corresponds to a calculated mitral valve area of approximately:

- A. 0.5 cm squared
- B. 1.0 cm squared
- C. 2.0 cm squared
- D. 4.0 cm squared

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

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

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

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

24. Which mitral inflow pattern is most consistent with a restrictive filling pattern (grade III diastolic dysfunction)?

- A. E/A ratio greater than 2 with short deceleration time
- B. E/A ratio less than 0.8 with prolonged deceleration time
- C. E/A ratio approximately 1 with normal deceleration time
- D. Dominant A wave with no measurable E wave

25. The simplified Bernoulli equation used to convert a Doppler velocity to a pressure gradient is best expressed as which of the following?

- A. Pressure gradient equals 4 times velocity squared
- B. Pressure gradient equals velocity squared divided by 4
- C. Pressure gradient equals 2 times velocity squared
- D. Pressure gradient equals 4 times velocity