

Tips & Techniques in MRI Breast

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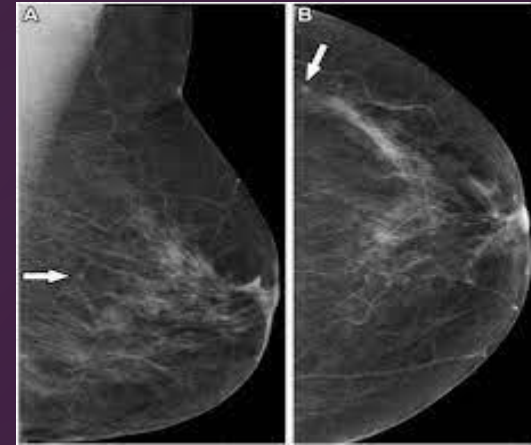
Introduction

- Breast cancer is one of the most common cancer in women in both developed and developing countries.
- The prognosis of breast cancer depends on the stage of presentation therefore, it is extremely important to detect them early.
- It is also of paramount importance to characterize these lesions for further management.
- Hence, a diagnostic test which is both sensitive and specific is required for the proper management of breast lesions.



Introduction

- Due to limited specificity of conventional mammogram and ultrasound in characterizing breast lesions, invasive procedures like FNAC and biopsies are being increasingly used to differentiate benign from malignant lesions.
- Most sensitive method (>90%) for the detection of breast cancer. Its role in diagnosis and management continues to evolve



Introduction

- In breast imaging, MRI is able to provide
 - a. high spatial resolution; thus prioritizing analysis of the morphology of the lesions (the contours, form, internal characteristics) and
 - b. high temporal resolution, preferring to use information from the dynamic enhancement curve of the lesions
- These two approaches are reconciled, thereby, making MRI breast an effective imaging tool.



Indication

- Identified mass with indeterminate characteristics following mammography or USG.
- Staging for chest wall invasion or lymphadenopathy after cancer diagnosis
- Palpable mass with negative mammography/USG
- Axillary node metastases with unknown primary
- Unexplained swollen breast or breast implant
- To check the response to neoadjuvant chemotherapy



Indication

- To check the extent of infiltrating lobular or ductal carcinoma
- To check residual disease post-lumpectomy
- Postoperative tissue reconstruction
- Dense breast in high risk patients
- Surveillance of high-risk patients
- Determine extent of disease
- Recurrence of breast cancer
- Lesion characterization



CONTRA INDICATION

- Any electrically, magnetically or mechanically activated implant (e.g. cardiac pacemaker, insulin pump biostimulator, neurostimulator, cochlear implant, and hearing aids)
- Intracranial aneurysm clips (unless made of titanium)
- Pregnancy (risk vs benefit ratio to be assessed)
- Ferromagnetic surgical clips or staples
- Metallic foreign body in the eye
- Metal shrapnel or bullet



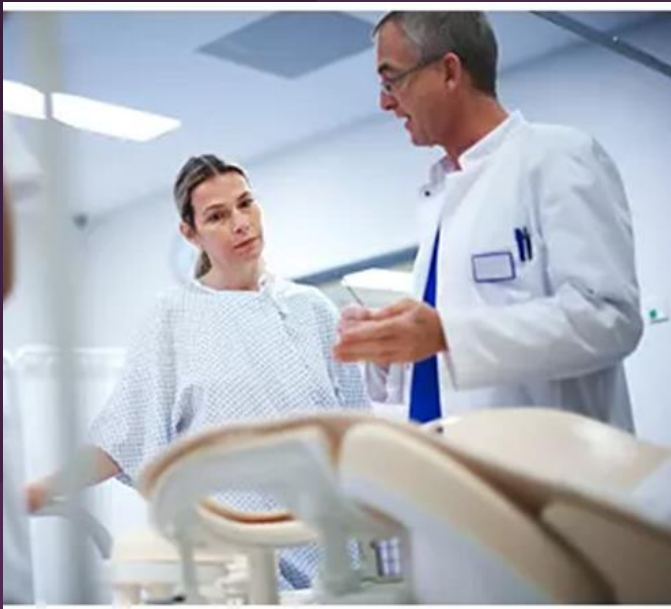
Patient Preparation

- A written consent form must be obtained from the patient before entering the scanner room
- Patient changes into a hospital gown that opens at the front.
- Ask the patient to remove all metal object including keys, coins, wallet, any cards with magnetic strips, jewellery, hearing aid and hairpins
- If possible, offer a chaperone to accompany claustrophobic patients into the scanner room (e.g. relative or staff)



Patient Preparation

- Obtain an IV access
- Contrast injection risk and benefits must be explained to the patient before the scan.
- Gadolinium should only be given to the patient if GFR is > 30
- Offer earplugs and/or headphones, possibly with music for extra comfort
- Properly explain the procedure to the patient
- Note the weight of the patient



Questionnaire

MRI Breast Exam Questionnaire

Patient Stamp:

MR#

Name:

DOB:

Patient Age:

Date of Exam:

Referring Physician:

Clinical History:

Breast Evaluation:

Menstrual Status: Start date of last menstrual period:

If you are in menopause, since when:

Pregnancy Status: Are you currently pregnant: **Yes / No**

Have you been pregnant in the past 6 months (including miscarriage or abortion) **Yes / No**

Are you currently breast feeding/lactating? **Yes / No**

Hormone Replacement Status:

Do you take hormone replacement: **Yes / No**

If yes, which hormone and how long?

Do you take Tamoxifen: **Yes / No**

Breast Cancer History:

Have you had breast cancer: **Yes / No**

If yes, did you have any of the following (please circle):

Surgery

Radiation Therapy

Chemotherapy



Questionnaire

Breast Cancer History:

Have you had breast cancer: **Yes / No**

If yes, did you have any of the following (please circle):

Surgery

Radiation Therapy

Chemotherapy

Breast Biopsy History: Have you had a prior biopsy of the breast: **Yes / No**

If yes, which side and when? _____

Family History of Breast Cancer: Yes / No

If yes, who in your family and at what age? _____

Breast Implants: Yes / No

If yes, implant type (please circle): **Saline Silicone**

Date of Surgery: _____

Silicone Injections: Have you had silicone injected directly in the breast tissue? **Yes / No**

Breast Symptoms: Do you have any pain, discharge or lump: **Yes / No**

Breast Skin: Do you have any scars: **Yes / No**

If yes, where on your breast? _____

Recent Infections: Have you been treated for a breast infection: **Yes / No**

If yes, when? _____

Recent Breast Trauma: In the past 4 months, have you injured your breast: **Yes / No**

Example: Motor vehicle accident with a shoulder restraint. Or a fall.

Patient Signature: _____ **Date & Time:** _____



Breast coil



Adaptations



Flex coil

+



A complete Breast flex coil



Breast Mattress



Positioning

- Head first or Feet first
- Prone
- Position the patient with breasts inside the breast coil
- Both arms by the sides of the body or fold arms in front of the head.
- Give cushions under the legs and under the forehead for extra comfort



Positioning

- Centre the laser beam localizer over the mid chest (T6-T7 level) parallel to the vertical breast
- Ensure breast is not trapped
- Release all folds.
- Provide a blanket to keep feet warm
- Provide head phone and call button



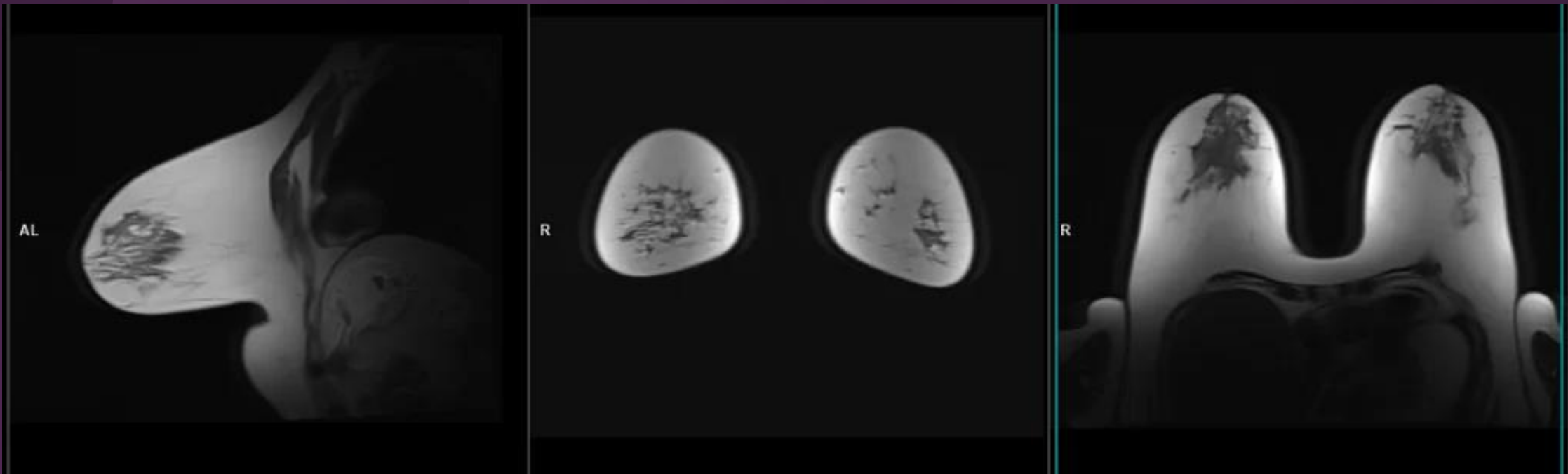
Sequences

- localizer_3 plane
- T2 3D 1mm
- T2_STIR_Axial
- T1_3D_Axial_1mm
- T2_TSE_Sagittal_RT
- T2_TSE_Sagittal_LT
- DWI_Axial_B0_B500_B1000
- T1_3D_Axial_FAT SAT 1MM Dynamic 1 Pre_5 Post
- T1_3D_Coronal_FAT SAT POST GD



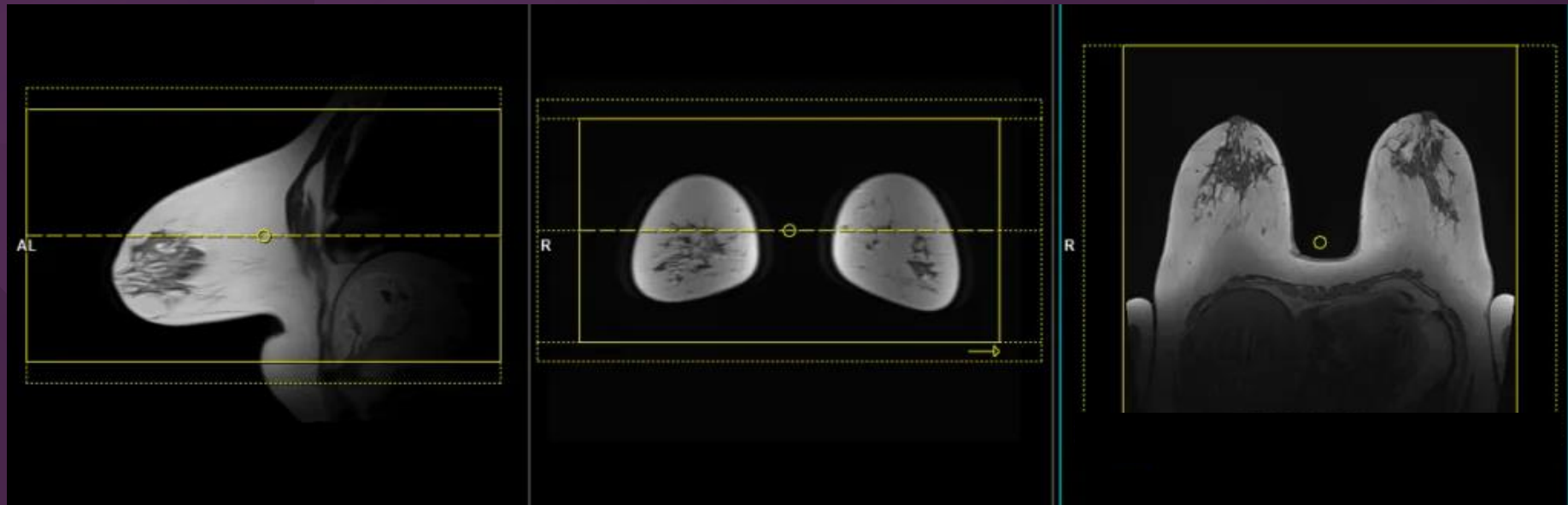
Sequences

A three-plane localizer



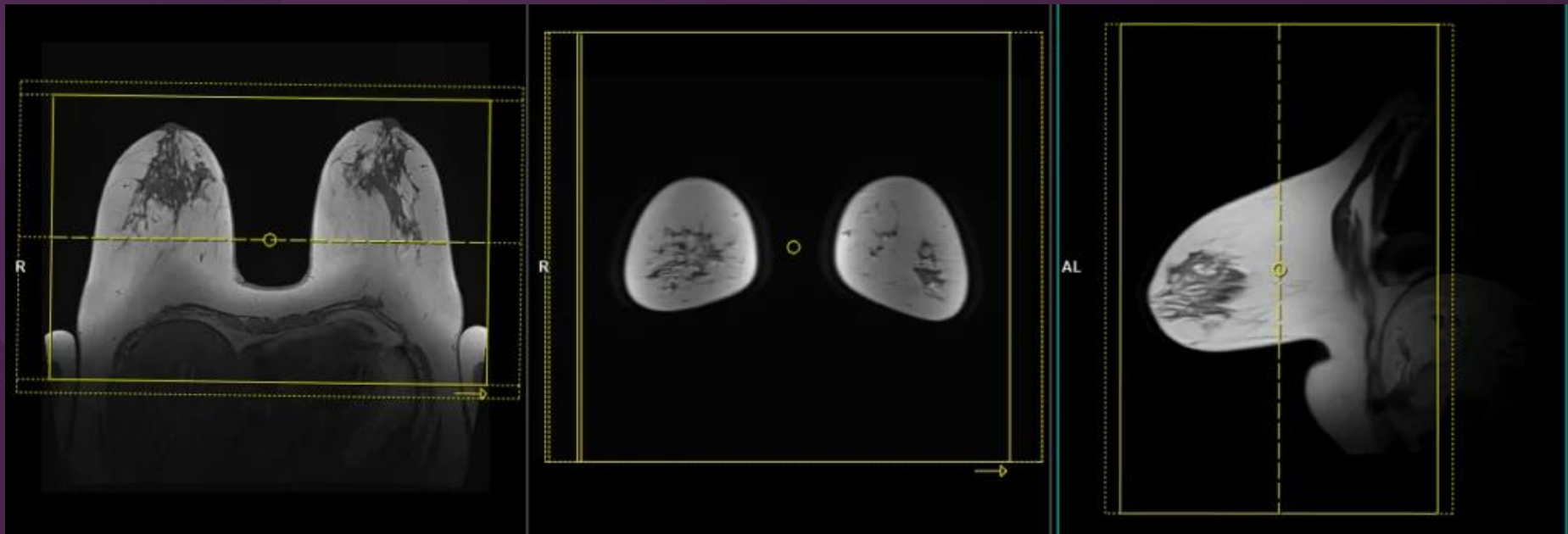
Axial Planning

- Plan axial slices on the sagittal plane and align the position block parallel to the breast.
- The slices should be sufficient to cover the entire breast.
- To prevent wrap-around artifacts, apply oversampling.
- Phase direction in the axial scans must be right >> left.
- Slice thickness of 3mm.



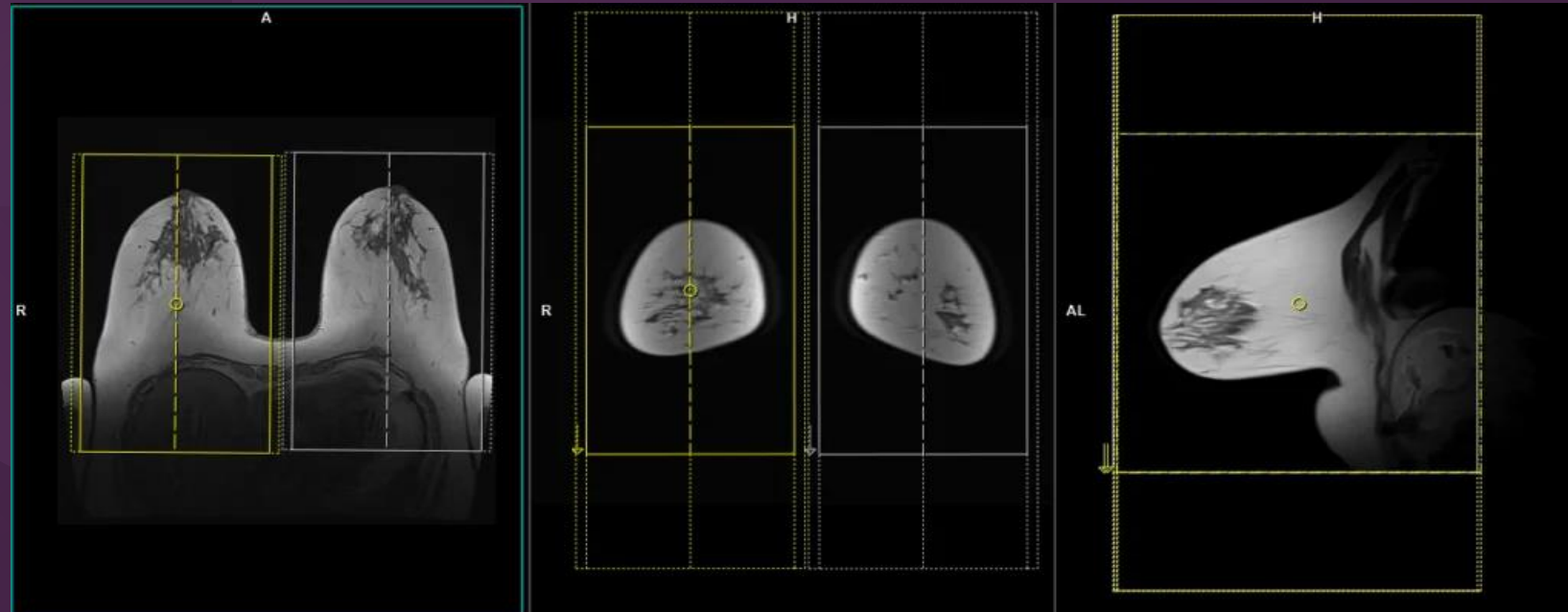
Coronal Planning

- Plan coronal slices on axial plane and position the block perpendicular to the right and left breast.
- The slices should adequately cover the entire breast from the nipple to the axilla.
- Phase direction - Anterior >> Posterior

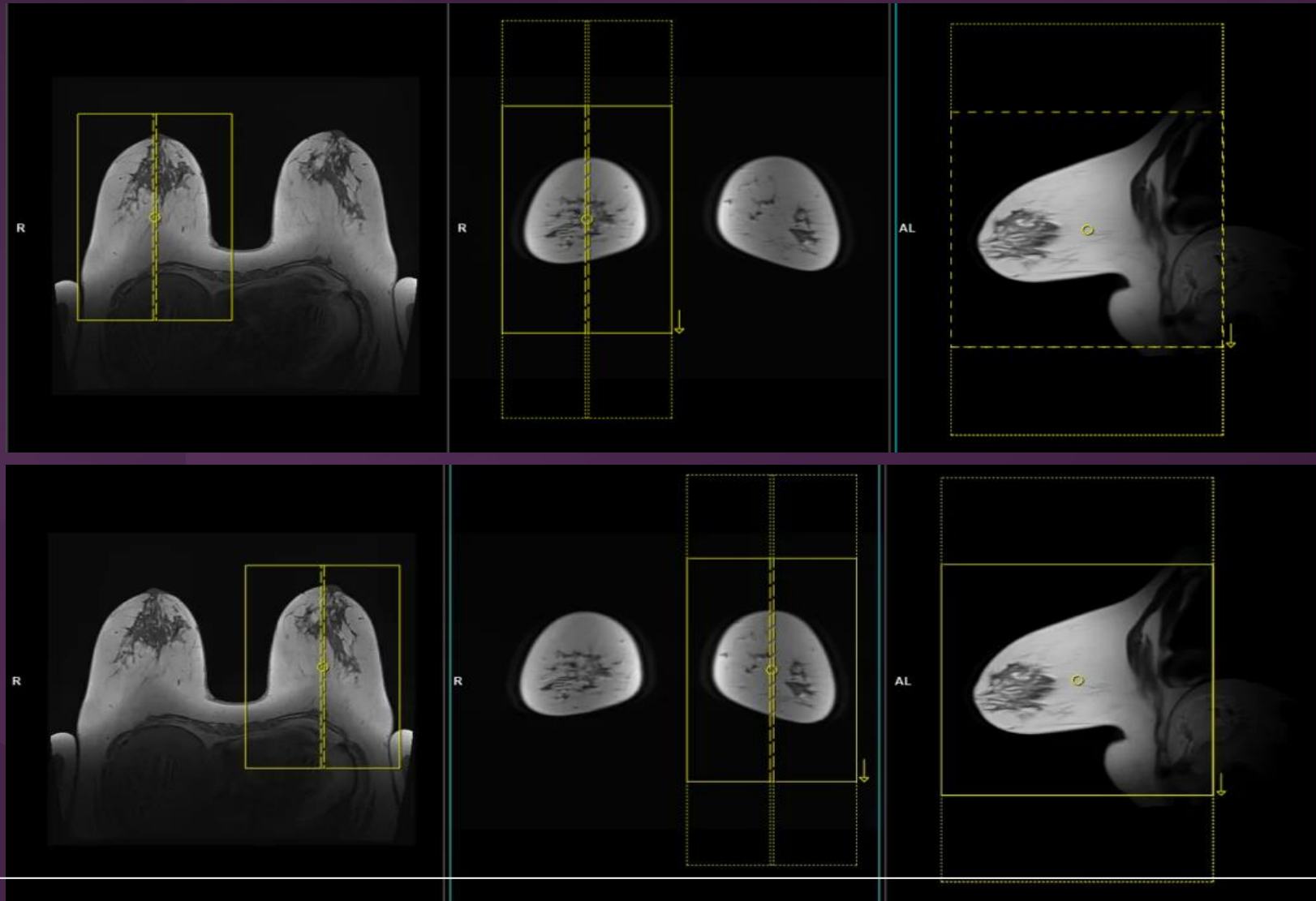


Bilateral Sagittal Planning

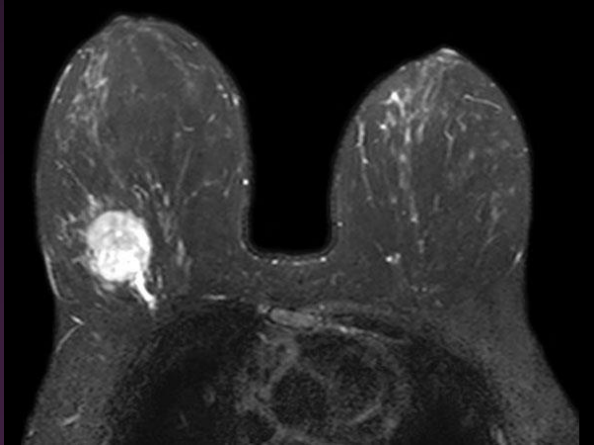
- Plan sagittal slices on axial plane and position the right block parallel to the right breast and the left block parallel to the left breast.
- The slices should adequately cover both the left and right breasts.
- Phase direction - head >> feet to minimize artifacts
- FOV should be small enough to accommodate each breast, typically ranging from 180 to 250mm.



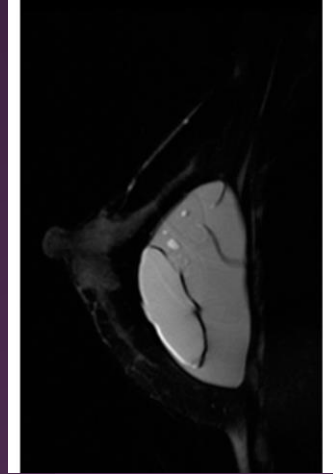
Unilateral Sagittal Planning



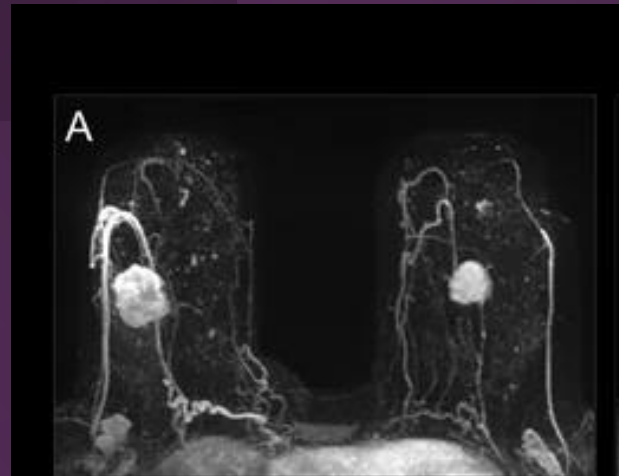
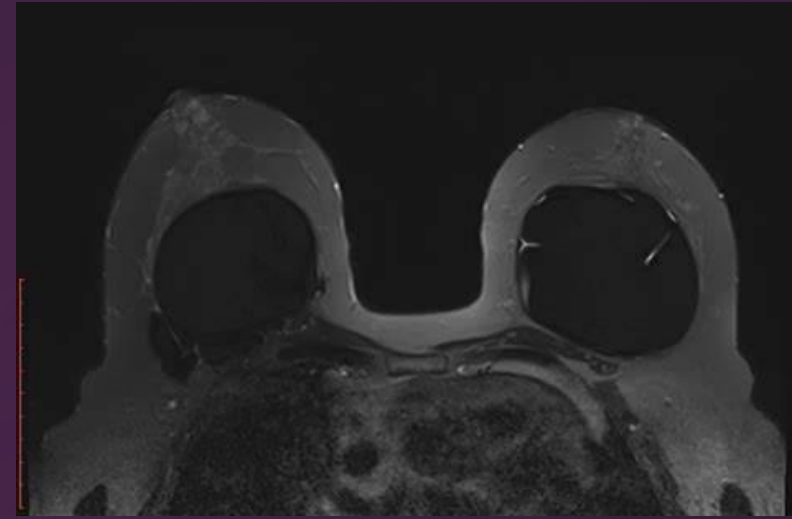
Images



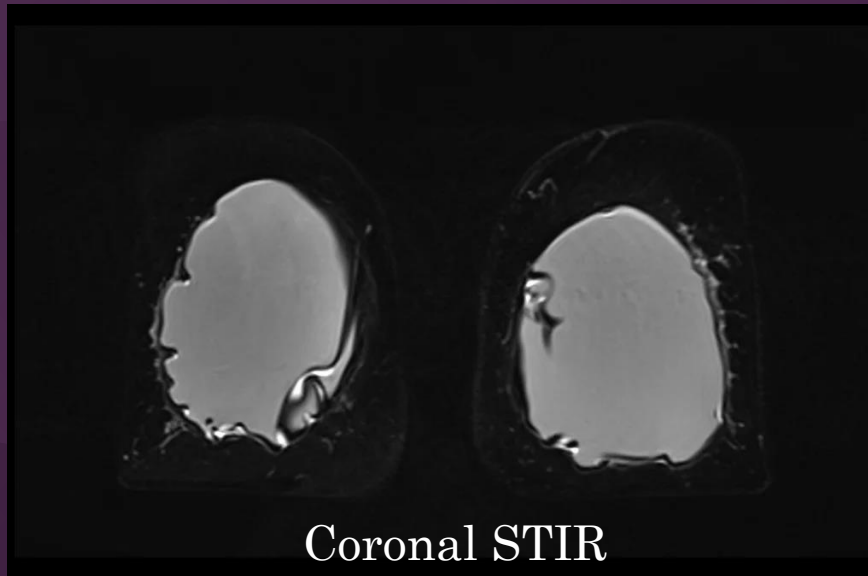
Axial T2w TSE with SPAIR



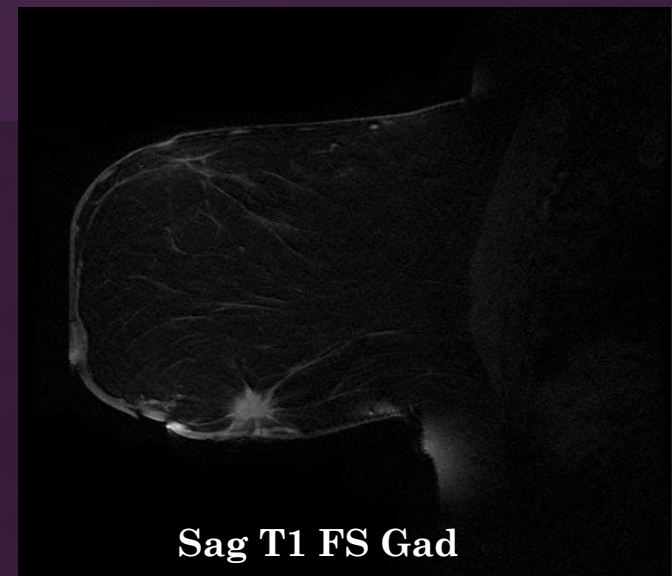
Axial T1w 3D



Axial T1w MIP



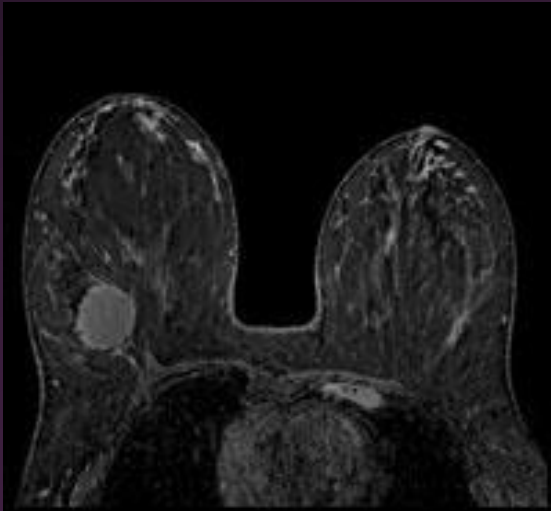
Coronal STIR



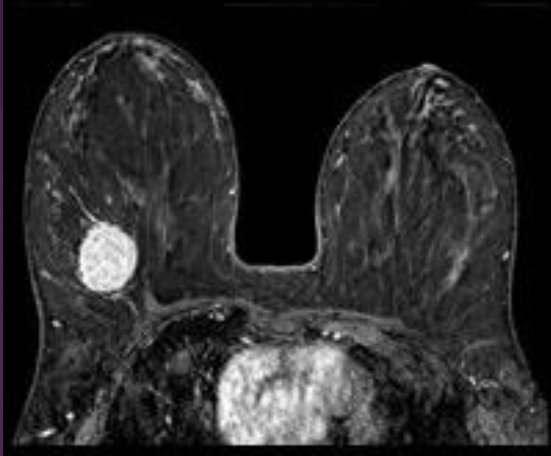
Sag T1 FS Gad



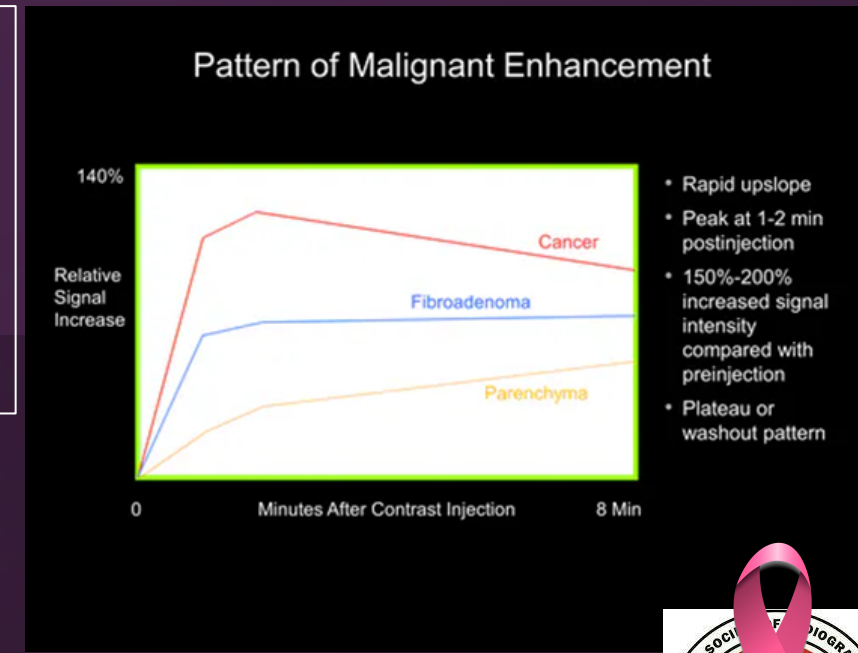
(DCE)-MRI



- Morphology and function of a lesion
- High sensitivity and specificity
- By tracking the contrast agent's uptake and washout over a series of sequential images.

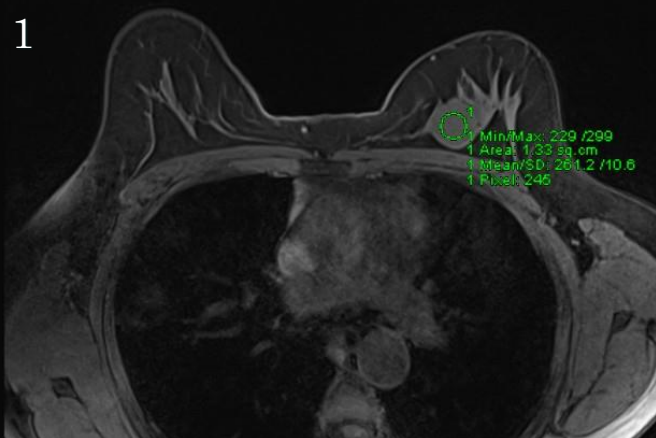


- Dorsal IV cannula 24G or 22G
- Dose of 0.2ml/kg
- Flow rate – 2ml/s + saline flush
- 1 mask
- 5 post contrast series



(DCE)-MRI

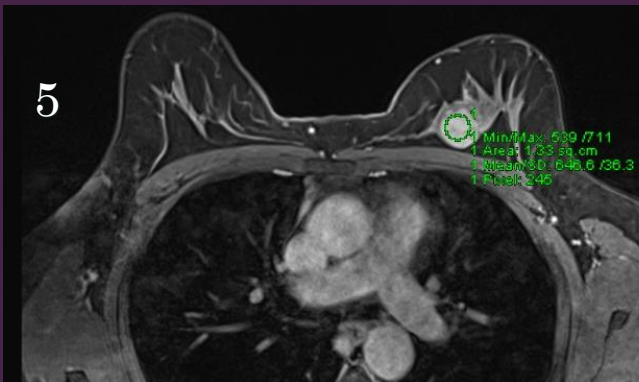
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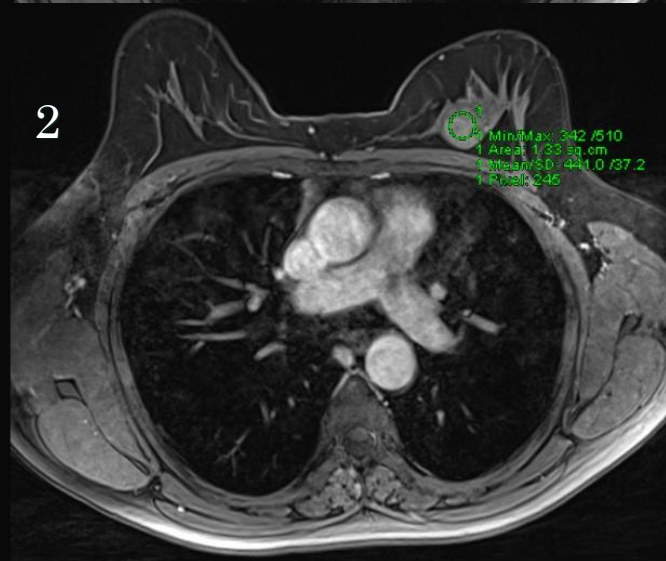
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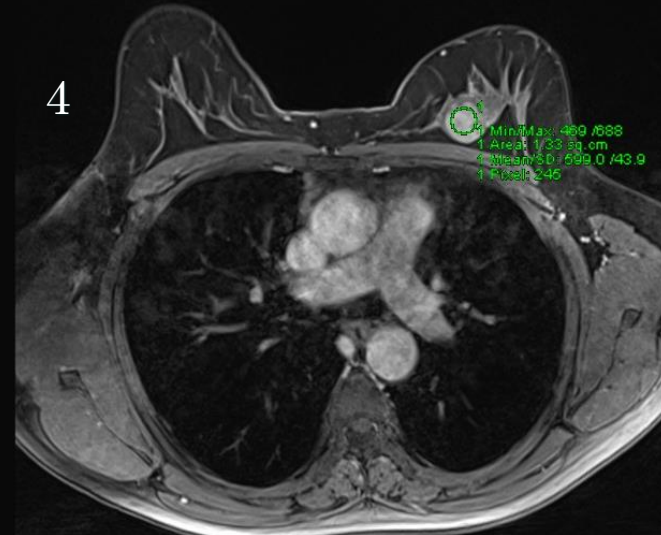
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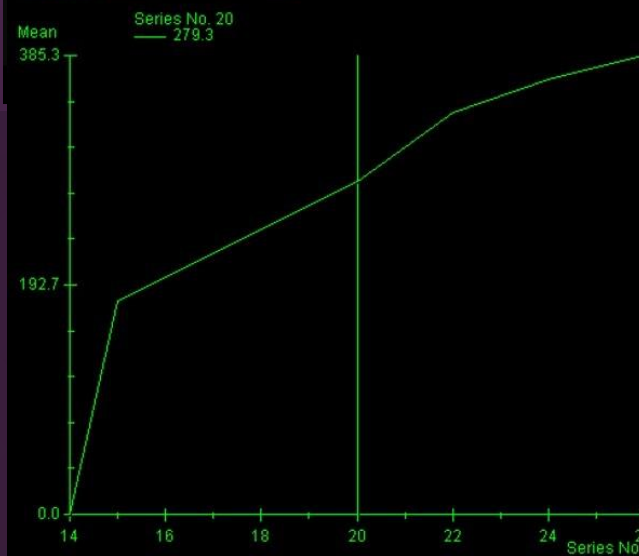
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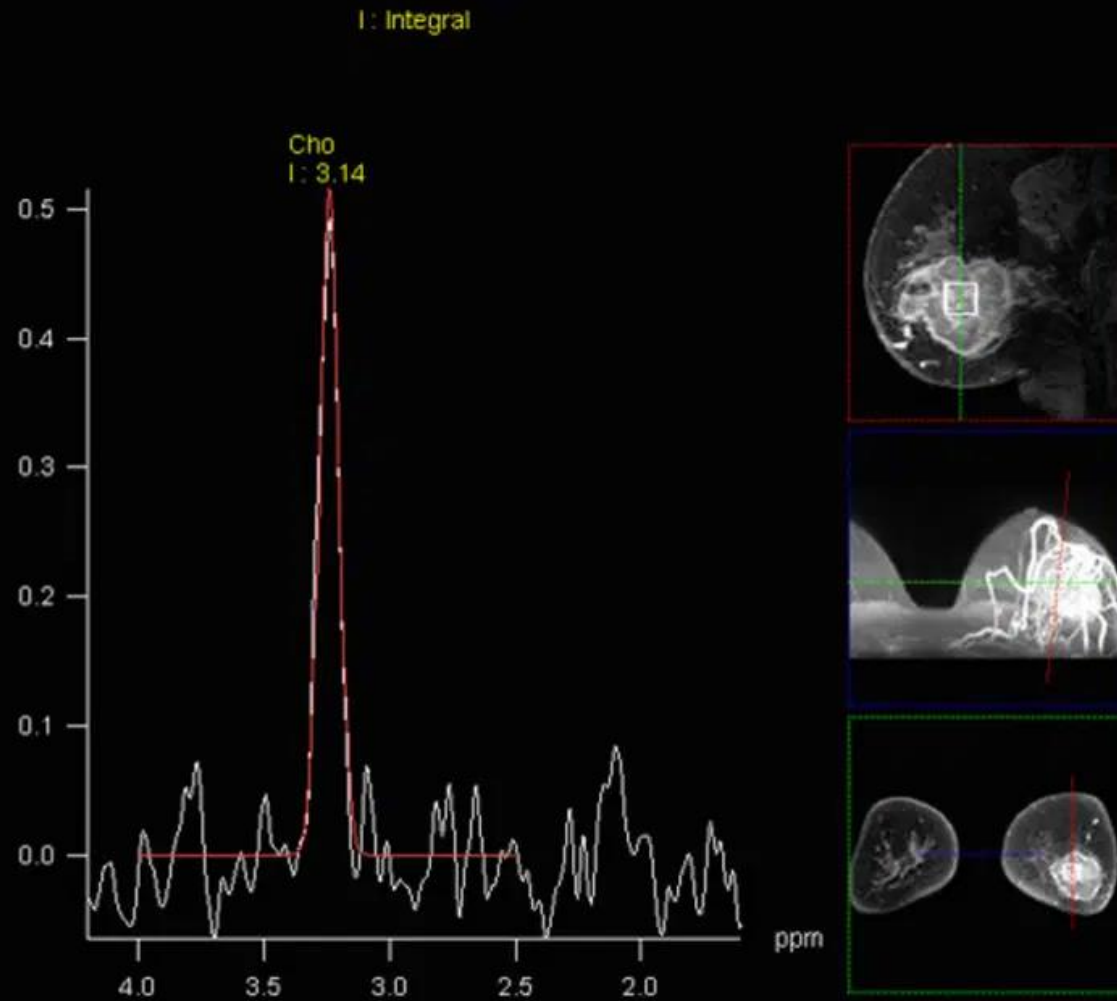
4



Result Image 1
Mean Curve across (14 ima 57 - 26 ima 57; rel 14 ima 57) diff
Scaling: Factor = 1.0 Offset = 0.0
Average of mean values: 1: 257.87
Average of areas: 1: 1.33



Post Processing



Breast
spectroscopy



Post Procedural care

- Check for contrast reaction before taking out IV line
- Assist patient to change back into her attire
- Dispatched based on departmental protocol



AND
WE'RE
DONE

