Ultrasound Mammography
An Imaging Modality for Evaluation of Palpable Breast Masses

Thesis submitted in Partial Fulfilment
For the Degree of M.Sc.
IN

Radio–Diagnosis

By

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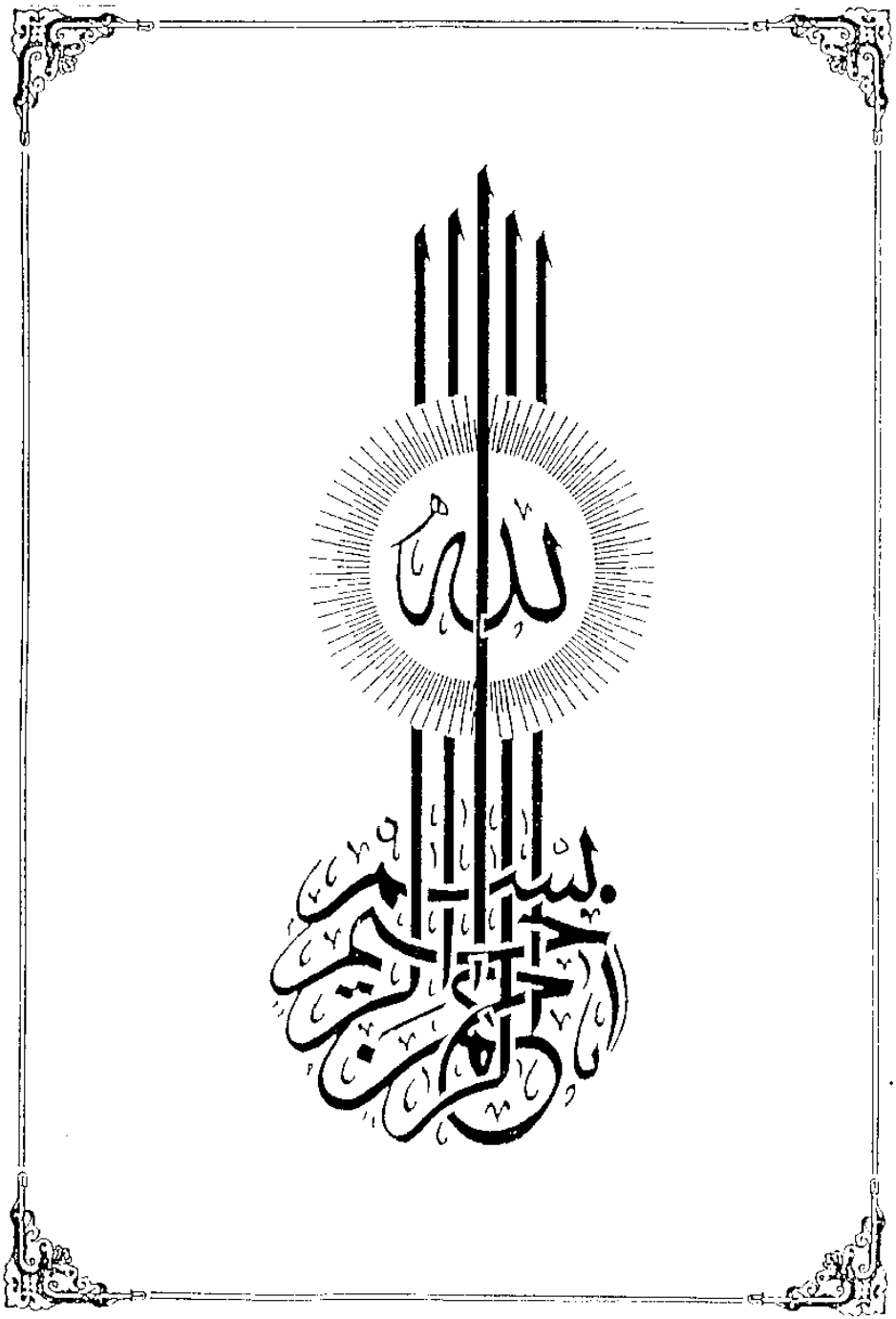
1987

TO MY PARENTS



Acknowledgement

My first expression of gratitude goes to Prof. Dr. Ahmed M. Osman, Head of Radiology Department of the National Cancer Institute, (NCI), Cairo University, who was the first to encourage me during this study. By his guidance, motivation, and keen revision of every word, this dissertation has been completed.

I want to express my gratefulness to Prof. Dr. Mohamed S. El Beblawy for his kind supervision and good advice to do what is best for reaching the final format of this work .

I owe my thanks and appreciation to Prof. Dr. Ismail Ali who gave me good advice on several points during my practical work, and kindly made his private ultrasound machine completely accessible for examining all the cases presented in this thesis.

Many thanks goes also to Dr. M. Sherief Soliman, Lecturer of Radio Diagnosis, NCI, Cairo University, colleagues and patients at the Department of Radiodiagnosis at NCI for their sincere help and cooperation.

Last, but not least, my deepest expression of gratitude goes to my husband and my son Hesham for their understanding of an individual decision, that they had the wisdom to change to a family goal.

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INTRODUCTION AND AIM OF WORK

Introduction and Aim of the Work

Breast cancer is an insidious disease that usually develops over a period of many years without producing any signs or symptoms until it becomes obvious. To achieve our goal of detecting breast cancer in a curable stage, every woman over 30 must be considered as potentially harbouring a suspected breast cancer. (Strax.P. 1984).

Different breast imaging modalities may help to differentiate a benign mass from a palpable malignant one, they may alert the physician to women who are at high risk and they may detect an unsuspected occult cancer.

The detection of breast cancer in a localised stage with negative nodes leads to an 87.5 % survival rate. According to 1984 data from American Cancer Society, if nodes are involved, survival rate drops to 47 % or less, which is the stage at which most breast cancers are detected today.

Wild and Reid (1952) were first to report on ultrasound examination of the breast. Sonographic criteria of benign and malignant lesions of the breast have been summarized by Kobayashi (1974).

Over the past 30 years diagnostic ultrasound has been applied to the differential diagnosis of breast tumours with high diagnostic accuracy. (Schmidt et al 1982).

At present, one of the essential advantages of echomammography of the breast is the high detection rate of liquid filled cysts, which may often be missed by mammography. Although sonography of the breast is at the moment not suitable as a screening method for breast cancer, echography as an additional diagnostic tool in the preoperative diagnostic procedures of breast masses is still under prospective evaluation.

This work aims at defining the role of ultrasound mammography in the diagnosis of the nature of a palpable breast mass, and its comparative evaluation to X-ray mammography.

Thus a prospective study of 16 patients with palpable mass on physical examination was compared with X-ray mammography and sonography to:

(1) establish the relative accuracy of sonography to physical examination and X-ray mammography.

(2) determine the ultrasound image characteristics

most useful for diagnosis and the frequency with which some imaging features occured in carcinoma (Jagged Wall, homogenous internal echoes, non homogenous internal echoes, internal echoes not discernible due to attenuation effects and attenuation shadowing), and fibroadenoma (smooth walls, homogenous internal echoes, and no demonstrable posterior shadowing).

(3) determine any complementray value of sonography to physical examination and X - ray mammography.

(4) select types of breast in which sonography would be potentially useful and,

(5) evaluate the acceptance of sonography by women and referring physicians.

I - Ultrasound Anatomy of the Breast

The breast is composed of stroma and parenchyma. The stroma is the supporting tissue and it is divided into fat and dense connective tissue (Egan 1976), while the parenchyma includes the lactiferous ducts and alveoli. Ultrasound Scans are tomographic representation of the breast tissue, the ultrasonic image of the breast depends to a great extent on the ratio of the parenchyma to stromal element (Jellins et al 1978).

In normal breast the following areas are demonstrated ultrasonographically:

1- Skin and subcutaneous fat. (S.C.).

2- Fibroglandular layer.

3- Retromammary layer.

4- Pectoral muscles.

5- Ribs.

6- Nipple and areola.

7- Lactiferous ducts.

The ultrasonic imaging characteristics of these layers are:-

1- Skin

It appears as an echogenic line, the thickness of which depends on whether the breast is compressed or not. In the compressed breast there is an apparant increase in the thickness of the skin (Maturo et al 1980).

2- Subcutaneous Fat

The s.c. fat lies deep to the skin, and its amount varies with age and parity. It is represented as a uniform anechoic zone. Frequently, moderately intense, linear reflections are seen to radiate in an orderly fashion through the subcutaneous anechoic zone. These linear reflections are thought to portray the retinacular cutis or supportive connective tissue of the breast (Cooper's ligaments) which originate at the retromammary fascia, dividing the lobules of glandular and adipose tissue, and inserted into the skin (Maturo et al 1980).

3- Fibroglandular Layer

It lies below the s.c. fatty layer and is separated from it by a highly echogenic band

representing the superficial fascia. The fibroglandular tissue seen in the centre of the breast assumes a pyramidal configuration giving rise to a region of homogeneously distributed echoes of relatively high amplitude (Maturo 1980). This layer (parenchyma) includes the ducts, alveoli and intralobular connective tissue. Deep to this layer is the deep fascia which is an echogenic band similar to that of the superficial fascia.

4- Retromammary Layer

This lies between the deep connective tissue plane and the fascia of the underlying muscle. It is mainly composed of fat lobules which are similar to those of s.c.layer, and connective tissue ligaments which are thin and not usually seen (Egan 1984).

5- Pectoralis Muscles

The pectoralis major and minor muscles are visualised as structures of low echogenicity deep in the breast above the ribs and parallel to the skin, best seen in the upper outer quadrant of the breast (Harper P.1985).

6- Ribs

The ribs form the ventral aspect of the thoracic cage over which the breast lie, they are composed of bone laterally and cartilage medially.

Laterally ribs are seen as highly attenuating structures interspaced by the intercostal muscles while medially, the cartilage appears as oval masses with low internal echoes (Harper P. 1985).

7- Nipple and Areola

The image of the nipple is relatively cone shaped when the breast is uncompressed. It is hypoechoic compared to the rest of the skin. The nipple appears smaller on compression. It is seen as an oval mass with a sharp anterior border and an indistinct posterior margin. The subareolar ducts radiate into the base of the nipple.

8- Lactiferous Ducts

They are easily seen on most ultrasound scans especially when dilated. A normal breast is composed of 15-20 lobules which are drained by a network of ducts. These ducts are branched in the peripheral parts of the

breast and join in the subareolar region to form 15-20 ducts, which drain into the surface of the nipple. In non-lactating breasts the lactiferous ducts are usually collapsed, while in lactating breasts, the ducts have a potential diameter of 8 mm at the sinus level in the subareolar region, and peripherally they have 2-4 mm diameter. They appear as small echofree circles when viewed in cross section or as elongated anechoic tubular structure coursing toward the nipple when the section is perpendicular to the long axis of the duct. Ducts are more easily recognized when viewed with the rapid sequence mode of display (Maturo 1980).