Understanding Harmonic Imaging in Ultrasound

By Julie Kirk

Harmonic imaging produces a far better quality ultrasound image when compared with conventional (fundamental) imaging. With conventional imaging, a sound beam of a specific frequency is transmitted from the transducer. This signal passes through tissue and then returns to the transducer. When it returns, the signal is identical to when it was transmitted or it could lose strength and become less intense, which will typically produce a suboptimal ultrasound image.

Harmonic imaging occurs at the point when the sound beam passes through the tissue in the body. The signal returned will be multiples of the initial transmitted fundamental beam. For example, if the transmitting band of frequency is at 2 MHz, the return signal will produce the harmonic frequency bands of 4 MHz, 6 MHz, 8 MHz, etc. Since the higher frequencies are lost as they pass through the tissue only the lower frequency harmonics are actually used to form the images. Harmonic imaging reduces artifacts that are often found in conventional imaging. It decreases noise and clutter, decreases reverberation, decreases side lobe artifacts and slice thickness. It improves contrast and spatial resolution as well as axial and lateral resolution.

In daily practice, the use of harmonic imaging is preferred and can help make the difficult, large habitus patients easier to scan. It can also help visualize cysts clearer and decrease scan time by obtaining images quicker. But the major advantage of harmonic imaging is the dramatically clear, crisp ultrasound images that are obtained which improves the quality and confidence of the ultrasound diagnosis.