

MULTIPLE CHOICE

AE DOPPLER AND HEMODYNAMICS - PRACTICE SET - ANSWER KEY

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 Qp/Qs 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, Qp/Qs)?

- 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