PRACTICE EXAM 20: VASCULAR TECHNOLOGY SIMULATION (170 QUESTIONS)

This practice examination contains 170 questions modeled on the ARDMS Vascular Technology examination. Allow three hours. Select the single best answer for each question. The official examination uses a scaled score from 300 to 700, with 555 required to pass; this practice score is for study purposes only.

1. During case review, the vascular technologist considers celiac artery fasting waveform. Which finding is most appropriate?

A. high-resistance pattern with diastolic reversal

B. continuous venous pattern without systolic peaks

C. low-resistance pattern with forward diastolic flow

D. to-and-fro pattern at the origin

2. During case review, the vascular technologist considers great saphenous vein location. Which finding is most appropriate?

A. inside the popliteal artery wall

B. within the saphenous compartment superficial to muscular fascia

C. within the tibial interosseous membrane

D. deep to the femoral artery

3. During case review, the vascular technologist considers posterior tibial artery landmark. Which finding is most appropriate?

A. over the dorsum between metatarsals

B. anterior to the lateral malleolus

C. posterior to the medial malleolus

D. within the popliteal fossa only

4. During case review, the vascular technologist considers hepatic vein waveform. Which finding is most appropriate?

A. cardiac pulsatility with multiple phases
B. steady monophasic arterial flow
C. high-resistance triphasic arterial flow
D. continuous nonphasic portal flow

5. During case review, the vascular technologist considers normal lower-extremity artery. Which finding is most appropriate?

A. nonphasic venous waveform
B. persistent retrograde systolic flow
C. continuous low-velocity monophasic flow
D. multiphasic waveform with rapid systolic upstroke

6. During case review, the vascular technologist considers brachial artery bifurcation. Which finding is most appropriate?

A. anterior and posterior tibial arteries
B. radial and ulnar arteries
C. axillary and subclavian arteries
D. common and internal carotid arteries

7. During case review, the vascular technologist considers external carotid artery identification. Which finding is most appropriate?

A. temporal tapping oscillations in the waveform
B. absence of visible branches in the neck

C. markedly lower resistance than the ICA
D. continuous flow without pulsatility

8. During case review, the vascular technologist considers renal artery waveform. Which finding is most appropriate?

A. nonphasic venous flow only
B. bidirectional flow with no net perfusion
C. low-resistance flow with continuous diastolic perfusion
D. high-resistance flow with early diastolic reversal

9. During case review, the vascular technologist considers normal venous augmentation. Which finding is most appropriate?

A. marked decrease in systolic arterial velocity
B. brief increase in antegrade venous flow
C. sustained arterial flow reversal
D. complete loss of venous signal

10. During case review, the vascular technologist considers intracranial MCA insonation. Which finding is most appropriate?

A. suboccipital window only
B. transorbital window only
C. submandibular window only
D. transtemporal window

11. During case review, the vascular technologist considers vertebral artery direction. Which finding is most appropriate?

A. alternating flow in every normal patient

B. continuous flow toward the arm
C. antegrade flow toward the brain
D. retrograde flow toward the subclavian artery

12. During case review, the vascular technologist considers superior mesenteric artery fasting waveform. Which finding is most appropriate?

A. to-and-fro flow without net direction
B. high-resistance pattern with limited diastolic flow
C. low-resistance pattern with abundant diastolic flow
D. continuous venous pattern with respiration

13. During case review, the vascular technologist considers popliteal vein relationship. Which finding is most appropriate?

A. usually superficial to the popliteal artery on a posterior approach
B. always medial to the artery
C. within the arterial lumen
D. always lateral and deep to the artery

14. During case review, the vascular technologist considers common carotid artery waveform. Which finding is most appropriate?

A. continuous nonphasic venous flow
B. bidirectional to-and-fro flow
C. high-resistance flow with absent diastolic flow
D. low-resistance flow with persistent diastolic flow

15. During case review, the vascular technologist considers main portal vein direction. Which finding is most appropriate?

A. retrograde flow toward the spleen
B. hepatofugal flow away from the liver
C. alternating flow with each heartbeat
D. hepatopetal flow toward the liver

16. During case review, the vascular technologist considers normal lower-extremity vein response to compression. Which finding is most appropriate?

A. complete lumen collapse
B. persistent rigid circular lumen
C. marked arterial color aliasing
D. sustained retrograde arterial flow

17. During case review, the vascular technologist considers aortic spectral pattern. Which finding is most appropriate?

A. low-resistance flow identical to the renal artery
B. high-resistance pulsatile flow in the fasting state
C. permanent flow reversal throughout systole
D. continuous nonpulsatile venous flow

18. During case review, the vascular technologist considers internal carotid artery waveform. Which finding is most appropriate?

A. reversed systolic flow throughout
B. high-resistance flow with little diastolic velocity
C. low-resistance flow with substantial diastolic velocity
D. phasic flow varying with respiration

19. The examination protocol calls for assessment of celiac artery fasting waveform. Which observation should be documented?

A. high-resistance pattern with diastolic reversal
B. low-resistance pattern with forward diastolic flow
C. continuous venous pattern without systolic peaks
D. to-and-fro pattern at the origin

20. The examination protocol calls for assessment of great saphenous vein location. Which observation should be documented?

A. inside the popliteal artery wall
B. within the tibial interosseous membrane
C. within the saphenous compartment superficial to muscular fascia
D. deep to the femoral artery

21. The examination protocol calls for assessment of posterior tibial artery landmark. Which observation should be documented?

A. over the dorsum between metatarsals
B. anterior to the lateral malleolus
C. within the popliteal fossa only
D. posterior to the medial malleolus

22. The examination protocol calls for assessment of hepatic vein waveform. Which observation should be documented?

A. cardiac pulsatility with multiple phases
B. steady monophasic arterial flow
C. high-resistance triphasic arterial flow
D. continuous nonphasic portal flow

23. The examination protocol calls for assessment of normal lower-extremity artery. Which observation should be documented?

A. multiphasic waveform with rapid systolic upstroke
B. nonphasic venous waveform
C. persistent retrograde systolic flow
D. continuous low-velocity monophasic flow

24. The examination protocol calls for assessment of brachial artery bifurcation. Which observation should be documented?

A. anterior and posterior tibial arteries
B. axillary and subclavian arteries
C. radial and ulnar arteries
D. common and internal carotid arteries

25. The examination protocol calls for assessment of external carotid artery identification. Which observation should be documented?

A. absence of visible branches in the neck
B. temporal tapping oscillations in the waveform
C. markedly lower resistance than the ICA
D. continuous flow without pulsatility

26. The examination protocol calls for assessment of renal artery waveform. Which observation should be documented?

A. nonphasic venous flow only
B. bidirectional flow with no net perfusion
C. high-resistance flow with early diastolic reversal
D. low-resistance flow with continuous diastolic perfusion

27. The examination protocol calls for assessment of normal venous augmentation. Which observation should be documented?

A. marked decrease in systolic arterial velocity
B. sustained arterial flow reversal
C. brief increase in antegrade venous flow
D. complete loss of venous signal

28. The examination protocol calls for assessment of intracranial MCA insonation. Which observation should be documented?

A. suboccipital window only
B. transorbital window only
C. submandibular window only
D. transtemporal window

29. The examination protocol calls for assessment of vertebral artery direction. Which observation should be documented?

A. antegrade flow toward the brain
B. alternating flow in every normal patient
C. continuous flow toward the arm
D. retrograde flow toward the subclavian artery

30. The examination protocol calls for assessment of superior mesenteric artery fasting waveform. Which observation should be documented?

A. to-and-fro flow without net direction
B. high-resistance pattern with limited diastolic flow
C. low-resistance pattern with abundant diastolic flow
D. continuous venous pattern with respiration

31. The examination protocol calls for assessment of popliteal vein relationship. Which observation should be documented?

A. usually superficial to the popliteal artery on a posterior approach
B. always medial to the artery
C. within the arterial lumen
D. always lateral and deep to the artery

32. The examination protocol calls for assessment of common carotid artery waveform. Which observation should be documented?

A. continuous nonphasic venous flow
B. low-resistance flow with persistent diastolic flow
C. bidirectional to-and-fro flow
D. high-resistance flow with absent diastolic flow

33. The examination protocol calls for assessment of main portal vein direction. Which observation should be documented?

A. retrograde flow toward the spleen
B. hepatofugal flow away from the liver
C. hepatopetal flow toward the liver
D. alternating flow with each heartbeat

34. The examination protocol calls for assessment of normal lower-extremity vein response to compression. Which observation should be documented?

A. persistent rigid circular lumen
B. marked arterial color aliasing
C. sustained retrograde arterial flow
D. complete lumen collapse

35. The examination protocol calls for assessment of aortic spectral pattern. Which observation should be documented?

A. low-resistance flow identical to the renal artery
B. permanent flow reversal throughout systole
C. high-resistance pulsatile flow in the fasting state
D. continuous nonpulsatile venous flow

36. The examination protocol calls for assessment of internal carotid artery waveform. Which observation should be documented?

A. low-resistance flow with substantial diastolic velocity
B. reversed systolic flow throughout
C. high-resistance flow with little diastolic velocity
D. phasic flow varying with respiration

37. During case review, the vascular technologist considers pseudoaneurysm neck. Which finding is most appropriate?

A. continuous low-resistance antegrade flow
B. to-and-fro spectral flow
C. triphasic peripheral arterial flow
D. phasic respiratory venous flow

38. During case review, the vascular technologist considers renal artery stenosis. Which finding is most appropriate?

A. normal low-resistance flow everywhere
B. complete absence of a renal vein
C. uniform venous phasicity
D. focal high velocity with post-stenotic turbulence

39. During case review, the vascular technologist considers May-Thurner anatomy. Which finding is most appropriate?

A. portal vein compression by the hepatic artery
B. left common iliac vein compression by the right common iliac artery
C. right renal artery compression by the SMA
D. left carotid compression by the jugular vein

40. During case review, the vascular technologist considers fibromuscular dysplasia. Which finding is most appropriate?

A. calcified plaque confined to the ostium
B. venous valve incompetence only
C. portal cavernous transformation
D. alternating stenosis and dilation in the mid-distal renal artery

41. During case review, the vascular technologist considers acute lower-extremity DVT. Which finding is most appropriate?

A. a noncompressible, enlarged vein with hypoechoic thrombus
B. a calcified artery with triphasic flow
C. a small vein with brisk augmentation
D. a fully compressible vein with spontaneous flow

42. During case review, the vascular technologist considers complete ICA occlusion. Which finding is most appropriate?

A. continuous venous flow in the lumen
B. brief temporal tapping oscillations
C. no detectable flow after careful optimization
D. normal low-resistance spectral flow

43. During case review, the vascular technologist considers abdominal aortic aneurysm. Which finding is most appropriate?

A. isolated venous enlargement on the current vascular laboratory examination
B. focal aortic dilation measured outer wall to outer wall
C. temporary color aliasing on the current vascular laboratory examination
D. normal respiratory caliber change during this vascular examination

44. During case review, the vascular technologist considers portal hypertension. Which finding is most appropriate?

A. reduced or reversed portal venous flow with collateral vessels
B. triphasic pedal arterial flow during this vascular examination
C. complete jugular compressibility on the current vascular laboratory examination
D. normal hepatopetal portal flow only on this examination

45. During case review, the vascular technologist considers arterial thoracic outlet syndrome. Which finding is most appropriate?

A. carotid occlusion during inspiration
B. portal flow reversal after fasting
C. subclavian arterial compression during provocative positioning
D. renal artery dilation during Valsalva

46. During case review, the vascular technologist considers carotid body tumor. Which finding is most appropriate?

A. an avascular cyst behind the knee
B. a thrombus within the portal vein
C. a renal cortical cyst without flow
D. a hypervascular mass splaying the ICA and ECA

47. During case review, the vascular technologist considers carotid stenosis jet. Which finding is most appropriate?

A. complete venous compressibility
B. steady portal venous flow
C. focal velocity elevation with spectral broadening
D. uniformly reduced gain without turbulence

48. During case review, the vascular technologist considers pseudoaneurysm sac. Which finding is most appropriate?

A. bidirectional swirling color flow
B. fixed high-resistance arterial color
C. uniform absence of all echoes
D. parallel laminar venous color only

49. During case review, the vascular technologist considers intrarenal tardus-parvus. Which finding is most appropriate?

A. rapid upstroke with high amplitude
B. delayed systolic upstroke and damped amplitude
C. continuous venous pulsatility
D. brief early diastolic reversal only

50. During case review, the vascular technologist considers nutcracker phenomenon. Which finding is most appropriate?

A. portal vein compression at the hilum
B. femoral vein compression by the profunda artery
C. right renal vein compression behind the IVC
D. left renal vein compression between the SMA and aorta

51. During case review, the vascular technologist considers popliteal aneurysm complication. Which finding is most appropriate?

A. mural thrombus with distal embolization
B. jugular valve reflux only
C. portal venous hypertension
D. carotid body tumor secretion

52. During case review, the vascular technologist considers chronic post-thrombotic change. Which finding is most appropriate?

A. a distended anechoic vein that fully compresses
B. a normal artery with multiphasic flow
C. a small irregular vein with echogenic wall-adherent material
D. a cyst without vascular attachment

53. During case review, the vascular technologist considers subclavian steal. Which finding is most appropriate?

A. bilateral renal venous reversal
B. retrograde or alternating ipsilateral vertebral flow
C. continuous antegrade ECA flow only
D. increased portal venous pulsatility

54. During case review, the vascular technologist considers aortic dissection. Which finding is most appropriate?

A. a simple renal cyst
B. a venous valve leaflet only
C. a normal posterior wall artifact
D. an intimal flap separating true and false lumens

55. During case review, the vascular technologist considers Budd-Chiari syndrome. Which finding is most appropriate?

A. hepatic venous outflow obstruction
B. isolated superficial leg reflux
C. carotid bifurcation plaque only
D. normal portal inflow after eating

56. During case review, the vascular technologist considers venous thoracic outlet syndrome. Which finding is most appropriate?

A. portal hypertension at the hilum
B. renal artery fibromuscular dysplasia
C. isolated below-knee arterial stenosis
D. subclavian vein obstruction or thrombosis near the costoclavicular space

57. During case review, the vascular technologist considers distal arterial disease. Which finding is most appropriate?

A. hepatopetal portal flow
B. normal multiphasic waveforms throughout
C. damped monophasic waveforms beyond a significant lesion
D. spontaneous phasic venous flow

58. During case review, the vascular technologist considers carotid near occlusion. Which finding is most appropriate?

A. normal distal ICA caliber with uniform flow on this examination
B. marked lumen narrowing with reduced distal caliber and variable low flow
C. isolated ECA tapping artifact during the current vascular laboratory examination
D. high venous pulsatility only during the current vascular laboratory examination

59. During case review, the vascular technologist considers arteriovenous fistula. Which finding is most appropriate?

A. low-resistance feeding artery and pulsatile draining vein
B. normal triphasic artery with nonpulsatile vein
C. absent arterial flow with compressible vein
D. high-resistance feeding artery and silent vein

60. During case review, the vascular technologist considers mesenteric ischemia. Which finding is most appropriate?

A. isolated hepatic vein reversal
B. normal venous respiratory phasicity
C. complete vein compressibility
D. elevated focal velocities in a fasting mesenteric artery

61. During case review, the vascular technologist considers popliteal artery entrapment. Which finding is most appropriate?

A. fixed portal vein thrombosis
B. dynamic arterial compression with provocative plantar flexion
C. carotid flow reversal during swallowing
D. renal vein pulsatility with breathing

62. During case review, the vascular technologist considers Baker cyst. Which finding is most appropriate?

A. a compressible vein with augmentation
B. a solid hypervascular carotid mass
C. an avascular fluid collection in the popliteal fossa
D. a pulsatile arterial sac with a neck

63. During case review, the vascular technologist considers venous reflux testing. Which finding is most appropriate?

A. complete venous compressibility
B. retrograde flow exceeding the laboratory threshold after provocation
C. brief antegrade augmentation only
D. arterial systolic acceleration

64. The examination protocol calls for assessment of pseudoaneurysm neck. Which observation should be documented?

A. to-and-fro spectral flow
B. continuous low-resistance antegrade flow
C. triphasic peripheral arterial flow
D. phasic respiratory venous flow

65. The examination protocol calls for assessment of renal artery stenosis. Which observation should be documented?

A. normal low-resistance flow everywhere
B. complete absence of a renal vein
C. focal high velocity with post-stenotic turbulence
D. uniform venous phasicity

66. The examination protocol calls for assessment of May-Thurner anatomy. Which observation should be documented?

A. portal vein compression by the hepatic artery
B. right renal artery compression by the SMA
C. left carotid compression by the jugular vein
D. left common iliac vein compression by the right common iliac artery

67. The examination protocol calls for assessment of fibromuscular dysplasia. Which observation should be documented?

A. alternating stenosis and dilation in the mid-distal renal artery
B. calcified plaque confined to the ostium
C. venous valve incompetence only
D. portal cavernous transformation

68. The examination protocol calls for assessment of acute lower-extremity DVT. Which observation should be documented?

A. a calcified artery with triphasic flow
B. a small vein with brisk augmentation
C. a fully compressible vein with spontaneous flow
D. a noncompressible, enlarged vein with hypoechoic thrombus

69. The examination protocol calls for assessment of complete ICA occlusion. Which observation should be documented?

A. continuous venous flow in the lumen
B. no detectable flow after careful optimization
C. brief temporal tapping oscillations
D. normal low-resistance spectral flow

70. The examination protocol calls for assessment of abdominal aortic aneurysm. Which observation should be documented?

A. isolated venous enlargement on the current vascular laboratory examination
B. temporary color aliasing on the current vascular laboratory examination
C. focal aortic dilation measured outer wall to outer wall
D. normal respiratory caliber change during this vascular examination

71. The examination protocol calls for assessment of portal hypertension. Which observation should be documented?

A. reduced or reversed portal venous flow with collateral vessels
B. triphasic pedal arterial flow during this vascular examination
C. complete jugular compressibility on the current vascular laboratory examination
D. normal hepatopetal portal flow only on this examination

72. The examination protocol calls for assessment of arterial thoracic outlet syndrome. Which observation should be documented?

A. carotid occlusion during inspiration
B. portal flow reversal after fasting
C. subclavian arterial compression during provocative positioning
D. renal artery dilation during Valsalva

73. The examination protocol calls for assessment of carotid body tumor. Which observation should be documented?

A. an avascular cyst behind the knee
B. a hypervascular mass splaying the ICA and ECA
C. a thrombus within the portal vein
D. a renal cortical cyst without flow

74. The examination protocol calls for assessment of carotid stenosis jet. Which observation should be documented?

A. complete venous compressibility
B. steady portal venous flow
C. uniformly reduced gain without turbulence
D. focal velocity elevation with spectral broadening

75. The examination protocol calls for assessment of pseudoaneurysm sac. Which observation should be documented?

A. bidirectional swirling color flow
B. fixed high-resistance arterial color
C. uniform absence of all echoes
D. parallel laminar venous color only

76. The examination protocol calls for assessment of intrarenal tardus-parvus. Which observation should be documented?

A. rapid upstroke with high amplitude
B. delayed systolic upstroke and damped amplitude
C. continuous venous pulsatility
D. brief early diastolic reversal only

77. The examination protocol calls for assessment of nutcracker phenomenon. Which observation should be documented?

A. portal vein compression at the hilum
B. femoral vein compression by the profunda artery
C. right renal vein compression behind the IVC
D. left renal vein compression between the SMA and aorta

78. The examination protocol calls for assessment of popliteal aneurysm complication. Which observation should be documented?

A. jugular valve reflux only
B. portal venous hypertension
C. mural thrombus with distal embolization
D. carotid body tumor secretion

79. The examination protocol calls for assessment of chronic post-thrombotic change. Which observation should be documented?

A. a small irregular vein with echogenic wall-adherent material
B. a distended anechoic vein that fully compresses
C. a normal artery with multiphasic flow
D. a cyst without vascular attachment

80. The examination protocol calls for assessment of subclavian steal. Which observation should be documented?

A. bilateral renal venous reversal
B. continuous antegrade ECA flow only
C. retrograde or alternating ipsilateral vertebral flow
D. increased portal venous pulsatility

81. The examination protocol calls for assessment of aortic dissection. Which observation should be documented?

A. a simple renal cyst
B. a venous valve leaflet only
C. a normal posterior wall artifact
D. an intimal flap separating true and false lumens

82. The examination protocol calls for assessment of Budd-Chiari syndrome. Which observation should be documented?

A. isolated superficial leg reflux
B. hepatic venous outflow obstruction
C. carotid bifurcation plaque only
D. normal portal inflow after eating

83. The examination protocol calls for assessment of venous thoracic outlet syndrome. Which observation should be documented?

A. portal hypertension at the hilum
B. renal artery fibromuscular dysplasia
C. subclavian vein obstruction or thrombosis near the costoclavicular space
D. isolated below-knee arterial stenosis

84. The examination protocol calls for assessment of distal arterial disease. Which observation should be documented?

A. hepatopetal portal flow
B. normal multiphasic waveforms throughout
C. spontaneous phasic venous flow
D. damped monophasic waveforms beyond a significant lesion

85. The examination protocol calls for assessment of carotid near occlusion. Which observation should be documented?

A. marked lumen narrowing with reduced distal caliber and variable low flow
B. normal distal ICA caliber with uniform flow on this examination
C. isolated ECA tapping artifact during the current vascular laboratory examination
D. high venous pulsatility only during the current vascular laboratory examination

86. The examination protocol calls for assessment of arteriovenous fistula. Which observation should be documented?

A. normal triphasic artery with nonpulsatile vein
B. low-resistance feeding artery and pulsatile draining vein
C. absent arterial flow with compressible vein
D. high-resistance feeding artery and silent vein

87. The examination protocol calls for assessment of mesenteric ischemia. Which observation should be documented?

A. isolated hepatic vein reversal
B. normal venous respiratory phasicity
C. complete vein compressibility
D. elevated focal velocities in a fasting mesenteric artery

88. The examination protocol calls for assessment of popliteal artery entrapment. Which observation should be documented?

A. dynamic arterial compression with provocative plantar flexion
B. fixed portal vein thrombosis
C. carotid flow reversal during swallowing
D. renal vein pulsatility with breathing

89. The examination protocol calls for assessment of Baker cyst. Which observation should be documented?

A. a compressible vein with augmentation
B. a solid hypervascular carotid mass
C. an avascular fluid collection in the popliteal fossa
D. a pulsatile arterial sac with a neck

90. The examination protocol calls for assessment of venous reflux testing. Which observation should be documented?

A. complete venous compressibility
B. retrograde flow exceeding the laboratory threshold after provocation
C. brief antegrade augmentation only
D. arterial systolic acceleration

91. During case review, the vascular technologist considers venous ablation follow-up. Which finding is most appropriate?

A. confirm treated-vein closure and exclude deep venous thrombosis
B. document only pedal arterial pressures
C. avoid the saphenofemoral junction
D. measure carotid intima only

92. During case review, the vascular technologist considers prosthetic bypass graft surveillance. Which finding is most appropriate?

A. measure only the contralateral limb
B. evaluate inflow, graft body, anastomoses, and outflow
C. omit velocity measurements entirely
D. scan only the mid-graft segment

93. During case review, the vascular technologist considers EVAR endoleak. Which finding is most appropriate?

A. artifact outside the body contour on the current vascular laboratory examination
B. normal flow confined to graft limbs during this vascular examination
C. venous flow in the adjacent IVC during this vascular examination
D. persistent blood flow outside the graft but within the aneurysm sac

94. During case review, the vascular technologist considers stented carotid artery. Which finding is most appropriate?

A. apply venous thrombosis criteria
B. ignore spectral velocities
C. apply validated stent-specific velocity criteria
D. assume every elevated velocity is occlusion

95. During case review, the vascular technologist considers failing hemodialysis access. Which finding is most appropriate?

A. ignore outflow veins
B. evaluate only the contralateral arm
C. correlate focal lesions with access flow and clinical dysfunction
D. diagnose failure from bruit alone

96. During case review, the vascular technologist considers dialysis access stenosis. Which finding is most appropriate?

A. normal portal venous phasicity
B. uniform color filling and stable velocities
C. complete compressibility of the feeding artery
D. focal velocity increase with color aliasing and flow disturbance

97. During case review, the vascular technologist considers carotid endarterectomy surveillance. Which finding is most appropriate?

A. assess the repair site for restenosis and technical defects
B. avoid imaging the surgical segment
C. measure only jugular vein diameter
D. use venous reflux criteria

98. During case review, the vascular technologist considers renal transplant artery. Which finding is most appropriate?

A. omit color Doppler entirely
B. evaluate the anastomosis and intrarenal perfusion
C. assess only superficial leg veins
D. scan only the native carotid arteries

99. During case review, the vascular technologist considers AV fistula maturation. Which finding is most appropriate?

A. only the patient's blood pressure
B. arterial triphasicity alone
C. adequate diameter, depth, flow, and usable segment
D. absence of any venous enlargement

100. During case review, the vascular technologist considers TIPS surveillance. Which finding is most appropriate?

A. scan only the common carotid artery
B. evaluate shunt patency and velocities along its course
C. measure ankle pressures exclusively
D. assess superficial reflux only

101. During case review, the vascular technologist considers proper pressure cuff. Which finding is most appropriate?

A. a width approximately 20 percent greater than limb diameter
B. the narrowest cuff available
C. a cuff covering only one quarter of the limb
D. a rigid cuff that cannot encircle the limb

102. During case review, the vascular technologist considers ABI interpretation. Which finding is most appropriate?

A. ankle pressure divided by lower brachial pressure
B. toe pressure divided by calf pressure
C. higher brachial pressure divided by ankle pressure
D. ankle systolic pressure divided by the higher brachial pressure

103. During case review, the vascular technologist considers exercise ABI. Which finding is most appropriate?

A. unmask flow-limiting disease when resting results are normal
B. replace all duplex imaging
C. diagnose acute DVT directly
D. measure portal venous direction

104. During case review, the vascular technologist considers venous PPG refill. Which finding is most appropriate?

A. calculate carotid stenosis directly
B. measure aortic diameter
C. assess venous filling after calf-muscle emptying
D. identify renal artery origins

105. During case review, the vascular technologist considers reactive hyperemia. Which finding is most appropriate?

A. eliminate all venous flow
B. reverse portal flow in healthy patients
C. produce permanent arterial occlusion
D. temporarily increase flow demand after cuff release

106. During case review, the vascular technologist considers segmental pressure drop. Which finding is most appropriate?

A. normal venous respiratory phasicity
B. a meaningful pressure decrease between adjacent cuff levels
C. identical pressures at every level
D. a higher distal pressure after exercise

107. During case review, the vascular technologist considers photoplethysmography. Which finding is most appropriate?

A. detect superficial changes in blood volume using infrared light
B. measure deep arterial diameter with x-rays
C. image thrombus using magnetic fields
D. record only cardiac electrical activity

108. During case review, the vascular technologist considers toe-brachial index. Which finding is most appropriate?

A. toe pressure divided by ankle pressure only
B. calf pressure divided by toe pressure
C. higher brachial pressure divided by toe pressure
D. toe systolic pressure divided by the higher brachial pressure

109. During case review, the vascular technologist considers noncompressible ankle arteries. Which finding is most appropriate?

A. omit all distal perfusion assessment
B. report a falsely high ABI as normal
C. obtain toe pressures or another alternative physiologic test
D. increase cuff pressure indefinitely

110. During case review, the vascular technologist considers pulse volume recording. Which finding is most appropriate?

A. directly image the arterial wall
B. reflect limb volume change during the cardiac cycle
C. measure venous valve diameter
D. display portal vein anatomy

111. The examination protocol calls for assessment of proper pressure cuff. Which observation should be documented?

A. a cuff covering only one quarter of the limb
B. a rigid cuff that cannot encircle the limb
C. the narrowest cuff available
D. a width approximately 20 percent greater than limb diameter

112. The examination protocol calls for assessment of ABI interpretation. Which observation should be documented?

A. toe pressure divided by calf pressure
B. higher brachial pressure divided by ankle pressure
C. ankle systolic pressure divided by the higher brachial pressure
D. ankle pressure divided by lower brachial pressure

113. The examination protocol calls for assessment of exercise ABI. Which observation should be documented?

A. diagnose acute DVT directly
B. unmask flow-limiting disease when resting results are normal
C. measure portal venous direction
D. replace all duplex imaging

114. The examination protocol calls for assessment of venous PPG refill. Which observation should be documented?

A. assess venous filling after calf-muscle emptying
B. measure aortic diameter
C. identify renal artery origins
D. calculate carotid stenosis directly

115. The examination protocol calls for assessment of reactive hyperemia. Which observation should be documented?

A. reverse portal flow in healthy patients
B. produce permanent arterial occlusion
C. temporarily increase flow demand after cuff release
D. eliminate all venous flow

116. The examination protocol calls for assessment of segmental pressure drop. Which observation should be documented?

A. a meaningful pressure decrease between adjacent cuff levels
B. identical pressures at every level
C. a higher distal pressure after exercise
D. normal venous respiratory phasicity

117. The examination protocol calls for assessment of photoplethysmography. Which observation should be documented?

A. image thrombus using magnetic fields
B. record only cardiac electrical activity
C. measure deep arterial diameter with x-rays
D. detect superficial changes in blood volume using infrared light

118. The examination protocol calls for assessment of toe-brachial index. Which observation should be documented?

A. calf pressure divided by toe pressure
B. toe systolic pressure divided by the higher brachial pressure
C. higher brachial pressure divided by toe pressure
D. toe pressure divided by ankle pressure only

119. The examination protocol calls for assessment of noncompressible ankle arteries. Which observation should be documented?

A. obtain toe pressures or another alternative physiologic test
B. report a falsely high ABI as normal
C. increase cuff pressure indefinitely
D. omit all distal perfusion assessment

120. The examination protocol calls for assessment of pulse volume recording. Which observation should be documented?

A. measure venous valve diameter
B. reflect limb volume change during the cardiac cycle
C. display portal vein anatomy
D. directly image the arterial wall

121. During case review, the vascular technologist considers ultrasound-guided vascular access. Which finding is most appropriate?

A. follow only the needle shaft shadow
B. advance without seeing the target
C. maintain continuous visualization of the needle tip
D. aim through the posterior wall intentionally

122. During case review, the vascular technologist considers pseudoaneurysm thrombin injection. Which finding is most appropriate?

A. place the needle in the parent artery during this vascular examination
B. compress the contralateral carotid artery during the current vascular laboratory examination
C. inject without imaging guidance in the vessel being evaluated during this examination
D. visualize the needle tip and keep it away from the native artery

123. During case review, the vascular technologist considers post-thrombin assessment. Which finding is most appropriate?

A. confirm sac thrombosis and parent-artery patency
B. assume treatment success without Doppler
C. document only the skin puncture
D. omit distal perfusion checks

124. During case review, the vascular technologist considers post-access complication check. Which finding is most appropriate?

A. assess only carotid intima thickness
B. evaluate for hematoma, pseudoaneurysm, fistula, or thrombosis
C. measure portal vein diameter alone
D. omit color and spectral Doppler

125. During case review, the vascular technologist considers preprocedure timeout. Which finding is most appropriate?

A. substitute room number for identity
B. omit laterality verification
C. confirm patient, procedure, site, and relevant consent
D. begin before identity confirmation

126. During case review, the vascular technologist considers procedure anticoagulation review. Which finding is most appropriate?

A. rely only on patient age
B. check relevant medication and laboratory information before intervention
C. ignore all medication history
D. stop prescribed drugs independently

127. During case review, the vascular technologist considers pseudoaneurysm compression. Which finding is most appropriate?

A. compress the entire limb without imaging
B. press only on the distal vein
C. avoid reassessing the parent artery
D. apply focused pressure to the communicating neck while monitoring flow

128. During case review, the vascular technologist considers intraoperative duplex. Which finding is most appropriate?

A. provide immediate assessment of repair patency and residual defects
B. evaluate only unrelated veins during this vascular examination
C. delay all findings until discharge on this examination
D. replace sterile technique on the current vascular laboratory examination

129. During case review, the vascular technologist considers procedural image documentation. Which finding is most appropriate?

A. omit laterality and annotations
B. retain only an unlabeled image
C. delete unsuccessful guidance images
D. save preprocedure, guidance, and postprocedure findings as required

130. During case review, the vascular technologist considers sterile transducer use. Which finding is most appropriate?

A. place a bare probe in the field
B. reuse a contaminated cover
C. use an appropriate sterile cover and sterile coupling medium
D. apply nonsterile gel to the puncture site

131. During case review, the vascular technologist considers tumescent anesthesia in ablation. Which finding is most appropriate?

A. surround the target vein and separate it from nearby tissues
B. eliminate the need for imaging
C. increase heat transfer to the skin
D. fill the deep artery with fluid

132. During case review, the vascular technologist considers venous ablation guidance. Which finding is most appropriate?

A. use arterial pressure cuffs alone
B. track the catheter and treatment segment in real time
C. image only the opposite limb
D. ignore the deep venous junction

133. During case review, the vascular technologist considers quality assurance trend. Which finding is most appropriate?

A. discard all prior measurements
B. change protocols every day
C. compare unrelated exam types only
D. track standardized measurements and investigate systematic drift

134. During case review, the vascular technologist considers color aliasing. Which finding is most appropriate?

A. decrease wall filter to zero always
B. increase transmit frequency only
C. increase the color scale or pulse-repetition frequency
D. increase color gain until noise fills the box

135. During case review, the vascular technologist considers sample volume. Which finding is most appropriate?

A. place it within the lumen and size it for the measurement goal
B. use maximum width for all stenoses on the current vascular laboratory examination
C. place it outside the vessel during the current vascular laboratory examination
D. include every adjacent vessel in the vessel being evaluated during this examination

136. During case review, the vascular technologist considers cross-talk artifact. Which finding is most appropriate?

A. increase gain further
B. raise wall filter to maximum
C. change patient identity
D. reduce excessive spectral gain

137. During case review, the vascular technologist considers color gain. Which finding is most appropriate?

A. maximize gain regardless of noise
B. increase until speckle appears, then reduce slightly
C. adjust only grayscale depth
D. leave gain at zero

138. During case review, the vascular technologist considers mirror-image artifact. Which finding is most appropriate?

A. measure the artifact as pathology
B. diagnose every duplicate as a second vessel
C. recognize duplicated anatomy across a strong reflector
D. increase gain until duplication worsens

139. During case review, the vascular technologist considers spectral aliasing. Which finding is most appropriate?

A. raise PRF or shift the baseline appropriately
B. increase Doppler gain only
C. enlarge the color box
D. decrease wall filter without limit

140. During case review, the vascular technologist considers acoustic output. Which finding is most appropriate?

A. ignore displayed safety indices in the vessel being evaluated during this examination
B. extend dwell time unnecessarily in the vessel being evaluated during this examination
C. maximize output for every patient during the current vascular laboratory examination
D. use the lowest output and shortest exposure that answer the clinical question

141. During case review, the vascular technologist considers range ambiguity. Which finding is most appropriate?

A. increase persistence without review on the current vascular laboratory examination
B. assume every echo depth is exact on this examination
C. recognize echoes assigned to an incorrect depth at high PRF
D. reduce image depth only on the current vascular laboratory examination

142. During case review, the vascular technologist considers wall filter. Which finding is most appropriate?

A. set maximum for every venous exam
B. set low enough to preserve slow flow without excessive clutter
C. remove all motion information
D. use it to change insonation angle

143. During case review, the vascular technologist considers twinkle or flash artifact. Which finding is most appropriate?

A. turn off grayscale imaging
B. diagnose occlusion from color alone
C. accept all color as blood flow
D. distinguish motion-related color from true intraluminal flow

144. During case review, the vascular technologist considers Doppler angle. Which finding is most appropriate?

A. ignore the flow direction under standard testing conditions in the current vascular laboratory
B. set every vessel to 90 degrees during the current vascular laboratory examination
C. keep the correction cursor aligned with flow and at 60 degrees or less
D. align the cursor across the vessel wall on the current vascular laboratory examination

145. The examination protocol calls for assessment of quality assurance trend. Which observation should be documented?

A. track standardized measurements and investigate systematic drift
B. discard all prior measurements
C. change protocols every day
D. compare unrelated exam types only

146. The examination protocol calls for assessment of color aliasing. Which observation should be documented?

A. decrease wall filter to zero always
B. increase the color scale or pulse-repetition frequency
C. increase transmit frequency only
D. increase color gain until noise fills the box

147. The examination protocol calls for assessment of sample volume. Which observation should be documented?

A. use maximum width for all stenoses on the current vascular laboratory examination
B. place it within the lumen and size it for the measurement goal
C. place it outside the vessel during the current vascular laboratory examination
D. include every adjacent vessel in the vessel being evaluated during this examination

148. The examination protocol calls for assessment of cross-talk artifact. Which observation should be documented?

A. increase gain further
B. raise wall filter to maximum
C. change patient identity
D. reduce excessive spectral gain

149. The examination protocol calls for assessment of color gain. Which observation should be documented?

A. maximize gain regardless of noise
B. adjust only grayscale depth
C. increase until speckle appears, then reduce slightly
D. leave gain at zero

150. The examination protocol calls for assessment of mirror-image artifact. Which observation should be documented?

A. recognize duplicated anatomy across a strong reflector
B. measure the artifact as pathology
C. diagnose every duplicate as a second vessel
D. increase gain until duplication worsens

151. The examination protocol calls for assessment of spectral aliasing. Which observation should be documented?

A. increase Doppler gain only
B. enlarge the color box
C. decrease wall filter without limit
D. raise PRF or shift the baseline appropriately

152. The examination protocol calls for assessment of acoustic output. Which observation should be documented?

A. use the lowest output and shortest exposure that answer the clinical question
B. ignore displayed safety indices in the vessel being evaluated during this examination
C. extend dwell time unnecessarily in the vessel being evaluated during this examination
D. maximize output for every patient during the current vascular laboratory examination

153. The examination protocol calls for assessment of range ambiguity. Which observation should be documented?

A. increase persistence without review on the current vascular laboratory examination
B. recognize echoes assigned to an incorrect depth at high PRF
C. assume every echo depth is exact on this examination
D. reduce image depth only on the current vascular laboratory examination

154. The examination protocol calls for assessment of wall filter. Which observation should be documented?

A. set maximum for every venous exam
B. remove all motion information
C. set low enough to preserve slow flow without excessive clutter
D. use it to change insonation angle

155. The examination protocol calls for assessment of twinkle or flash artifact. Which observation should be documented?

A. turn off grayscale imaging
B. diagnose occlusion from color alone
C. distinguish motion-related color from true intraluminal flow
D. accept all color as blood flow

156. The examination protocol calls for assessment of Doppler angle. Which observation should be documented?

A. ignore the flow direction under standard testing conditions in the current vascular laboratory
B. keep the correction cursor aligned with flow and at 60 degrees or less
C. set every vessel to 90 degrees during the current vascular laboratory examination
D. align the cursor across the vessel wall on the current vascular laboratory examination

157. During case review, the vascular technologist considers infection precautions. Which finding is most appropriate?

A. reuse contaminated materials on the current vascular laboratory examination
B. omit hand hygiene on the current vascular laboratory examination
C. assume vascular patients are noninfectious on this examination
D. apply standard precautions and additional measures indicated by risk

158. During case review, the vascular technologist considers fasting abdominal vascular study. Which finding is most appropriate?

A. confirm preparation and document when fasting was not possible
B. provide food immediately before scanning
C. omit preparation from the record
D. cancel every nonfasting study automatically

159. During case review, the vascular technologist considers professional communication. Which finding is most appropriate?

A. discuss confidential cases publicly
B. guarantee a normal result
C. use unexplained technical jargon only
D. explain the examination clearly without promising a diagnosis

160. During case review, the vascular technologist considers technical limitation. Which finding is most appropriate?

A. document the limitation and its effect on the examination
B. silently omit the vessel
C. invent a normal result
D. delete all obtained images

161. During case review, the vascular technologist considers image labeling. Which finding is most appropriate?

A. label every image as normal
B. include vessel, side, orientation, and relevant measurement information
C. omit laterality from paired anatomy
D. use unlabeled screenshots

162. During case review, the vascular technologist considers fall-risk patient. Which finding is most appropriate?

A. rush the transfer without help
B. leave the patient standing alone
C. adapt transfers and positioning using appropriate assistance
D. disable safety devices

163. During case review, the vascular technologist considers unexpected incidental finding. Which finding is most appropriate?

A. document it and follow the laboratory's communication pathway
B. erase the image
C. make a definitive diagnosis outside scope
D. ignore all nonvascular anatomy

164. During case review, the vascular technologist considers patient identification. Which finding is most appropriate?

A. ask only a family member
B. use two approved identifiers before the examination
C. identify by diagnosis alone
D. use room number alone

165. During case review, the vascular technologist considers prior study review. Which finding is most appropriate?

A. change measurement conventions silently
B. ignore all earlier images
C. compare relevant findings using the same landmarks and criteria
D. compare unrelated vessels only

166. During case review, the vascular technologist considers preliminary findings. Which finding is most appropriate?

A. provide an independent final diagnosis
B. withhold urgent abnormalities
C. discuss another patient's results
D. communicate within scope and according to laboratory policy

167. During case review, the vascular technologist considers pain during compression. Which finding is most appropriate?

A. stop documenting limitations
B. ignore the patient's response
C. apply unlimited force
D. modify technique while obtaining the safest diagnostic information

168. During case review, the vascular technologist considers archiving check. Which finding is most appropriate?

A. verify that required images and measurements reached the correct patient record
B. delete measurements after scanning during the current vascular laboratory examination
C. assume transfer succeeded in the vessel being evaluated during this examination
D. store under a temporary identity on the current vascular laboratory examination

169. During case review, the vascular technologist considers critical finding communication. Which finding is most appropriate?

A. wait for the routine final report
B. tell only another patient
C. follow the facility's urgent notification and read-back policy
D. omit time and recipient documentation

170. During case review, the vascular technologist considers patient history. Which finding is most appropriate?

A. avoid asking about procedures during the current vascular laboratory examination
B. connect symptoms, laterality, onset, interventions, and risk factors to the protocol
C. use the referral label alone on the current vascular laboratory examination
D. record age only in the vessel being evaluated during this examination

Practice Exam 20: Answer Key and Explanations

1. C — The celiac axis supplies the liver and spleen, organs with relatively low vascular resistance. Even while fasting, the normal celiac waveform maintains appreciable forward diastolic flow. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

2. B — The great saphenous vein travels in a characteristic fascial compartment between superficial and muscular fascia. Recognizing the saphenous eye helps distinguish it from tributaries. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

3. C — The posterior tibial artery is accessible behind the medial malleolus. This predictable landmark is commonly used for Doppler pressures and pedal pulse assessment. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

4. A — Hepatic veins communicate closely with the right atrium, so normal pressure changes during the cardiac cycle create a multiphasic venous waveform. Respiration also influences venous return. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

5. D — At rest, a healthy peripheral muscular artery usually has a multiphasic waveform: rapid systolic acceleration, brief early diastolic reversal, and sometimes late forward flow due to elastic recoil. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

6. B — The brachial artery normally divides near the antecubital fossa into the radial and ulnar arteries. The bifurcation level can vary, including a high origin. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

7. A — Gentle tapping over a superficial temporal artery transmits small oscillations through the external carotid system. The maneuver helps distinguish the ECA from the ICA when anatomy is difficult. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

8. C — Normal kidneys receive blood throughout the cardiac cycle. The renal artery is therefore a low-resistance artery with forward diastolic flow, reflecting continuous parenchymal perfusion. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct

vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

9. B — Distal compression propels venous blood toward the heart, producing a short surge of antegrade flow. A weak or absent response can indicate obstruction between the compression site and sample location. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one

10. D — The middle cerebral artery is commonly evaluated through the transtemporal window. Depth, direction, and neighboring vessel responses help confirm identification rather than color alone. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

11. C — A normal vertebral artery carries blood cranially toward the basilar circulation. Direction is judged relative to the transducer and compared with the adjacent carotid vessels, not by color alone. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

12. B — Before eating, the bowel vascular bed has relatively high resistance, producing a sharp systolic peak and little diastolic flow in the SMA. Postprandial demand lowers resistance. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

13. A — With the patient examined from behind the knee, the popliteal vein commonly lies closer to the transducer than the popliteal artery, though position may vary. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

14. D — The common carotid supplies both the low-resistance internal carotid bed and the higher-resistance external carotid bed, so its normal spectrum is intermediate but retains forward diastolic flow. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

15. D — Normal portal venous flow is hepatopetal, carrying blood from the gastrointestinal tract and spleen toward hepatic sinusoids. Spectral flow is normally continuous with mild respiratory variation. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

16. A — Normal veins are thin walled and should collapse completely under adequate transducer pressure. Failure to compress is the principal direct ultrasound sign suggesting venous thrombus. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

17. B — The normal abdominal aorta demonstrates a strongly pulsatile, relatively high-resistance waveform when fasting. Branch flow demands and reflected waves shape the brief diastolic components. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

18. C — The internal carotid supplies the brain, a continuously perfused low-resistance vascular bed. Its spectral waveform therefore shows brisk systolic flow and sustained forward flow throughout diastole. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

19. B — The celiac axis supplies the liver and spleen, organs with relatively low vascular resistance. Even while fasting, the normal celiac waveform maintains appreciable forward diastolic flow. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

20. C — The great saphenous vein travels in a characteristic fascial compartment between superficial and muscular fascia. Recognizing the saphenous eye helps distinguish it from tributaries. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

21. D — The posterior tibial artery is accessible behind the medial malleolus. This predictable landmark is commonly used for Doppler pressures and pedal pulse assessment. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

22. A — Hepatic veins communicate closely with the right atrium, so normal pressure changes during the cardiac cycle create a multiphasic venous waveform. Respiration also influences venous return. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

23. A — At rest, a healthy peripheral muscular artery usually has a multiphasic waveform: rapid systolic acceleration, brief early diastolic reversal, and sometimes late forward flow due to elastic recoil. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct

vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

24. C — The brachial artery normally divides near the antecubital fossa into the radial and ulnar arteries. The bifurcation level can vary, including a high origin. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

25. B — Gentle tapping over a superficial temporal artery transmits small oscillations through the external carotid system. The maneuver helps distinguish the ECA from the ICA when anatomy is difficult. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

26. D — Normal kidneys receive blood throughout the cardiac cycle. The renal artery is therefore a low-resistance artery with forward diastolic flow, reflecting continuous parenchymal perfusion. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

27. C — Distal compression propels venous blood toward the heart, producing a short surge of antegrade flow. A weak or absent response can indicate obstruction between the compression site and sample location. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one

28. D — The middle cerebral artery is commonly evaluated through the transtemporal window. Depth, direction, and neighboring vessel responses help confirm identification rather than color alone. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

29. A — A normal vertebral artery carries blood cranially toward the basilar circulation. Direction is judged relative to the transducer and compared with the adjacent carotid vessels, not by color alone. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

30. B — Before eating, the bowel vascular bed has relatively high resistance, producing a sharp systolic peak and little diastolic flow in the SMA. Postprandial demand lowers resistance. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

31. A — With the patient examined from behind the knee, the popliteal vein commonly lies closer to the transducer than the popliteal artery, though position may vary. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

32. B — The common carotid supplies both the low-resistance internal carotid bed and the higher-resistance external carotid bed, so its normal spectrum is intermediate but retains forward diastolic flow. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

33. C — Normal portal venous flow is hepatopetal, carrying blood from the gastrointestinal tract and spleen toward hepatic sinusoids. Spectral flow is normally continuous with mild respiratory variation. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

34. D — Normal veins are thin walled and should collapse completely under adequate transducer pressure. Failure to compress is the principal direct ultrasound sign suggesting venous thrombus. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

35. C — The normal abdominal aorta demonstrates a strongly pulsatile, relatively high-resistance waveform when fasting. Branch flow demands and reflected waves shape the brief diastolic components. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

36. A — The internal carotid supplies the brain, a continuously perfused low-resistance vascular bed. Its spectral waveform therefore shows brisk systolic flow and sustained forward flow throughout diastole. This differentiates normal anatomy and hemodynamics from venous patterns, artifacts, and disease. Correct vessel identification should combine location, waveform, direction, and physiologic response rather than relying on one feature.

37. B — Blood enters a pseudoaneurysm during systole and returns toward the parent artery during diastole, producing the characteristic to-and-fro waveform in the communicating neck. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

38. D — A renal artery narrowing produces localized acceleration and downstream disturbed flow. Indirect intrarenal tardus-parvus changes may support a proximal hemodynamically important lesion. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation.

Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

39. B — May-Thurner anatomy describes compression of the left common iliac vein between the crossing right common iliac artery and the spine, predisposing to left-sided venous obstruction. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

40. D — Fibromuscular dysplasia is nonatherosclerotic and commonly affects mid-to-distal renal arteries. Angiography may show a string-of-beads pattern; duplex may detect turbulence and velocity shifts. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

41. A — Acute thrombus often distends the vein and may appear hypoechoic. The decisive direct finding is failure of the venous walls to coapt during compression. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

42. C — Occlusion requires demonstrating lumen-filling material and absence of flow despite appropriate low-flow settings, multiple planes, and power or color Doppler optimization. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

43. B — Aneurysm assessment requires maximum orthogonal diameter using a consistent outer-wall convention. Longitudinal and transverse imaging reduce errors from tortuosity or oblique measurement. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

44. A — Elevated portal resistance may slow portal flow, cause hepatofugal direction, and open portosystemic collateral pathways. Findings must be integrated with hepatic morphology and clinical data. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

45. C — Arterial thoracic outlet testing evaluates positional changes in subclavian or axillary flow. A change must be interpreted with symptoms because asymptomatic compression can occur. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

46. D — A carotid body tumor arises at the bifurcation and characteristically splays the internal and external carotid arteries. Color Doppler often shows prominent vascularity. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

47. C — A hemodynamically important stenosis narrows the lumen, accelerating blood locally. Disturbed flow and spectral broadening commonly appear within and just beyond the lesion. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

48. A — Opposing inflow and outflow within a pseudoaneurysm sac commonly create the yin-yang color pattern. This supports, but does not replace, neck waveform confirmation. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

49. B — A severe proximal renal arterial stenosis attenuates and delays the systolic pressure wave reaching intrarenal branches, creating a tardus-parvus pattern. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

50. D — Anterior nutcracker anatomy involves compression of the left renal vein between the superior mesenteric artery and aorta, potentially causing venous hypertension and collateralization. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

51. A — Popliteal aneurysms can thrombose or embolize to tibial vessels, threatening limb perfusion. Duplex documents diameter, patent lumen, mural thrombus, and distal flow. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

52. C — Chronic thrombus becomes more echogenic, retracts, and may leave wall thickening, synechiae, recanalized channels, and an incompletely compressible irregular lumen. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

53. B — A proximal subclavian obstruction lowers pressure beyond the lesion and may draw blood retrograde down the ipsilateral vertebral artery to supply the arm. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine

grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

54. D — A dissection creates a second flow channel when blood enters through an intimal tear. A mobile or fixed flap separating lumens is the central sonographic feature. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

55. A — Budd-Chiari syndrome results from obstruction of hepatic venous outflow. Abnormal or absent hepatic vein flow, thrombosis, collaterals, and caudate lobe changes may be present. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

56. D — Venous thoracic outlet pathology affects the axillosubclavian vein, producing thrombosis, collateral veins, loss of phasicity, or positional flow limitation. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies. Clinical correlation and laboratory protocol remain essential for final

57. C — A significant upstream arterial lesion reduces pulsatility and delays systolic acceleration downstream. Waveforms become damped and monophasic as energy is lost across the obstruction. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

58. B — Near occlusion can reduce flow rather than create the highest velocity because the residual lumen is extremely small. Distal ICA collapse or caliber reduction is an important clue. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

59. A — An abnormal artery-to-vein connection lowers downstream resistance, increases arterial diastolic flow, and transmits pulsatility and turbulence into the draining vein. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

60. D — Mesenteric stenosis commonly produces focal spectral acceleration and turbulence. Examination is typically performed fasting to limit bowel gas and standardize expected resistance. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

61. B — Popliteal artery entrapment may produce positional arterial narrowing or occlusion in young patients. Provocative maneuvers and comparison with symptoms help reveal dynamic compression. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

62. C — A Baker cyst is a synovial fluid collection typically found between the semimembranosus and medial gastrocnemius tendons. Lack of internal flow helps distinguish it from vascular lesions. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

63. B — Reflux is pathologic retrograde venous flow elicited by an accepted maneuver such as distal compression-release or Valsalva. Duration must be measured using the laboratory's validated criteria. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

64. A — Blood enters a pseudoaneurysm during systole and returns toward the parent artery during diastole, producing the characteristic to-and-fro waveform in the communicating neck. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

65. C — A renal artery narrowing produces localized acceleration and downstream disturbed flow. Indirect intrarenal tardus-parvus changes may support a proximal hemodynamically important lesion. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

66. D — May-Thurner anatomy describes compression of the left common iliac vein between the crossing right common iliac artery and the spine, predisposing to left-sided venous obstruction. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

67. A — Fibromuscular dysplasia is nonatherosclerotic and commonly affects mid-to-distal renal arteries. Angiography may show a string-of-beads pattern; duplex may detect turbulence and velocity shifts. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

68. D — Acute thrombus often distends the vein and may appear hypoechoic. The decisive direct finding is failure of the venous walls to coapt during compression. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine

grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

69. B — Occlusion requires demonstrating lumen-filling material and absence of flow despite appropriate low-flow settings, multiple planes, and power or color Doppler optimization. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

70. C — Aneurysm assessment requires maximum orthogonal diameter using a consistent outer-wall convention. Longitudinal and transverse imaging reduce errors from tortuosity or oblique measurement. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

71. A — Elevated portal resistance may slow portal flow, cause hepatofugal direction, and open portosystemic collateral pathways. Findings must be integrated with hepatic morphology and clinical data. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

72. C — Arterial thoracic outlet testing evaluates positional changes in subclavian or axillary flow. A change must be interpreted with symptoms because asymptomatic compression can occur. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

73. B — A carotid body tumor arises at the bifurcation and characteristically splays the internal and external carotid arteries. Color Doppler often shows prominent vascularity. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

74. D — A hemodynamically important stenosis narrows the lumen, accelerating blood locally. Disturbed flow and spectral broadening commonly appear within and just beyond the lesion. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

75. A — Opposing inflow and outflow within a pseudoaneurysm sac commonly create the yin-yang color pattern. This supports, but does not replace, neck waveform confirmation. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

76. B — A severe proximal renal arterial stenosis attenuates and delays the systolic pressure wave reaching intrarenal branches, creating a tardus-parvus pattern. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

77. D — Anterior nutcracker anatomy involves compression of the left renal vein between the superior mesenteric artery and aorta, potentially causing venous hypertension and collateralization. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

78. C — Popliteal aneurysms can thrombose or embolize to tibial vessels, threatening limb perfusion. Duplex documents diameter, patent lumen, mural thrombus, and distal flow. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

79. A — Chronic thrombus becomes more echogenic, retracts, and may leave wall thickening, synechiae, recanalized channels, and an incompletely compressible irregular lumen. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

80. C — A proximal subclavian obstruction lowers pressure beyond the lesion and may draw blood retrograde down the ipsilateral vertebral artery to supply the arm. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

81. D — A dissection creates a second flow channel when blood enters through an intimal tear. A mobile or fixed flap separating lumens is the central sonographic feature. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

82. B — Budd-Chiari syndrome results from obstruction of hepatic venous outflow. Abnormal or absent hepatic vein flow, thrombosis, collaterals, and caudate lobe changes may be present. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

83. C — Venous thoracic outlet pathology affects the axillosubclavian vein, producing thrombosis, collateral veins, loss of phasicity, or positional flow limitation. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale,

color, spectral findings, symptoms, and comparison with the contralateral side or prior studies. Clinical correlation and laboratory protocol remain essential for final

84. D — A significant upstream arterial lesion reduces pulsatility and delays systolic acceleration downstream. Waveforms become damped and monophasic as energy is lost across the obstruction. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

85. A — Near occlusion can reduce flow rather than create the highest velocity because the residual lumen is extremely small. Distal ICA collapse or caliber reduction is an important clue. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

86. B — An abnormal artery-to-vein connection lowers downstream resistance, increases arterial diastolic flow, and transmits pulsatility and turbulence into the draining vein. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

87. D — Mesenteric stenosis commonly produces focal spectral acceleration and turbulence. Examination is typically performed fasting to limit bowel gas and standardize expected resistance. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

88. A — Popliteal artery entrapment may produce positional arterial narrowing or occlusion in young patients. Provocative maneuvers and comparison with symptoms help reveal dynamic compression. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

89. C — A Baker cyst is a synovial fluid collection typically found between the semimembranosus and medial gastrocnemius tendons. Lack of internal flow helps distinguish it from vascular lesions. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

90. B — Reflux is pathologic retrograde venous flow elicited by an accepted maneuver such as distal compression-release or Valsalva. Duration must be measured using the laboratory's validated criteria. The competing choices describe normal physiology, another vascular bed, or a nonspecific observation. Diagnosis should combine grayscale, color, spectral findings, symptoms, and comparison with the contralateral side or prior studies.

91. A — Post-ablation duplex documents the treated segment and checks the adjacent deep system for thrombus extension. The examination should follow the facility's timing and reporting protocol. Postoperative anatomy changes expected velocities and landmarks, so the operative report and validated laboratory criteria matter. A complete circuit assessment is safer than judging patency from a single image or isolated velocity.

92. B — A complete bypass evaluation follows the entire reconstructed circuit. Inflow disease, graft stenosis, anastomotic lesions, and outflow disease can each threaten patency. Postoperative anatomy changes expected velocities and landmarks, so the operative report and validated laboratory criteria matter. A complete circuit assessment is safer than judging patency from a single image or isolated velocity.

93. D — An endoleak is continued perfusion of the excluded aneurysm sac. Duplex uses grayscale, color, and spectral Doppler to identify and characterize flow around the endograft. Postoperative anatomy changes expected velocities and landmarks, so the operative report and validated laboratory criteria matter. A complete circuit assessment is safer than judging patency from a single image or isolated velocity.

94. C — Carotid stents alter vessel compliance and may raise baseline velocities. Laboratories should use validated stent-specific criteria and compare with prior studies rather than blindly applying native-vessel thresholds. Postoperative anatomy changes expected velocities and landmarks, so the operative report and validated laboratory criteria matter. A complete circuit assessment is safer than judging patency from a single image or isolated

95. C — Access dysfunction can arise from inflow, anastomotic, conduit, or outflow disease. Duplex findings should be correlated with access flow, cannulation problems, pressures, and dialysis performance. Postoperative anatomy changes expected velocities and landmarks, so the operative report and validated laboratory criteria matter. A complete circuit assessment is safer than judging patency from a single image or isolated velocity.

96. D — Access stenosis produces focal acceleration, aliasing, and downstream turbulence. Interpretation also considers access flow and the location relative to inflow, anastomosis, and outflow. Postoperative anatomy changes expected velocities and landmarks, so the operative report and validated laboratory criteria matter. A complete circuit assessment is safer than judging patency from a single image or isolated velocity.

97. A — After endarterectomy, duplex evaluates the reconstructed carotid lumen, residual plaque, intimal flap, restenosis, and distal flow using postoperative criteria appropriate to the laboratory. Postoperative anatomy changes expected velocities and landmarks, so the operative report and validated laboratory criteria matter. A complete circuit assessment is safer than judging patency from a single image or isolated velocity.

98. B — Transplant evaluation includes the renal artery from its iliac inflow through the anastomosis and intrarenal branches, plus venous outflow and parenchymal perfusion. Postoperative anatomy changes expected velocities and landmarks, so the operative report and validated laboratory criteria

matter. A complete circuit assessment is safer than judging patency from a single image or isolated velocity.

99. C — Dialysis fistula usability depends on more than patency. Duplex assesses access flow, vein diameter and depth, stenosis, branches, and an adequate cannulation segment. Postoperative anatomy changes expected velocities and landmarks, so the operative report and validated laboratory criteria matter. A complete circuit assessment is safer than judging patency from a single image or isolated velocity.

100. B — TIPS surveillance examines the portal vein, shunt segments, and hepatic venous outflow. Velocity changes, absent flow, or directional abnormalities can suggest dysfunction. Postoperative anatomy changes expected velocities and landmarks, so the operative report and validated laboratory criteria matter. A complete circuit assessment is safer than judging patency from a single image or isolated velocity.

101. A — A cuff that is too narrow can overestimate systolic pressure, while an excessively wide cuff can distort results. Correct cuff sizing is essential for reliable segmental pressures. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

102. D — The ankle-brachial index compares ankle systolic pressure with the higher of the two brachial pressures, reducing error from unilateral upper-extremity disease. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

103. A — Exercise increases lower-extremity flow demand. A stenosis that appears compensated at rest may cause a postexercise pressure decrease and delayed recovery, revealing functional limitation. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

104. C — Venous PPG records skin blood-volume changes as exercise empties the calf and veins refill. Abnormally rapid refill may indicate reflux, with tourniquets helping localize superficial contribution. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

105. D — Reactive hyperemia follows temporary arterial occlusion and causes transient vasodilation and increased flow demand. It can expose hemodynamically important disease when exercise is not feasible. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

106. B — A significant pressure drop between adjacent segments helps localize hemodynamically important arterial disease. Results should be interpreted with waveforms, cuff fit, and clinical context.

Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

107. A — Photoplethysmography uses emitted and reflected infrared light to detect small changes in cutaneous blood volume. It supports digital pressure and venous refill assessments. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

108. D — The toe-brachial index parallels ABI methodology but uses digital systolic pressure as the numerator. It is particularly helpful when ankle arteries are noncompressible. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

109. C — Medial arterial calcification can prevent cuff compression and create an artificially elevated ABI. Toe vessels are often more compressible, so toe pressures and waveforms provide useful alternatives. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

110. B — Pulse volume recordings detect changes in limb volume produced by arterial inflow. Waveform contour and amplitude help localize disease and are less affected by arterial calcification than cuff pressures. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique

111. D — A cuff that is too narrow can overestimate systolic pressure, while an excessively wide cuff can distort results. Correct cuff sizing is essential for reliable segmental pressures. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

112. C — The ankle-brachial index compares ankle systolic pressure with the higher of the two brachial pressures, reducing error from unilateral upper-extremity disease. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

113. B — Exercise increases lower-extremity flow demand. A stenosis that appears compensated at rest may cause a postexercise pressure decrease and delayed recovery, revealing functional limitation. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

114. A — Venous PPG records skin blood-volume changes as exercise empties the calf and veins refill. Abnormally rapid refill may indicate reflux, with tourniquets helping localize superficial contribution. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response.

A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

115. C — Reactive hyperemia follows temporary arterial occlusion and causes transient vasodilation and increased flow demand. It can expose hemodynamically important disease when exercise is not feasible. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

116. A — A significant pressure drop between adjacent segments helps localize hemodynamically important arterial disease. Results should be interpreted with waveforms, cuff fit, and clinical context. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

117. D — Photoplethysmography uses emitted and reflected infrared light to detect small changes in cutaneous blood volume. It supports digital pressure and venous refill assessments. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

118. B — The toe-brachial index parallels ABI methodology but uses digital systolic pressure as the numerator. It is particularly helpful when ankle arteries are noncompressible. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

119. A — Medial arterial calcification can prevent cuff compression and create an artificially elevated ABI. Toe vessels are often more compressible, so toe pressures and waveforms provide useful alternatives. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique is inconsistent.

120. B — Pulse volume recordings detect changes in limb volume produced by arterial inflow. Waveform contour and amplitude help localize disease and are less affected by arterial calcification than cuff pressures. Pressure values must be correlated with waveform contour, cuff size, symptoms, and exercise response. A single number can mislead when arteries are calcified, upper-extremity disease is present, or technique

121. C — Continuous tip visualization helps the operator enter the intended vessel while avoiding posterior-wall puncture and nearby structures. Needle orientation and probe alignment are adjusted together. Real-time imaging, sterile technique, patient monitoring, and immediate reassessment reduce procedural risk. The sonographer supports the authorized operator and documents required views without independently changing medication or treatment plans.

122. D — Real-time ultrasound guidance confirms needle position within the pseudoaneurysm sac while avoiding the neck and parent artery. Flow is monitored during treatment for thrombosis and

complications. Real-time imaging, sterile technique, patient monitoring, and immediate reassessment reduce procedural risk. The sonographer supports the authorized operator and documents required views without independently changing medication or treatment plans.

123. A — After thrombin treatment, ultrasound should document cessation of pseudoaneurysm flow while confirming patency of the native artery and evaluating distal perfusion. Real-time imaging, sterile technique, patient monitoring, and immediate reassessment reduce procedural risk. The sonographer supports the authorized operator and documents required views without independently changing medication or treatment plans.

124. B — A focused post-access examination looks for common vascular complications at and beyond the puncture site. Grayscale, color, and spectral Doppler findings are integrated. Real-time imaging, sterile technique, patient monitoring, and immediate reassessment reduce procedural risk. The sonographer supports the authorized operator and documents required views without independently changing medication or treatment plans.

125. C — A procedural timeout prevents wrong-patient, wrong-site, and wrong-procedure events. The team verifies identity, planned intervention, laterality, consent, allergies, and required resources. Real-time imaging, sterile technique, patient monitoring, and immediate reassessment reduce procedural risk. The sonographer supports the authorized operator and documents required views without independently changing medication or treatment plans.

126. B — Bleeding and thrombosis risks depend partly on anticoagulants, antiplatelet agents, laboratory results, and the planned procedure. The care team determines appropriate management. Real-time imaging, sterile technique, patient monitoring, and immediate reassessment reduce procedural risk. The sonographer supports the authorized operator and documents required views without independently changing medication or treatment plans.

127. D — Ultrasound-guided compression aims to stop flow through the pseudoaneurysm neck while preserving native arterial patency. Repeated imaging evaluates success and distal perfusion. Real-time imaging, sterile technique, patient monitoring, and immediate reassessment reduce procedural risk. The sonographer supports the authorized operator and documents required views without independently changing medication or treatment plans.

128. A — Intraoperative duplex can identify residual stenosis, flap, thrombus, or poor flow before the operation ends, allowing the surgeon to revise a correctable defect. Real-time imaging, sterile technique, patient monitoring, and immediate reassessment reduce procedural risk. The sonographer supports the authorized operator and documents required views without independently changing medication or treatment plans.

129. D — Complete procedural documentation establishes baseline anatomy, records guidance and device position, and demonstrates the immediate result or complication. Images require accurate labels and laterality. Real-time imaging, sterile technique, patient monitoring, and immediate reassessment reduce procedural risk. The sonographer supports the authorized operator and documents required views without independently changing medication or treatment plans.

130. C — A sterile probe cover and sterile gel preserve the procedural field during percutaneous guidance. Standard precautions and facility infection-control policies remain necessary. Real-time imaging, sterile technique, patient monitoring, and immediate reassessment reduce procedural risk. The sonographer supports the authorized operator and documents required views without independently changing medication or treatment plans.

131. A — Tumescent fluid compresses the treated vein, improves catheter-wall contact, provides local anesthesia, and insulates surrounding structures from thermal injury. Real-time imaging, sterile technique, patient monitoring, and immediate reassessment reduce procedural risk. The sonographer supports the authorized operator and documents required views without independently changing medication or treatment plans. Clinical correlation and laboratory protocol remain essential for final interpretation

132. B — During venous ablation, ultrasound identifies the target vein, guides access and catheter position, supports tumescent anesthesia placement, and monitors adjacent deep veins. Real-time imaging, sterile technique, patient monitoring, and immediate reassessment reduce procedural risk. The sonographer supports the authorized operator and documents required views without independently changing medication or treatment plans.

133. D — A quality assurance program uses consistent tests, documentation, and corrective action. Trending results can reveal gradual equipment degradation or operator variability before clinical quality is affected. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

134. C — Color aliasing occurs when Doppler shift exceeds the Nyquist limit. Raising scale or PRF reduces aliasing, although true high velocity should still be documented spectrally. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

135. A — Sample-volume position and size affect the recorded velocity distribution. Center-stream sampling supports reproducible measurements, while broader gates may demonstrate disturbed flow. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

136. D — Spectral cross-talk mirrors the waveform across the baseline, often because gain is excessive or the insonation geometry is nearly perpendicular. Gain reduction usually helps. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

137. B — Optimizing color gain just below the noise threshold improves sensitivity without creating false color outside the vessel. Gain should be reassessed when depth or scale changes. The adjustment

should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

138. C — Mirror artifact occurs when sound follows an indirect path involving a strong reflector, creating a duplicated structure at an incorrect location. Changing the acoustic window can clarify it. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains

139. A — Pulsed-wave spectral aliasing reflects sampling above the Nyquist limit. Increasing PRF, shifting baseline, lowering transmit frequency, or using continuous-wave Doppler when available can help. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

140. D — Diagnostic ultrasound safety follows prudent output and exposure principles. The operator monitors thermal and mechanical indices and adjusts power, time, and mode appropriately. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

141. C — When pulses are emitted before earlier echoes return, the system may assign a returning echo to the wrong pulse and therefore the wrong depth. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

142. B — The wall filter suppresses low-frequency Doppler shifts from tissue motion. A filter set too high can erase true slow venous or end-diastolic flow. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

143. D — Probe or tissue motion can create bursts of color unrelated to blood flow. Correlation with grayscale anatomy, spectral Doppler, and repeated imaging prevents misinterpretation. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

144. C — Velocity calculation depends strongly on the cosine of the insonation angle. Small cursor errors become magnified at high angles, so consistent alignment and angles at or below 60 degrees improve reproducibility. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations

145. A — A quality assurance program uses consistent tests, documentation, and corrective action. Trending results can reveal gradual equipment degradation or operator variability before clinical quality is affected. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

146. B — Color aliasing occurs when Doppler shift exceeds the Nyquist limit. Raising scale or PRF reduces aliasing, although true high velocity should still be documented spectrally. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

147. B — Sample-volume position and size affect the recorded velocity distribution. Center-stream sampling supports reproducible measurements, while broader gates may demonstrate disturbed flow. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

148. D — Spectral cross-talk mirrors the waveform across the baseline, often because gain is excessive or the insonation geometry is nearly perpendicular. Gain reduction usually helps. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

149. C — Optimizing color gain just below the noise threshold improves sensitivity without creating false color outside the vessel. Gain should be reassessed when depth or scale changes. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

150. A — Mirror artifact occurs when sound follows an indirect path involving a strong reflector, creating a duplicated structure at an incorrect location. Changing the acoustic window can clarify it. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains

151. D — Pulsed-wave spectral aliasing reflects sampling above the Nyquist limit. Increasing PRF, shifting baseline, lowering transmit frequency, or using continuous-wave Doppler when available can help. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

152. A — Diagnostic ultrasound safety follows prudent output and exposure principles. The operator monitors thermal and mechanical indices and adjusts power, time, and mode appropriately. The adjustment should improve signal quality without creating false flow or erasing clinically important

information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

153. B — When pulses are emitted before earlier echoes return, the system may assign a returning echo to the wrong pulse and therefore the wrong depth. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

154. C — The wall filter suppresses low-frequency Doppler shifts from tissue motion. A filter set too high can erase true slow venous or end-diastolic flow. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

155. C — Probe or tissue motion can create bursts of color unrelated to blood flow. Correlation with grayscale anatomy, spectral Doppler, and repeated imaging prevents misinterpretation. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations when optimization remains inadequate.

156. B — Velocity calculation depends strongly on the cosine of the insonation angle. Small cursor errors become magnified at high angles, so consistent alignment and angles at or below 60 degrees improve reproducibility. The adjustment should improve signal quality without creating false flow or erasing clinically important information. Recheck the result in grayscale, color, and spectral modes and document limitations

157. D — Standard precautions apply to every patient. Hand hygiene, equipment cleaning, gloves, and additional transmission-based precautions protect patients and staff and follow facility policy. This approach protects patient safety, preserves an auditable record, and supports accurate interpretation. The alternatives create identification, privacy, scope-of-practice, or communication failures that can directly affect care.

158. A — Fasting commonly reduces bowel gas and standardizes mesenteric hemodynamics. Urgent circumstances may prevent preparation, so the sonographer adapts technique and records the limitation. This approach protects patient safety, preserves an auditable record, and supports accurate interpretation. The alternatives create identification, privacy, scope-of-practice, or communication failures that can directly affect care.

159. D — Clear, respectful explanations improve cooperation and reduce anxiety. The sonographer describes what the patient will experience while avoiding unauthorized interpretation or promises about results. This approach protects patient safety, preserves an auditable record, and supports accurate interpretation. The alternatives create identification, privacy, scope-of-practice, or communication failures that can directly affect care.

160. A — Body habitus, wounds, pain, dressings, bowel gas, or inability to position may limit a study. Transparent documentation tells the interpreting clinician what was and was not evaluated. This

approach protects patient safety, preserves an auditable record, and supports accurate interpretation. The alternatives create identification, privacy, scope-of-practice, or communication failures that can directly affect care.

161. B — Accurate labels allow the interpreter to reconstruct the examination and compare serial studies. Incorrect laterality or anatomy can create serious diagnostic and treatment errors. This approach protects patient safety, preserves an auditable record, and supports accurate interpretation. The alternatives create identification, privacy, scope-of-practice, or communication failures that can directly affect care.

162. C — Patient condition determines safe positioning and transfer methods. Assistance, rails, brakes, gait devices, and monitoring should be used according to assessed risk and facility policy. This approach protects patient safety, preserves an auditable record, and supports accurate interpretation. The alternatives create identification, privacy, scope-of-practice, or communication failures that can directly affect care.

163. A — Vascular examinations may reveal masses, cysts, or other incidental abnormalities. Appropriate images and communication allow the interpreting clinician to determine significance and recommend follow-up. This approach protects patient safety, preserves an auditable record, and supports accurate interpretation. The alternatives create identification, privacy, scope-of-practice, or communication failures that can directly affect care.

164. B — Two approved identifiers reduce wrong-patient errors. Room location is not an identifier. Identity confirmation should precede imaging, documentation, medication-related review, and any invasive participation. This approach protects patient safety, preserves an auditable record, and supports accurate interpretation. The alternatives create identification, privacy, scope-of-practice, or communication failures that can directly affect care.

165. C — Reviewing prior studies helps identify true interval change, guides targeted imaging, and reveals prior technical limitations. Comparisons require consistent anatomy, technique, and diagnostic criteria. This approach protects patient safety, preserves an auditable record, and supports accurate interpretation. The alternatives create identification, privacy, scope-of-practice, or communication failures that can directly affect care.

166. D — The sonographer documents technical observations and communicates findings according to credentialing, supervision, and facility policy. Final interpretation remains with the authorized interpreting clinician. This approach protects patient safety, preserves an auditable record, and supports accurate interpretation. The alternatives create identification, privacy, scope-of-practice, or communication failures that can directly affect care.

167. D — Compression is important in venous testing, but severe pain, surgery, wounds, or suspected injury may require modified pressure or alternative views. Limitations must be documented. This approach protects patient safety, preserves an auditable record, and supports accurate interpretation. The alternatives create identification, privacy, scope-of-practice, or communication failures that can directly affect care.

168. A — Before completing the examination, the sonographer confirms images, cine clips, measurements, labels, and worksheets are linked to the correct patient and available for interpretation. This approach protects patient safety, preserves an auditable record, and supports accurate interpretation. The alternatives create identification, privacy, scope-of-practice, or communication failures that can directly affect care.

169. C — Critical findings require prompt communication through the established escalation pathway. Documentation should include the finding, recipient, date and time, and confirmation or read-back when required. This approach protects patient safety, preserves an auditable record, and supports accurate interpretation. The alternatives create identification, privacy, scope-of-practice, or communication failures that can directly affect care.

170. B — A focused vascular history clarifies the clinical question and may require protocol modification. Symptoms, timing, laterality, surgery, medication, and relevant risk factors guide the examination. This approach protects patient safety, preserves an auditable record, and supports accurate interpretation. The alternatives create identification, privacy, scope-of-practice, or communication failures that can directly affect care.