

Role of Tomosynthesis with correlation to 2D Mammography in characterization of breast lesions in dense breast

Thesis

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List of Contents

<i>Subject</i>	<i>Page No.</i>
List of Abbreviations	i
List of Tables	ii
List of Figures	iii
List of Cases	vii
Abstract	viii
Introduction	1
Aim of the Work.....	3
Review of Literature	
Radiological Anatomy of the Breast.....	4
Breast Density	7
Physical Principles and Technique of Tomosynthesis.....	14
Manifestations of different breast lesions by tomosynthesis compared to mammography.....	21
Patients and Methods.....	27
Results.....	33
Illustrative Cases	51
Discussion	71
Summary and Conclusion	81
References	84
Arabic Summary	—

List of Abbreviations

Abbr.	Full-term
2D	Two Dimensional
3D	Three Dimensional
ACR	American college of Radiology
BIRADS	Breast Imaging And Reporting Data System
CC	Craniocaudal
DBT	Digital Breast Tomosynthesis
DCIS	Ductal Carcinoma In Situ
DM	Digital mammography
FDA	Food and Drug Administration
FFDM	Full field digital mammography
FN	False negative
FP	False positive
Hz	Hertz
MLO	Medio-lateral Oblique
MRI	Magnetic resonance imaging
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

List of Tables

Table No.	Title	Page No.
Table (1):	BIRADS assessment categories according to BIRADS atlas 2013	29
Table (2):	Age distribution of the patients participating in the study.....	34
Table (3):	Distribution of cases according to the ACR BIRADS lexicon breast density classification.	35
Table (4):	Distribution of groups according to mammography findings.....	36
Table (5):	Mass Shape according to mammography findings.....	37
Table (6):	The distribution of masses entities into benign and malignantlooking according to mammography.....	38
Table (7):	The results of BI-RADS by mammography.....	40
Table (8):	Distribution of groups according to Tomosynthesis results.	41
Table (9):	Mass shape characterization by Tomosynthesis.....	42
Table (10):	The distribution of masses entities into benign and malignant looking according to Tomosynthesis.	43
Table (11):	Results of BIRADS by Tomosynthesis	45
Table (12):	Comparison between Mammography & Tomosynthesis by BIRADS	46
Table (13):	Results of pathology	47
Table (14):	Diagnostic indices of Mammography and Tomosynthesis.....	50

List of Figures

Figure No.	Title	Page No.
Figure (1):	Mammographic medio-lateral- oblique (MLO) projection of a normal breast.	6
Figure (2):	Mammographic cranio-caudal (CC) projection of a normal breast	6
Figure (3):	ACR BI-RADS® Mammography. In: ACR BI-RADS® Atlas 2013	9
Figure (4):	Photograph of prototype Digital Breast Tomosynthesis unit.....	15
Figure (5):	Schematic view of digital breast tomosynthesis.	16
Figure (6):	An illustrative example of digital breast tomosynthesis acquisition geometry with the reconstructed tomographic breast image	17
Figure (7):	Craniocaudal (CC) right image and mediolateral oblique (MLO) left image is performed.....	19
Figure (8):	Comparison of screening mammography with breast tomosynthesis in a 57y old woman.....	21
Figure (9):	Micropapillary type ductal carcinoma insitu in a 65-year-old woman	22
Figure (10):	Invasive ductal carcinoma in a 45-year-old woman with a lump in the left breast for 6 months	22

Figure (11):	Improved visualization of architectural distortion at DBT.	23
Figure (12):	Hamartoma in a 38-year-old woman with a breast asymmetry at baseline screening mammography.	24
Figure (13):	Full field digital mammography (FFDM) shows multiple masses and calcifications.	25
Figure (14):	Pleomorphic calcifications in a linear distribution in the lower left breast.....	26
Figure (15):	Distribution of cases according to the ACR BIRADS lexicon breast density	35
Figure (16):	Distribution of groups according to mammography findings.....	36
Figure (17):	Mass shape characterization by mammography.	37
Figure (18):	The distribution of the different masses into benign and malignant by mammography	38
Figure (19):	Distribution of calcification in mammography	39
Figure (20):	Mammography BI-RADS categories.	40
Figure (21):	Distribution of groups according to Tomosynthesis results.....	41
Figure (22):	Mass shape characterization by Tomosynthesis	42
Figure (23):	The distribution of the different masses into benign and malignant by Tomosynthesis.	43

Figure (24):	The distribution of calcification in Tomosynthesis.	44
Figure (25):	The results of BIRADS by Tomosynthesis.....	45
Figure (26):	Comparison between Mammography & Tomosynthesis by BIRADS	46
Figure (27):	Final results according to pathology.....	48
Figure (28):	Diagnostic indices of Mammography and Tomosynthesis.	50
Figure (29):	Mammography and Tomosynthesis CC and MLO views of both breasts.....	51
Figure (30):	Mammography and Tomosynthesis CC & MLO view.....	54
Figure (31):	Mammography and Tomosynthesis CC &MLO view.....	57
Figure (32):	Mammography and Tomosynthesis CC &MLO view.....	59
Figure (33):	Mammography and Tomosynthesis CC & MLOview.....	62
Figure (34):	Mammography and Tomosynthesis CC and MLO views	65
Figure (35):	Mammography and Tomosynthesis CC& MLO views.	67
Figure (36):	Mammography and Tomosynthesis MLO and CC views	69

List of Cases

Case No.	Title	Page No.
Case (1):.....		51
Case (2):.....		53
Case (3):.....		56
Case (4):.....		59
Case (5):.....		62
Case (6):.....		64
Case (7):.....		67
Case (8):.....		68

ABSTRACT

Background: Digital Breast Tomosynthesis is a new technology of digital mammography that enables the acquisition of three dimensional volume of thin section data, and thus reduces or eliminates tissue overlap especially in dense breast, such ability allow visualization of cancers not apparent by digital mammography and differentiate between benign and malignant lesion.

Objectives: to compare the efficacy of digital breast Tomosynthesis (BDT) to digital Mammography (DM) in diagnosis of different breast lesions in dense breast.

Patients and Method: in this prospective study 30 patients with breast density ACR/C and ACR/D were assessed by Digital Mammography and Digital Breast Tomsynthesis. Each lesion was assigned a blinded category in an individual performance for each modality. The resultant BI-RADS categories were correlated with report of the pathology specimens or outcome follow up.

Results: Both modalities were compared regarding characterization, using Chi Square test (p value:0.035).The sensitivity, specificity and accuracy of digital mammography was 62.5%, 68.75% and 66% have significantly increase with tomosynthesis to be 100%,91% and 97% respectively.

Conclusion: Digital breast tomosynthesis significantly enhanced characterization of breast lesions than digital mammography in dense breast parenchyma (ACR/C and ACR/D).

Key Words: ACR density –Digital Breast Tomosynthesis –
Digital mammography

Introduction

Detection of breast lesions is important for future evaluation and predicting the risk of malignancies (*Cheung et al., 2014*).

Mammography is the breast imaging technique for both clinical and screening purposes. Nevertheless, the limitations of mammography are well-known. These deficits stem largely from the superimposition of normal breast structures in the path of the X-ray beam leading to false positive results and diminishing the examination specificity. Conversely, normal breast tissue elements that lie outside the plane of interest can obscure an abnormality leading to false negative results and decreasing the examination sensitivity (*Poplack et al., 2007*).

Breast density was assigned according to the BI-RADS edition (2013) to a, b, c and d-categories (a: the breast is almost entirely fatty, b: scattered areas of fibroglandular density, c: the breast is heterogeneously dense, and d: the breast is extremely dense (*D’Orsi et al., 2013*).

Digital breast tomosynthesis (DBT) is an imaging technology that provides a three dimensional reconstruction of the breast from a limited angle scan involving a series of low dose mammographic exposures (*Vendatham et al., 2015*), thus increasing sensitivity in detecting cancers (*Lang et al., 2016*).

Digital breast tomosynthesis is of interest for screening and diagnostic procedures because it enables 3D studies evaluating tomosynthesis in the screening population where it has been shown to reduce recall rates and increase the sensitivity and specificity for breast cancer detection (***Lei et al., 2014***). The use of DBT has been shown to increase the diagnostic confidence of radiologists in lesions detection and margin characterization (***Yang et al., 2013***).

Aim of the Work

To compare the efficacy of digital breast Tomosynthesis (BDT) as compared to digital Mammography (DM) in diagnosis of different breast lesions in dense breast.

Radiological Anatomy of the Breast

The breast is a symmetrical organ located on the front of the chest on both of the each side of the midline. It occupies an area that stretches from the third rib to the seventh rib and from the edge of the sternum to the armpit. The volume, shape and degree of development are very variable in relation to various factors such as age, gland development, and amount of fat and relative influence of endocrine stimulation (*Balboni et al., 2000*).

Normal mammographic anatomy

The mammographic appearance of the normal breast depends on the amount of the main components: the fat tissue appears radiolucent, the stroma and the gland appear radiopaque. The sensitivity of mammography powerfully depends on the density of the breast. A mammogram is usually performed in two projections, the MLO (medio-lateral- oblique) and CC (cranio-caudal) after compression (Figs. 1,2) (*De Benedetto et al., 2016*).

The skin appears as a thin, continuous, radiopaque rim of homogeneous density, of about 1 mm well distinguishable from the radiolucency of the underlying subcutaneous fat tissue. The areola usually has a thickness of 3-5 mm with a central opacity of cylindrical shape corresponding to the nipple. Posteriorly there is the retro areolar region that is a triangular-shaped area which is of particular interest because it