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

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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 detec-
tion 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 patholo-
gies. 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) pre-
cise 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.

This work was performed pursuant to contract PH 86-68-193 with the

Acknowledgement is made of Professor William J. Fry, originator of
this instrumental approach, who died before the research could be imple-
mented.

Abstracts, Tenth International Cancer Congress, Houston, Texas,
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