Chapter (1)

Introduction

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INTRODUCTION

Breast cancer is the second most frequent type of cancer in the world and the most common in women. About 1 in 8 women in the United States will develop invasive breast cancer over the course of their lifetime. In the US, approximately 207,090 new cases of female invasive breast cancer were predicted to occur in 2010, along with 1,970 cases in men (Jemal, 2010). In addition to invasive breast cancer, 54,010 new cases of in situ breast cancer were expected to occur among women, of which approximately 85% were expected to be ductal carcinoma in situ (DCIS))Jemal, 2010) . The goal of screening exams for early breast cancer detection is to find cancers before they start to cause symptoms. Screening refers to tests and exams used to find a disease, such as cancer, in people who do not have any symptoms. Early detection means using an approach that allows earlier diagnosis of breast cancer than otherwise might have occurred. Breast cancers that are found because they are causing symptoms tend to be larger and are more likely to have already spread beyond the breast. In contrast, breast cancers found during screening exams are more likely to be smaller and still confined to the breast. The size of a breast cancer and how far it has spread are some of the most important factors in predicting the prognosis (outlook) of a woman with this disease (American Cancer Society, 2011). Mammography has a false-negative (missed cancer) rate of at least 10 percent. This is partly due to dense tissues obscuring the cancer and the fact that the appearance of cancer on mammograms has a large overlap with the appearance of normal tissues. There are also some conditions for which mammography have a limited role in assessment as they often have no clearly recognizable features on mammograms. These conditions are recognized as being precancerous (Kolb 2002).

Ultrasound may help detect some breast masses and is the best way to determine whether a cyst is present without placing a needle into the area of concern to aspirate fluid but it is unable to image microcalcifications, tiny calcium deposits that are often the first indication of breast cancer (Imaginis, 1997).

Magnetic Resonance Imaging (MRI) has been increasingly used for accurate diagnosis of both primary and recurrent breast cancers, particularly in cases in which

mammography and breast sonography are inclusive or yield discrepancies. In addition, MR imaging may improve the analysis of the local extend of breast cancer by revealing multifocal and multicentre tumor growth in patients scheduled for conservative breast surgery. Although the high sensitivity of breast MR imaging has proved to be advantageous for preoperative patients, the limited specificity of this imaging method continues to be a significant problem (Philadelpho, 2011). Contrast enhanced MRI carries very high sensitivity but moderate specificity for the diagnosis of breast cancer (Bluemke, 2004). Hence, several studies have investigated the role of advanced MR imaging techniques such as diffusion weighted imaging (DWI), in improvement of the specificity of MR Imaging for the evaluation of breast lesion. In vivo proton MR spectroscopy of the breast is one of the new MR imaging techniques which used to obtain biochemical information about the tissues of the human body in a non-invasive way (without the need for a biopsy), and provide more accurate information about the makeup of different breast diseases than can be obtained with regular MRI, It has been proposed as an adjunct to the magnetic resonance imaging (MRI) examination to improve the specificity of distinguishing malignant breast tumors from benign breast tumors. Its diagnostic value in cancer is typically based on the detection of elevated levels of choline (Cho) compounds, choline being a marker of active tumor, whereas Cho is generally undetectable in normal breast tissues (Negendank, 1992). Diffusion weighted imaging has only recently been applied to breast imaging. Through imaging of alterations in the microscopic motion of water molecules DWI can yield novel quantitative and qualitative information reflecting cellular changes that can provide unique insights into tumor cellularity. With respect to breast DWI, potential role for the apparent diffusion coefficient (ADC), a quantitative measure that is directly proportional to the diffusion of water and inversely proportional to the tumor cellular density, has been reported to be useful for charactering breast tumors and distinguishing malignant tissues from benign tissues (Philadelpho, 2011). Since a successful treatment of this disease depends, in part, on early diagnosis, we hypothesize that these MR Imaging techniques (MRS and DWI) will allow a reliable discrimination between malignant and benign

lesions and may be expected to speed up the process of recovery of the patients by decreasing mortality rates as well as safe the patients from unnecessary operations and postoperative complications that may occur by reducing the number of false-positive results.

The purpose of this study was to find out the accuracy of MR spectroscopy and MR diffusion - weighted imaging in diagnosis of female breast cancer

1-1 Problem of the study

female breast cancer is a common disease for women of age above forty, therefore screening mammography is mandatory for a women in this age, but the high miss detection rate hindered the goal of screening. MR spectroscopy has objective characteristics which lead to more accurate diagnosis and hence will improve the detection of early breast cancer.

1.2 Objectives

The general objective of this study was to evaluate the accuracy of MR spectroscopy and diffusion technique in diagnosing female breast cancer to facilitate early detection of cancer.

Specific objectives:

- To evaluate MR spectroscopy and diffusion technique in tissue characterization of breast cancer.

- To correlate between biopsy result and tissue characterization of breast cancer by MR Spectroscopy and MRI diffusion technique

- To measure the accuracy, sensitivity and specificity of each modality.

- To measure the association between tumor size and ADC values and choline level.

- To clacify tumor type according to ADC map, choline level and T2-weighted images.

1-3 Significance of the study

This study will improve the quality of patients' life and get them back to living by avoiding them the pain that may be experienced during biopsy and unnecessary operations and postoperative complications that may follow. Also to provide accurate information not available with standard imaging methods by using MR Spectroscopy and diffusion technique to confirm positive cases of female breast cancer.

1-4 Overview of the study

This study contains five chapters; chapter one includes introduction, chapter two literature review while chapter three includes methodology and chapter four result and data Presentation, the last chapter, discussion and conclusion. SPSS program will be used for the analysis of data by using a suitable version with the assistance of statistician also the result would be discussed thoroughly and correlated to the previous studies and the conclusion would be presented accordingly.