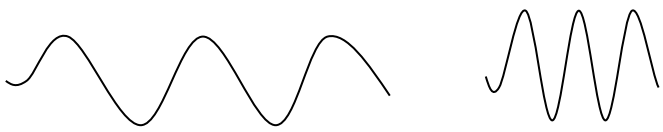
Ultrasound Physics Review: SPI Edition

Study Alert

Question:

116. Which statement about the two pulse trains displayed below is true? Each represents a signal versus time.

A **B**



A. A has a lower frequency than B.
B. B has a longer period than A.
C. A has a shorter wavelength than B.
D. A has better axial resolution than B.
E. A has a shorter spatial pulse length than B.

Answer:

A. A has a lower frequency than B.

Period *is the time it takes one complete cycle to occur. A's period is longer than B's. The pulse train with the shortest wavelength would be the highest frequency, which again is B. The shortest pulse (B) will have the better axial resolution. The longest pulse (A) has the greatest spatial pulse length.*

Question:

336. Which of the following is NOT a limitation of M-mode scanning?

A. Information is obtained along only one line of sight.
B. Motion lateral to the transducer is not displayed.
C. Motion axial to the transducer is not displayed.
D. The two-dimensional shape of a structure is not shown.
E. All of the above are limitations of M-mode.

Answer:

B. Motion lateral to the transducer is not displayed.

With M-mode, motion lateral to the transducer is not displayed, but motion axial to the transducer is displayed.

Question:

401. Which of the following artifacts may result in both an axial and lateral displacement of a reflector on the ultrasound image?

A. Refraction
B. Side lobe
C. Multipath reflections
D. Partial volume
E. Enhancement

Answer:

C. Multipath reflections.

*A **multipath artifact** is created when the sound beam bounces off of one or more reflectors before it encounters a reflector that redirects it back to the transducer. The increased round-trip time of the echo leads to its incorrect axial and lateral placement in the image. Because the artifact is caused by reflections that take multiple paths to reach the transducer, it is called multipath.*

▷Kremkau FW: *Diagnostic Ultrasound: Principles and Instrumentation*, 7th edition. St. Louis, MO, Elsevier, 2006, p 263.

Question:

466. What does the Doppler signal spectral display depict?

A. Relative signal power at each frequency in the Doppler signal
B. Depth to each vessel
C. Volume flow rate
D. Transmit frequency
E. Acoustic power

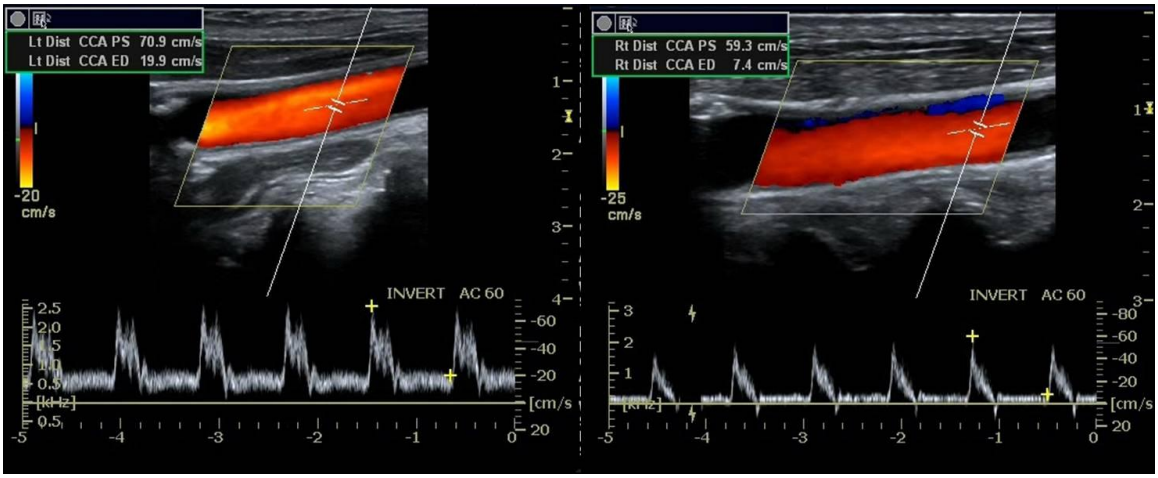
Answer:

A. Relative signal power at each frequency in the Doppler signal.

The Doppler signal spectral display depicts the frequency bandwidth and range of amplitudes in the reflected signal. The amplitude or signal power depends on the relative number of red blood cells comprising each component of the frequency-shift spectrum.

Question:

526. What statement is correct regarding the comparison of these two waveforms? *(See also Color Plates 13A and 13B.)*



A B

A. Waveform A shows a delayed systolic upstroke compared to B.
B. Waveform A shows decreased spectral broadening compared to B.
C. Waveform A indicates the presence of proximal disease and waveform B is normal.
D. Waveform A indicates a low-resistance state compared to waveform B.
E. Waveform A shows flow toward the transducer and waveform B shows flow away from the transducer.

Answer:

526. D. Waveform A indicates a low-resistance state compared to waveform B.

The amount of diastolic flow in the two waveforms differs, and resistance is best described through the amount of flow during diastole. When there is continuous forward flow throughout diastole, a low-resistance state is indicated. If the flow is coursing to an area of high resistance, the diastolic flow may be reversed or absent. Waveform A is a low-resistance waveform with forward flow depicted throughout the cardiac cycle. Waveform B is a high-resistance waveform with flow reversal during early diastole and low flow in end-diastole.