

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. 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 0.80**
- C. Greater than 0.50
- D. Greater than 0.95

2. During venous mapping for dialysis access creation, what minimum cephalic vein diameter is most commonly cited as acceptable?

- A. At least 0.5 mm
- B. At least 2.5 mm**
- C. At least 6 mm
- D. At least 10 mm

3. A renal artery tardus parvus waveform distal to its origin is most suggestive of:

- A. A proximal renal artery stenosis**
- B. Increased downstream renal resistance
- C. Renal vein thrombosis
- D. Intrarenal small vessel disease only

4. Spectral broadening at a focal site of suspected stenosis is BEST interpreted as evidence of:

- A. An aliasing artifact only
- B. A normal laminar flow profile
- C. Inappropriately low Doppler gain
- D. Disturbed or turbulent flow**

5. A patient presents with postprandial epigastric pain. Doppler imaging shows celiac artery PSV markedly elevated on expiration and returning to nearly normal on deep inspiration. Which diagnosis does this respiratory variation most strongly support?

- A. Fixed atherosclerotic celiac artery stenosis
- B. Median arcuate ligament syndrome**
- C. Acute mesenteric artery embolism
- D. Splanchnic artery aneurysm

6. A focal elevation of mean velocity to greater than 200 cm/s in the middle cerebral artery on transcranial Doppler following subarachnoid hemorrhage is most consistent with which diagnosis?

- A. Severe cerebral vasospasm**
- B. Severe intracranial atherosclerotic stenosis without spasm
- C. A normal post-bleed baseline
- D. Cerebral arteriovenous malformation

7. A focal velocity ratio (peak systolic velocity at the stenosis divided by the PSV in the upstream segment) of what value is most commonly used to identify a hemodynamically significant stenosis in a hemodialysis fistula or graft?

- A. Greater than 1.2
- B. Greater than 2.0 to 3.0**
- C. Greater than 5.0
- D. Greater than 10.0

8. The femoral vein in the thigh was previously known by which name?

- A. Common femoral vein
- B. Profunda femoris vein
- C. Superficial femoral vein**
- D. Great saphenous vein

9. Which statement BEST describes the relationship between volume flow, pressure gradient, and resistance in a vascular bed?

- A. Flow equals pressure gradient times resistance
- B. Flow equals pressure gradient divided by resistance**
- C. Flow equals resistance divided by pressure gradient
- D. Flow equals pressure gradient plus resistance

10. Which subclavian or upper extremity finding is most suggestive of a subclavian steal syndrome?

- A. Reversed flow in the ipsilateral vertebral artery with proximal subclavian artery stenosis**
- B. Antegrade flow in both vertebral arteries with equal velocities
- C. Bidirectional flow in the common carotid artery
- D. Elevated peak systolic velocity in the contralateral carotid artery

11. Which condition is characterized by intermittent episodes of digital ischemia in response to cold or emotional stress, typically demonstrating attenuated or flat-line digital PPG waveforms during cold immersion?

- A. Acute compartment syndrome
- B. Buerger disease in its end-stage form
- C. Thoracic outlet syndrome
- D. Raynaud phenomenon**

12. True or False: The deep femoral (profunda femoris) vein is a superficial vein of the thigh.

- A. True
- B. False**

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

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

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

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

15. When examining the vertebral artery in the cervical segment, the sonographer scans between which anatomic landmarks?

- A. The transverse processes of the cervical vertebrae**
- B. The carotid bulb and the angle of the mandible
- C. The thyroid cartilage and the cricoid cartilage
- D. The spinous processes of the cervical vertebrae

16. Which Doppler change in the main portal vein, when seen on serial post-TIPS surveillance, raises concern for shunt dysfunction?

- A. An unchanged spectral broadening pattern
- B. Persistent hepatopetal flow at the same velocity as the baseline study
- C. A new decrease in main portal vein velocity compared with prior studies**
- D. A new increase in main portal vein velocity compared with prior studies

17. Which technical pitfall most commonly results in artifactually elevated peak systolic velocities during peripheral arterial duplex imaging?

- A. Doppler insonation angle of 30 degrees
- B. Use of a high-frequency linear transducer in superficial vessels
- C. Color Doppler scale (PRF) set above the expected peak velocity
- D. Doppler insonation angle greater than 60 degrees**

18. 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 180 to 200 cm/s

- B. Greater than 50 cm/s
- C. Greater than 100 cm/s
- D. Greater than 400 cm/s

19. A normal pulse volume recording (PVR) waveform is characterized by which features?

A. Rapid systolic upstroke, sharp peak, and a dicrotic notch on the downslope

- B. High-amplitude continuous waveform without distinct systole and diastole
- C. Slow upstroke, rounded peak, and absent dicrotic notch
- D. Flat-lined tracing with minimal pulsatility

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

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

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

22. What is the standard ultrasound definition of an abdominal aortic aneurysm (AAA)?

- A. Any abdominal aorta measuring more than 1.5 times the diameter of the common iliac artery
- B. Focal dilation of the abdominal aorta to 3.0 cm or greater in outer-wall to outer-wall diameter**
- C. Focal dilation of the abdominal aorta to 2.0 cm or greater
- D. Focal dilation of the abdominal aorta to 5.5 cm or greater

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

A. Viscosity

- B. Temperature
- C. Density
- D. Compressibility

24. Which technique is most commonly used as first-line nonsurgical treatment of an iatrogenic femoral pseudoaneurysm and is frequently guided by sonography?

- A. Endovascular stent placement
- B. Ultrasound-guided thrombin injection**
- C. Surgical bypass grafting
- D. Percutaneous thrombolysis with tPA

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

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

26. In the modified Bernoulli equation used clinically, a pressure gradient across a stenosis is estimated as:

- A. Eight times the peak velocity
- B. Four times the peak velocity squared**
- C. Peak velocity squared divided by two
- D. Two times the peak velocity

27. In a patient with suspected subclavian steal but a borderline vertebral waveform at rest, which provocative maneuver is most appropriate to unmask the steal?

- A. Carotid sinus massage

- B. Temporal tap of the affected side
- C. Ipsilateral arm hyperemia after a brief blood-pressure cuff inflation and release**
- D. Valsalva maneuver

28. In an upper extremity venous duplex, an absent or markedly diminished cardiac pulsatility in the subclavian or axillary vein, combined with loss of respiratory phasicity, most strongly suggests:

- A. Normal upper extremity venous flow
- B. Subclavian artery stenosis
- C. Acute thrombus only in the distal cephalic vein
- D. Central venous obstruction (innominate, SVC, or proximal subclavian)**

29. Loss of normal phasicity and conversion of the hepatic veins to a flat, monophasic waveform is most characteristic of which condition?

- A. Median arcuate ligament syndrome
- B. Acute pulmonary embolism
- C. Renal artery stenosis
- D. Advanced cirrhosis or hepatic venous outflow compromise**

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

31. Which scenario will MOST predispose to turbulent flow?

- A. Low velocity flow in a smooth straight artery
- B. Steady low pressure flow in a vein
- C. High velocity flow through an abrupt narrowing**
- D. High viscosity flow in a narrow capillary

32. Retrograde flow from a patent inferior mesenteric artery into the aneurysm sac after EVAR represents which endoleak type?

- A. Type V (endotension)
- B. Type II**
- C. Type I
- D. Type III

33. 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. Progressive enlargement of the aneurysm sac diameter over serial studies**
- D. A 1 mm change in sac diameter on a single study

34. End diastolic velocity becomes elevated in the internal carotid artery primarily when:

- A. A high-grade stenosis is present in the ICA**
- B. The CCA waveform is biphasic
- C. The Doppler angle is set at 45 degrees
- D. The patient is bradycardic

35. During a distal augmentation maneuver, the calf is squeezed while the spectral Doppler is sampled in the popliteal vein. What is the expected normal response?

- A. A prompt, brisk increase in cephalad venous flow**
- B. A pulsatile arterial-type spectral signal
- C. Sustained reverse (retrograde) flow lasting several seconds
- D. No change in the venous waveform

36. Which technique is preferred for measuring AAA maximum diameter on ultrasound?

- A. Longitudinal measurement only, leading edge to leading edge
- B. Anteroposterior measurement, outer wall to outer wall, perpendicular to the long axis of the aorta**
- C. Anteroposterior measurement, inner wall to inner wall, in transverse only

D. Largest diameter regardless of plane, including oblique cuts

37. Which structural change in an artery will MOST effectively reduce resistance to flow?

- A. Decreasing the driving pressure
- B. Increasing blood viscosity
- C. Doubling the vessel length
- D. Doubling the vessel radius**

38. As blood flows through a focal arterial stenosis, the velocity at the narrowest point compared to the prestenotic segment will:

- A. Drop to zero
- B. Increase**
- C. Decrease
- D. Stay the same

39. A patient is found to have antegrade systolic flow that decelerates sharply to a brief retrograde notch in mid-systole followed by forward diastolic flow in the right vertebral artery. Which stage of subclavian steal does this best represent?

- A. Vertebral artery occlusion
- B. Complete (full) subclavian steal
- C. Partial (incomplete) subclavian steal**
- D. Normal vertebral waveform

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

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

41. A vascular sonographer observes a sharp color shift (mosaic) at a focal segment of an artery on color Doppler. The most likely underlying phenomenon is:

- A. Mirror image artifact
- B. Increased Doppler gain only
- C. Range ambiguity from a deep vessel
- D. Turbulence with aliasing at a stenosis**

42. In the normal common femoral vein at rest in a supine patient, the spectral Doppler waveform should demonstrate which feature?

- A. Continuous, non-phasic, low-velocity flow
- B. Pulsatile arterial-type flow with a sharp systolic upstroke
- C. Spontaneous, phasic flow that varies with respiration**
- D. Bidirectional flow throughout the respiratory cycle

43. In a confirmed complete subclavian steal, what does the spectral Doppler of the affected vertebral artery show at baseline?

- A. Fully retrograde (reversed) flow throughout the cardiac cycle**
- B. Antegrade flow with a mid-systolic deceleration notch only
- C. Absent flow signal
- D. Normal antegrade low-resistance flow

44. Following a femoral cardiac catheterization, an iatrogenic arteriovenous fistula will most likely demonstrate which Doppler finding in the draining vein near the communication?

- A. High-velocity, pulsatile, arterialized venous waveform**
- B. Absent venous flow consistent with thrombosis
- C. Reversed venous flow toward the foot
- D. Normal phasic venous flow with respiratory variation

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

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

46. For the great saphenous and small saphenous veins, the commonly accepted threshold for pathologic reflux on duplex testing is reverse flow lasting longer than:

- A. 0.5 second
- B. 0.1 second
- C. 2 seconds
- D. 5 seconds

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

- A. An aneurysmal dilatation of the common carotid bulb
- B. A focal calcified plaque at the carotid bulb with acoustic shadowing
- C. A tapered, smoothly narrowed ICA lumen with an intimal flap or eccentric intramural hematoma
- D. A heterogeneous, hypervascular soft tissue mass splaying the carotid bifurcation

48. Which artery is the continuation of the anterior tibial artery as it crosses the ankle onto the dorsum of the foot?

- A. Medial plantar artery
- B. Peroneal artery
- C. Dorsalis pedis artery
- D. Posterior tibial artery

49. A patient with chronic indwelling PICC line presents with arm swelling. Duplex shows the catheter within a non-compressible, mildly distended basilic vein with low-level intraluminal echoes and absent color flow around the catheter. The most likely diagnosis is:

- A. Normal PICC line position
- B. Subclavian artery thrombosis
- C. Catheter-associated upper extremity deep vein thrombosis
- D. Superficial thrombophlebitis of the cephalic vein

50. Which equation describes the Doppler shift used in vascular ultrasound?

- A. Doppler shift = (transmitted frequency x cosine of angle) / velocity
- B. Doppler shift = (2 x transmitted frequency x velocity x cosine of angle) / propagation speed
- C. Doppler shift = transmitted frequency x velocity x sine of angle
- D. Doppler shift = (velocity x propagation speed) / (2 x cosine of angle)