

AbstractID: 3673 Title: Ultrasound Transducer Performance Evaluation With An Electronic Probe Tester

Purpose: Ultrasound transducer performance plays a major role in the integrity of B-mode images and in image quality. A frequent problem with arrays is "element drop out," caused by electronic or mechanical interruption of signals. Currently this is detected using visual inspection of images of patients and or phantoms. Our objectives were to evaluate an electronic probe tester for determining functionality of array transducers and to compare results of the tester with subjective analysis of images of uniform phantoms.

Method and Materials: A FirstCall 2000 (Sonora Medical Systems) electronic transducer tester was used on array transducers. The device exercises each element in the array, measuring its capacitance, pulse-echo sensitivity, pulse width, center frequency and bandwidth using planar targets. Probe adapters and software enable the FirstCall to utilize connection configurations of different transducer manufacturers. Probes from Siemens Sequoia and Philips HDI 5000 machines available in the UW Hospital were tested. Images of a uniform phantom were obtained from each transducer using sensitivity and gain settings for uniform gray scale. The images were examined for evidence of element dropout.

Results: Of twenty-one probes initially tested, nine exhibited some level of malfunction (>2 "dead" elements). Of the nine, four exhibited a significant level of malfunction (>5 dead elements). Probes that had only a few dead elements showed no signs of image degradation in the phantom tests. When multiple (~5 or more) elements are dead, manifestations of the problem appeared in the phantom images.

Conclusion: The FirstCall provides an objective test of transducer performance, with greater sensitivity than a phantom test. The penalty for using a probe with only a few dead elements may seem minimal if no indication is seen in a uniform phantom image. A clinically applicable threshold for determining whether a transducer is suitable for use still needs to be established.