بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / سلوي محمود عقل

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد

The role of Diffusion Weighted Imaging MRI in discrimination between benign and malignant axillary lymph nodes in breast cancer patients

Thesis

Submitted for Partial Fulfillment of M.D. Degree in Radiodiagnosis

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2022

سورة البقرة الآية: ٣٢

Acknowledgment

First and foremost, I feel always indebted to **ALLAH,**
the Most Kind and Most Merciful.

I'd like to express my respectful thanks and profound gratitude to **Prof. Dr. Rania Aly Maarouf,** *Professor of Radiodiagnosis, Faculty of Medicine, Ain Shams University for her keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.*

I am also delighted to express my deepest gratitude and thanks to **Prof. Dr. Ahmed Mohamed Hussein,** *Assistant Professor of Radiodiagnosis, Faculty of Medicine, Ain Shams University, for his kind care, continuous supervision, valuable instructions, constant help and great assistance throughout this work.*

I would like to express my deepest gratitude and cardinal appreciation to **Dr. Aliaa Sayed Sheha,** *Lecturer of Radiodiagnosis, Faculty of Medicine, Ain Shams University, who kindly supervised and motivated the performance of this work, for her kind guidance and constant encouragement throughout this work.*

Amany Mohamed

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List of Abbreviations

Abb.	Full term
ADC	Apparent diffusion co-efficient
ALND	Axillary lymph node dissection
AUC	Area under the ROC curve
CE-FS- T1W1	Contrast enhanced fat suppressed T1 weighted image
DCE-MRI	Dynamic contrast enhanced MRI
DW-MRI	Diffusion weighted magnetic resonance imaging
L/S ratio	Long to short axis ratio
LNs	Lymph nodes
NPV	Negative predictive value
PPV	Positive predictive value
RF	Radiofrequency
ROC curve	Receiver operating characteristics curve
SE-EPI	Spin echo-echo planer imaging
SI	Signal intensity
SLN	Sentinel lymph node
SNB	Sentinel node biopsy
SPAIR	Spectral selective attenuation inversion recovery
STAIR	Short time inversion recovery
TSE	Turbo spin echo sequence

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INTRODUCTION

Statistical studies of cancer have revealed that breast cancer is one of the most common malignancies and the second leading cause of death in women worldwide ***(Li et al., 2018).***

Axillary lymph node metastasis is common in breast cancer patients which affect the treatment modalities as well as surgical procedures ***(Jessing et al., 2018).*** Axillary lymph node metastasis is one of the main criteria affecting the prognosis of breast cancer patients and 5-year survival ***(Li et al., 2014).*** Axillary lymph node dissection and biopsy are considered invasive methods which have long and short term complications on patients with breast cancer negatively affecting their life quality ***(Zaiton et al., 2016).***

It has been shown that complete nodal axillary dissection (ALND)for breast cancer patients with limited nodal invasion (1-3nodes) is not useful, additionally nodal biopsy which is an invasive technique carries a potential risk of complications ***(Elmesidy et al., 2021).***

Classification of axillary lymph nodes into malignant or benign on morphological basis is constantly challenging ***(Razek et al., 2016).***

Diffusion weighted magnetic resonance imaging (DW-MRI) is a noninvasive technique that works on Brownian motion of water molecules, which are dependent on certain

parameters such as size of the cell, cell membrane permeability and inside and outside cellular volume fraction ***(Hasanzadeh et al., 2017).***

ADC is a quantitative parameter that acquired by (DW-MRI) which can exclude the T2 shine -effect besides quantitative assessment of water diffusivity in the target tissue making differentiation between different lesions easier ***(Zaiton et al., 2016).***

During the acquisition motion-sensitizing gradients are used b-value in the real DW-MRI or sensitization (s/mm^2), so no need for contrast because the DW-MRI has its own tissue contrast, ADC is the representative extent of the water molecules of the examined tissue occupies as square mm per second ***(Durur-Subasi, 2019).*** Identification of the nodes on DW-MRI is remarkably higher than that on T2WI, with marked high SI compared with adjacent muscles & surrounding normal vessels made it easy to identify ***(Ismail et al., 2014).***

AIM OF THE WORK

The purpose of this study was to evaluate the role of DW-MRI and ADC in discrimination between benign and malignant axillary lymph nodes in breast cancer patients.

Chapter 1

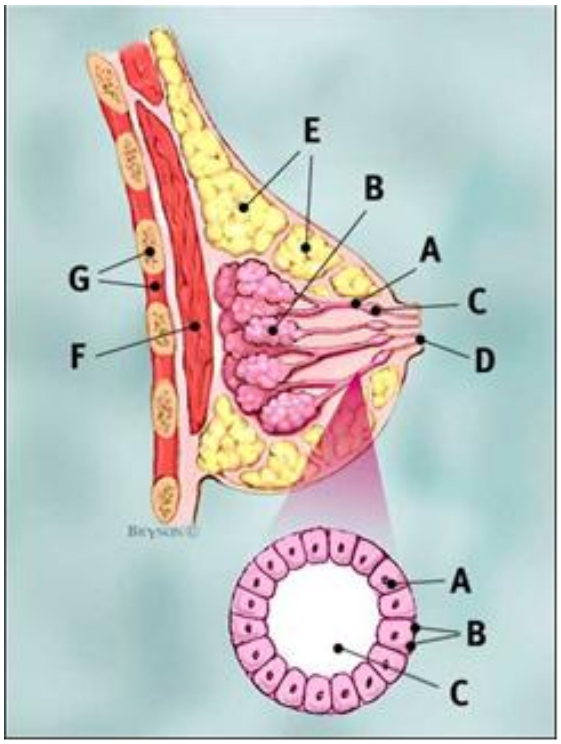
ANATOMY OF THE BREAST

The human breast is considered a modified cutaneous exocrine gland that is composed of skin, subcutaneous tissue, breast parenchyma (ducts& lobules) and supporting stroma. Fat is interposed in a complex network of ligaments, veins, arteries, nerves and lymphatics ***(Osborne and Boolbal, 2009).***

The female breast is laying on the anterior chest wall, extending from the second intercostal space superiorly down to the inframammary fold at the sixth or seventh intercostal space inferiorly. It extends medially from the lateral border of the sternum laterally to the midaxillary line ***(Lemaine and Simmons, 2012).***

The axillary tail is extending up to the axilla. The breast could be divided into four quadrants: the upper inner, lower inner, upper outer, lower outer quadrants. The upper outer quadrant contains more fibro glandular tissue than other quadrantes. It is also the most common location of tumors in the breast ***(Pandya and Moore, 2011).***

The fibroglandular tissue of the breast is composed of 15-20 lobes, each one divided into 20-40 lobules, which is consisting of 10-100 alveoli. Each lobe contains minor interlobular ducts, which drain into major lactiferous ducts which dilate into subareolar lactiferous ampullae. Ten major ducts open at the nipple ***(Lemaine and Simmons, 2012).***



A. Ducts
B. Lobules
C. Dilated section of duct to hold milk
D. Nipple
E. Fat
F. Pectoralis major muscle
G. Chest wall/rib cage
Enlargement:
A. Normal duct cells
B. Basement membrane
C. Lumen (center of duct

Fig. (1): Represents Breast profile ***(Ellies et al., 1993).***

The nipple and areola

The areola has a round shape varying in size from (3-6cm) in average, situated around the forth rib level. It has sebaceous glands that make projections on its surface that form tubercle of morgana. In the center of the areola emerges a papillary cylindrical formation varying in size from (10-12mm) wide in average by (9-10mm) in height ***(Zucca et al., 2016)***.