The Role of MRI in Evaluation of Breast Cancer after Therapy

Essay study submitted for partial fulfillment of the Master Degree (M.Sc) in Radiodiagnosis

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Dr/Hany Samy Wahib

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List of Abbreviations

3D	Three dimensions.
2D	Two dimensions.
ADCw	Apparent diffusion coefficient of water
ANDI	Aberrations of Normal Development and Involution
AUC	Area under the enhancement curve
BCS	Breast conserving surgery
BCT	Breast Conservation Therapy
BI-RADS	Breast Imaging Reporting and Data System
Cho	Choline
DCE-MRI	Dynamic contrast enhanced-MRI
DCIS	Ductal Carcinoma In-Situ
DWMRI	Diffusion-weighted magnetic resonance imaging
ERT	Estrogen replacement therapy
FOV	Field of view
GRE	Gradient echo
1H MRS	Proton MRS
LCIS	Lobular Carcinoma In-Situ
MIP	Maximum intensity projection
MRA	Magnetic resonance angiography
MRI	Magnetic resonance imaging
MRM	Magnetic resonance mammography

MRS	Magnetic resonance spectroscopy
MRSI	Magnetic resonance spectroscopy imaging
PST	Primary systemic therapy
SERMs	Selective estrogen receptor modulators
SER	Signal enhancement ratio
TNM	Tumor, Node and Metastasis
TRAM	Transverse rectus abdominis myocutaneous flap
US	Ultrasound

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Introduction

Breast cancer is the most frequent cancer in women; consisting 23 % of all cancers. The high incidence in the richer countries of the world is partially ought to the systematic screening control with mammography that result in diagnosis of breast cancer in early stage ***(Trichopoulos et al., 2008).***

Breast cancer therapy includes surgery, radiation therapy and/or chemotherapy.

The effectiveness of lumpectomy plus radiation therapy (breast-conserving therapy) as an alternative to mastectomy is well established ***(Spilsbury et al., 2005).***

Several strategies help reduce the number of women who require return to the operation room for re-excision or mastectomy; new technologies include preoperative lesion mapping with magnetic resonance imaging (MRI) and ultrasound (US) ***(Silverstein et al., 2005).***

MRI is also a useful tool in the setting of follow-up of breast cancer after therapy.

Follow –up with MRI has better results compared to conventional modalities, mammography and US. Magnetic resonance mammography (MRM) has 92% positive predictive value for detection of residual tumor at site of lumpectomy ***(Frei et al., 2000; Vandermeer and Bluemke, 2007).***

Studies have shown a high sensitivity of MRI in the detection of recurrence after 1 year as the sensitivity and specificity of MRI in this setting depends on the time interval between surgery and MRI; should be done at least 1 month after surgery to reduce false positives from inflammatory changes at the surgical site ***(Frei et al., 2000; Vandermeer and Bluemke, 2007).***

Breast MRI has been shown to be more useful than clinical examination and mammography in monitoring for patient response to chemotherapy, and in differentiating responders from non- responders early in the course of therapy ***(Rosen et al., 2003; Pickles et al., 2005).***

MRM also has an important role in assessment of tumor extent after the end of the cycles of chemotherapy ***(Balu-Maestro et al 2002).***

In past few years, in vivo proton MR spectroscopy (MRS) of the breast is demonstrating great promise in early evaluation of the effects of chemotherapeutic agents ***(Kumar et al., 2006).***

Contrast–Enhanced MRI (CE-MRI) is useful for identifying recurrence in patients following breast reconstruction ***(Bone et al., 1995)***.