BREAST IMAGING SOCIETY, INDIA

BEST PRACTICE GUIDELINES – MRI BREAST

INTRODUCTION

Magnetic Resonance Imaging (MRI) of the breasts is an established, robust and important imaging tool in the armamentarium of a trained breast radiologist for the detection and characterization of breast abnormalities. Its high sensitivity to detect breast cancer has led it being established as an excellent screening tool in women with strong family history of breast cancer and with dense breasts & further for pre-therapeutic local staging of newly diagnosed breast cancers where its role is being increasingly well accepted. It also serves as a good problem solving tool to clarify findings that are indeterminate on mammography and breast ultrasound.

Various groups and organisations have established recommendations for appropriate use of MRI, one such being the American College of Radiology (ACR) which has laid down certain guidelines to standardise various aspects of conducting and reporting breast MRI studies in the ACR Breast Imaging - Reporting and Data System (ACR BI-RADS). At present this is the most widely used MR Imaging Lexicon in India enabling clinicians across specialities to communicate well and work towards the common goal of better patient care. With increasing availability of Breast MRI in facilities across our country it is important to understand its advantages and limitations so that it can be utilised appropriately and effectively.

PRE-REQUISITES

- At least a 1.5-T magnet.
- Dedicated bilateral Breast surface Coils capable of simultaneous bilateral imaging.
- Equipment to perform mammographic correlation & directed breast ultrasonography.
- Ideally MR imaging-guided intervention facility or at least have a referral arrangement with a cooperating facility that could provide the service.

TECHNIQUE

Although, there may be minor variations in breast MR imaging acquisition protocols from centre to centre, there is a general agreement that high-quality imaging should include a technique that is bilateral, obtained using a dedicated breast coil with complete coverage of the breasts and axillae, is a dynamic multiphasic contrast enhanced study and has key pulse sequences with appropriate high spatial and temporal resolution for morphologic and kinetic assessment of the lesion.(1)

It is always a good idea to talk to the patient prior to the scan to obtain required history, clinically examine the patient and to prepare her/him by explaining the entire procedure including the unusual prone position, contrast injection and importance of not moving during scanning. Proper patient/breast positioning in the coil with application of optimal lateral compression plates to minimise movement and other inhomogenous fat suppression artefacts balanced with adequate patient comfort is imperative in obtaining images of diagnostic quality.

Contrast agent & dose - Gadolinium contrast agent injected intravenously at a dose of 0.1 mmol/kg followed by a 20 ml saline flush at a rate of approximately 2 ml/s, using a power injector.(1)

Pulse Sequences – For optimal diagnostic usefulness a fluid sensitive sequence with and without fat suppression – T2 FS/STIR, T1W & T2W 2D or 3D images of at least 3 mm or less slice thickness with a maximum in-plane pixel dimension of 1 mm or less to achieve good spatial resolution followed by a multiphase T1-W Dynamic Contrast Enhanced (DCE) series with pre-contrast, initial post-contrast in a 60 to 120s window for reasonable temporal resolution & subsequent delayed post-contrast images are required.(1) Silicone selective sequences may be acquired for implant evaluation. Intravenous contrast administration can be omitted and a plain study carried out for assessment of implant integrity. Newer techniques such as Diffusion weighted imaging (DWI) and MR spectroscopy are optional.

Abbreviated (FAST) Breast MRI as a cost effective screening protocol with similar sensitivity and specificity to a full diagnostic protocol may also be used with fewer sequences (3-4 in number) in varying combinations as per reader comfort to shorten the scan time. This would include a fluid sensitive T2 / STIR, pre and a single post-contrast fat suppressed T1W sequence.

Post processing techniques – Evaluation of images using Subtraction, Maximum intensity projections (MIP), morphologic and Kinetic analysis on a dedicated workstation.

INDICATIONS

Divided into two main categories – Screening and Diagnostic

SCREENING Breast MRI

X-ray Mammography is the investigation of choice for Breast Screening. However, mammography has its limitations especially in young high risk women with dense breasts. Among other modalities, contrast enhanced MRI has greater sensitivity compared to X-ray mammography and sonography for invasive (94-99%) and in-situ cancers (50-80%) in high risk population. Hence MRI has been widely accepted in its role in the high risk category of patients as an adjunct screening modality with X-ray mammography and not replacing it. It may also have a supplemental role in screening of the intermediate (15-20%) risk category in the future which is currently under research (2,3,4,5).

Annual screening MRI along with X-ray mammogram should be offered in high risk women i.e. those with a life time risk of breast cancer of 20% or more (2,4). This subset includes -

- Known BRCA1 or BRCA2 gene mutation
- Untested first-degree relative (mother, father, brother, sister, or child) of BRCA1 or BRCA2 gene mutation.
- Those with a lifetime risk of breast cancer of 20-25% or greater, according to risk assessment models.
- Received mantle radiation to the chest for Hodgkin's disease between the ages of 10 and 30 years.
- Having genetic disease such as Li-Fraumeni syndrome, Cowden syndrome, or Bannayan-Riley-Ruvalcaba syndrome, or first-degree relatives with it.

Breast MRI may also be considered as a supplement to mammography to screen women at intermediate risk of breast cancer (15%-20%) such as those with a personal history of breast cancer and dense tissue or for those diagnosed with breast cancer under the age of 50 (6).

Patients with breast augmentation – Screening breast MRI may also be considered in patients with silicone or saline implants and/or free injections with silicone, paraffin, or polyacrylamide gel in whom mammography is difficult and for those who have undergone implant reconstruction following lumpectomy or mastectomy for breast cancer where contrast-enhanced breast MRI screening may be beneficial (6).

DIAGNOSTIC Breast MRI

In its diagnostic role Breast MRI is helpful in the following clinical settings –

Assessment of extent of disease in newly diagnosed breast cancer
Although current literature does not support widespread use of MRI for breast cancer staging in terms of increasing overall survival and reducing re-excision rates, MRI does have the superior sensitivity and accuracy for detection of invasive and in situ disease as compared with Clinical Breast Examination (CBE), mammography & ultrasound with limited specificity and hence maybe useful in select subpopulations such as

- In dense breasts to assess multifocality /multicentricity & ductal carcinoma in situ (DCIS) where it influences eligibility for Breast Conservation Surgery (BCS).
- Lobular cancers which are more accurately imaged with MRI by virtue of their pattern of growth.
- Posterior tumors better imaged with MRI for chest wall invasion
- Patients being planned for partial breast irradiation (PBI) following BCS.

However, in view of its limited specificity It is emphasised that all suspicious MR findings should be correlated with biopsy prior to definitive therapy to ensure appropriate treatment. Targeted second-look ultrasound, re-evaluation of mammograms, targeted mammographic views, or images obtained with digital breast tomosynthesis are useful, offering possibility of a biopsy under their guidance. Mass lesions identified on MRI are more likely to have a sonographic correlate than non-mass like lesions (65% vs 12%, respectively). Hence a second-look US is a useful diagnostic tool for lesions incidentally detected on breast MRI and also helps in guiding biopsies. In suspicious MR only detected lesions (BI-RADS 4 or 5) however, an MR-guided biopsy will be required (7).

Assessing Response to Neoadjuvant Chemotherapy in locally advanced breast cancers not amenable to upfront surgeries, to reduce tumor size to enable BCS and to assess tumor responsiveness to therapy.

Metastatic axillary adenopathy with occult primary on Clinical Breast Examination (CBE), Mammography and Ultrasound
MRI accurately detects the occult primary in 62-86 % of cases (8) which is then treated accordingly or when MRI too is negative, axillary nodal dissection is done along with mastectomy or Whole Breast Radiation therapy (WBRT).

Scar versus tumor recurrence

For Problem Solving in cases with equivocal or inconclusive findings on mammograms and ultrasound such as asymmetries with a suspicious appearance, multiple masses, pathological nipple discharge with no mammographic or sonographic correlate and to localise lesions for image guided biopsies and wire placements in cases where multiple solid lesions of similar characteristics are seen [to select the most suspicious (1 or 2) to biopsy and also where the lesions are difficult to resolve sonographically such as intraductal

inspissated secretions or intraductal solid lesion where MRI helps in retrospective identification on re-look ultrasound and localised].

Evaluation of Augmented breasts

MR imaging is the most sensitive imaging method to detect breast silicone implant integrity and does not require injection of intravenous contrast for assessing rupture only. Contrast may however be indicated in the evaluation of patients with silicone or saline implants and/or free injections with silicone, autologous fat, paraffin, or polyacrylamide gel as well as for those who have undergone implant reconstruction following lumpectomy or mastectomy for breast cancer. The presence of implants does not affect the sensitivity of MRI for breast cancer detection.

REPORTING BREAST MRI

Report of MRI breasts should clearly mention the clinical indication for which it is being done along with findings noted on the other conventional imaging modalities, as it should never be interpreted in isolation. It is also important to remember that mammograms are obtained in upright position, ultrasound in supine / semi lateral decubitus position and MRI in prone position, which may lead to mild variation in the lesion location described as the o' clock position, especially those bordering the quadrants and should be noted as such. Comparison must be made with any priors available. It is very important to mention the background breast parenchymal enhancement pattern (BPE) which is inherent to this modality only along with the breast composition. All findings need to be described as per standardised descriptors given in international guidelines such as the ACR BIRADS Reporting System in terms of morphology and kinetic assessment and a final impression should be mentioned indicating the worst comprehensive BIRADS category with a clear mention of further investigative advise such as biopsy or a follow up protocol (9).

DISCLAIMER

The Best Practice Guidelines of Breast Imaging Society, India are the broad guidelines for investigation, intervention and management of clients opting for breast screening and patients with breast symptoms in India, and intended for the use of qualified medical caregivers only. These are based on various national and international guidelines and personal experiences and opinions of BISI members, as there is no large credible Indian data to formulate these guidelines. These guidelines are purely recommendatory and general purpose only in nature. Actual decisions for management of patients should be individualized according to own judgement of the caregiver and tailored on case-to-case basis. As scientific knowledge is continuously improving, a regular update of the same by the caregiver is essential. Failure to do so may result in untoward patient management or outcome and BISI members or BISI as the organization cannot be held responsible for that in any manner.

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