

MRI Guided Breast Biopsies

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Introduction

Magnetic resonance imaging (MRI) is a non-invasive technique that produces computer-generated cross-sectional images. The images produced contain anatomic and physiologic information. (Long, Rollins, & Smith, 2019). MRI breast imaging is performed on women who are at high risk of developing breast cancer.

(Mann, Cho, Moy, 2019)

Magnetic Resonance Imaging

- Imaging modality used to evaluate organs, tissues, and skeletal systems
- The images produced are complex because of the different properties of tissue proton density, relaxation rates, and flow phenomena
- 3 dimensional detailed anatomical images are produced
- Gadolinium is a contrast agent used in MRI to highlight different properties of tissue



1.5 Tesla MRI Machine

(Stanford Health Center 2017)

Indications for breast Imaging

- Abnormalities not detectable in any of the conventional imaging modalities due to the breast tissue or size of the lesion (Papalouka, Kilburn-Toppin, Gaskarth, Gilbert, 2018).

- Dense breast tissue
- Strong family history

MRI Breast Imaging

- The different sequences used could detect small abnormalities that may be missed under ultrasound or mammography.
- MRI is able to detect masses that could be >1 cm
- Screening with breast MRI leads to earlier cancer detection in all women because it has the highest predictive value for carcinoma
- Precise location of the lesion is a preoperative step in treating the disease
- T2 images are used for visualizing cysts
- T1 weighted images to observe contrast enhancement
- T1 and T2 is the time constant which is the the rate at which excited protons reach equilibrium or go out of phase with each other
- Diffusion weighted imaging (DWI) highlight cancerous lesions (Radswiki and Mical, 2022)



Image above shows MRI open breast coil, grid system, fiducial marker, VAB (Nolan-Pleckham, 2022)

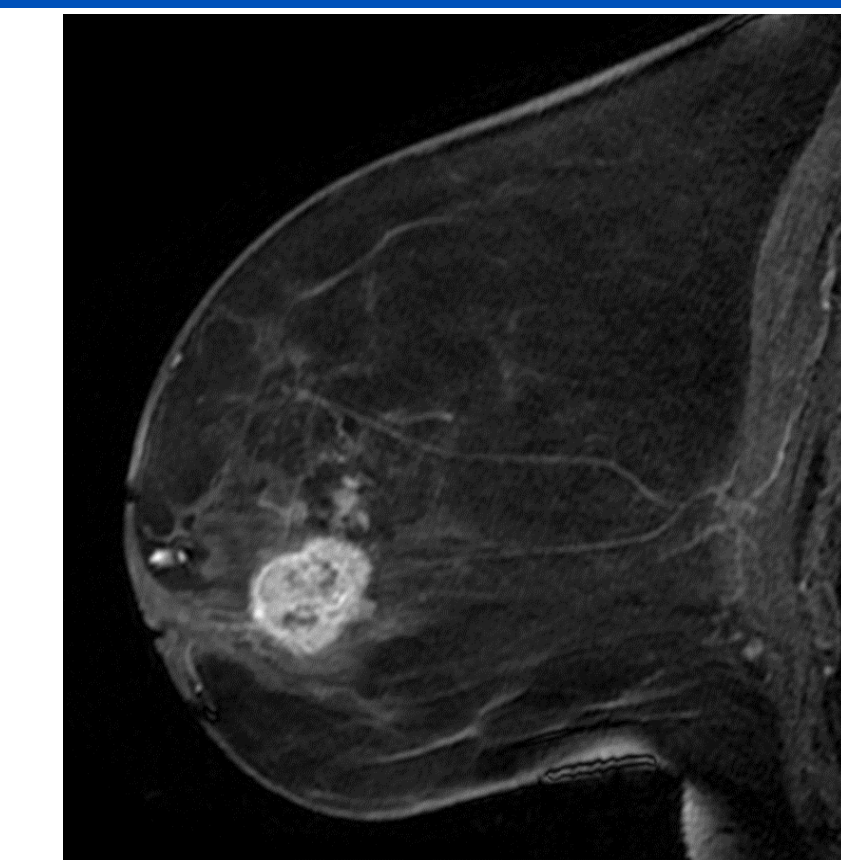


Image above demonstrates sagittal breast image showing a highlighted breast lesion (Mann et al. 2019)

Findings

- 69% of breast cancer detected on MRI are smaller than 1 cm
- Precise location of the lesion
- Malignancy or benign lesions from the sample
- Treatment plan

Equipment utilized for MRI guided breast biopsies

- MRI system needs to have a magnet strength of at least 1.5 or 3 Tesla
- Dedicated open breast coil
- Adjustable grid system
- Fiducial marker (opaque landmark fixed to the grid with its tip in contact with the breast)
- Introducer
- Vacuum Assisted Breast Biopsy (VAB) apparatus and needle,
- Localization marker clip.

(Gao et al. 2022)

Contraindications for breast imaging

- Lab values do not meet needed criteria: Glomerular Filtration Rate (GFR) >30, Blood Urea Nitrogen (BUN) 7.00-21.00, Creatine 0.50-0.90

(Radswiki et al., 2022)

- Lab values are needed to ensure patients kidneys are functioning well enough to filter out the Gadolinium
- Claustrophobia
- Implanted devices such as pacemakers, wires, defibrillators

Conclusion

MRI guided breast biopsies are becoming more prevalent in diagnosing breast cancer and treatment planning because of the specificity of MRI. MRI has the highest sensitivity compared to other imaging modalities and is able to detect masses or abnormalities as small as 1 cm in size. (Mann et al. 2019). Multiple studies showed that MRI identified earlier stage disease than mammography and that combined MRI and mammography is associated with improved survival rates

(Mann et al. 2019).