PRACTICE EXAM 5: VASCULAR TECHNOLOGY SIMULATION (170 QUESTIONS)

This practice exam contains 170 questions. Allow three hours. Select the single best answer for each item. The ARDMS VT examination uses a scaled score from 300 to 700, and 555 or higher is passing. This original practice examination is not affiliated with or endorsed by ARDMS or Inteleos.

1. Which vessel normally gives rise to the internal and external carotid arteries?

A. Vertebral artery
B. Subclavian artery
C. Brachiocephalic vein
D. Common carotid artery

2. Which carotid branch normally has no cervical branches?

A. External carotid artery
B. Internal carotid artery
C. Common carotid artery
D. Superior thyroid artery

3. A normal high-resistance peripheral arterial waveform at rest is best described as what?

A. Continuous and minimally pulsatile
B. Monophasic with delayed systole
C. Steady retrograde flow throughout diastole
D. Triphasic with brief flow reversal

4. Which vein is located within the calf muscle and commonly paired with an artery?

A. Great saphenous vein
B. Posterior tibial vein
C. Small saphenous vein
D. Cephalic vein

5. Which vessel normally carries blood from the gastrointestinal tract toward the liver?

A. Hepatic artery
B. Inferior vena cava
C. Portal vein
D. Hepatic vein

6. Where is the common femoral artery normally found relative to the common femoral vein?

A. Lateral to the vein
B. Medial to the vein
C. Posterior to the vein
D. Within the venous lumen

7. Which artery is the direct continuation of the external iliac artery below the inguinal ligament?

A. Deep femoral artery
B. Superficial femoral artery
C. Popliteal artery
D. Common femoral artery

8. Which vessel normally passes through the transverse foramina of the cervical vertebrae?

A. Vertebral artery
B. External carotid artery
C. Internal jugular vein
D. Superior thyroid artery

9. Which abdominal artery typically demonstrates a low-resistance waveform after a meal?

A. External iliac artery
B. Distal aorta
C. Superior mesenteric artery
D. Common femoral artery

10. Which vessel courses anterior to the aorta and posterior to the superior mesenteric artery?

A. Right renal artery
B. Left renal vein
C. Inferior mesenteric artery
D. Splenic vein

11. Which superficial vein normally drains into the common femoral vein at the groin?

A. Small saphenous vein
B. Great saphenous vein
C. Anterior tibial vein
D. Peroneal vein

12. Which cerebral artery is a branch of the internal carotid circulation?

A. Middle cerebral artery
B. Basilar artery
C. Posterior inferior cerebellar artery

D. Vertebral artery

13. During case review 2, which vessel normally gives rise to the internal and external carotid arteries?

A. Vertebral artery
B. Subclavian artery
C. Common carotid artery
D. Brachiocephalic vein

14. During case review 2, which carotid branch normally has no cervical branches?

A. External carotid artery
B. Common carotid artery
C. Superior thyroid artery
D. Internal carotid artery

15. During case review 2, a normal high-resistance peripheral arterial waveform at rest is best described as what?

A. Continuous and minimally pulsatile
B. Monophasic with delayed systole
C. Steady retrograde flow throughout diastole
D. Triphasic with brief flow reversal

16. During case review 2, which vein is located within the calf muscle and commonly paired with an artery?

A. Posterior tibial vein
B. Great saphenous vein
C. Small saphenous vein
D. Cephalic vein

17. During case review 2, which vessel normally carries blood from the gastrointestinal tract toward the liver?

A. Hepatic artery
B. Portal vein
C. Inferior vena cava
D. Hepatic vein

18. During case review 2, where is the common femoral artery normally found relative to the common femoral vein?

A. Medial to the vein
B. Posterior to the vein
C. Lateral to the vein
D. Within the venous lumen

19. During case review 2, which artery is the direct continuation of the external iliac artery below the inguinal ligament?

A. Deep femoral artery
B. Superficial femoral artery
C. Common femoral artery
D. Popliteal artery

20. During case review 2, which vessel normally passes through the transverse foramina of the cervical vertebrae?

A. Vertebral artery
B. External carotid artery
C. Internal jugular vein

D. Superior thyroid artery

21. During case review 2, which abdominal artery typically demonstrates a low-resistance waveform after a meal?

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B. Superior mesenteric artery
C. Distal aorta
D. Common femoral artery

22. During case review 2, which vessel courses anterior to the aorta and posterior to the superior mesenteric artery?

A. Right renal artery
B. Inferior mesenteric artery
C. Splenic vein
D. Left renal vein

23. During case review 2, which superficial vein normally drains into the common femoral vein at the groin?

A. Great saphenous vein
B. Small saphenous vein
C. Anterior tibial vein
D. Peroneal vein

24. During case review 2, which cerebral artery is a branch of the internal carotid circulation?

A. Basilar artery
B. Posterior inferior cerebellar artery
C. Middle cerebral artery

D. Vertebral artery

25. During case review 3, which vessel normally gives rise to the internal and external carotid arteries?

A. Vertebral artery
B. Subclavian artery
C. Brachiocephalic vein
D. Common carotid artery

26. During case review 3, which carotid branch normally has no cervical branches?

A. External carotid artery
B. Internal carotid artery
C. Common carotid artery
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27. During case review 3, a normal high-resistance peripheral arterial waveform at rest is best described as what?

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B. Monophasic with delayed systole
C. Steady retrograde flow throughout diastole
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28. During case review 3, which vein is located within the calf muscle and commonly paired with an artery?

A. Great saphenous vein
B. Small saphenous vein
C. Posterior tibial vein
D. Cephalic vein

29. During case review 3, which vessel normally carries blood from the gastrointestinal tract toward the liver?

A. Portal vein
B. Hepatic artery
C. Inferior vena cava
D. Hepatic vein

30. During case review 3, where is the common femoral artery normally found relative to the common femoral vein?

A. Medial to the vein
B. Lateral to the vein
C. Posterior to the vein
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31. During case review 3, which artery is the direct continuation of the external iliac artery below the inguinal ligament?

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33. During case review 3, which abdominal artery typically demonstrates a low-resistance waveform after a meal?

A. External iliac artery
B. Superior mesenteric artery
C. Distal aorta
D. Common femoral artery

34. During case review 3, which vessel courses anterior to the aorta and posterior to the superior mesenteric artery?

A. Left renal vein
B. Right renal artery
C. Inferior mesenteric artery
D. Splenic vein

35. During case review 3, which superficial vein normally drains into the common femoral vein at the groin?

A. Small saphenous vein
B. Anterior tibial vein
C. Great saphenous vein
D. Peroneal vein

36. During case review 3, which cerebral artery is a branch of the internal carotid circulation?

A. Basilar artery
B. Posterior inferior cerebellar artery
C. Vertebral artery

D. Middle cerebral artery

37. Which duplex finding most strongly supports acute lower-extremity deep vein thrombosis?

A. Failure of the vein to compress
B. Normal respiratory phasicity
C. Complete color filling
D. Thin echogenic valve leaflets

38. A focal arterial stenosis causes which immediate Doppler change at the narrowed segment?

A. Reduced velocity with a narrow spectrum
B. Increased velocity with spectral broadening
C. Absent systolic flow in all branches
D. Uniform venous pulsatility

39. Which waveform is expected distal to a hemodynamically significant arterial obstruction?

A. Sharp triphasic high-resistance flow
B. Continuous venous phasic flow
C. Damped monophasic tardus-parvus flow
D. Bidirectional alias-free flow

40. Which finding best distinguishes pseudoaneurysm flow at its neck?

A. Steady hepatopetal flow
B. To-and-fro spectral pattern
C. Continuous high-resistance flow
D. Absent color in the sac

41. Which color Doppler appearance is commonly seen within a pseudoaneurysm sac?

A. Uniform single-color laminar flow
B. No detectable flow at any setting
C. Only respiratory phasicity
D. Bidirectional yin-yang flow

42. Which clinical condition is most associated with venous reflux and ambulatory venous hypertension?

A. Chronic venous insufficiency
B. Acute arterial embolism
C. Thoracic outlet arterial spasm
D. Renal artery stenosis

43. A carotid plaque surface with a focal crater extending into the plaque is termed what?

A. Ulceration
B. Calcific shadowing
C. Intimal thickening
D. Venous recanalization

44. Which finding suggests an arteriovenous fistula near the communication?

A. Triphasic artery and phasic vein
B. Absent arterial and venous signals
C. Normal artery with spontaneous slow vein
D. Low-resistance arterial flow and pulsatile venous flow

45. Which duplex feature favors chronic rather than acute venous thrombus?

A. Dilated vein with soft hypoechoic material
B. Smooth lumen with full compressibility
C. Small irregular vein with echogenic wall-adherent material
D. Normal augmentation and spontaneous flow

46. What is the typical hemodynamic effect of severe proximal arterial disease on a distal pulse-volume recording?

A. Rapid upstroke and tall amplitude
B. Delayed upstroke and reduced amplitude
C. Prominent venous respiratory variation
D. Unchanged contour with higher pressure

47. Which condition can produce falsely elevated ankle pressures despite peripheral arterial disease?

A. Acute venous reflux
B. Low cardiac output only
C. Superficial thrombophlebitis
D. Medial arterial calcification

48. Which ultrasound finding is most concerning for an abdominal aortic aneurysm complication?

A. Laminar flow in the lumen
B. Mural thrombus without symptoms
C. New periaortic fluid with pain
D. Visible lumbar branches

49. Which flow direction defines portal venous reversal?

A. Hepatopetal flow toward the liver
B. Hepatofugal flow away from the liver
C. Cephalad flow in the aorta
D. Retrograde flow in the femoral artery

50. Which duplex pattern suggests renal artery stenosis when sampled within the stenosis?

A. Focal velocity elevation with poststenotic turbulence
B. Uniform low velocity without disturbance
C. Venous pulsatility with reflux
D. Triphasic flow throughout the renal artery

51. Which lesion most commonly produces subclavian steal physiology?

A. Distal radial artery stenosis
B. Proximal subclavian artery stenosis
C. Internal carotid plaque
D. Inferior vena cava thrombosis

52. Which symptom pattern is most consistent with acute limb ischemia?

A. Gradual edema with skin pigmentation
B. Warm limb with bounding pulses
C. Sudden pain, pallor, and absent pulse
D. Chronic painless varicosities

53. During case review 2, which duplex finding most strongly supports acute lower-extremity deep vein thrombosis?

A. Normal respiratory phasicity
B. Complete color filling

C. Thin echogenic valve leaflets
D. Failure of the vein to compress

54. During case review 2, a focal arterial stenosis causes which immediate Doppler change at the narrowed segment?

A. Increased velocity with spectral broadening
B. Reduced velocity with a narrow spectrum
C. Absent systolic flow in all branches
D. Uniform venous pulsatility

55. During case review 2, which waveform is expected distal to a hemodynamically significant arterial obstruction?

A. Damped monophasic tardus-parvus flow
B. Sharp triphasic high-resistance flow
C. Continuous venous phasic flow
D. Bidirectional alias-free flow

56. During case review 2, which finding best distinguishes pseudoaneurysm flow at its neck?

A. Steady hepatopetal flow
B. Continuous high-resistance flow
C. Absent color in the sac
D. To-and-fro spectral pattern

57. During case review 2, which color Doppler appearance is commonly seen within a pseudoaneurysm sac?

A. Uniform single-color laminar flow
B. Bidirectional yin-yang flow

C. No detectable flow at any setting
D. Only respiratory phasicity

58. During case review 2, which clinical condition is most associated with venous reflux and ambulatory venous hypertension?

A. Acute arterial embolism
B. Thoracic outlet arterial spasm
C. Chronic venous insufficiency
D. Renal artery stenosis

59. During case review 2, a carotid plaque surface with a focal crater extending into the plaque is termed what?

A. Calcific shadowing
B. Intimal thickening
C. Ulceration
D. Venous recanalization

60. During case review 2, which finding suggests an arteriovenous fistula near the communication?

A. Low-resistance arterial flow and pulsatile venous flow
B. Triphasic artery and phasic vein
C. Absent arterial and venous signals
D. Normal artery with spontaneous slow vein

61. During case review 2, which duplex feature favors chronic rather than acute venous thrombus?

A. Dilated vein with soft hypoechoic material
B. Small irregular vein with echogenic wall-adherent material
C. Smooth lumen with full compressibility

D. Normal augmentation and spontaneous flow

62. During case review 2, what is the typical hemodynamic effect of severe proximal arterial disease on a distal pulse-volume recording?

A. Rapid upstroke and tall amplitude
B. Prominent venous respiratory variation
C. Unchanged contour with higher pressure
D. Delayed upstroke and reduced amplitude

63. During case review 2, which condition can produce falsely elevated ankle pressures despite peripheral arterial disease?

A. Medial arterial calcification
B. Acute venous reflux
C. Low cardiac output only
D. Superficial thrombophlebitis

64. During case review 2, which ultrasound finding is most concerning for an abdominal aortic aneurysm complication?

A. Laminar flow in the lumen
B. Mural thrombus without symptoms
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65. During case review 2, which flow direction defines portal venous reversal?

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D. Retrograde flow in the femoral artery

66. During case review 2, which duplex pattern suggests renal artery stenosis when sampled within the stenosis?

A. Uniform low velocity without disturbance
B. Venous pulsatility with reflux
C. Triphasic flow throughout the renal artery
D. Focal velocity elevation with poststenotic turbulence

67. During case review 2, which lesion most commonly produces subclavian steal physiology?

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A. Gradual edema with skin pigmentation
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C. Warm limb with bounding pulses
D. Chronic painless varicosities

69. During case review 3, which duplex finding most strongly supports acute lower-extremity deep vein thrombosis?

A. Failure of the vein to compress
B. Normal respiratory phasicity
C. Complete color filling
D. Thin echogenic valve leaflets

70. During case review 3, a focal arterial stenosis causes which immediate Doppler change at the narrowed segment?

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A. Normal respiratory phasicity
B. Failure of the vein to compress
C. Complete color filling
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86. During case review 4, a focal arterial stenosis causes which immediate Doppler change at the narrowed segment?

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87. During case review 4, which waveform is expected distal to a hemodynamically significant arterial obstruction?

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89. During case review 4, which color Doppler appearance is commonly seen within a pseudoaneurysm sac?

A. Uniform single-color laminar flow
B. No detectable flow at any setting
C. Bidirectional yin-yang flow
D. Only respiratory phasicity

90. During case review 4, which clinical condition is most associated with venous reflux and ambulatory venous hypertension?

A. Acute arterial embolism
B. Thoracic outlet arterial spasm
C. Renal artery stenosis
D. Chronic venous insufficiency

91. Which segment of an autogenous vein bypass is especially prone to stenosis during surveillance?

A. Every segment equally without preference
B. Only the native contralateral artery
C. Only the distal deep vein
D. Anastomotic or valve-site segment

92. A sudden loss of flow in a previously patent dialysis graft most strongly suggests what?

A. Acute graft thrombosis
B. Normal maturation
C. Expected venous phasicity
D. Improved access function

93. Which endovascular aneurysm repair finding represents persistent flow outside the graft but within the aneurysm sac?

A. Normal graft limb flow
B. Endoleak
C. Venous reflux
D. Carotid dissection

94. During bypass surveillance, a focal velocity increase with turbulence most directly indicates what?

A. Normal uniform conduit flow
B. Complete venous compression
C. Possible graft stenosis
D. Expected postoperative edema only

95. Which structure should be evaluated after carotid endarterectomy for recurrent narrowing?

A. Only the contralateral jugular vein
B. Only the distal radial artery
C. Only the portal venous system
D. Endarterectomy site and adjacent artery

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A. Anastomotic or valve-site segment
B. Every segment equally without preference
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B. Endarterectomy site and adjacent artery
C. Only the distal radial artery
D. Only the portal venous system

101. How is the ankle-brachial index calculated for one leg?

A. Lower brachial pressure divided by ankle pressure
B. Ankle pressure minus brachial pressure
C. Higher ankle pressure divided by higher brachial pressure
D. Toe pressure divided by ankle pressure

102. What is the purpose of exercise testing after a normal resting ankle-brachial index in a symptomatic patient?

A. Diagnose deep venous thrombosis directly
B. Measure carotid plaque thickness
C. Confirm portal vein direction
D. Reveal flow-limiting disease under demand

103. Which maneuver is commonly used to evaluate lower-extremity venous reflux?

A. Distal augmentation followed by release
B. Continuous breath holding only
C. Rapid arm exercise only
D. Carotid compression

104. Which test is useful when ankle arteries are noncompressible?

A. Ankle pressure alone
B. Toe-brachial index
C. Carotid intima measurement
D. Portal velocity ratio

105. Which plethysmographic change generally indicates worsening arterial perfusion distally?

A. Higher amplitude with sharp upstroke
B. Greater respiratory phasicity
C. More venous pulsatility
D. Lower amplitude with rounded contour

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D. More venous pulsatility

121. Before an ultrasound-guided vascular access procedure, what is the most important initial verification?

A. Correct patient, procedure, and access site
B. Only the transducer frequency
C. Only the room temperature
D. Only the image depth

122. For real-time ultrasound-guided needle placement, where should the needle tip be maintained?

A. Beyond the displayed field
B. Behind acoustic shadowing
C. Within continuous visualization

D. Outside the target vessel

123. Which technique reduces contamination during ultrasound-guided vascular access?

A. Uncovered transducer with lotion
B. Nonsterile gel inside the field
C. Routine towel without disinfection
D. Sterile cover and sterile gel

124. During intraoperative duplex assessment, a focal color aliasing jet most strongly prompts what action?

A. Ignore the finding as expected
B. Obtain spectral Doppler at the site
C. Turn off all Doppler modes
D. Assess only the opposite limb

125. During case review 2, before an ultrasound-guided vascular access procedure, what is the most important initial verification?

A. Only the transducer frequency
B. Only the room temperature
C. Correct patient, procedure, and access site
D. Only the image depth

126. During case review 2, for real-time ultrasound-guided needle placement, where should the needle tip be maintained?

A. Within continuous visualization
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133. Which control primarily changes the strength of returning echoes displayed throughout the image?

A. Overall gain
B. Pulse repetition frequency
C. Wall filter
D. Doppler angle cursor

134. What is the principal effect of increasing pulse repetition frequency in pulsed-wave Doppler?

A. Lowers the transmit frequency automatically
B. Raises the Nyquist limit
C. Eliminates all spectral broadening

D. Increases acoustic impedance

135. Which adjustment helps reduce color Doppler aliasing?

A. Lower the color scale further
B. Increase persistence greatly
C. Increase the color velocity scale
D. Move the focal zone away

136. Why should the Doppler insonation angle be kept at or below 60 degrees for velocity measurements?

A. Flow becomes physically faster
B. Small angle errors cause less velocity error
C. Aliasing becomes impossible
D. The vessel diameter increases

137. Which artifact causes duplicated anatomy across a strong reflector?

A. Aliasing
B. Range ambiguity
C. Spectral window filling
D. Mirror-image artifact

138. What does the wall filter remove from a Doppler signal?

A. Low-frequency high-amplitude motion
B. High-frequency arterial flow only
C. All color information
D. Transmit pulse energy

139. Which principle directs using the lowest acoustic output consistent with diagnostic imaging?

A. Bernoulli principle
B. Poiseuille relationship
C. ALARA
D. Doppler shift equation

140. What does a tissue-mimicking phantom help evaluate in vascular laboratory quality assurance?

A. Patient blood pressure accuracy only
B. Physician credential validity
C. Sterile supply inventory
D. System performance and image consistency

141. During case review 2, which control primarily changes the strength of returning echoes displayed throughout the image?

A. Pulse repetition frequency
B. Overall gain
C. Wall filter
D. Doppler angle cursor

142. During case review 2, what is the principal effect of increasing pulse repetition frequency in pulsed-wave Doppler?

A. Raises the Nyquist limit
B. Lowers the transmit frequency automatically
C. Eliminates all spectral broadening
D. Increases acoustic impedance

143. During case review 2, which adjustment helps reduce color Doppler aliasing?

A. Lower the color scale further
B. Increase the color velocity scale
C. Increase persistence greatly
D. Move the focal zone away

144. During case review 2, why should the Doppler insonation angle be kept at or below 60 degrees for velocity measurements?

A. Small angle errors cause less velocity error
B. Flow becomes physically faster
C. Aliasing becomes impossible
D. The vessel diameter increases

145. During case review 2, which artifact causes duplicated anatomy across a strong reflector?

A. Aliasing
B. Range ambiguity
C. Spectral window filling
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B. Patient blood pressure accuracy only
C. Physician credential validity
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149. During case review 3, which control primarily changes the strength of returning echoes displayed throughout the image?

A. Pulse repetition frequency
B. Wall filter
C. Doppler angle cursor
D. Overall gain

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153. During case review 3, which artifact causes duplicated anatomy across a strong reflector?

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C. Range ambiguity
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157. Which action best confirms patient identity before a vascular examination?

A. Ask only for the room number
B. Rely only on the schedule
C. Recognize the patient's face
D. Use two approved patient identifiers

158. What should the sonographer do when the examination order conflicts with the patient's symptoms?

A. Clarify the order before proceeding
B. Silently change the ordered study
C. Ignore the symptoms entirely
D. Document nothing until discharge

159. Which documentation practice best supports longitudinal vascular surveillance?

A. Change protocols at each visit
B. Omit prior comparisons
C. Use consistent landmarks and measurement methods

D. Record only normal segments

160. Which information is essential when communicating a critical vascular finding?

A. Only the scanner model
B. Only the appointment time
C. Only the room location
D. Patient identity, finding, and read-back confirmation

161. Why should relevant symptoms and prior vascular interventions be documented?

A. They replace duplex imaging
B. They guide protocol and interpretation
C. They eliminate consent requirements
D. They determine transducer disinfection

162. During case review 2, which action best confirms patient identity before a vascular examination?

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B. Ask only for the room number
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Practice Exam 5: Answer Key and Explanations

1. D — The common carotid bifurcates into the internal and external carotid arteries. The vertebral and subclavian arteries have different branches, while the brachiocephalic vein is venous. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

2. B — The internal carotid artery ordinarily has no branches in the neck. The external carotid supplies multiple cervical and facial branches, including the superior thyroid artery. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

3. D — Normal resting limb arteries commonly show rapid systolic forward flow, brief early-diastolic reversal, and a smaller late-diastolic forward component. This produces a triphasic high-resistance waveform. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated procedure.

4. B — Posterior tibial veins are deep paired veins accompanying the posterior tibial artery. The great and small saphenous veins are superficial lower-extremity conduits, while the cephalic vein is superficial in the upper extremity. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

5. C — The portal vein transports nutrient-rich venous blood from the gastrointestinal tract and spleen into the liver. Hepatic veins drain the liver to the inferior vena cava, and the hepatic artery supplies oxygenated arterial blood. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical

6. A — At the groin, the common femoral artery is normally lateral to the common femoral vein. Remembering the lateral-to-medial order of nerve, artery, vein, and lymphatics helps establish correct anatomy. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated

7. D — The external iliac artery becomes the common femoral artery after passing beneath the inguinal ligament. The deep and superficial femoral arteries arise distally, and the superficial femoral continues as the popliteal artery. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

8. A — The vertebral artery ascends through cervical transverse foramina before entering the skull. The carotid system and internal jugular vein follow different cervical courses, and the superior thyroid is an external carotid branch. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

9. C — After eating, intestinal metabolic demand increases and the superior mesenteric artery becomes lower resistance with greater diastolic flow. Resting limb arteries and the distal aorta generally retain higher-resistance characteristics. This distinction matters because choosing the wrong mechanism can

lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated

10. B — The left renal vein crosses anterior to the aorta and posterior to the superior mesenteric artery. This anatomic relationship is central to recognizing the so-called nutcracker compression location. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

11. B — The great saphenous vein joins the common femoral vein at the saphenofemoral junction. The small saphenous usually drains near the popliteal fossa, while tibial and peroneal veins are deep. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

12. A — The middle cerebral artery is a major terminal branch of the internal carotid artery. The vertebral arteries unite into the basilar artery, and the posterior inferior cerebellar artery usually arises from a vertebral artery. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according

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17. B — The portal vein transports nutrient-rich venous blood from the gastrointestinal tract and spleen into the liver. Hepatic veins drain the liver to the inferior vena cava, and the hepatic artery supplies oxygenated arterial blood. The competing choices describe a different vessel, mechanism, or testing

purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical

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19. C — The external iliac artery becomes the common femoral artery after passing beneath the inguinal ligament. The deep and superficial femoral arteries arise distally, and the superficial femoral continues as the popliteal artery. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

20. A — The vertebral artery ascends through cervical transverse foramina before entering the skull. The carotid system and internal jugular vein follow different cervical courses, and the superior thyroid is an external carotid branch. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

21. B — After eating, intestinal metabolic demand increases and the superior mesenteric artery becomes lower resistance with greater diastolic flow. Resting limb arteries and the distal aorta generally retain higher-resistance characteristics. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated

22. D — The left renal vein crosses anterior to the aorta and posterior to the superior mesenteric artery. This anatomic relationship is central to recognizing the so-called nutcracker compression location. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

23. A — The great saphenous vein joins the common femoral vein at the saphenofemoral junction. The small saphenous usually drains near the popliteal fossa, while tibial and peroneal veins are deep. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

24. C — The middle cerebral artery is a major terminal branch of the internal carotid artery. The vertebral arteries unite into the basilar artery, and the posterior inferior cerebellar artery usually arises from a vertebral artery. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according

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35. C — The great saphenous vein joins the common femoral vein at the saphenofemoral junction. The small saphenous usually drains near the popliteal fossa, while tibial and peroneal veins are deep. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

36. D — The middle cerebral artery is a major terminal branch of the internal carotid artery. The vertebral arteries unite into the basilar artery, and the posterior inferior cerebellar artery usually arises from a vertebral artery. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according

37. A — Complete venous compression is the primary duplex criterion for excluding thrombus at an accessible segment. Failure to compress strongly supports thrombosis, whereas normal phasicity and color filling argue against occlusion. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

38. B — Conservation of flow through a narrowed lumen produces a focal velocity increase. Disturbed flow and a range of velocities generate spectral broadening, while distal disease may instead create damped waveforms. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

39. C — A significant upstream obstruction delays systolic acceleration and reduces pulsatility distally, producing a damped monophasic tardus-parvus pattern. A sharp triphasic waveform indicates preserved inflow. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated procedure.

40. B — Blood enters a pseudoaneurysm during systole and returns toward the parent artery during diastole, creating the characteristic to-and-fro neck waveform. The sac often shows swirling color flow. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

41. D — Swirling blood within a pseudoaneurysm commonly creates adjacent red and blue regions called the yin-yang sign. The neck waveform and grayscale anatomy are needed for confirmation. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

42. A — Incompetent venous valves permit retrograde flow during provocation, increasing ambulatory venous pressure and contributing to edema, skin changes, and ulceration. The other disorders primarily involve arterial circulation. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated procedure.

43. A — An ulcer is a focal excavation or crater in the plaque surface that communicates with the lumen. Calcification describes composition and may shadow, while intimal thickening lacks a crater. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

44. D — A fistula shunts arterial blood directly into a vein. The feeding artery loses resistance and gains diastolic flow, while the draining vein becomes arterialized, pulsatile, and turbulent. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

45. C — Chronic thrombosis commonly leaves an irregular, contracted vein with echogenic adherent residual material, wall thickening, collaterals, or recanalized channels. Acute thrombus more often distends the vein. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated procedure.

46. B — Severe proximal inflow disease reduces energy reaching the limb, producing a rounded delayed upstroke, lower amplitude, and loss of the normal dicrotic notch in distal pulse-volume recordings. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

47. D — Noncompressible calcified tibial arteries resist cuff compression and can yield falsely high ankle pressures and ankle-brachial indices. Toe pressures or waveform analysis may better assess perfusion. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

48. C — New periaortic fluid in a symptomatic patient raises concern for leakage or rupture and requires urgent escalation. Laminar flow and branch visualization are not rupture signs; mural thrombus alone is common. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular

49. B — Normal portal venous flow is hepatopetal, directed toward the liver. Hepatofugal flow moves away from the liver and may occur with advanced portal hypertension or collateralization. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

50. A — A hemodynamically important renal artery narrowing accelerates flow locally and often creates poststenotic turbulence. Intrarenal tardus-parvus waveforms may support a proximal lesion but are indirect. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

51. B — A significant proximal subclavian stenosis lowers pressure beyond the lesion and can draw blood retrograde through the ipsilateral vertebral artery to supply the arm. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated procedure.

52. C — Acute arterial occlusion classically causes sudden pain, pallor, pulselessness, paresthesia, paralysis, and poikilothermia. This differs from chronic venous disease, which usually develops more gradually. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

53. D — Complete venous compression is the primary duplex criterion for excluding thrombus at an accessible segment. Failure to compress strongly supports thrombosis, whereas normal phasicity and color filling argue against occlusion. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

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79. C — Noncompressible calcified tibial arteries resist cuff compression and can yield falsely high ankle pressures and ankle-brachial indices. Toe pressures or waveform analysis may better assess

perfusion. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

80. A — New periaortic fluid in a symptomatic patient raises concern for leakage or rupture and requires urgent escalation. Laminar flow and branch visualization are not rupture signs; mural thrombus alone is common. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

81. D — Normal portal venous flow is hepatopetal, directed toward the liver. Hepatofugal flow moves away from the liver and may occur with advanced portal hypertension or collateralization. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated procedure.

82. B — A hemodynamically important renal artery narrowing accelerates flow locally and often creates poststenotic turbulence. Intrarenal tardus-parvus waveforms may support a proximal lesion but are indirect. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

83. C — A significant proximal subclavian stenosis lowers pressure beyond the lesion and can draw blood retrograde through the ipsilateral vertebral artery to supply the arm. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

84. D — Acute arterial occlusion classically causes sudden pain, pallor, pulselessness, paresthesia, paralysis, and poikilothermia. This differs from chronic venous disease, which usually develops more gradually. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated procedure.

85. B — Complete venous compression is the primary duplex criterion for excluding thrombus at an accessible segment. Failure to compress strongly supports thrombosis, whereas normal phasicity and color filling argue against occlusion. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

86. A — Conservation of flow through a narrowed lumen produces a focal velocity increase. Disturbed flow and a range of velocities generate spectral broadening, while distal disease may instead create damped waveforms. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

87. B — A significant upstream obstruction delays systolic acceleration and reduces pulsatility distally, producing a damped monophasic tardus-parvus pattern. A sharp triphasic waveform indicates preserved inflow. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated procedure.

88. A — Blood enters a pseudoaneurysm during systole and returns toward the parent artery during diastole, creating the characteristic to-and-fro neck waveform. The sac often shows swirling color flow. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

89. C — Swirling blood within a pseudoaneurysm commonly creates adjacent red and blue regions called the yin-yang sign. The neck waveform and grayscale anatomy are needed for confirmation. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

90. D — Incompetent venous valves permit retrograde flow during provocation, increasing ambulatory venous pressure and contributing to edema, skin changes, and ulceration. The other disorders primarily involve arterial circulation. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated procedure.

91. D — Vein graft stenoses often develop at anastomoses, retained valve sites, or areas of intimal hyperplasia. Surveillance examines the entire conduit plus inflow and outflow rather than focusing on unrelated vessels. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

92. A — Abrupt absence of access flow strongly suggests thrombosis and requires urgent clinical communication. Normal maturation should increase usable flow, and ordinary respiratory phasicity does not explain loss of graft flow. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

93. B — An endoleak is persistent blood flow within the excluded aneurysm sac but outside the endograft lumen. Its source and timing determine the type and clinical significance. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated procedure.

94. C — A focal velocity increase and disturbed flow within a bypass graft suggest luminal narrowing. Comparison with adjacent segments, waveform changes, and serial examinations helps determine hemodynamic significance. In practice, the complete examination still requires correlation with

symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

95. D — Post-endarterectomy surveillance evaluates the treated segment and adjacent carotid artery for residual or recurrent stenosis, intimal flap, thrombosis, or other complications. Unrelated peripheral and portal vessels do not answer the question. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

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101. C — The ankle-brachial index uses the higher dorsalis pedis or posterior tibial systolic pressure for that leg divided by the higher brachial systolic pressure. This standardizes limb pressure against systemic pressure. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

102. D — Exercise increases lower-extremity flow demand. A pressure drop or delayed recovery can reveal arterial obstruction that is not evident at rest, especially in a patient with exertional symptoms. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

103. A — Distal compression and release challenges venous valves and creates a controlled flow response. Retrograde flow after release indicates valve incompetence when measured with the laboratory's validated criteria. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated procedure.

104. B — Digital arteries are often less affected by medial calcification than tibial arteries. Toe pressure and the toe-brachial index therefore provide useful perfusion information when ankle pressures are artificially elevated. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

105. D — As arterial perfusion worsens, pulse-volume recordings lose amplitude, develop a delayed rounded upstroke, and lose normal contour features. Respiratory phasicity and venous pulsatility describe venous signals. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

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121. A — A formal verification or time-out confirms the correct patient, planned procedure, side, site, and team agreement before puncture. Equipment optimization remains important but cannot replace this safety step. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

122. C — Continuous identification of the needle tip helps prevent posterior-wall puncture and injury to adjacent structures. The operator adjusts probe and needle alignment rather than advancing a tip that cannot be seen. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

123. D — A properly disinfected transducer, sterile probe cover, sterile gel, and appropriate barrier precautions protect the sterile field. Ordinary lotion or nonsterile gel can introduce contamination. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated procedure.

124. B — Focal aliasing can identify accelerated or disturbed flow at a technical defect. Spectral Doppler, grayscale imaging, and evaluation of adjacent segments help determine whether revision is needed. In practice, the complete examination still requires correlation with symptoms, grayscale

anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

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133. A — Overall gain amplifies received echo signals and changes brightness throughout the image. Pulse repetition frequency and wall filter affect Doppler display, while the angle cursor supports velocity calculation. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

134. B — Increasing pulse repetition frequency raises the Nyquist limit and can reduce aliasing, although depth and system constraints limit the available setting. It does not change tissue acoustic impedance. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

135. C — Raising the color velocity scale increases the displayed Nyquist limit and reduces aliasing. Lowering the scale worsens aliasing, while persistence and focal-zone location address other image characteristics. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated procedure.

136. B — Velocity calculation depends on the cosine of the insonation angle. Near 90 degrees, small angle errors create very large velocity errors; standardized angles at or below 60 degrees improve reproducibility. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

137. D — A strong specular reflector can redirect echoes and make the system place a duplicated structure deeper than the reflector, producing a mirror image. Aliasing is a sampling phenomenon. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

138. A — The wall filter suppresses low-frequency, high-amplitude signals from vessel-wall and tissue motion. An excessively high setting can also remove legitimate low-velocity blood flow. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated procedure.

139. C — ALARA means keeping ultrasound exposure as low as reasonably achievable while obtaining necessary diagnostic information. Output power and dwell time should be minimized appropriately. In

practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

140. D — A tissue-mimicking phantom can evaluate depth calibration, resolution, sensitivity, and consistency over time. Trending results helps detect equipment deterioration before it compromises clinical examinations. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

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157. D — Two approved identifiers reduce wrong-patient errors and should be matched with the order before beginning. Room number, appearance, or schedule position alone is not a reliable identifier. In practice, the complete examination still requires correlation with symptoms, grayscale anatomy, color flow, spectral waveforms, and the laboratory protocol before a final interpretation is made.

158. A — A mismatch between the order and clinical presentation should be clarified through the appropriate clinical channel. The sonographer should not independently substitute an unauthorized examination or ignore relevant symptoms. The competing choices describe a different vessel, mechanism, or testing purpose. Reliable interpretation combines the stated finding with adjacent segments, technical quality, and the patient's clinical presentation.

159. C — Consistent landmarks, technique, labels, and measurement methods make serial comparisons meaningful. Prior studies should be reviewed when available, and both normal and abnormal required segments should be documented. This distinction matters because choosing the wrong mechanism can lead to an incorrect protocol or interpretation. Findings should be confirmed in multiple views and documented according to the vascular laboratory's validated procedure.

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