

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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# دور التصوير بالرنين المغناطيسي في تقييم سرطان الثدي بعد العلاج

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## ***List of Abbreviations***

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

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