The Role Of MRI In Early Detection Of Ductal Carcinoma In Situ (DCIS) Of The Breast

An essay

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List of Abbreviations

Abbreviation	*Stands for*
US	Ultra sound
MLO	Medio lateral oblique
CC	Cranio coudal
MRI	Magnetic resonance imaging
DCIS	Ductal carcinoma in situ
LCIS	Lobular carcinoma in situ
IDC	Invasive ductal carcinoma
ILC	Invasive lobular carcinoma
NOS	Not otherwise specified
BIRADS	Breast Imaging Reporting and Data System
ACR	American College of Radiology
MG	Mammography
DCE-MRI	Dynamic contrast enhanced MRI
FOV	Field of view
IV	Intra venous
ROI	Region of interest
DWI	Diffusion weighted imaging
EPI	Echo planner imaging
ADC	Apparent diffusion coofficient
MIP	Maximum intensity projection
SNR	Sound to noise ratio
SVS	Single voxel spectroscopy
SI	Spectroscopic imaging
STEAM	Stimulated echo acquisition mode
PRESS	point-resolved spatially localized spectroscopy
NMLE	Non mass like enhancement
MRS	Magnetic resonance spectroscopy
Cho	choline
tCho	Total choline
P	peak
BCT	Breast conservation therapy
LCNB	Large core-needle biopsy
VAB	Vacuum- assisted biopsy

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Introduction

Ductal carcinoma in situ (DCIS) or intraductal carcinoma is a noninvasive malignancy characterized by the clonal proliferation of malignant epithelial cells originating in the terminal ductal lobular unit, with no histologic evidence of invasion of the basement membrane. It is most often asymptomatic and may involve multiple sites separated by normal tissue in the same ductal system or in different ductal systems. ***(Raza et al, ٢٠٠٨).***

Known mutations in the *BRCA*١ and *BRCA*٢ genes account for about ٥٠٪ of the hereditary breast cancers. *BRCA*١ and *BRCA*٢ mutation carriers face a lifetime breast cancer risk as high as ٨٥٪ and develop breast cancer at an early age, approximating ٥٠٪ by ٥٠ years. ***(Causer et al, ٢٠٠٧).***

The American College of Radiology (ACR) Breast Imaging Reporting and Data System (BI-RADS®) is a quality assurance tool designed to standardize mammographic reporting, reduce confusion in breast imaging interpretations and facilitate outcome monitoring. ***(American College of Radiology, ٢٠٠٣).***

The extent of DCIS involvement is frequently underestimated at mammography, which can reliably help detect only calcified DCIS. Because not all DCIS calcifies, the sensitivity of mammography ranges widely (٢٧٪–٨٠٪). Disease extent is also frequently underestimated at mammography due to incomplete lesion calcification, which can result in additional operations such as surgical bed reexcision or completion mastectomy being performed to obtain negative margins. ***(Mossa-Basha et al, ٢٠١٠).***

Magnetic resonance (MR) imaging has become established as a diagnostic and research tool in many areas of medicine because of its ability to provide excellent soft-tissue delineation in different areas of interest. ***(Jacobs et al ٢٠٠٧).***

More recent developments in MR gradient systems and pulse sequences allow the simultaneous achievement of high spatial resolution and adequate temporal resolution. ***(Rausch et al, ٢٠٠٦).***

Alternative means of detecting DCIS have been explored, including the use of contrast enhanced MRI. Breast MRI has emerged as an important tool in the detection and characterization of breast cancer, showing sensitivity ranging from ٩٠–١٠٠٪ for invasive carcinoma. ***(Raza et al, ٢٠٠٨).***

Contrast-enhanced dynamic MRI of the breast is complementary to mammography in the detection of DCIS because enhancement may be seen in areas of calcified as well as noncalcified intraductal carcinoma. This allows detection of noncalcified disease and more accurate assessment of the extent of disease, improving treatment and prognosis. ***(Raza et al, ٢٠٠٨).***

To maximally benefit from its sensitivity (as MR imaging–only visible lesions including cancers are often encountered), some means of MR imaging–guided biopsy is essential in a screening program. ***(Causer et al, ٢٠٠٧).***

For suspicious breast lesions detected initially by MRI and recommended for biopsy (BI-RADS ٤ or ٥), malignancies exhibit significantly lower mean apparent diffusion coefficient (ADC) values compared with benign lesions, and increased positive predictive value (PPV) can be achieved by incorporating an ADC threshold into the breast MRI assessment. ***(Partridge et al, ٢٠٠٩).***