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

Thesis

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Lobaba Mohamed Osman

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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

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ABSTRACT

Background: Digital Breast Tomosythesis 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 tomosythesis 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