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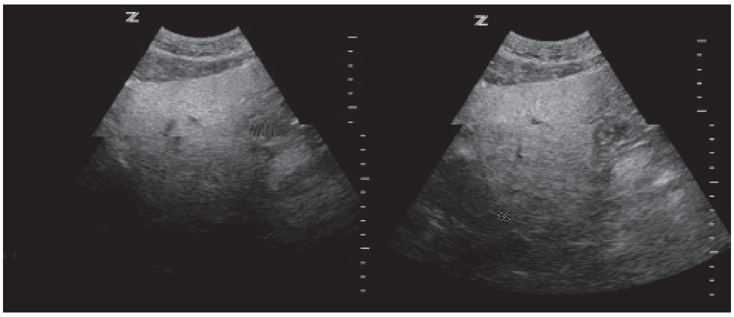
Ultrasound

New Ultrasound Technique: Zone Sonography

The new ultrasound technique "Zone Sonography" (McLaughlin 2004) represents a radical departure from the scanning and signal processing techniques that are typically relied on by all other ultrasound systems. In current, commonly used ultrasound systems, a "beamformer" (or specially programmed processor) emits a focused pulse from the sending crystals of the transducer onto the tissue. This pulse penetrates through body tissue and is reflected or sent back by the boundary layers. It arrives back at the transducer's crystals, whereby the time it requires depends on the distance from the transducer. Next, the signals are pre-processed. The signals received by the neighboring transducer crystals are added up. Differences in time are corrected based on the distance to the transducer (dynamic focus) and loaded into the frame buffer by continuing to process signals before they are read out and displayed on the monitor. This process is repeated for each of the groups of crystals along the transducer. There are profound disadvantages to this method that interfere with further advancements, such as high frame rates and modern signal

Comment:
This publication clearly expresses the possibilities for processing signals that the new ultrasound technique (ZONARE) has to offer. Much like the idea of an automatic focus setting that many cameras feature, the optimum signal to noise ratio for the velocity of sound is determined through an iterative process and the actual velocity of sound is measured rather easily. Whereas in this paper, correction of an entire image line is the overriding objective, correction of every centimeter of an image is now possible and this will result in yet another improvement to image quality. This means that automatically optimized system (signal) settings will be possible for individual patients.

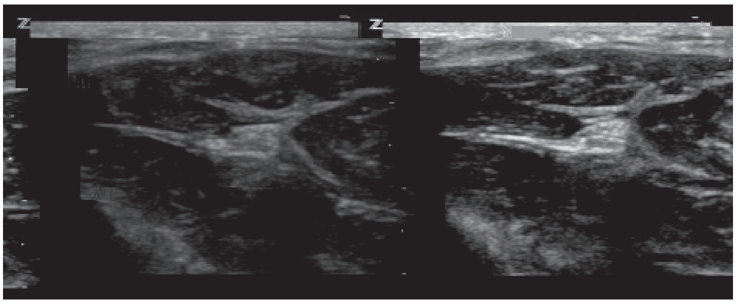
Fig. 3



a) b)

Figure 3. Ultrasonic images of a difficult to image liver: (a) Imaged at a sound speed of 1540 m/s. (b) Imaged at a sound speed of 1490 m/s and +2 dB digital gain to improve the signal-to-noise ratio. Note the differences in penetration, contrast resolution, boundary clarity, and detail resolution seen in image (b) compared with image (a). These images were obtained with a curved transducer (C5-2) at a centre frequency of 3.0 MHz and depth of 18 cm.

Fig. 4



(a) (b)

Figure 4. Ultrasonic images of a radial nerve: (a) Imaged at a sound speed of 1540 m/s. (b) Imaged at a sound speed of 1650 m/s. Note the differences in contrast resolution, boundary clarity, and detail resolution seen in image (b) compared with image (a). These images were obtained with a linear transducer (L10-5) operated under a frequency compounding modality at a depth of 3 cm.

Literature

McLaughlin G, United States Patent 6,685,645 B1.
Ting-Lan J, editors.
2-2-2004. PIRS Image Database.

Napolitano D, Chou CH, McLaughlin G. Ji TL, Mo L, Debusschere D et al. Sound speed correction in ultrasound imaging.
Ultrasonics 2006; 44S:e43-e46.

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