ROLE OF 3D DIGITAL BREAST TOMOSYNTHESIS IN SCREENING OF DIFFERRENT BREAST LESIONS

Thesis

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Abstract & keywords

(FFDM, TOMOSYNTHESIS, Mammography, BREAST,ct,3D)

Tomosynthesis in this study showed better screening performance compared to mammography. The sensitivity of Tomosynthesis was 87%, the specificity was 97% , the positive predictive value of 87% , the negative predictive value was 97% and the diagnostic accuracy was 95%, while the sensitivity of mammography was 53%, the specificity was 85% , the positive predictive value was 50% ,the negative predictive value was 86%, and the diagnostic accuracy was 77% . Mammography is the best-studied breast cancer screening modality and the only recommended imaging tool for screening the general population of women. Deciding when and how to participate in screening should involve a personalized discussion between a woman and her provider, weighing the individual breast cancer risk factors and competing co-morbidities. In addition, a balanced discussion regarding both the benefits and risks of routine screening is warranted.FFDM is accused of having a low sensitivity because the overlapping breast tissue may hide an abnormality and this increases the number of false negative results. On the other hand it is accused of having a low specificity because the overlapping tissues may give the impression of a false abnormality which is responsible for a large number of false positive results.Eighty-five patients were evaluated by Mammography and 3D Digital Breast Tomosynthesis individually. Each lesion was assigned an independent BIRADS score for each modality. The results were studied and correlated.3D Digital Tomosynthesis resolved the problem of tissue overlap in FFDM. It enhanced the detection and diagnostic ability of

FFDM.Tomosynthesis enabled better depiction of masses and asymmetries. It was very useful in the screening setting where better lesion detection and accurate description of its margins, shape and effects on surrounding structures, as well as the presence or absence of microcalcifications can be of value in confirming or excluding the potential for malignancy of a certain lesion

List of Abbreviations

2D:	**Two Dimensional**
3D:	**Three Dimensional**
ABVS:	**Automated Breast Volumetric Scanning**
ACR:	**American college of Radiology**
BIRADS:	**Breast Imaging And Reporting Data System**
BRCA1 and 2:	**Breast Cancer gene 1 and 2**
BSGI:	**Breast Specific Gamma Imaging**
CAD:	**Computer Aided Detector**
CC:	**Craniocaudal**
CISNET:	**Cancer Intervention Surveillance Network**
CsI:	**Cesium iodide**
DBT:	**Digital Breast Tomosynthesis**
DCIS:	**Ductal Carcinoma In Situ**
DM:	**Digital mammography**
DMIST:	**Digital Mammography Imaging Screening Trials**
FDA:	**Food and Drug Administration**
FDG:	**Fluro-2-Deoxy Glucose**
FFDM:	**Full field digital mammography**
FN:	**False negative**
FP:	**False positive**
Gd202S	**Gadolinium oxysulfide**
HHUS:	**Hand Held Ultra Sound**
Hz:	**Hertz**
MLO:	**Medio-lateral Oblique**
MRI:	**Magnetic resonance imaging**

PEM:	**Positron Emission Mammography**
PPV:	**Positive predictive value**
RCTs:	**Randomized Control Trials**
RRL:	**Relative Radiation Level**
SD:	**standard deviation**
STORM	**Screening with Tomosynthesis OR standard Mammography**
TN:	**True negative**
TP:	**True positive**
US:	**Ultrasonography**
US:	**United States**

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Chapter 1: Introduction

Breast cancer in women is a major public health problem throughout the world. It is the most common cancer among women both in developed and developing countries, accounting for 22.9% of all new female cancers. In Egypt breast cancer accounts for 37.7% of the total new cancer cases and it is the leading cause of cancer related mortality accounting for 29.1% of the cancer related deaths (***Zeeneldin, et al, 2013***).

To reduce the morbidity and mortality associated with breast cancer, early detection becomes a very important job. If the cancers could be diagnosed through regular breast cancer examinations at an earlier stage than is currently possible, the survival rate within 5 years would increase to about 95% (***Chang, et al, 2008***). Mammography is the basic breast imaging modality for early detection and diagnosis of breast cancer ***(Van den Biggelaar, et al, 2009)***.

Full Field Digital Mammography developments have been rapid, enabling high-quality breast images with higher contrast resolution, an improved dynamic range, and rapid processing of data and images when compared with Screen Film Mammography. However, some limitations still persist (***Dromain and Balleyguier, 2010***).

One of the genuine limitations of mammography is its use in dense breasts. This remains true even for Digital Mammography, although slightly better than in Screen Film Mammography (***Park, 2009***).

Mammography has low sensitivity and specificity in women with radiographically dense breast due to decrease contrast between a possible tumour and surrounding breast tissue and summation of tissues may obscure lesions **(Fallenberg, et al, 2013).**

Breast Tomosynthesis is a new tool that can be expected to ameliorate this problem by reducing or eliminating tissue overlap. Breast Tomosynthesis technology is essentially a modification of a Digital Mammography unit to enable the acquisition of a three-dimensional volume of thin section data ***(Park, et al, 2007)***.

An important diagnostic application that may be considered is the role of Tomosynthesis for ruling out suspected abnormalities that are identified during screening ***(Gur, 2007).*** It also allows visualization of cancers not apparent by Mammography ***(Helvie, 2010).***The clearer depiction with Tomosynthesis should allow easier differentiation between benign and malignant lesions ***(Park, et al, 2007).***

Aim of the work

The aim of the study is to evaluate the role of 3D Digital Breast Tomosynthesis in screening of different breast lesions.

Chapter 2: BREAST CANCER SCREENING

Breast cancer screening is used to identify women with asymptomatic cancer with the goal of enabling women to undergo less invasive treatments that lead to better outcomes, ideally at earlier stages and before the cancer progresses. There are important considerations for who should be screened, how often women should be screened, and with which imaging modality (or modalities). Ultimately, clinicians need to help women understand the benefits and risks of breast cancer screening to make informed decisions **(Mackenzie, et al, 2015).**

Mammography is the best-studied breast cancer screening modality and the only recommended imaging tool for screening the general population of women. Deciding when and how to participate in screening should involve a personalized discussion between a woman and her provider, weighing the individual breast cancer risk factors and competing co-morbidities. In addition, a balanced discussion regarding both the benefits and risks of routine screening is warranted **(Mackenzie, et al, 2015).**

WHO SHOULD UNDERGO SCREENING ?

For **high-risk** women, annual screening mammography and contrast-enhanced MRI are both indicated. Ultrasound can be used for patients with contraindications to MRI **(Martha, et al, 2013).**

For **intermediate-risk** women, annual screening mammography is indicated. Contrast-enhanced MRI may be indicated in some patients **(Martha, et al, 2013).**