THE ROLE OF DIFFUSION WEIGHTED MRI IN THE DIAGNOSIS AND FOLLOW UP OF BREAST CANCER

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DEDICATION

I DEDICATE THIS WORK TO:

MY PARENTS

MY SISTER

MY DAUGHTER

CONTENTS

LIST OF ABBREVIATIONS

ACC	Adenoid cystic carcinoma
ADC	Apparent Diffusion Coefficient
ALND	Axillary lymph node dissection
BIRADS	Breast imaging reporting and data system
DCE-MRI	Dynamic contrast enhanced- magnetic resonance imaging
DCIS	Ductal carcinoma Insitu
DWI	Diffusion Weighted Imaging
EPI	Echo planar imaging
FSE	Fast spin echo
HASTLE	Half acquisition single shot turbo spin echo sequence
HRT	Hormone replacement therapy
IBC	Inflammatory breast carcionoma
LIQ	Lower inner quadrant
LOQ	Lower outer quadrant
LVI	Lymphovascular invasion
MBC	Mucinous breast carcinoma
MIP	Maximum intensity projection
MPG	Motion probing gradient
MRA	Magnetic resonance angiography
MRI	Magnetic resonance imaging

NACT	Neo adjuvant chemotherapy
NMLE	Non mass lesion enhancement
NOS	Not other wise specified
pCR	Pathological complete response
PROPELLER	Periodically rotated overlapping parallel lines with enhanced reconstruction
RECIST	Response evaluated criteria in solid tumors
RF	Radiofrequency
ROC	Receiver operating charchtaristics
ROI	Region of interest
SE	Spin Echo
SI	Signal intensity
SLNB	Sentinel lymph node biopsy
SNR	Signal noise ratio
SPIR	Spectral presaturation with inversion recovery
STIR	Short tau inversion recovery
TDLU	Terminal duct lobular unit
TE	Echo time
TR	Repition time
TSE	Turbo spin echo
UIQ	Upper inner quadrant
UOQ	Upper outer quadrant

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INTRODUCTION

Breast cancer is among the most common diseases affecting women worldwide, carrying a high mortality rate. Early detection and treatment may increase survival and improve quality of life which is why diagnostic accuracy is critical ***(Nogueira et al., 2014).***

Among all the existing pre surgical imaging modalities for breast cancer, Magnetic resonance imaging (MRI) is considered to be more accurate than ultrasound and mammography and can discriminate between benign and malignant masses ***(Jiang et al., 2014)*** especially in women with dense breast parenchyma where mammography has week role in it***(Gareth et al., 2014).***

Contrast enhanced MRI study of the breast is based on the enhancement pattern of the lesions and morphologic changes ***(Petralia et al., 2011).*** With these two criteria breast MRI has a sensitivity of about 85-99% in detecting malignant breast lesions, however there is an overlap of these criteria with benign lesions which leads to a reported specificity of about 40 to 80% ***(Cai et al., 2014).***

Nowadays, there are an increasing number of published studies which mention that the specificity of the breast MRI could be increased by using diffusion weighted imaging (DWI) moreover it can be useful for detection, assessment and treatment response monitoring of breast cancer ***(Janka et al., 2014).***

DWI is a technique that provides information about the functional environment of water in tissues. It relies on the detection of the random microscopic motion of free water molecules known as Brownian movment. It detects changes that include shift of water from extracellular

to intracellular spaces, restriction of cellular membrane permeability, increased cellular density and disruption of cellular membrane permeability ***(cakir et al., 2013).***

Diffusion rates vary between normal and pathologic tissue. The value of diffusion of water in tissues is called apparent diffusion coefficient (ADC) and it is calculated in the MRI machine by using ADC mapping**.**The studies showed that the ADC values vary between malignant and benign breast masses So application of DW sequence to the breast MRI will improve the specificity of the MRI without the need for intravenous contrast material injection ***(Tan et al., 2014).***

Also this sequence plays an important role in early assessment of tumor response to therapy, assessment of residual tumor after the end of therapy and in diagnosis of recurrence ***(Hahn et al., 2014).***

It is found that there is a correlation between ADC values and different prognostic factors of breast cancer as estrogen and progesterone receptors and microvascular density of breast cancer ***(choi et al., 2012).***

In breast cancer with brain and bone metastasis DWI is used to monitor tumor vascular permeability and cellularity where in brain metastasis there is increase in ADC values unlike bone metastasis that shows decrease in ADC values ***(Budde et al., 2012).***

AIM OF WORK

To review the role of diffusion weighted MRI in increasing the specificity of the MRI of the breast in detection of cancer breast and in follow up of the treatment.