Breast Screening by MRI

Essay
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Radiodiagnosis

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بسم الله الرحمن الرحيم

وقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ
ورَسُولُهُ والْمُؤْمِنُونَ

صدق الله العظيم

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List of Abbreviations

ADC	:	Apparent diffusion coefficient
BCT	:	Breast conserving therapy
DCIS	:	Ductal carcinoma in situ
Gd-DTPA	:	Gadolinium diethylene triamine penta aceticacid
IBC	:	Inflammatory breast cancer
IDC	:	Ductal carcinoma
ILC	:	Invasive lobular carcinoma
LCIS	:	Lobular carcinoma in situ
LIN	:	Lobular intraepithelial neoplasia
LVI	:	Lymphovascular invasion
MCB	:	Carcinoma of the breast
MRI	:	Magnetic resonance imaging
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NOS	:	Not otherwise specified
NST	:	No special type
ROI	:	Region of interest

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Introduction

Breast cancer is by far the most frequent cancer of women (23% of all cancers (ranking second overall when both sexes are considered together ***(Jemal et al., 2004)***. Breast cancer is the second leading cause of cancer death around the world ***(Ferlay et al., 2008), (DeSantis et al., 2011).***

Breast cancer screening is the medical screening of asymptomatic, apparently healthy women for breast cancer in an attempt to achieve an earlier diagnosis. The assumption is that early detection will improve outcomes. A number of screening tests have been employed, including clinical and self breast exams, mammography, genetic screening, ultrasound, and magnetic resonance imaging ***(Kösters, 2003).***

Magnetic resonance imaging (MRI) has been shown to detect cancers not visible on mammograms. The chief strength of breast MRI is its very high negative predictive value. A negative MRI can rule out the presence of cancer to a high degree of certainty, making it an excellent tool for screening in patients at high genetic risk or radiographically dense breasts, and for pre-treatment staging where the extent of disease is difficult to determine on mammography and ultrasound. MRI can diagnose benign proliferative change,

fibroadenomas, and other common benign findings at a glance, often eliminating the need for costly and unnecessary biopsies or surgical procedures ***(DeMartini et al., 2008).***

Women at high risk for breast cancer based on certain factors should get an MRI and a mammogram every year. This includes women whom have a lifetime risk of breast cancer of about 20% to 25% or greater, according to risk assessment tools that are based mainly on family history:

1. Have a known *BRCA1* or *BRCA2* gene mutation.
2. Have a first-degree relative (parent, brother, sister, or child) with a *BRCA1* or *BRCA2* gene mutation, but have not had genetic testing themselves.
3. Had radiation therapy to the chest when they were between the ages of 10 and 30 years.
4. Have Li-Fraumeni syndrome, Cowden syndrome, or Bannayan-Riley-Ruvalcaba syndrome, or have first-degree relatives with one of these syndromes

(Saslow et al., 2007).

However, an important disadvantage of breast MRI is the rate of false positive results. The sensitivity of breast MRI is high but the specificity is low. Breast cysts, fibroadenomas, papillomas, and fibrocystic changes may all appear as abnormalities on contrast images, resulting in

unnecessary biopsies, also it is expensive and not widely available ***(Leach, 2005).***

Breast MRI may not detect some in situ carcinomas and other low grade benign or malignant lesions and is only an adjunct to mammography and ultrasound.Breast MRI should never be offered as a substitute for conventional screening mammography ***(Nemec et al., 2007).***

However, one could argue that in high-risk populations the sensitivity of mammography is quite low and may be of limited value, making MRI an imperfect but better tool ***(Liberman et al., 2004).***

So MRI has it's advantages and disadvantages when using it as a screening tool for breast cancer but it should be done because of it's high negative predictive value.

Aim of The Work

The aim of the work is to demonstrate the value of MRI (magnetic resonance imaging) in breast cancer screening in high risk groups.

Anatomy of The Breast

General anatomy:

The breast overlies the second to the sixth ribs on the anterior chest wall.

It's hemispherical with an axillary tail (of Spence) and consists of fat and a variable amount of glandular tissue. It's entirely invested by the fascia of the chest wall, which splits into anterior and posterior layers to envelope it. The fascia forms septa called Cooper's ligament, which attach the breast to the skin anteriorly and to the fascia of pectoralis posteriorly. They also run through the breast, providing a supportive framework between the two fascial layers. The pigmented nipple projects from the anterior surface of the breast. It's surrounded by the pigmented areola and its position is variable, but it usually lies over the fourth intercostal space in the non pendulous breast **(Fig. 1)** ***(Ryan et al., 2011).***

Lobular structure:

The internal architecture of the breast is arranged into 15-20 lobes, each of which is drained by a single major lactiferous duct that opens on to the nipple. Each lobe is made up of several lobules, each of which drains several