

APPLICATION OF ULTRASONIC VISUALIZATION METHODS  
FOR STUDY OF THE NORMAL FEMALE BREAST AND FOR  
DEMONSTRATION OF BREAST PATHOLOGIES

Elizabeth Kelly Fry and Larry V. Gibbons

Interscience Research Institute,  
Champaign, Illinois, USA

Ultrasound offers unique advantages, in comparison to other forms of energy, for the detection of cancer and other pathological conditions in the human female breast. Among these advantages are the opportunity for repeated examinations without any danger of deleterious, cumulative effects, the possibility of precise location of abnormalities with an accuracy of the order of 0.5 mm, and the potential for the early detection of pathological precursors as reflected by tissue changes. The normal breast is a complex, variable structure, influenced by multiple factors, in particular hormone levels and age. In this investigation, a detailed ultrasonic visualization study was done with normal subjects, ranging in age from 20 to 70 years, and subjects with specified pathologies. Sophisticated instrumentation techniques were applied throughout this research, including the incorporation of an on-line computer as an integral part of the experiment. The use of the computer provides 2 major advantages in the acquisition and analyses of the data: (1) precise control of the 3 linear motions of the acoustic scanning transducer system which permits examination of breast area in 1 mm cross-sectional views across the full depth of tissue, and (2) control of such functions as the sensitivity ranges of the acoustic-electronics system. Excised breast tissue, both normal and pathological, also was examined by the ultrasonic method. The results, evidenced by echogram presentation, show distinct acoustic differentiation of breast tissue type and the precise detection of certain pathological conditions.

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