ROLE OF MRI BI-RADS IN PREDICTING BREAST MALIGNANCY

Essay

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بسم الله الرحمن الرحيم
قَالُواْ سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا
عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ
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Noha Alaaeldin Farouk Elsayed Aboueldahab

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List of Abbreviations

ACC : Adenoid cystic Carcinoma

ACR : American College of Radiology

ACS : American Cancer Society

ADC : Apparent diffusion coefficient

BI-RADS : Breast Imaging and Reporting Data Systems

BMI : Body mass index

BRCA : Breast cancer

CAD : Computer-aided detection

DCE-MRI : Dynamic contrast-enhanced MRI

DCIS : Ductal carcinoma in situ

DES : Diethylstilbestrol

DNA : Deoxyribonucleic acid

DWI : Diffusion-weighted imaging

FLASH : Fast low-angle shot pulse sequence

FOV : Field of vision

FSPGR : Fast spoiled gradient recalled echo

GFR : Glomerular filtration rate

IDC : Invasive ductal carcinoma

ILC : Invasive (infiltrating) lobular carcinoma

LCIS : Lobular carcinoma in situ

MIP : Maximum intensity projection

MPR : Multiplanner reformat PG55

MRA : Magnetic resonance angiography

MR-CAD : Computer Aided Detection

MRI : Magnetic resonance imaging

List of Abbreviations *(Cont.)*

NCI : National Cancer Institute

NMLE : Non-mass like enhancement

NSF : Nephrogenic systemic fibrosis

ROI : Region of interest

STIR : Short time inversion recovery

TDLU : Terminal ductal-lobular unit

TNM : Tumour, Nodes, metastasis

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Introduction

Breast cancer is the most common invasive cancer in females worldwide. It accounts for 16% of all female cancers and 22.9% of invasive cancers in women. 18.2% of all cancer deaths worldwide, including both males and females, are from breast cancer. According to the National Cancer Institute (NCI), 232,340 female breast cancers and 2,240 male breast cancers are reported in the USA each year, as well as about 39,620 deaths caused by the disease ***(Christian, 2012).***

BI-RADS stands for 'breast imaging reporting and data system', and was established by the American College of Radiology. BIRADS is a scheme for putting the findings of mammograms, (for breast cancer diagnosis), into a small number of well-defined categories. Although BIRADS started out only for mammograms, it was later adapted for use with MRI and ultrasound as well ***(Razaet al., 2010)***.

The Breast Imaging Reporting and Data System (BI-RADS) terminology employed by radiologists to classify breast imaging results is useful in predicting malignancy in breast lesions detected with magnetic resonance imaging (MRI), a recent study demonstrated ***(Delicia, 2012)***.

The American College of Radiology (ACR) Breast Imaging Reporting and data System (BI-RADS) has

undergone revision. The main objectives of the new BI-RADS edition remain the same: to diminish confusion in the interpretation of imaging findings, to standardize reporting, and to simplify outcome monitoring. The overall changes made to the ACR BI-RADS have been designed to give more flexibility for situations where the previous edition of BI-RADS in the past had given much confusion ***(Hauthet al., 2010)***.

The new edition of BI-RADS has made changes to its 3 components, the BI-RADS breast imaging lesion, the standardized reporting language, and the medical audit and outcome monitoring. The mammography, ultrasound, and magnetic resonance imaging (MRI) lesions have been made more compatible with each other by using the same descriptors for a lesion across whenever possible all 3 imaging modalities. Also added in this new edition is an increase in number of reference citations, which provides evidence-based justification to the lesion and management recommendations ***(Cecilia, 2014)***.

Magnetic resonance imaging (MRI) has emerged as a valuable imaging modality for breast cancer detection and staging. The MR imaging finding includes terms used to describe morphologic characteristics of breast lesions (focus, mass, non-mass like enhancement [NMLE]) and kinetic features (initial enhancement, delayed enhancement) and

defines final assessment categories to describe the level of suspicion regarding MR findings. The lesion has been evaluated, and it has been found useful in quantification of the likelihood of carcinoma for mammographic and US abnormalities ***(Mary et al., 2012)***.

Dynamic contrast-enhanced MRI (DCE-MRI) is the most sensitive technique for screening high-risk women and for evaluating the extent of disease in patients with a recent diagnosis of breast cancer. Despite its numerous advantages, the moderate specificity of DCE-MRI can result in a substantial number of false positive findings that translate to high recall rates and unnecessary biopsies. Incorporating diffusion-weighted imaging (DWI) into conventional breast MRI examinations has strong potential to increase specificity. Apparent diffusion coefficient (ADC) measures for breast carcinomas is significantly lower than for benign breast lesions or normal tissue. Furthermore, recent studies have shown improvements in breast MRI accuracy achieved through a combination of DWI and DCE-MRI features, and have identified potential ADC thresholds for differentiating benign from malignant lesions ***(Sana and Savannah, 2013)***.

The higher magnetic field strength of 3T provides an improved signal-to-noise ratio and allows for increased spatial and temporal resolution. This should allow for better visualization and characterization of enhancing lesions, which may improve detection of breast cancers ***(Ana et al., 2014)***.

Aim of the Work

To evaluate the role of magnetic resonance imaging (MRI) Breast Imaging and Reporting Data Systems (BI-RADS) in predicting breast malignancy.