EXAMINATION OF THE FEMALE BREAST BY MEANS OF MAMMOGRAPHY, AUTOMATIC B-MODE AND RAPID, REAL-TIME ULTRASOUND SCANNING

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Introduction

The goals of the studies carried out under this program are to increase the accuracy of differential diagnoses of breast masses that have been found by manual examination of the breast by the subject herself, or by her physician, and to develop techniques for detection of breast masses before they are manually palpable. These goals are being pursued by maintaining a clinical program which gives the patient the advantage of the present state-of-the-art of both mammography and B-mode ultrasound investigation, while concurrently carrying out laboratory investigations of various aspects of ultrasound visualization in respect to examination of the breast.

Discussion and Results

The ultrasound breast examination system that has been in routine clinical use, a laboratory modified B-mode linear scan unit, which provides for automatic scanning at space intervals of 5 mm or 1 mm and for interchange of transducers of various design characteristics and frequencies, has been previously described.[1,2] By the time of this presentation, well over 500 patients will have been examined with this instrument. While the majority of the patients were middle-aged or older, a reasonable percentage were under 30 years of age, some as young as 15 or 16 years old. It is generally well known that mammography is diagnostically unsuccessful in approximately 50% of young patients examined, primarily because of the high density characteristics of the young breast. However, cases of this nature were successfully diagnosed with the specially adapted B-mode unit. It has been concluded, on the basis of patients examined to date, that in the case of the young, dense breast, ultrasound is more successful than mammography and can, in most cases, be used as the sole instrument examination technique.

For the older subjects examined (or younger subjects for whom either their symptoms or their ultrasound scans indicated a strong possibility of malignancy), the combined application of mammography and ultrasound proved to be a significant help to the physician, insofar as differential diagnosis is concerned, by yielding more data than either technique used alone could provide. Additionally, it was found that for older subjects whose examination results were indeterminate by mammography, that is, no diagnosis could be made from the x-ray film images, it was possible to definitively diagnose most of these indeterminate cases by ultrasound. The factors which have been found to be significant to the correct differential diagnosis by B-mode ultrasound visualization techniques will be discussed in this presentation, and examples of benign tumors which may mimic the echogram pattern of malignant masses and, conversely, malignant masses which may have some of the characteristics of benign tumors, will be illustrated.

The present laboratory studies are primarily concerned with the development of an ultrasound real-time breast instrumentation system which has adequate resolution and penetration, and is capable of scanning the breast in a much more rapid fashion than is now possible with all currently available instruments designed for breast examination. In that regard, several real-time systems with transducers ranging in frequency from 2.5 to 7.0 MHz were tested to determine their suitability for adaptation to breast scanning. For these tests, the patients were maintained in a supine position (with water coupling of the sound to the breast), since this position has distinct advantages for breast examination. An apparently successful rapid, real-time breast scanning system has been devised and preliminary studies on the use of this system for examination of breasts are underway. The results obtained to date on examination of patients with this system will be presented in the form of video cassette images.

References

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2. E. Kelly Fry, P. Harper and G. W. Gardner: Possible Misdiagnosis of Sound Attenuating Breast Masses as Detected by Ultrasound Visualization Techniques and Solutions to This Problem. In Proceedings, 1978 American Institute of Ultrasound in Medicine, Vol. 1, p. 129.

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