

MULTIPLE CHOICE

VASCULAR - MIXED EXAM - 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. Which peak systolic velocity threshold in the superior mesenteric artery is most commonly cited as suggestive of greater than 70 percent stenosis?

- A. Greater than 275 cm/s**
- B. Greater than 150 cm/s
- C. Greater than 500 cm/s
- D. Greater than 100 cm/s

2. Which Doppler finding within a TIPS is most concerning for shunt stenosis?

- A. A focal peak velocity within the stent greater than approximately 190 to 200 cm/s with a marked velocity gradient**
- B. Velocities within the stent of approximately 90 to 120 cm/s throughout
- C. Continuous low-velocity flow in the hepatic veins
- D. Hepatopetal flow in the main portal vein

3. Which of the following collateral vessels, when identified on ultrasound, is essentially diagnostic of portal hypertension?

- A. An enlarged middle hepatic vein
- B. A recanalized paraumbilical vein in the falciform ligament**
- C. A patent ligamentum venosum
- D. A prominent right gastroepiploic vein

4. An ankle-brachial index value greater than 1.40 most likely indicates which condition?

- A. Medial arterial calcification with noncompressible vessels**
- B. Severe peripheral arterial disease
- C. Normal arterial physiology
- D. Acute arterial occlusion

5. In the Society of Radiologists in Ultrasound (SRU) consensus criteria for ICA stenosis, which ICA peak systolic velocity (PSV) threshold defines a stenosis of 70 percent or greater?

- A. Greater than 230 cm/s**
- B. Greater than 180 cm/s
- C. Greater than 400 cm/s
- D. Greater than 125 cm/s

6. Which vascular bed normally exhibits low-resistance flow with continuous forward diastolic flow?

- A. Internal carotid artery**
- B. External carotid artery
- C. Resting brachial artery
- D. Resting common femoral artery

7. The principle that allows pulsed wave Doppler to determine the depth of a moving reflector is:

- A. Time gating of the returning echo (range resolution)**
- B. Independence from the pulse repetition frequency
- C. The continuous emission of sound
- D. Use of beam angles greater than 90 degrees

8. A normal peripheral arterial spectral Doppler waveform in a resting lower extremity is best described as:

- A. Biphasic with absent diastolic flow
- B. Triphasic**

- C. Monophasic with continuous forward flow
- D. Continuous high-diastolic flow

9. A focal turbulent jet with markedly elevated PSV in the proximal ICA, immediately downstream of plaque, is most plausibly explained by which mechanism?

- A. Increased Doppler angle at the lesion
- B. Conservation of flow through a narrowed lumen, increasing local velocity**
- C. Reduction of color PRF at the lesion
- D. Use of a higher transducer frequency at the lesion

10. In a standard transcranial Doppler examination, the basilar artery is best insonated through which window?

- A. Suboccipital (foramen magnum) window**
- B. Submandibular window
- C. Transtemporal window
- D. Transorbital window

11. During venous mapping for an autologous lower extremity bypass, which great saphenous vein characteristic would render the conduit unacceptable?

- A. Multiple segments of luminal thrombus or sclerosed vein along the course**
- B. GSV diameter greater than the femoral vein
- C. A single tributary at the saphenofemoral junction
- D. Visualization of competent valves along the vein

12. A normal vertebral artery spectral Doppler waveform most closely resembles which of the following?

- A. A high-resistance waveform with reversed diastolic flow, similar to a resting external iliac
- B. A low-resistance waveform with continuous forward diastolic flow, similar to the ICA**
- C. A bidirectional pendular waveform
- D. A waveform identical to the ECA with sharp diastolic notching

13. A bruit heard on auscultation over an artery is generated by:

- A. Turbulent flow producing vibrations in the vessel wall**
- B. Smooth laminar flow at normal velocity
- C. Static blood within a fully occluded artery
- D. Hydrostatic pressure changes during respiration

14. To calculate the renal-aortic ratio (RAR), the renal artery peak systolic velocity is divided by the peak systolic velocity in which vessel?

- A. The contralateral renal artery
- B. The superior mesenteric artery
- C. The abdominal aorta at the bifurcation
- D. The abdominal aorta at the level of the renal arteries**

15. Which structure is most likely to be mistaken for an acute deep vein thrombosis in the popliteal fossa?

- A. Lymph node in the femoral triangle
- B. Baker (popliteal) cyst**
- C. Femoral artery aneurysm
- D. Hematoma in the gastrocnemius muscle

16. Spectral broadening on Doppler waveforms is best defined as:

- A. Increased peak systolic velocity above 125 cm/s
- B. Wider color flow bandwidth on a duplex image
- C. Loss of the spectral window only in early diastole
- D. A wider range of velocities present within the sample volume during a cardiac cycle**

17. Which spectral Doppler feature most reliably distinguishes a normal internal carotid artery (ICA) from a normal external carotid artery (ECA)?

- A. The ICA waveform shows sharp diastolic notching
- B. The ICA shows a low-resistance waveform with continuous forward diastolic flow**
- C. The ICA gives multiple anterior branches in the neck
- D. The ICA demonstrates the highest peak systolic velocity in the neck under normal conditions

18. On color Doppler, a focal outpouching connected to a femoral artery by a narrow neck shows a swirling 'yin-yang' flow pattern. The most likely diagnosis is:

- A. Arteriovenous fistula
- B. Femoral hematoma with no communication
- C. True saccular aneurysm
- D. Pseudoaneurysm**

19. Paget-Schroetter syndrome (effort thrombosis) most commonly produces thrombus in which vein?

- A. Internal jugular vein
- B. Femoral vein
- C. Axillosubclavian (subclavian) vein**
- D. Cephalic vein

20. Which testing modality is least affected by medial arterial calcification and noncompressible vessels?

- A. Ankle-brachial index
- B. Doppler-derived ankle systolic pressure
- C. Segmental systolic pressures
- D. Pulse volume recordings**

21. Aliasing on pulsed wave Doppler occurs when:

- A. Spectral broadening exceeds the velocity scale
- B. The Doppler angle exceeds 60 degrees
- C. The Doppler shift is below half the pulse repetition frequency
- D. The Doppler shift frequency exceeds one half of the pulse repetition frequency**

22. During a lower extremity venous duplex, which patient position is preferred to promote venous distention and improve visualization?

- A. Left lateral decubitus with both legs straight
- B. Prone with the leg internally rotated
- C. Supine reverse Trendelenburg with the leg externally rotated and knee slightly flexed**
- D. Trendelenburg (head down) with legs elevated

23. An ankle-brachial index between 0.91 and 0.99 is best classified as:

- A. Normal
- B. Mild disease
- C. Moderate to severe disease
- D. Borderline**

24. A patient undergoing venous reflux evaluation is positioned and a Valsalva maneuver is performed at the common femoral vein. After release of Valsalva, the spectral Doppler shows reversed flow lasting longer than 1 second. This finding indicates:

- A. A normal response to Valsalva
- B. Acute thrombus in the common femoral vein
- C. Compression of the iliac vein
- D. Valvular incompetence at or proximal to the sample site**

25. Which is the most common etiology of a femoral artery pseudoaneurysm?

- A. Inherited connective tissue disorder
- B. Iatrogenic arterial puncture (catheterization)**
- C. Spontaneous degeneration of the arterial media
- D. Penetrating trauma from gunshot wound

26. The small (lesser) saphenous vein typically terminates at which anatomic location?

- A. Posterior tibial vein at the ankle
- B. Saphenopopliteal junction**
- C. Common femoral vein
- D. Saphenofemoral junction

27. Diffuse tardus-parvus (delayed upstroke, low amplitude) waveforms in both common carotid arteries are most suggestive of which condition?

- A. Subclavian steal
- B. Carotid body tumor
- C. Bilateral severe ICA stenosis distal to the bulb
- D. Significant aortic valve stenosis or proximal innominate disease**

28. For a fixed Doppler angle and constant blood velocity, increasing the transmit frequency will:

- A. Eliminate aliasing automatically
- B. Leave the Doppler shift unchanged
- C. Increase the Doppler shift frequency**
- D. Decrease the Doppler shift frequency

29. Which peak systolic velocity (PSV) threshold in the main renal artery is most commonly cited as suggestive of hemodynamically significant renal artery stenosis of 60 percent or greater?

- A. Greater than 100 cm/s
- B. Greater than 400 cm/s
- C. Greater than 50 cm/s
- D. Greater than 180 to 200 cm/s**

30. How is the ankle-brachial index calculated?

- A. Higher ankle systolic pressure of that limb divided by the higher of the two brachial systolic pressures**
- B. Higher ankle pressure divided by ipsilateral brachial pressure
- C. Lower ankle systolic pressure divided by the lower brachial systolic pressure
- D. Mean ankle pressure divided by mean brachial pressure

31. Why must the sonographer wait between positional maneuvers when testing for thoracic outlet syndrome with photoplethysmography?

- A. To prevent the Doppler signal from drifting due to thermal noise
- B. To rest the patient's shoulder muscles before contraction
- C. To allow the cuff to recalibrate to zero pressure
- D. To allow reactive hyperemia from the prior position to dissipate, preventing falsely elevated waveforms**

32. A patient with chronic kidney disease and a left-arm arteriovenous dialysis fistula develops left arm pain with exercise and is found to have reversed flow in the left vertebral artery during arm exertion. What is the most likely mechanism?

- A. Left ICA near-occlusion
- B. Acute basilar artery occlusion
- C. Acute left vertebral artery dissection
- D. Hemodialysis-access steal physiology causing functional subclavian steal**

33. Which patient population is most likely to have falsely elevated ankle-brachial index values due to noncompressible arteries?

- A. Pregnant patients
- B. Patients with long-standing diabetes mellitus or end-stage renal disease**
- C. Patients on beta-blocker therapy
- D. Young athletes with low resting heart rates

34. A vein bypass graft demonstrates a uniformly low peak systolic velocity below 45 cm/sec throughout its length. This finding most likely represents:

- A. An arteriovenous fistula at the distal anastomosis
- B. Normal graft function early after implantation
- C. A localized high-grade stenosis
- D. Impending graft failure due to low-flow state**

35. Which gray-scale feature most strongly favors chronic over acute deep vein thrombosis?

- A. Free-floating thrombus tail in a fully patent lumen
- B. Dilated vein larger than the adjacent artery with hypoechoic thrombus
- C. Anechoic, fully compressible lumen
- D. Small, contracted vein with echogenic, wall-adherent thrombus and visible collaterals**

36. Which of the following best characterizes the normal common carotid artery (CCA) spectral Doppler waveform?

- A. A mixed-resistance waveform with characteristics of both high- and low-resistance flow**
- B. A triphasic waveform identical to a peripheral lower-extremity artery
- C. A pure low-resistance waveform identical to the ICA
- D. A pure high-resistance waveform with reversed diastolic flow

37. Which finding on a venous duplex is MOST suggestive of post-thrombotic syndrome (chronic post-DVT changes) rather than acute DVT?

A. Thickened, echogenic vein walls with web-like residual material and surrounding collaterals

B. Vein larger than the adjacent artery filled with hypoechoic material

C. Free-floating thrombus tail extending into a patent lumen

D. Fully compressible, anechoic vein with normal phasicity

38. By SRU consensus criteria, which ICA end-diastolic velocity (EDV) threshold supports a diagnosis of ICA stenosis of 70 percent or greater?

A. Greater than 100 cm/s

B. Greater than 60 cm/s

C. Greater than 140 cm/s

D. Greater than 40 cm/s

39. A young patient presents with neck pain, headache, and Horner syndrome after minor trauma. Carotid duplex shows a long tapered narrowing of the ICA beginning 2 to 3 cm distal to the bulb. Which diagnosis is most consistent with these findings?

A. Spontaneous or traumatic internal carotid artery dissection

B. Atherosclerotic ICA stenosis

C. Carotid body tumor

D. Fibromuscular dysplasia of the renal artery

40. Which gray-scale and color Doppler finding is most characteristic of internal carotid artery dissection?

A. A focal calcified plaque at the carotid bulb with acoustic shadowing

B. A heterogeneous, hypervascular soft tissue mass splaying the carotid bifurcation

C. An aneurysmal dilatation of the common carotid bulb

D. A tapered, smoothly narrowed ICA lumen with an intimal flap or eccentric intramural hematoma

41. Which finding on post-EVAR surveillance ultrasound is the strongest indicator that an endoleak is clinically significant and requires intervention?

A. Visualization of the stent graft folds

B. Presence of mural thrombus within the excluded sac

C. A 1 mm change in sac diameter on a single study

D. Progressive enlargement of the aneurysm sac diameter over serial studies

42. Poiseuille's law predicts that, for steady laminar flow in a rigid tube, flow is proportional to:

A. The cube of the radius

B. The radius itself

C. The fourth power of the radius

D. The square of the radius

43. Which is a recognized indication for transcranial Doppler in clinical practice?

A. First-line diagnosis of carotid plaque ulceration

B. Measurement of carotid intima-media thickness

C. Routine screening of asymptomatic adults for atherosclerosis

D. Monitoring for cerebral vasospasm after aneurysmal subarachnoid hemorrhage

44. By SRU consensus criteria, which ICA peak systolic velocity (PSV) threshold defines an ICA stenosis of 50 percent or greater?

A. Greater than 100 cm/s

B. Greater than 200 cm/s

C. Greater than 230 cm/s

D. Greater than 125 cm/s

45. In the early postoperative period after renal transplantation, an intrarenal arterial resistive index (RI) above what value is generally considered abnormal and a possible sign of rejection or other parenchymal dysfunction?

A. Greater than 0.60

B. Greater than 0.50

C. Greater than 0.80

D. Greater than 0.95

46. Which factor will MOST increase the calculated velocity error in Doppler measurements?

A. Using a Doppler angle of 45 degrees

B. Using a lower transmit frequency

C. Sampling at the center of the lumen

D. Using a Doppler angle of 75 degrees

47. Which finding on a venous reflux study most specifically indicates incompetence of a perforating vein rather than incompetence of the great saphenous vein?

A. Outward (deep-to-superficial) flow through a vein crossing the muscular fascia on release of distal compression

- B. Reversed flow at the saphenopopliteal junction on calf release
- C. Reversed flow at the saphenofemoral junction on Valsalva
- D. Reversed flow in the common femoral vein on Valsalva

48. Which finding distal to a tight peripheral arterial stenosis would the sonographer most expect?

- A. Markedly elevated peak systolic velocity above the stenosis
- B. Damped monophasic flow with reduced peak systolic velocity**
- C. Absent flow with patent vessel walls
- D. Triphasic waveform with sharp upstroke

49. What is the single most reliable gray-scale finding used to diagnose acute deep vein thrombosis?

- A. Loss of respiratory phasicity on spectral Doppler
- B. Failure of distal augmentation
- C. Inability to fully coapt the vein walls with transducer compression in the transverse plane**
- D. Absence of color filling on color Doppler

50. Which fluid property primarily determines viscous resistance to blood flow?

- A. Density
- B. Temperature
- C. Viscosity**
- D. Compressibility