COMPARATIVE STUDY BETWEEN BREAST ULTRASOUND, CONTRAST ENHANCED SPECTRAL MAMMOGRAPHY AND 3D DIGITAL TOMOSYNTHESIS AS COMPLEMENTARY TECHNIQUES TO MAMMOGRAPHY IN DENSE BREAST PARENCHYMA

Thesis

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Abstract

Women with dense breast are doubly disadvantaged as they are both at higher risk of developing breast cancer and at greater risk that cancer will not be detected. 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 large number of false positive results. The results of our study showed that Contrast Enhanced Spectral Mammography, Tomosynthesis and breast ultrasound have superior diagnostic accuracy than Mammography in dense breast parenchyma.Contrast Enhanced Spectral Mammography has a significant higher specificity while breast ultrasound has a significant higher sensitivity compared to other imaging modalities. Breast Tomosynthesis showed higher senstivity and specificity than Mammography.

<u>**Key Words:**</u> **Dense Breast Parenchyma, Mammography ,Breast Ultrasound, 3D Digital Tomosynthesis, Contrast Enhanced Spectral Mammography**

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List of Abbreviations

2D:	**Two Dimensional**
3D:	**Three Dimensional**
ACR:	**American college of Radiology**
BIRADS:	**Breast Imaging And Reporting Data System**
BRCA1 and 2:	**Breast Cancer gene 1 and 2**
CCDs:	**charge coupled devices**
CESM:	**Contrast Enhanced Spectral Mammography**
CT :	**computed tomography**
CC:	**Craniocaudal**
CsI:	**Cesium iodide**
DM:	**Digital mammography**
DBT:	**Digital Breast Tomosynthesis**
DCIS:	**Ductal carcinoma in situ**
FDA:	**Food and Drug Administration**
FFDM:	**Full field digital mammography**
FN:	**False negative**
FP:	**False positive**
Gd202S	**Gadolinium oxysulfide**
Hz:	**Hertz**
IDC:	**Invasive Ductal Carcinoma**
IV:	**Intravenous**
Kev:	**Kilo electronvolt**
KVP:	**kilovoltage Peak**
MLO:	**Mediolateral Oblique**
MRI:	**Magnetic resonance imaging**
MGy:	**milligray**
MHz:	**mega Hertz**

PPV:	**Positive predictive value**
SD:	**standard deviation**
TFDs:	**thin film diodes**
TFTs:	**thin film transistors**
TN:	**True negative**
TP:	**True positive**
US:	**Ultrasonography**

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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