

Ultrasound: New Technologies

There are many recent technological changes in ultrasound imaging instrumentation, and these changes advance this modality well beyond where it was only a few years ago. Although specific features vary from one manufacturer to the next, most changes are directed towards improved spatial resolution, more sensitive detection of blood flow, and extension of the image format beyond the format established simply by the footprint and scan layout of the transducer.

In this presentation, we will examine these advances by describing the new technologies and wherever possible, comparing their imaging benefits with those of the more conventional approaches in hopes of gaining an appreciation for their effectiveness. Important features that will be considered are the following:

Broadband transducers,
Strategies for reducing slice thickness,
Very high frequency scanning,
Coded excitation,
Extended field of view and 3-D imaging,
Compound scanning,
Harmonic imaging, and
Contrast agent modes.

These advances are found mainly in high-end scanners, common in radiology departments and echocardiology laboratories. Another interesting development in medical ultrasound is the small, portable scanner, some models providing image quality that rivals that in the previous generation of high-end scanners. These devices also will be discussed.

Educational Objectives:

1. Describe each of the features listed above and state its benefits;
2. Estimate the expected spatial resolution for an ultrasound scanner;
3. Understand the role of multi-dimensional arrays in ultrasound;
4. Identify possible clinical roles of extended field imaging, such as Seascope;
5. Describe how second harmonic signals are formed by tissue, and list the benefits of tissue harmonic imaging.
6. Describe how ultrasound scanners must be outfitted to optimize imaging of contrast agents.