

COMPREHENSIVE MOCK EXAM 12

Supplemental to: Ultrasound Physics Board Review 2026-2027

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ARDMS SPI (Sonography Principles and Instrumentation) Examination, Inteleos -- 110 questions, single-best-answer, four options (A-D), domain-weighted per official ARDMS SPI Content Outline

Board-Review Questions

- 1.** Electrical leakage-current testing on ultrasound equipment is performed primarily to protect against:
 - A.** Improving overall image quality
 - B.** Increasing the transducer's frequency range
 - C.** Reducing acoustic output levels
 - D.** Electrical shock hazard to patients and staff

- 2.** Diagnostic ultrasound is classified as non-ionizing, which distinguishes it from imaging modalities such as X-ray or CT primarily because ultrasound:
 - A.** Does not carry enough photon energy to remove electrons from atoms
 - B.** Uses a completely different transducer material
 - C.** Cannot penetrate any tissue at all
 - D.** Requires no acoustic output monitoring whatsoever

- 3.** Battery-powered, wireless handheld transducers require electrical-safety testing that differs somewhat from that of cable-connected probes primarily because of the:
 - A.** Absence of any piezoelectric element
 - B.** A complete lack of any output monitoring
 - C.** Battery/wireless components introducing new failure modes
 - D.** An inability to be used for any exam

- 4.** A facility's system-failure downtime/contingency plan primarily addresses:
 - A.** How patient care continues if the system fails
 - B.** How to increase the operating frequency
 - C.** How to improve routine image quality
 - D.** How to schedule elective vacation time

5. A peer review program, in which sonographer or physician cases are randomly audited for accuracy, is intended primarily to:

- A. Replace the need for any initial credentialing
- B. Assign individual blame for every discrepancy found
- C. Eliminate the need for ongoing CME
- D. Support ongoing quality improvement through structured case review

6. A biohazard body-fluid spill in the scanning room should be cleaned according to a defined protocol primarily to:

- A. Increasing the room's turnover speed
- B. Improving equipment calibration overall
- C. Preventing exposure and transmission risk to others
- D. Satisfying billing documentation requirements

7. A single-use, disposable needle-guide bracket differs from a reusable one primarily in that the single-use version:

- A. Requires high-level disinfection between every patient
- B. Can be reprocessed indefinitely
- C. Is discarded after one patient use, avoiding reprocessing entirely
- D. Is never compatible with any biopsy procedure

8. When facility policy and a device's manufacturer Instructions for Use (IFU) appear to conflict on a disinfection detail, the generally controlling reference is:

- A. Whichever the sonographer personally prefers
- B. The manufacturer's IFU for that specific device
- C. An older policy version from a different facility
- D. No reference is controlling in this situation

9. Before using an endocavity probe cover, checking its printed expiration date is important because an expired cover may:

- A.** Always perform identically to a fresh one
- B.** Only affect resolution, not infection control
- C.** Never affect the seal integrity at all
- D.** Have degraded material integrity, compromising the barrier

10. When a patient declines a recommended exam or portion of an exam, appropriately documenting this as an informed refusal primarily serves to:

- A.** Automatically bill for the exam anyway
- B.** Eliminate informing the ordering physician
- C.** Substitute for the exam findings
- D.** Record the patient's informed, autonomous decision

11. For a suspected or confirmed aerosol-generating procedure performed near the airway, standard precautions are typically supplemented with:

- A.** No additional precautions of any kind
- B.** Airborne or droplet precautions per policy
- C.** Only a change in frequency
- D.** Disabling all monitoring equipment

12. Acoustic streaming refers to:

- A.** The reversible to-and-fro motion of tissue particles during a single cycle
- B.** A steady, unidirectional flow of fluid induced by the passage of an ultrasound beam
- C.** The reflection of sound at a tissue-air interface
- D.** The electronic steering of a phased array beam

13. Radiation force is the physical phenomenon in which:

- A.** A beam exerting a steady directional force
- B.** Tissue reflecting sound to the transducer
- C.** Two waves interfering constructively
- D.** An element depoling from heat

14. Transient (inertial) cavitation differs from stable cavitation in that transient cavitation involves:

- A.** Bubbles oscillating gently at fixed size
- B.** No bubble activity whatsoever
- C.** Violent bubble collapse generating high pressure
- D.** A purely thermal mechanism, no bubbles

15. For a given tissue, propagation speed of sound:

- A.** Increasing with transducer frequency
- B.** Independent of frequency, set by stiffness/density
- C.** Decreasing as frequency rises
- D.** Determined by the transducer's bandwidth

16. Speckle in an ultrasound image arises from coherent scattering, meaning the scattered wavelets:

- A.** Maintain a fixed phase relationship and interfere with one another
- B.** Arrive with entirely random, unrelated phases and simply add in amplitude
- C.** Originate from a single large reflector only
- D.** Are eliminated by the receive beamformer

17. A specular reflector, such as a smooth organ capsule, differs from a diffuse (rough) reflector in that a specular reflector:

- A.** Redirecting energy in one predictable direction
- B.** Scattering energy nearly equally in all directions
- C.** Always smaller than the wavelength
- D.** Never producing a detectable echo

18. The attenuation coefficient, typically expressed in dB/cm/MHz, describes:

- A.** The total attenuation for one exam
- B.** The beam's frequency at fixed depth
- C.** Propagation speed per unit frequency
- D.** Intensity loss rate per cm per MHz

19. The three-dimensional region defined by a system's axial, lateral, and elevational resolution at a given point is called the:

- A.** The Doppler sample volume
- B.** The transducer's focal zone
- C.** The beam's near zone
- D.** The resolution cell, or voxel

20. A transducer has a center frequency of 5 MHz and a bandwidth of 4 MHz. Its fractional bandwidth (bandwidth divided by center frequency, expressed as a percentage) is closest to:

- A.** 20%
- B.** 80%
- C.** 125%
- D.** 45%

21. The -6 dB beam width is commonly used to define the practical width of the ultrasound beam because it represents the points at which:

- A.** The beam has fully dissipated
- B.** Intensity has fallen to about half its peak
- C.** The beam first begins to diverge
- D.** The Curie point is reached

22. Insertion loss describes the reduction in signal amplitude that occurs when:

- A.** A transducer element depoles
- B.** Tissue attenuates the beam
- C.** A component is placed in the signal path
- D.** The PRF is set too high

23. Describing an ultrasound beam's shape in three dimensions requires considering its behavior along all of the following axes EXCEPT:

- A.** Axial
- B.** Lateral
- C.** Elevational
- D.** Temporal

24. A radiation force balance (power meter) measures a transducer's total acoustic output power by:

- A.** Counting the active elements
- B.** Measuring the force on a suspended target
- C.** Timing the repetition period
- D.** Analyzing the echo spectrum

25. In the Doppler equation, the cosine of the insonation angle appears because:

- A.** Converting frequency to wavelength

- B.** Accounting for beam-path attenuation
- C.** Extracting only the velocity component along the beam
- D.** Correcting for transducer bandwidth

26. A transducer has a center frequency of 4 MHz and a bandwidth of 2 MHz. Its Q-factor (center frequency divided by bandwidth) is:

- A.** 2
- B.** 0.5
- C.** 8
- D.** 6

27. The general diagnostic ultrasound frequency range used in clinical imaging is approximately:

- A.** 20 Hz to 20 kHz
- B.** 60 Hz to 1 MHz
- C.** 100 MHz to 1 GHz
- D.** 2 MHz to 15 MHz

28. A micro-convex transducer, smaller and more tightly curved than a standard curvilinear probe, is especially useful for:

- A.** Deep abdominal imaging in large adults
- B.** Standard adult cardiac imaging
- C.** Neonatal/pediatric imaging with a small footprint
- D.** Standard transrectal prostate imaging

29. An endfire endocavity probe directs its imaging plane from the tip of the probe, while a sidefire probe directs its imaging plane:

- A.** Also from the tip, identically

- B.** From the side, perpendicular to the axis
- C.** From both tip and side at once
- D.** Not a real design distinction

30. An 'acoustic window' refers to:

- A.** A site with minimal overlying bone or gas
- B.** A frequency range printed on the housing
- C.** The transducer's acoustic matching layer
- D.** A system software display setting

31. Over years of use, the adhesive bonding layers within a transducer's acoustic stack can degrade, most often resulting in:

- A.** An automatic increase in operating frequency
- B.** Improved bandwidth
- C.** Delamination and progressive loss of image quality
- D.** An intentional design feature requiring no concern

32. Corrosion or oxidation of a transducer connector's pins over time can lead to:

- A.** Improved electrical connection
- B.** Automatic self-cleaning
- C.** Increased operating frequency
- D.** Intermittent or complete connection failure

33. A multi-frequency, single-element (non-array) transducer achieves more than one usable frequency by:

- A.** Swapping the crystal physically

- B.** Using electronic beam steering
- C.** Requiring a separate housing per frequency
- D.** Incorporating two or more tuned crystal elements

34. Checking a transducer's face for flatness and full skin contact during scanning is important because:

- A.** Gaps introduce air, severely degrading the image
- B.** It changes the Curie point
- C.** It affects only Doppler, not grayscale
- D.** It has no measurable effect at all

35. Standard diagnostic transducer elements are typically designed to vibrate in the thickness mode, meaning the element's:

- A.** Length sets the resonant frequency
- B.** Width sets the resonant frequency
- C.** Thickness sets the resonant frequency
- D.** Color sets the resonant frequency

36. 'Virtual convex' imaging on a linear array uses software beam-steering to make the field of view appear:

- A.** Trapezoidal, wider at depth, like a curved array
- B.** Narrower at depth than standard linear
- C.** Identical to a true curvilinear footprint
- D.** Unusable for any clinical application

37. In a dedicated CW Doppler probe with two angled crystals, the fixed angle between the transmit and receive crystals:

- A.** Having no effect on the measured shift

- B.** Establishing a fixed, built-in insonation angle
- C.** Eliminating the need for depth information
- D.** Being adjustable by the operator in real time

38. Transcranial Doppler imaging typically uses a relatively low operating frequency (around 2 MHz) primarily because:

- A.** Lower frequency improves axial resolution more than higher frequency
- B.** Lower frequency experiences less attenuation, allowing penetration through the skull's acoustic window
- C.** Lower frequency eliminates the need for Doppler angle correction
- D.** The skull has no effect on ultrasound transmission at any frequency

39. Neonatal cranial ultrasound is performed through the anterior fontanelle using a small-footprint, relatively high-frequency probe primarily because:

- A.** The fontanelle is the only acoustic access site
- B.** Skull bone elsewhere has not yet formed
- C.** The open fontanelle gives an acoustic window
- D.** Lower frequencies are required in pediatrics

40. Before placing a third-party refurbished transducer into clinical service, verifying its performance against a phantom and confirming its acoustic output specifications is important because:

- A.** Refurbished probes may not match original specs
- B.** Refurbished probes never need QA testing
- C.** Only new probes can image diagnostically
- D.** Refurbishment always improves performance

41. During manufacturing, a piezoelectric ceramic element is 'poled' by applying a strong electric field, which:

- A.** Has no lasting effect on the material
- B.** Sets the operating frequency exclusively
- C.** Is identical to the Curie point
- D.** Aligns the material's internal dipoles consistently

42. Between transmitted pulses, a pulsed system spends most of its time listening for returning echoes; this listening interval is directly reflected in a:

- A.** A consistently high duty factor
- B.** A low duty factor, since transmit time is brief
- C.** A duty factor of exactly one
- D.** A duty factor that is simply irrelevant here

43. Transducer handle ergonomic design, such as a contoured pinch grip, is intended primarily to:

- A.** Reduce hand and wrist strain
- B.** Increase the operating frequency
- C.** Improve Doppler sensitivity
- D.** Reduce the need for QA testing

44. Each individual element in an array transducer is connected to the system's electronics via:

- A.** A single shared wire for the array
- B.** An individual conductor per element
- C.** A wireless connection instead
- D.** No electrical connection needed

45. Slightly repositioning or angling a transducer to find the clearest image of a target structure, sometimes called finding the 'sweet spot,' primarily compensates for:

- A.** A malfunctioning transducer
- B.** An incorrect system preset
- C.** Patient-specific acoustic window variation
- D.** A Doppler angle correction error

46. The grayscale reject control eliminates:

- A.** All echoes above a certain amplitude
- B.** Low-level noise and weak echoes below a set threshold
- C.** The entire color Doppler overlay
- D.** The transducer's operating frequency

47. The left-right image flip control changes:

- A.** The image's horizontal display orientation
- B.** The transducer's frequency
- C.** The vertical depth scale
- D.** The Doppler direction convention

48. Automated caliper measurement of liver span (craniocaudal length) on a sagittal image is used primarily to:

- A.** Calculating gallbladder volume
- B.** Assessing portal vein diameter
- C.** Grading hepatic steatosis
- D.** Screening for hepatomegaly against norms

49. Automated measurement of splenic length is the primary screening tool used to assess for:

- A.** Splenic enlargement

- B.** Portal vein thrombosis
- C.** A splenic artery aneurysm
- D.** Gallbladder wall thickening

50. An elastography quality or confidence indicator overlay is displayed to help the operator judge:

- A.** The patient's overall body mass index
- B.** Whether the measurement is technically reliable
- C.** The transducer's operating frequency
- D.** The current color gain setting

51. A contrast agent dose and injection-rate tracking display helps the operator:

- A.** Automatically diagnose a liver lesion
- B.** Monitor how much contrast was given
- C.** Eliminate the need for an order
- D.** Increase the frame rate

52. Automated ovarian volume calculation using the ellipsoid formula requires caliper measurement in:

- A.** Three orthogonal dimensions (length, width, height)
- B.** A single dimension only
- C.** Two dimensions only, in one plane
- D.** No caliper placement at all, fully automatic

53. Automated measurement of gallbladder wall thickness is used primarily to help assess for:

- A.** Common bile duct stones
- B.** Cholecystitis
- C.** Pancreatic duct dilation

D. Hepatic steatosis

54. An automated estimated fetal weight calculation combines several fetal biometric measurements, typically including biparietal diameter, head circumference, abdominal circumference, and:

A. Amniotic fluid index

B. Placental grade

C. Femur length

D. Nuchal translucency

55. In a linked biplane display, a cursor placed on one plane automatically:

A. Freezes only that single plane

B. Increases both planes' frame rate

C. Switches the system to 3D mode

D. Shows the location on the other plane

56. Switching a 3D volume's rendering mode from surface mode to transparent (maximum-intensity or minimum-intensity) mode changes:

A. The underlying acquired volume data

B. The transducer's frequency

C. The acquisition frame rate

D. How the data is visually displayed

57. Displaying elastography and B-mode grayscale images simultaneously, side by side or overlaid, allows the operator to:

A. Automatically calculate lesion volume

B. Directly correlate stiffness with location

C. Eliminate the need for a region of interest

D. Increase acquisition speed

58. Automated prostate volume calculation using the ellipsoid formula is clinically useful for, among other things:

- A. Diagnose prostatitis directly**
- B. Inform PSA density and monitor size**
- C. Measure bladder wall thickness**
- D. Grade hydronephrosis severity**

59. A real-time needle-tip confidence or visibility indicator is designed to help the operator:

- A. Recognize uncertain tip position during guidance**
- B. Automatically reposition the needle**
- C. Eliminate in-plane visualization needs**
- D. Increase the needle's echogenicity physically**

60. Tracking automated splenic length measurements across serial exams over time is most useful for:

- A. Diagnosing acute appendicitis**
- B. Monitoring interval change in spleen size**
- C. Grading gallbladder polyps**
- D. Assessing renal function**

61. A simultaneous 2D-plus-3D thumbnail preview display allows the operator to:

- A. Automatically switch to Doppler mode**
- B. Monitor 2D while previewing the 3D volume**
- C. Eliminate the need for 2D imaging**
- D. Increase the 3D frame rate**

62. A structured measurement worksheet that automatically flags a value falling outside the expected normal range is intended to:

- A.** Draw attention to a potential abnormal finding
- B.** Automatically finalize the diagnosis
- C.** Replace physician interpretation entirely
- D.** Eliminate the need for accuracy

63. Synchronized cine playback of a stored grayscale loop alongside its corresponding Doppler spectral trace allows the operator to:

- A.** Correlate an anatomic frame with the waveform
- B.** Automatically calculate the RI
- C.** Increase the PRF retroactively
- D.** Eliminate angle correction needs

64. A 'smart' TGC curve auto-suggestion feature analyzes the current image and proposes an adjusted TGC curve primarily to:

- A.** Permanently lock the TGC
- B.** Reduce time to optimize brightness manually
- C.** Increase the transducer's frequency
- D.** Eliminate the need for gain adjustment

65. Automated measurement of carotid intima-media thickness (IMT) is used as a marker of:

- A.** Overall atherosclerotic risk, independent of plaque
- B.** An acute carotid dissection specifically
- C.** The size of a carotid body tumor
- D.** Internal jugular vein thrombosis

66. Tomographic ultrasound imaging (TUI) displays a 3D volume as:

- A.** A single two-dimensional plane only
- B.** Multiple parallel slices, as in CT/MRI review
- C.** A single rendered three-dimensional surface
- D.** An audio waveform display only

67. Automated measurement of endometrial thickness on a midline sagittal uterine image is commonly used in the evaluation of:

- A.** Postmenopausal bleeding
- B.** Ovarian torsion
- C.** Ectopic pregnancy location
- D.** Fallopian tube patency

68. A system supporting rapid switching between two connected transducers without physically unplugging either one is primarily useful for:

- A.** Automatically increase frame rate
- B.** Eliminate the need for presets
- C.** Quickly change exam types during the visit
- D.** Improve axial resolution

69. Contrast-enhanced ultrasound perfusion quantification software analyzes the contrast time-intensity curve to derive parameters such as:

- A.** Doppler angle correction values
- B.** Wash-in rate, peak, and wash-out rate
- C.** Axial resolution alone
- D.** Transducer bandwidth alone

70. Serial automated tracking of abdominal aortic diameter across follow-up exams is used primarily to monitor:

- A.** Renal artery stenosis
- B.** A known aneurysm's growth rate over time
- C.** Gallbladder wall thickness
- D.** Hepatic vein waveform pattern

71. A real-time on-screen indicator showing the selected needle-guide angle, distinct from the overlay line itself, helps the operator:

- A.** Automatically increase frame rate
- B.** Eliminate the need for the overlay line
- C.** Increase needle visibility physically
- D.** Confirm which guide angle is active

72. An automated TI-RADS-style scoring tool applied to a thyroid nodule combines several sonographic features to:

- A.** Diagnose malignancy with certainty
- B.** Replace the need for any biopsy
- C.** Generate a structured risk category
- D.** Measure the resistive index

73. Automated detection and confirmation of a true apical 4-chamber cardiac view is intended to help ensure:

- A.** An increase in frame rate
- B.** Elimination of the need for Doppler
- C.** A standardized, reproducible view for measurement
- D.** Automatic ejection fraction calculation

74. A structured ultrasound report that automatically exports key measurements directly into the patient's electronic health record primarily reduces:

- A.** Manual transcription errors and duplicate data entry
- B.** The need for physician interpretation
- C.** The need for image storage space
- D.** The system's overall frame rate

75. An automated tool that calculates estimated percent carotid stenosis directly from measured peak systolic and end diastolic velocities is intended to:

- A.** Replace the need for velocity data
- B.** Eliminate observer variability
- C.** Function without velocity data
- D.** Apply established criteria consistently

76. During extended field-of-view acquisition, a real-time stitching quality indicator alerts the operator when:

- A.** The exam has simply reached completion
- B.** Motion or technique is degrading the stitch
- C.** The transducer frequency has changed
- D.** TGC settings need adjustment

77. In acute cholecystitis, color Doppler of the gallbladder wall characteristically shows:

- A.** Complete absence of any detectable flow
- B.** Flow identical to the normal, uninflamed gallbladder wall
- C.** Flow only within the gallbladder lumen, never the wall
- D.** Increased wall vascularity (hyperemia) corresponding to inflammation

78. Doppler assessment of an incidentally discovered adrenal mass is used, along with grayscale features and size, to help suggest:

- A.** The patient's exact cortisol level
- B.** Overall renal function alone
- C.** Overall hepatic synthetic function
- D.** A benign versus concerning appearance

79. Renal cell carcinoma classically demonstrates, compared with a simple renal cyst:

- A.** A complete absence of internal flow
- B.** Internal vascularity distinguishing it from a cyst
- C.** Flow confined only to the capsule
- D.** Flow identical to an angiomyolipoma

80. A classic hepatic hemangioma is often relatively avascular or shows only minimal peripheral flow on conventional Doppler because:

- A.** Hemangiomas contain no vascular channels
- B.** Hemangiomas are always malignant
- C.** Hemangiomas require CT for assessment
- D.** Channel flow is too slow to detect

81. A stellate, centrally radiating vascular pattern seen on Doppler within a hepatic lesion, extending outward from a central scar, is classically described as the:

- A.** The spoke-wheel pattern of FNH
- B.** The whirlpool sign of torsion
- C.** The yin-yang sign of pseudoaneurysm
- D.** The halo sign of vasculitis

82. A solid intratesticular mass demonstrating increased internal vascularity compared with the surrounding normal testicular parenchyma raises concern for:

- A.** A simple, benign epididymal cyst
- B.** A simple, benign hydrocele
- C.** A testicular tumor, such as seminoma
- D.** Simply normal testicular anatomy

83. An ovarian dermoid (mature cystic teratoma) is typically:

- A.** Highly vascular, like a malignancy
- B.** Largely avascular, aside from any solid nodule
- C.** Associated with reversed uterine flow
- D.** Indistinguishable from torsion on Doppler

84. An endometrioma ('chocolate cyst') typically shows internal low-level echoes with no significant internal Doppler flow, helping distinguish it from:

- A.** A vascular ovarian neoplasm, which shows flow
- B.** A simple ovarian cyst, also lacking flow
- C.** A corpus luteal cyst, also lacking flow
- D.** Normal ovarian stromal tissue

85. Diffuse myometrial vascularity on Doppler, in a uterus with heterogeneous myometrial echotexture and poorly defined endometrial-myometrial junction, supports a diagnosis of:

- A.** A discrete fibroid
- B.** An endometrial polyp
- C.** Cervical stenosis
- D.** Adenomyosis

86. Doppler findings supporting placenta accreta spectrum include turbulent vascular lakes within the placenta and:

- A.** Absence of placental vascularity
- B.** Reversed umbilical artery flow only
- C.** Hypervascularity at the uteroplacental interface
- D.** A normal, well-defined clear space

87. Vasa previa refers to fetal vessels that:

- A.** Are located entirely within the placental substance, away from the cervix
- B.** Supply the placenta from the umbilical cord insertion only
- C.** Run unprotected across or near the internal cervical os, at risk of rupture during labor
- D.** Are a normal variant requiring no monitoring

88. A single umbilical artery, identified by demonstrating only one artery alongside the umbilical vein on color Doppler of the cord, is associated with:

- A.** No increased risk of any kind
- B.** A guaranteed normal outcome
- C.** A diagnosis only made after delivery
- D.** An increased association with other anomalies

89. Doppler evidence of premature fetal ductus arteriosus constriction, showing elevated velocity and reduced pulsatility across the ductus, has been associated with maternal use of:

- A.** Prenatal vitamins
- B.** Third-trimester NSAID use
- C.** Any-dose acetaminophen
- D.** Routine iron supplementation

90. The cerebroplacental ratio, calculated as the MCA pulsatility index divided by the umbilical artery pulsatility index, is used to help assess:

- A.** Fetal well-being and brain flow redistribution
- B.** The mother's overall cardiac output
- C.** The placenta's exact anatomic location
- D.** The developing fetus's biological sex

91. Estimating pulmonary artery systolic pressure noninvasively from the peak velocity of a tricuspid regurgitant jet relies on applying the:

- A.** Simply the continuity equation
- B.** The modified Bernoulli equation, plus RA pressure
- C.** The Doppler shift equation, unmodified
- D.** Simply the resistive index formula

92. Doppler assessment of mitral regurgitation severity considers features such as jet area, vena contracta width, and:

- A.** Left atrial size, with no Doppler
- B.** Mitral annular calcification alone
- C.** Pulmonary vein systolic flow reversal
- D.** The aortic valve gradient

93. Holodiastolic flow reversal in the descending thoracic aorta on Doppler is a supportive sign of:

- A.** Significant aortic regurgitation
- B.** Mitral stenosis
- C.** Tricuspid regurgitation
- D.** A normal finding in most healthy adults

94. A saline contrast (bubble) study with Doppler/color assessment of the interatrial septum is used to evaluate for:

- A.** Aortic coarctation
- B.** Mitral valve prolapse
- C.** Pulmonary embolism directly
- D.** A right-to-left shunt

95. A persistent left superior vena cava, a congenital venous variant, is most often identified incidentally by:

- A.** An absence of right atrial flow
- B.** A dilated coronary sinus draining the vein
- C.** Reversed pulmonary vein flow pattern
- D.** Significant tricuspid regurgitation

96. A hypervascular mass splaying apart the internal and external carotid arteries at the carotid bifurcation is classic for a:

- A.** A carotid body tumor
- B.** A reactive lymph node
- C.** A thyroid nodule
- D.** A branchial cleft cyst

97. Popliteal artery entrapment syndrome, typically affecting younger, athletic patients, is characterized by:

- A.** Abnormalities present at rest, unchanged
- B.** A fixed, permanent resting occlusion
- C.** Positional compromise with ankle maneuvers
- D.** Abnormalities isolated to the vein

- 98.** Splenic vein thrombosis, often associated with pancreatic pathology, is diagnosed by demonstrating:
- A.** An echogenic thrombus with absent vein flow
 - B.** Increased velocity throughout the portal system
 - C.** Reversed hepatic artery flow
 - D.** A normal vein with splenomegaly only
- 99.** In portal hypertension, dilated, tortuous vessels near the gastroesophageal junction with flow through a dilated coronary (left gastric) vein represent:
- A.** A normal gastric vascular pattern
 - B.** A portosystemic collateral pathway
 - C.** A gastric malignancy present
 - D.** Acute gastritis alone
- 100.** Doppler surveillance of a TIPS (transjugular intrahepatic portosystemic shunt) primarily monitors for:
- A.** Shunt stenosis using velocity criteria
 - B.** Hepatic artery aneurysm formation
 - C.** Gallbladder wall thickening instead
 - D.** Renal transplant rejection instead
- 101.** A pulsatile, anechoic to complex structure near the porta hepatis demonstrating a 'yin-yang' swirling flow pattern on color Doppler and arterial waveform on spectral Doppler most likely represents a:
- A.** Simple hepatic cyst
 - B.** Portal vein thrombus
 - C.** Hepatic artery aneurysm
 - D.** Dilated common bile duct

102. The renal-to-aortic ratio (RAR), comparing peak systolic velocity in the renal artery to that in the adjacent aorta, is used as one criterion to help diagnose:

- A.** Renal vein thrombosis
- B.** Renal transplant rejection
- C.** Main renal artery stenosis
- D.** Polycystic kidney disease

103. Fibromuscular dysplasia affecting the renal artery classically produces which angiographic/Doppler appearance, distinct from typical atherosclerotic stenosis?

- A.** A smooth, tapered narrowing near origin
- B.** A 'string of beads' pattern of stenoses
- C.** Complete arterial occlusion
- D.** A finding limited to elderly patients

104. An accessory (duplicated) renal artery, a normal anatomic variant, should be considered when:

- A.** More than one artery supplying one kidney
- B.** Velocities always symmetric bilaterally
- C.** The renal vein being duplicated
- D.** Always indicating renal artery stenosis

105. A psoas abscess may demonstrate peripheral rim hyperemia on color Doppler, similar in principle to:

- A.** A simple, benign renal cyst
- B.** A normal, healthy psoas muscle
- C.** Other abscesses, such as tubo-ovarian
- D.** A simple, benign lipoma

106. Subacromial-subdeltoid bursitis, when inflamed, may show on Doppler:

- A.** Complete absence of flow always
- B.** Flow identical to the tendon
- C.** Increased signal within the inflamed bursa
- D.** Flow only in the bone

107. In carpal tunnel syndrome, Doppler assessment of the median nerve may show increased intraneural vascularity, which corresponds to:

- A.** Nerve irritation from the compressive process
- B.** Simply normal median nerve physiology
- C.** An unrelated tendon rupture
- D.** A ganglion cyst located elsewhere

108. De Quervain's tenosynovitis, involving the first dorsal extensor compartment tendons, may show on Doppler:

- A.** Increased vascularity from active inflammation
- B.** Complete absence of the tendon
- C.** Flow identical to an asymptomatic wrist
- D.** A finding limited to flexor tendons

109. A patient's renal artery peak systolic velocity is 200 cm/s, and the adjacent aortic peak systolic velocity is 50 cm/s. The renal-to-aortic ratio (RAR) is:

- A.** A ratio of 0.25
- B.** A ratio of 2
- C.** A ratio of 1
- D.** A ratio of 4

110. A trauma patient's FAST-adjacent Doppler exam shows absent flow in a segmental branch of the splenic artery with an adjacent hypoechoic parenchymal defect on grayscale. This pattern is most consistent with:

- A.** A splenic laceration with vascular injury
- B.** A normal splenic hilum
- C.** A splenic artery aneurysm
- D.** Chronic infarction from sickle cell disease

Answers

1. D. Leakage-current testing verifies that electrical equipment does not pose a shock hazard to patients or staff, a routine electrical-safety check distinct from acoustic output, image quality, or frequency considerations.

2. A. Ionizing radiation (such as X-rays) carries enough photon energy to strip electrons from atoms, causing ionization; diagnostic ultrasound uses mechanical acoustic energy well below this threshold, which is why it is classified as non-ionizing.

3. C. Battery and wireless charging systems introduce electrical-safety considerations (such as battery failure modes and charging-related risks) distinct from those of a cable-connected probe, requiring testing tailored to these added components.

4. A. A downtime/contingency plan specifically addresses how patient care and workflow continue when the primary system is unexpectedly unavailable, a business-continuity and safety consideration unrelated to frequency or scheduling.

5. D. Peer review programs use structured, often blinded case review to identify patterns and opportunities for improvement across a group, supporting ongoing quality improvement rather than serving as a tool for individual blame or replacing credentialing/CME.

6. C. A defined spill-cleanup protocol ensures body fluid is handled and disinfected in a way that minimizes exposure risk to staff and contamination risk to subsequent patients, an infection-control rather than administrative concern.

7. C. A single-use needle-guide bracket is intended for one patient and then discarded, avoiding the reprocessing/high-level disinfection cycle required for a reusable bracket.

8. B. When a conflict arises, the device manufacturer's IFU is generally treated as the controlling technical reference for that specific device, since it reflects testing and validation performed by the manufacturer for that product.

- 9. D.** An expired probe cover may have degraded material properties (such as reduced elasticity or barrier strength), compromising the infection-control seal it is meant to provide, regardless of its outward appearance.
- 10. D.** Documenting informed refusal creates a record that the patient was appropriately informed of the recommendation and its rationale, and made an autonomous decision to decline, which is a communication and documentation safeguard, not a substitute for clinical findings.
- 11. B.** Aerosol-generating procedures near the airway typically warrant additional airborne or droplet precautions layered on top of standard precautions, per facility infection-control policy, given the added transmission risk of aerosolized particles.
- 12. B.** Acoustic streaming describes a steady, one-directional bulk fluid flow induced by the passage of the ultrasound beam, distinct from the reversible particle oscillation of the wave itself, simple reflection, or electronic beam steering.
- 13. A.** As an ultrasound beam propagates through tissue, momentum transfer from the wave to the medium produces a net, steady force in the direction of beam travel, a phenomenon exploited in techniques like radiation force balance measurement and ARFI elastography.
- 14. C.** Transient (inertial) cavitation involves bubbles growing and then violently collapsing, generating brief but intense localized pressure and temperature spikes, in contrast to stable cavitation's gentler, sustained oscillation around an equilibrium size.
- 15. B.** Propagation speed in a given tissue is set by that tissue's stiffness and density and does not meaningfully change with the operating frequency of the transducer used to image it.
- 16. A.** Speckle arises because scattered wavelets from sub-resolution scatterers maintain a consistent phase relationship (coherence) as they combine, producing the characteristic constructive/destructive interference pattern rather than simple random amplitude summation.
- 17. A.** A specular reflector, being smooth and large relative to the wavelength, reflects most of its energy in a single direction determined by the angle of incidence (like a mirror), unlike a diffuse reflector, which scatters energy broadly in many directions.
- 18. D.** The attenuation coefficient is a rate, expressed per centimeter of path length and per megahertz of frequency, describing how quickly intensity is lost with distance for a given tissue -- distinct from a single exam's total attenuation value.
- 19. D.** The resolution cell (or voxel) is the smallest 3D volume the system can resolve at a given point, combining axial, lateral, and elevational resolution together, distinct from the sample volume (a Doppler-specific gating region), focal zone, or near zone.
- 20. B.** Fractional bandwidth = (bandwidth / center frequency) x 100% = (4 MHz / 5 MHz) x 100% = 80%.

- 21. B.** The -6 dB points on the beam profile correspond to where intensity has dropped to about half its peak (on-axis) value, providing a standardized, practical definition of beam width.
- 22. C.** Insertion loss specifically refers to signal loss introduced by inserting a component, such as a cable or connector, into the transmission path, distinct from tissue attenuation, element depoling, or PRF-related effects.
- 23. D.** A beam's 3D shape is described by its behavior along the axial, lateral, and elevational axes; temporal is a separate dimension (time-related, as in frame rate) rather than one of the beam's spatial shape axes.
- 24. B.** A radiation force balance directly measures the physical force (via a suspended absorbing or reflecting target) that the acoustic beam exerts, from which total radiated power can be calculated -- a direct physical measurement rather than an electronic or spectral analysis.
- 25. C.** Only the component of blood flow velocity that is parallel to (along) the ultrasound beam's axis contributes to the detected Doppler frequency shift; the cosine term mathematically extracts that parallel component from the true 3D velocity vector.
- 26. A.** $Q\text{-factor} = \text{center frequency} / \text{bandwidth} = 4 \text{ MHz} / 2 \text{ MHz} = 2$.
- 27. D.** Clinical diagnostic ultrasound imaging generally operates in the approximate range of 2 to 15 MHz, balancing penetration and resolution needs across different applications, well outside the audible or radio-frequency ranges listed in the other options.
- 28. C.** A micro-convex probe's smaller radius of curvature and compact footprint make it well suited to the limited acoustic windows and smaller body habitus encountered in neonatal and pediatric imaging, while still providing a useably wide field of view.
- 29. B.** A sidefire probe images from the side of its shaft, perpendicular to the long axis of insertion, which is useful for certain guided procedures, in contrast to an endfire probe's tip-directed imaging plane.
- 30. A.** An acoustic window is an anatomic location, such as a rib interspace or an organ free of overlying bowel gas, where sound can reach the target structure with minimal obstruction, a concept distinct from any specific frequency, matching layer, or display setting.
- 31. C.** Adhesive bonding layers holding the acoustic stack together can weaken or separate (delaminate) with age and use, progressively degrading image quality as the layers no longer transmit energy as efficiently or uniformly as when new.
- 32. D.** Corroded or oxidized connector pins degrade electrical contact quality, which can manifest as intermittent signal dropout during scanning or, if severe enough, complete failure of the connection.

- 33. D.** A multi-frequency single-element probe typically contains two or more separate crystal elements, each tuned to a different frequency, allowing the operator to select among them within a single probe housing without swapping physical probes.
- 34. A.** Even a small air gap at the transducer-skin interface, from poor contact or an uneven probe face, severely attenuates the beam because of the extreme impedance mismatch between tissue and air, degrading image quality across the entire field, not just Doppler.
- 35. C.** In the thickness (longitudinal) vibration mode used by standard diagnostic elements, the crystal's thickness dimension, measured along the direction of sound propagation, sets the resonant frequency; a thinner element resonates at a higher frequency.
- 36. A.** Virtual convex mode uses electronic beam steering across a linear array to synthesize a trapezoidal, wider-at-depth field of view resembling that of a curved array, without any change to the array's actual physical (straight) geometry.
- 37. B.** Because the transmit and receive crystals in this design are mounted at a fixed physical angle to each other and to the target vessel's expected orientation, the probe's geometry itself establishes a known, built-in angle of insonation for the Doppler calculation.
- 38. B.** Lower frequency is attenuated less by the dense temporal bone, allowing enough of the beam to penetrate the skull's thin acoustic window and interrogate the intracranial vessels, which a higher, more heavily attenuated frequency could not achieve as effectively.
- 39. C.** The anterior fontanelle remains unossified for months after birth, providing a genuine acoustic window into the brain that is otherwise blocked by the ossified skull; because the neonatal brain is superficial and small, a relatively higher frequency can be used for improved resolution without penetration being a limiting factor.
- 40. A.** Because refurbishment processes and quality vary, a refurbished probe's actual acoustic output and performance may differ from its original specification unless independently re-verified against a phantom and calibration standard before clinical use.
- 41. D.** Poling aligns the randomly oriented internal dipoles within the ceramic material in a consistent direction, which is what gives the material its usable piezoelectric (electromechanical conversion) properties in the first place; without poling, the material would not function as a transducer element.
- 42. B.** Because the transmit pulse itself occupies only a small fraction of the total pulse repetition period, with the remainder spent listening for echoes, pulsed systems inherently operate at a low duty factor, in contrast to continuous-wave systems, which have a duty factor of 1.
- 43. A.** Ergonomic handle features are designed to distribute grip forces more comfortably and reduce repetitive strain on the hand and wrist during the long scanning sessions sonographers routinely perform, unrelated to frequency, Doppler sensitivity, or QA needs.

- 44. B.** Each element (or small subgroup) requires its own independent electrical pathway, typically a fine conductor or flex-circuit trace, so that the system can drive and read each one separately, which is what makes electronic beam steering and focusing possible.
- 45. C.** Every patient has individually variable acoustic windows shaped by body habitus, bowel gas, rib position, and other overlying tissue; small adjustments in transducer position or angle let the operator find the path that best avoids these patient-specific obstacles.
- 46. B.** The reject control sets a threshold below which weak signals (often representing low-level noise rather than genuine tissue echoes) are excluded from the display, cleaning up the image without removing genuine higher-amplitude echo information.
- 47. A.** The left-right flip control simply mirrors how the already-acquired image is displayed on screen for orientation purposes; it does not alter the transducer's frequency, the depth scale, or any Doppler-related settings.
- 48. D.** Liver span measurement provides an objective size metric compared against established normal ranges, making it the standard tool for screening for hepatomegaly, distinct from gallbladder, portal vein, or steatosis-specific assessments.
- 49. A.** Splenic length is the standard, widely used metric for screening for splenomegaly, an enlarged spleen, rather than for vascular, wall-thickness, or other unrelated findings.
- 50. B.** A quality/confidence indicator helps the operator judge whether the acquisition conditions (such as adequate compression consistency or minimal motion) were suitable for a technically reliable elastography measurement, rather than reflecting patient body habitus directly or unrelated system settings.
- 51. B.** Tracking contrast dose and injection rate provides documentation and monitoring of how much agent has been administered and how quickly, supporting both safety and reproducibility, rather than performing diagnosis or replacing the physician order.
- 52. A.** The ellipsoid volume formula requires three orthogonal caliper measurements (length, width or anteroposterior, and height) to approximate the ovary's volume, the same general approach used for other organ volume estimates.
- 53. B.** Gallbladder wall thickening is a key sonographic criterion supporting a diagnosis of cholecystitis, distinct from CBD stone assessment, pancreatic duct measurement, or hepatic steatosis grading, which use different findings.
- 54. C.** Standard estimated fetal weight formulas (such as Hadlock-based methods) combine biparietal diameter, head circumference, abdominal circumference, and femur length, the core set of fetal biometric parameters, rather than amniotic fluid index, placental grade, or nuchal translucency.

- 55. D.** A linked biplane cursor lets the operator identify a point on one imaging plane and immediately see the corresponding anatomic location displayed on the simultaneously acquired second plane, aiding spatial correlation between the two views.
- 56. D.** Changing the rendering mode does not reacquire or alter the underlying volumetric data already captured; it only changes how that same dataset is visually processed and displayed (surface detail versus transparency-based intensity projection).
- 57. B.** Viewing elastography and B-mode together lets the operator directly map stiffness findings onto the corresponding anatomic structure seen on grayscale, improving spatial correlation rather than performing an automatic volume calculation.
- 58. B.** Prostate volume, alongside a measured PSA value, is used to calculate PSA density, a clinically useful risk-stratification metric, and serial volume measurements also help track gland size change over time, distinct from bladder, hydronephrosis, or direct prostatitis diagnosis.
- 59. A.** A needle-tip confidence indicator flags situations where the displayed bright reflector may not reliably represent the true needle tip position (such as with steep angles or reverberation), prompting the operator to verify placement rather than assume accuracy.
- 60. B.** Serial splenic length tracking over time is used to monitor interval growth or regression in conditions affecting spleen size, such as certain hematologic or infectious processes, rather than for unrelated diagnoses like appendicitis.
- 61. B.** A simultaneous 2D-plus-3D preview lets the operator continue to monitor the familiar 2D image for guidance and quality while the 3D volume is being acquired in the background, rather than requiring the operator to work blind during acquisition.
- 62. A.** An automatic out-of-range flag is a workflow aid meant to draw attention to a value that may warrant closer review, supporting rather than replacing the sonographer's and physician's own judgment and interpretation.
- 63. A.** Synchronized playback lets the operator step through the grayscale cine loop while simultaneously seeing exactly which point on the corresponding Doppler waveform trace lines up with each frame, aiding correlation between anatomy and hemodynamic timing.
- 64. B.** An auto-suggested TGC curve gives the operator a data-driven starting point for brightness uniformity, reducing the manual trial-and-error time needed to optimize the curve by hand, without permanently locking settings or eliminating operator control.
- 65. A.** Carotid IMT reflects a generalized measure of early atherosclerotic change in the vessel wall itself, used as a cardiovascular risk marker independent of whether a discrete focal plaque is also present.

- 66. B.** TUI presents a series of parallel 2D slices extracted from a 3D volume, displayed together for systematic review, conceptually similar to how CT or MRI slices are reviewed, rather than showing a single plane or a single rendered surface.
- 67. A.** Endometrial thickness measurement is a standard, well-established tool in the work-up of postmenopausal bleeding, helping stratify risk for endometrial pathology, distinct from its role (or lack thereof) in torsion, ectopic pregnancy, or tubal patency assessment.
- 68. C.** Rapid dual-transducer switching lets a sonographer move quickly between two different probe types or exam purposes on the same patient without the delay and disruption of physically disconnecting and reconnecting a probe.
- 69. B.** Perfusion quantification software analyzes how contrast signal intensity rises and falls over time within a region of interest, deriving parameters like wash-in rate, peak intensity, and wash-out rate that characterize the lesion's or tissue's perfusion pattern.
- 70. B.** Serial aortic diameter tracking is the standard method for monitoring a known abdominal aortic aneurysm's growth rate over time, informing decisions about surveillance interval or intervention threshold.
- 71. D.** Displaying the currently active guide angle explicitly helps the operator confirm, before starting a needle pass, that the correct one of potentially several available preset angles has been selected on a multi-angle guide bracket.
- 72. C.** A TI-RADS-style tool combines multiple sonographic features (composition, echogenicity, shape, margin, echogenic foci) into a structured point score that maps to a risk category, guiding management decisions rather than providing a certain diagnosis or replacing biopsy outright.
- 73. C.** Confirming a true, standardized 4-chamber view before certain measurements are taken helps ensure those measurements are obtained from a reproducible, correctly oriented plane, supporting measurement consistency rather than directly increasing frame rate or calculating EF on its own.
- 74. A.** Automatically populating structured measurements directly into the EHR reduces the need for manual re-entry of the same data, which is a common source of transcription errors and duplicate work.
- 75. D.** Automated percent-stenosis calculation applies established velocity-based diagnostic criteria consistently from the measured PSV/EDV values, reducing manual calculation error, though it still fundamentally depends on accurate underlying velocity measurements rather than replacing them.
- 76. B.** A stitching quality indicator monitors the panoramic reconstruction process in real time and alerts the operator when technique issues, such as uneven sweep speed or motion, are compromising the quality of the resulting composite image.

- 77. D.** Inflammation of the gallbladder wall in acute cholecystitis characteristically produces increased wall vascularity (hyperemia) on color Doppler, a supportive finding alongside grayscale features like wall thickening and pericholecystic fluid.
- 78. D.** Doppler vascularity pattern, combined with grayscale features like size, homogeneity, and growth on follow-up, contributes to an overall impression of whether an adrenal mass is more likely benign or concerning, rather than directly measuring hormone levels or unrelated organ function.
- 79. B.** The presence of internal vascularity within a solid component is a key feature distinguishing renal cell carcinoma from a simple, entirely avascular renal cyst, helping guide further work-up of a renal mass.
- 80. D.** Blood flow within a hemangioma's vascular channels is often very slow, falling below the velocity sensitivity of standard Doppler settings, which is why classic hemangiomas can appear relatively avascular on conventional color Doppler despite being vascular lesions.
- 81. A.** The spoke-wheel vascular pattern, vessels radiating outward from a central feeding vessel near a central scar, is a classic though not universally present Doppler feature described in focal nodular hyperplasia.
- 82. C.** Increased internal vascularity within a solid testicular mass, compared with normal surrounding parenchyma, is a concerning feature raising suspicion for a testicular tumor such as seminoma, distinct from avascular or fluid-filled benign entities.
- 83. B.** Because a dermoid is predominantly composed of fat and other non-vascular tissue, it typically shows little to no significant internal Doppler flow, aside from possible minimal flow related to a solid mural (Rokitansky) nodule if present.
- 84. A.** The absence of internal flow in a classic endometrioma helps distinguish it from a vascular ovarian neoplasm, which would be expected to show internal Doppler flow within its solid or septal components.
- 85. D.** Diffuse myometrial vascularity together with heterogeneous echotexture and an indistinct endometrial-myometrial junction is a characteristic Doppler and grayscale pattern supporting adenomyosis, as opposed to the more discrete, well-defined appearance of a fibroid or polyp.
- 86. C.** Marked hypervascularity at the interface between the placenta and myometrium/bladder, sometimes with vessels bridging into the bladder wall, is a Doppler feature supporting placenta accreta spectrum, alongside grayscale findings like vascular lakes.
- 87. C.** Vasa previa specifically describes fetal vessels running unprotected across or very near the internal cervical os, placing them at risk of rupture with membrane rupture or cervical change during labor, a distinct and dangerous variant of vessel course.

- 88. D.** A single umbilical artery carries an increased association with other congenital anomalies, which is why its identification prompts a more detailed anatomic survey rather than being dismissed as an isolated, inconsequential finding.
- 89. B.** NSAID exposure, particularly in the third trimester, has been associated with premature constriction of the fetal ductus arteriosus, detectable on Doppler as elevated velocity and reduced pulsatility across the ductal flow.
- 90. A.** The cerebroplacental ratio integrates cerebral and umbilical artery Doppler indices to assess whether blood flow redistribution favoring the fetal brain ('brain-sparing') is occurring, an important indicator of fetal well-being in growth-restricted pregnancies.
- 91. B.** The modified Bernoulli equation converts the peak tricuspid regurgitant jet velocity into an estimated pressure gradient across the tricuspid valve; adding an assumed or measured right atrial pressure to that gradient yields the estimated pulmonary artery systolic pressure.
- 92. C.** Systolic flow reversal in the pulmonary veins is a specific supportive sign of severe mitral regurgitation, used alongside jet area and vena contracta width as part of a comprehensive severity assessment.
- 93. A.** Reversed flow throughout diastole in the descending aorta reflects blood regurgitating backward through an incompetent aortic valve during diastole, a recognized supportive Doppler sign of significant aortic regurgitation.
- 94. D.** Agitated saline bubble studies are specifically used to detect a right-to-left shunt, such as through a patent foramen ovale, by observing bubbles crossing from the right to left atrium, which would not normally occur.
- 95. B.** A persistent left SVC typically drains into the coronary sinus, causing it to appear dilated on echocardiography, with Doppler confirming flow from the anomalous left-sided vein -- an incidental finding rather than a symptomatic presentation in most cases.
- 96. A.** A carotid body tumor's characteristic location at the carotid bifurcation, splaying the ICA and ECA apart, combined with its hypervascular appearance on Doppler, is a classic and distinctive presentation compared with other neck masses.
- 97. C.** Popliteal artery entrapment is a positional, dynamic condition; the diagnostic hallmark is reproducing flow compromise with active ankle maneuvers (such as plantarflexion or dorsiflexion) while the resting exam may appear entirely normal.
- 98. A.** Direct visualization of echogenic thrombus filling the splenic vein lumen with absent flow on Doppler confirms splenic vein thrombosis, often occurring in the setting of adjacent pancreatic inflammation or malignancy.

- 99. B.** Dilation of the coronary (left gastric) vein with flow feeding gastroesophageal varices represents a recognized portosystemic collateral pathway that develops in the setting of portal hypertension.
- 100. A.** TIPS surveillance uses established Doppler velocity criteria measured within the shunt to detect developing stenosis or occlusion before the shunt fails clinically, the primary purpose of routine post-procedure follow-up.
- 101. C.** A porta hepatis lesion showing a swirling 'yin-yang' color pattern with an arterial spectral waveform is characteristic of a pseudoaneurysm/aneurysm arising from the hepatic artery, distinguishing it from a simple cyst, thrombus, or dilated duct.
- 102. C.** The RAR compares renal artery velocity to a reference aortic velocity and is one of the established Doppler criteria used, alongside direct renal artery velocity, to help diagnose significant main renal artery stenosis.
- 103. B.** Fibromuscular dysplasia classically produces a 'string of beads' appearance of alternating areas of stenosis and dilation, typically affecting the mid-to-distal renal artery, a pattern distinct from the more proximal, smoother narrowing typical of atherosclerotic disease.
- 104. A.** Identifying more than one distinct artery supplying a single kidney on Doppler survey is the sonographic clue to an accessory (duplicated) renal artery, a common and usually clinically insignificant anatomic variant.
- 105. C.** Like abscesses elsewhere in the body, a psoas abscess can show peripheral rim hyperemia on color Doppler as part of the surrounding inflammatory response, a nonspecific but supportive finding consistent with an abscess rather than a benign cystic or fatty lesion.
- 106. C.** Active inflammation of the subacromial-subdeltoid bursa is associated with increased power Doppler signal within the distended bursal fluid, reflecting the hyperemic inflammatory response.
- 107. A.** Increased intraneural vascularity on Doppler in a compressed median nerve reflects the inflammatory/irritative response to chronic compression within the carpal tunnel, a supportive finding alongside nerve cross-sectional area measurement.
- 108. A.** Active tenosynovitis in De Quervain's disease is associated with increased peritendinous Doppler signal reflecting inflammation around the affected first dorsal compartment tendons, alongside grayscale findings like tendon sheath thickening.
- 109. D.** $RAR = \text{renal artery PSV} / \text{aortic PSV} = 200 \text{ cm/s} / 50 \text{ cm/s} = 4.$
- 110. A.** Absent flow in a segmental splenic artery branch corresponding to a hypoechoic parenchymal defect in a trauma patient is consistent with a traumatic laceration causing vascular injury and a devascularized (non-perfused) segment of splenic parenchyma.