

DR. MOHAMMED  
AYESH

**CONSULTANT  
RADIOLOGIST**

DR.SARAH  
ALSULTAN

BREAST IMAGING  
CONSULTANT

KING KHALID  
UNIVERSITY  
HOSPITAL

جامعة  
الملك سعود  
King Saud University

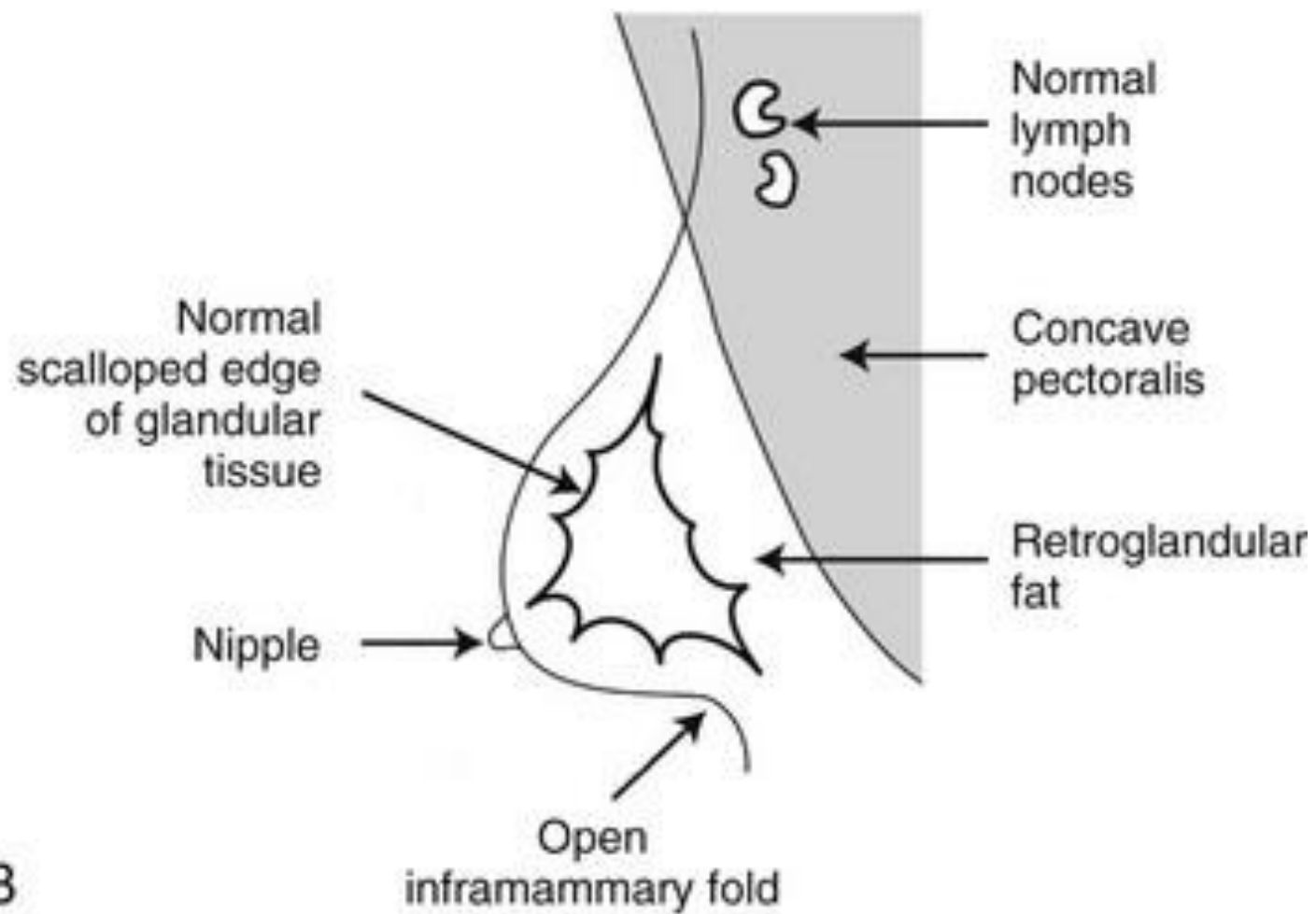


# BREAST IMAGING

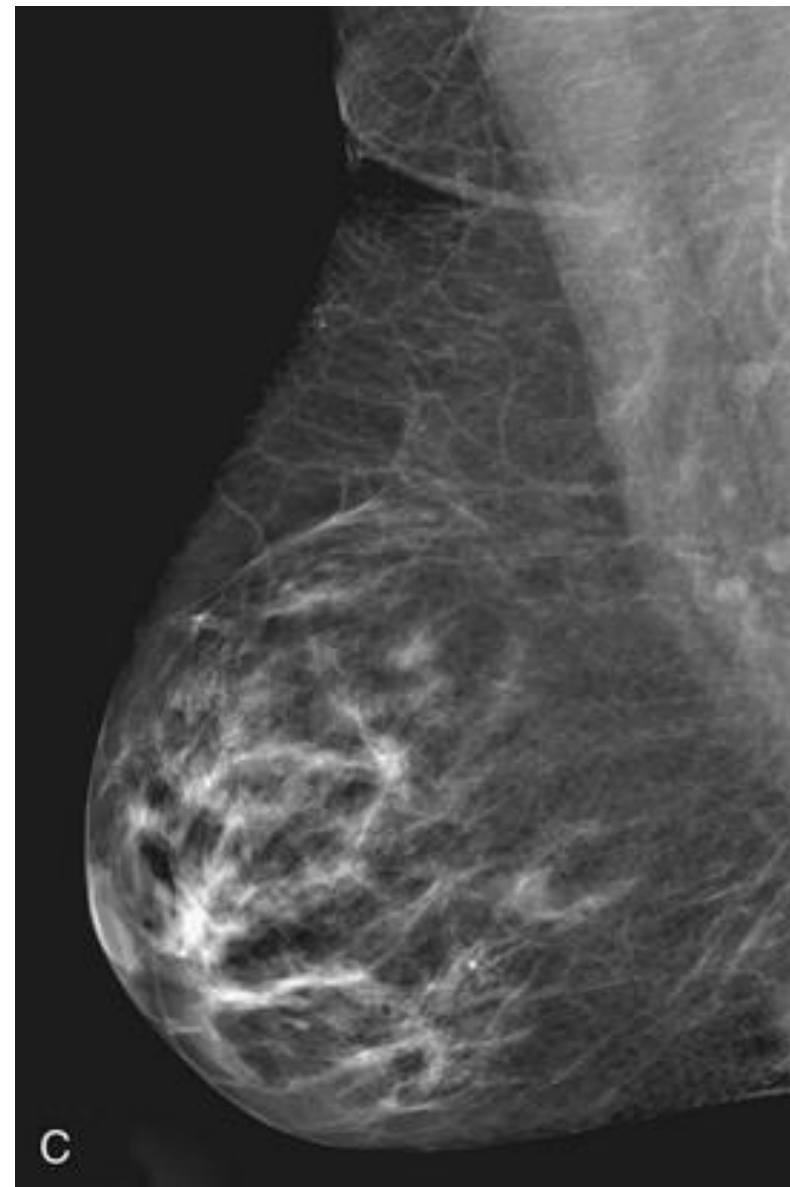
# OBJECTIVES

- Radiological **anatomy** of the breast.
- To highlight the **suitable modality** for each **age**.
- **Role of imaging/radiology** in diagnosing breast lesions particularly breast cancer.

# ANATOMY

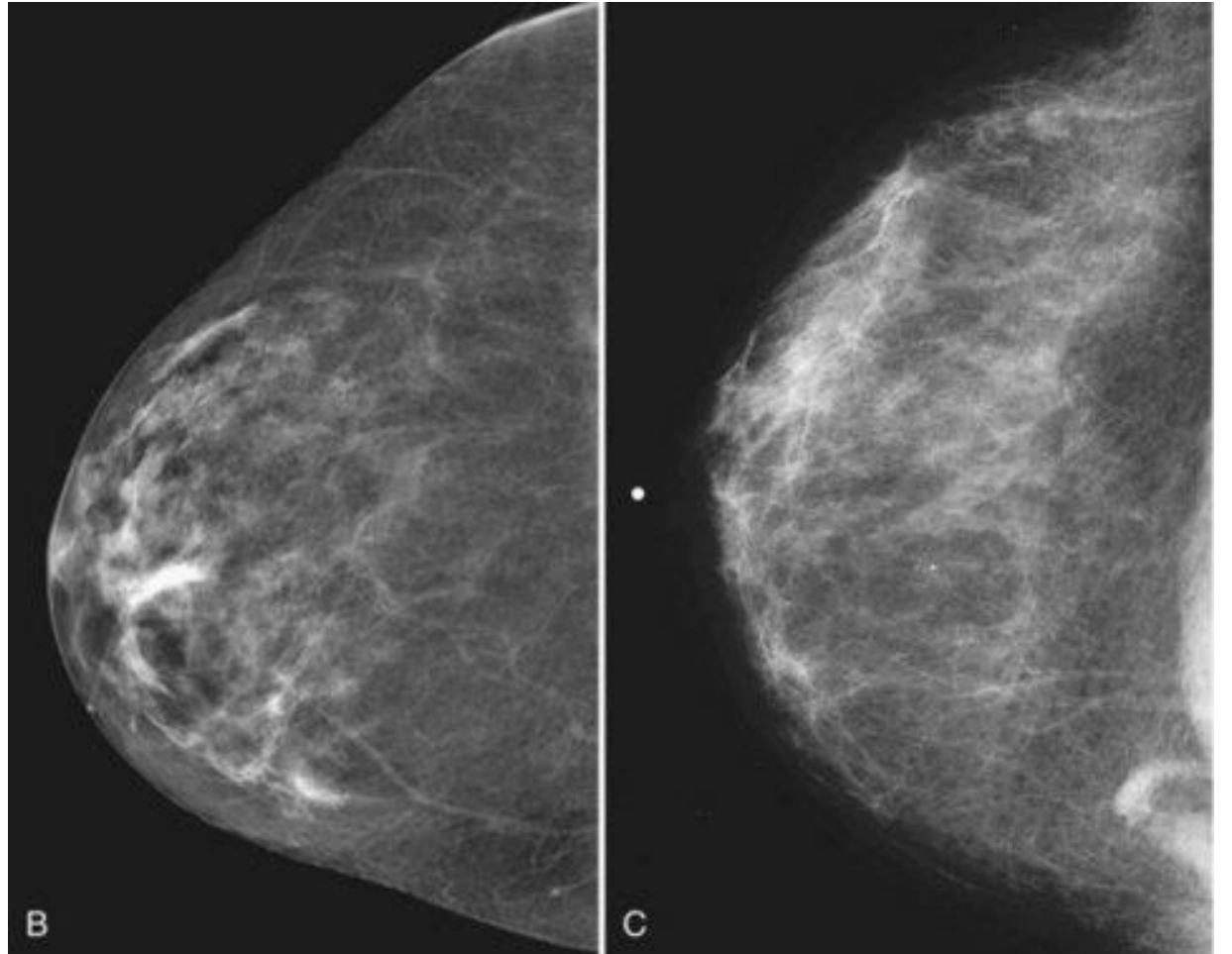
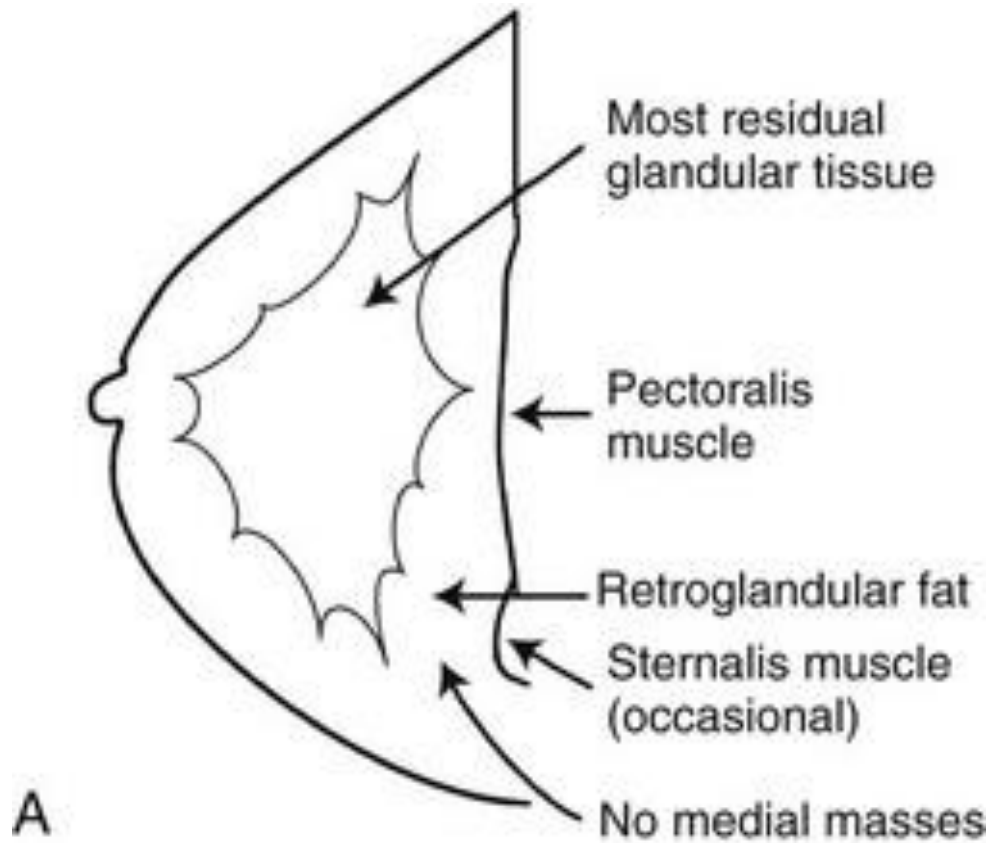


B

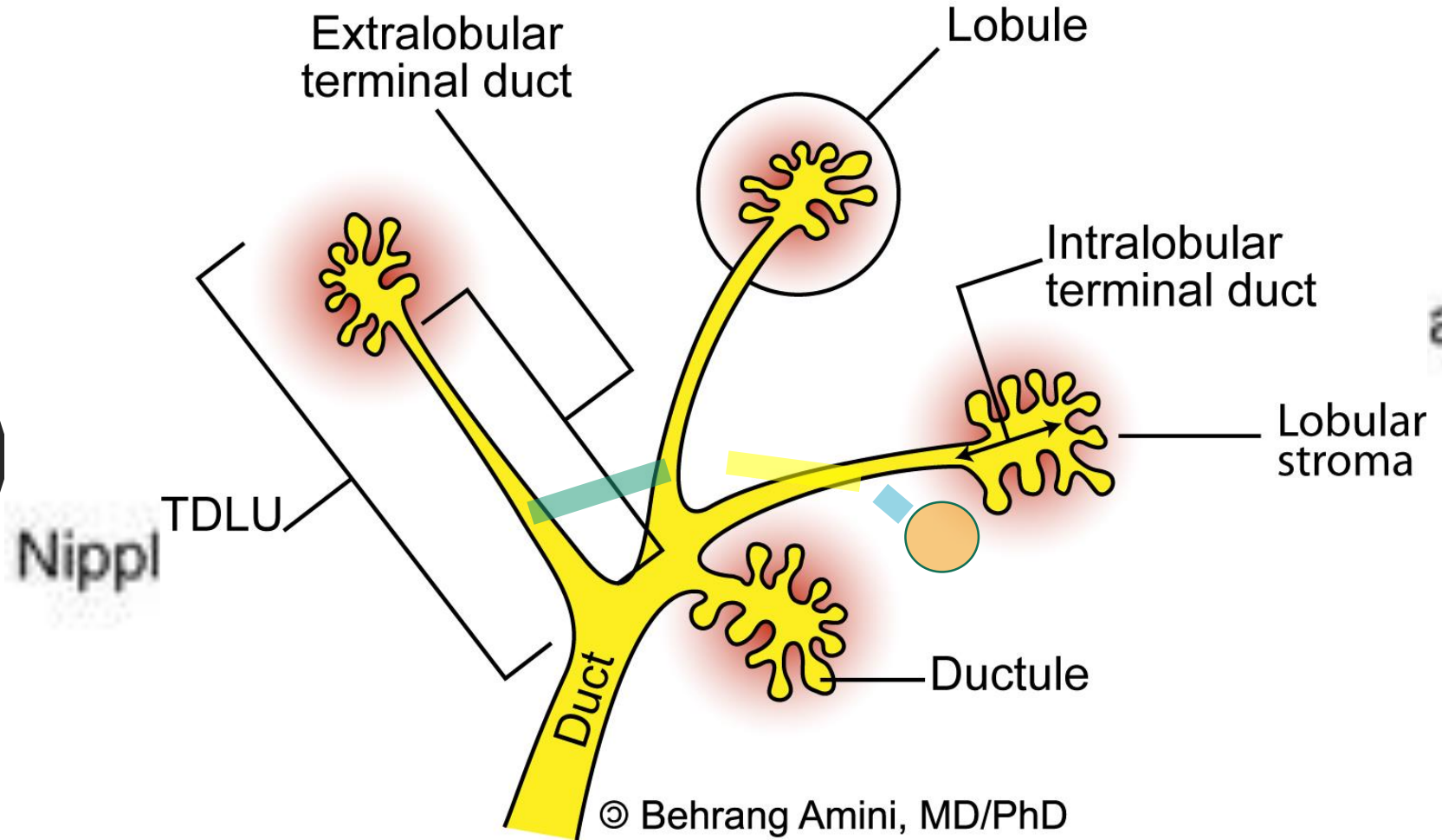


C

# ANATOMY



**Most breast cancer develops in the terminal ductal lobular unit (TDLU)**

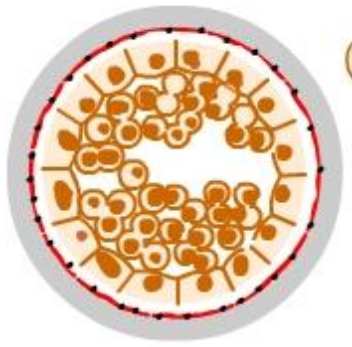


# Breast cancer can be divided into two major groups

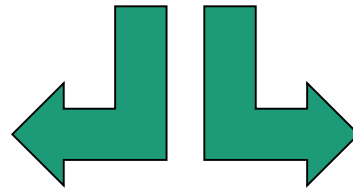
## IN SITU

Tumor cells, they **do not** invade the basement membrane.

Tumor cells remain confined to the ducts or lobules.



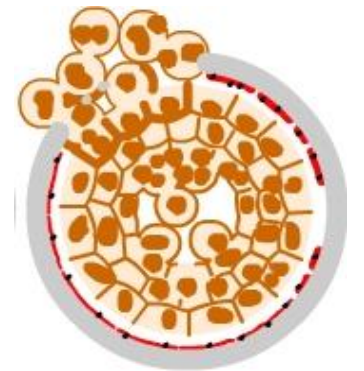
DCIS



## INVASIVE

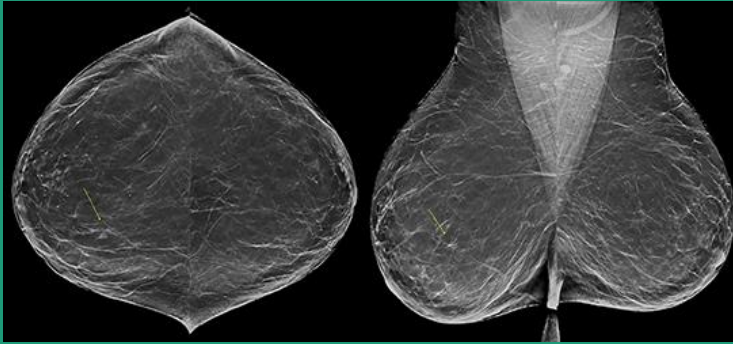
Tumor cells **invade** the breast stroma.

They have the potential to metastasize and result in death of the patient.

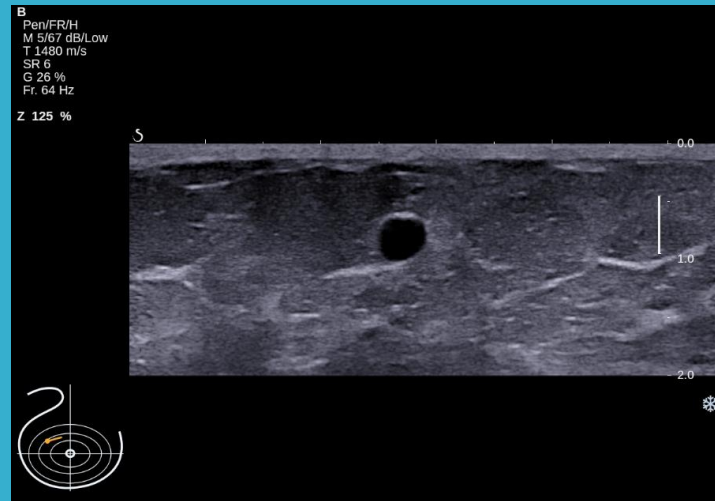


Invasive ductal carcinoma

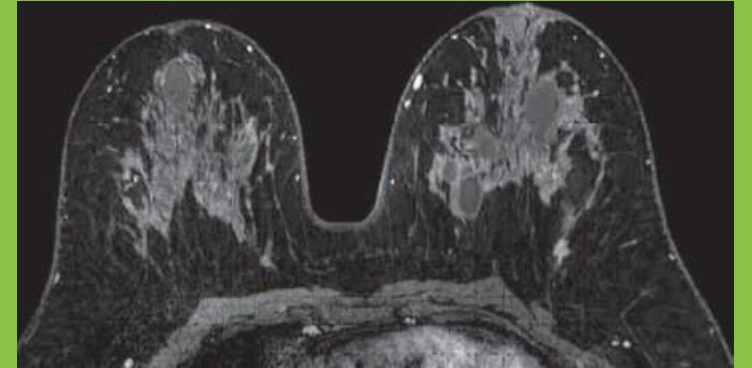
# BREAST IMAGING



Mammogram

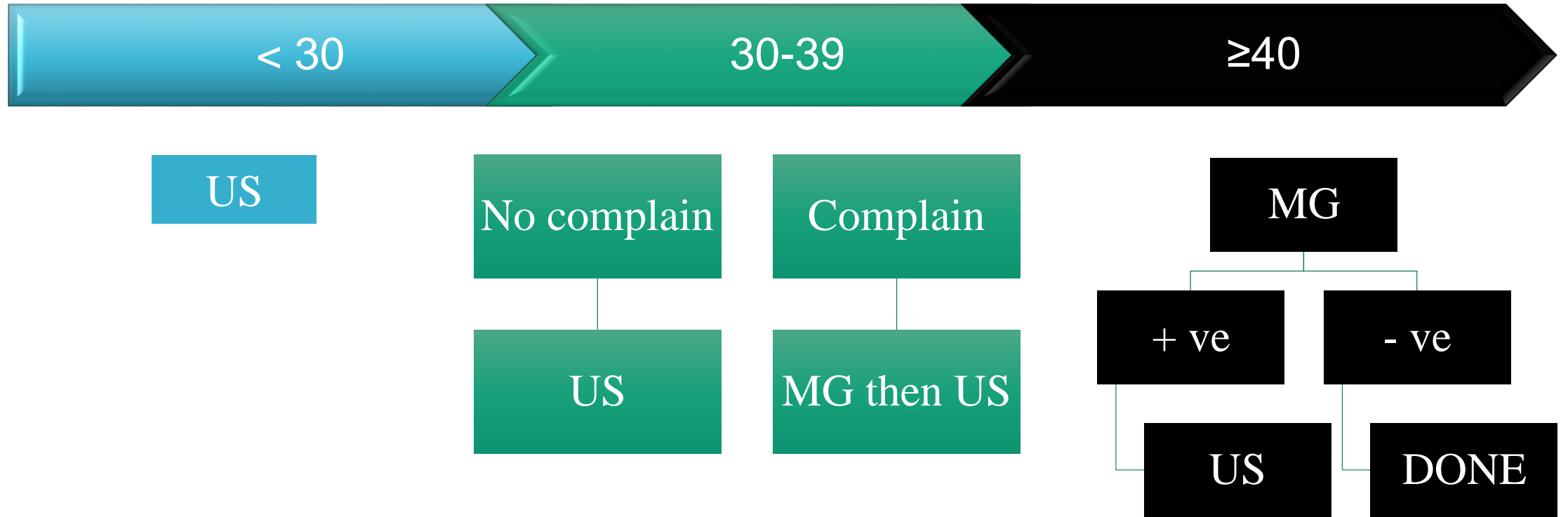


Ultrasound



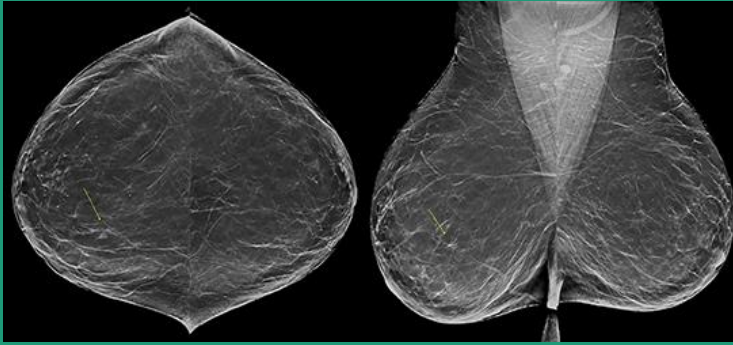
MRI

# MODALITY AND AGE

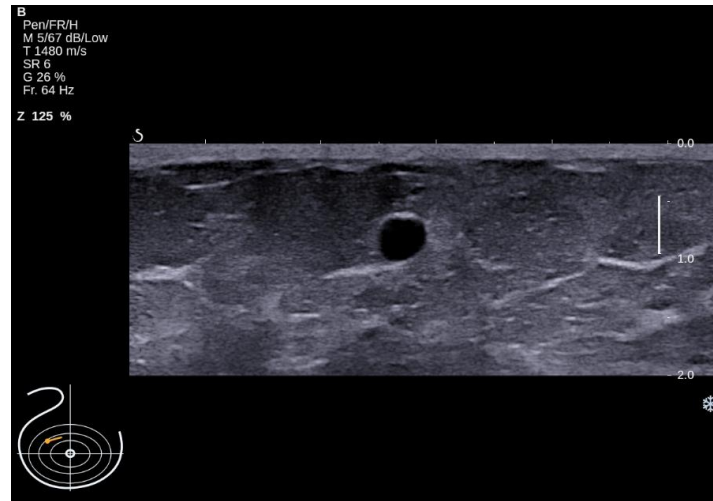




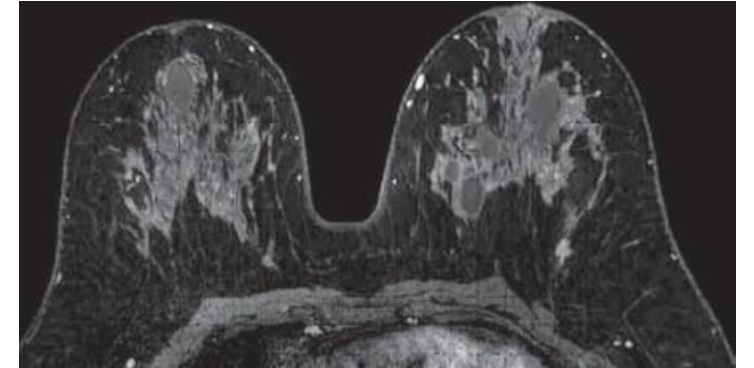
# BREAST IMAGING



Mammogram



Ultrasound



MRI

# MAMMOGRAM INDICATIONS

## 🍃 Screening [ **No Complain** ]

1. Patients 40 Y and above.
2. Young patient with first degree relative (Mother/ Sister) diagnosed with breast cancer.

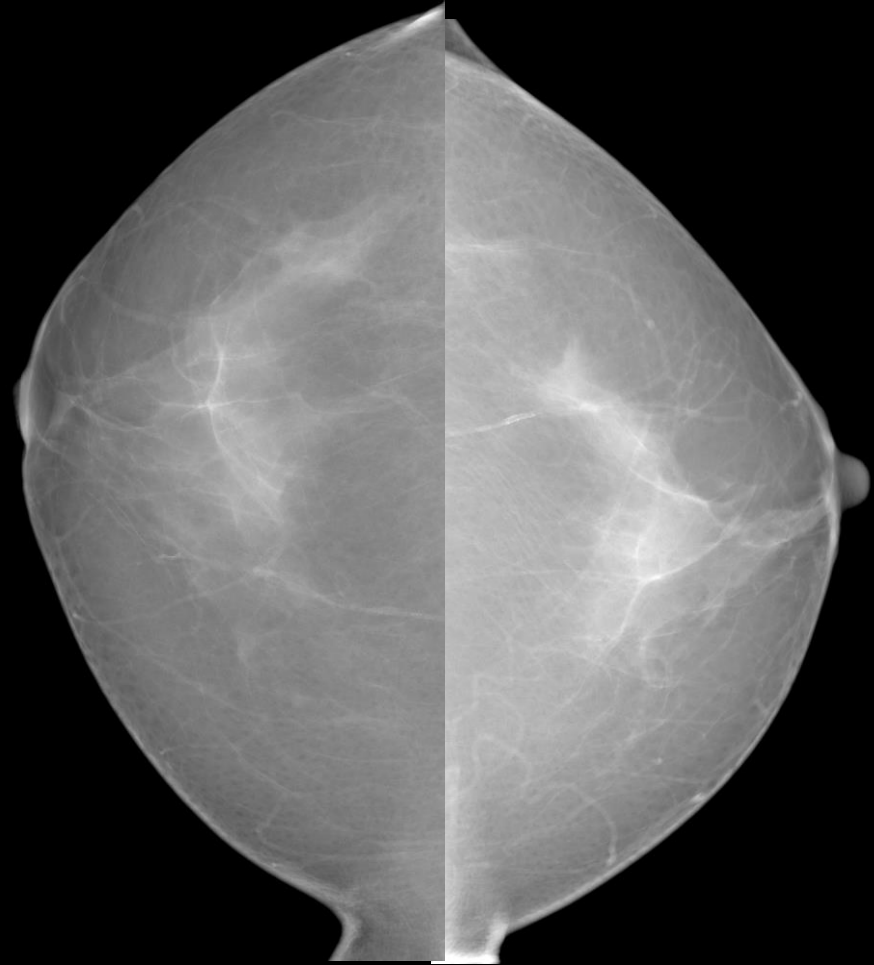
## 🍃 Diagnostic [ **Complain** ]

1. Palpable mass
2. Nipple discharge
3. Skin changes

# STANDARD MAMMOGRAM

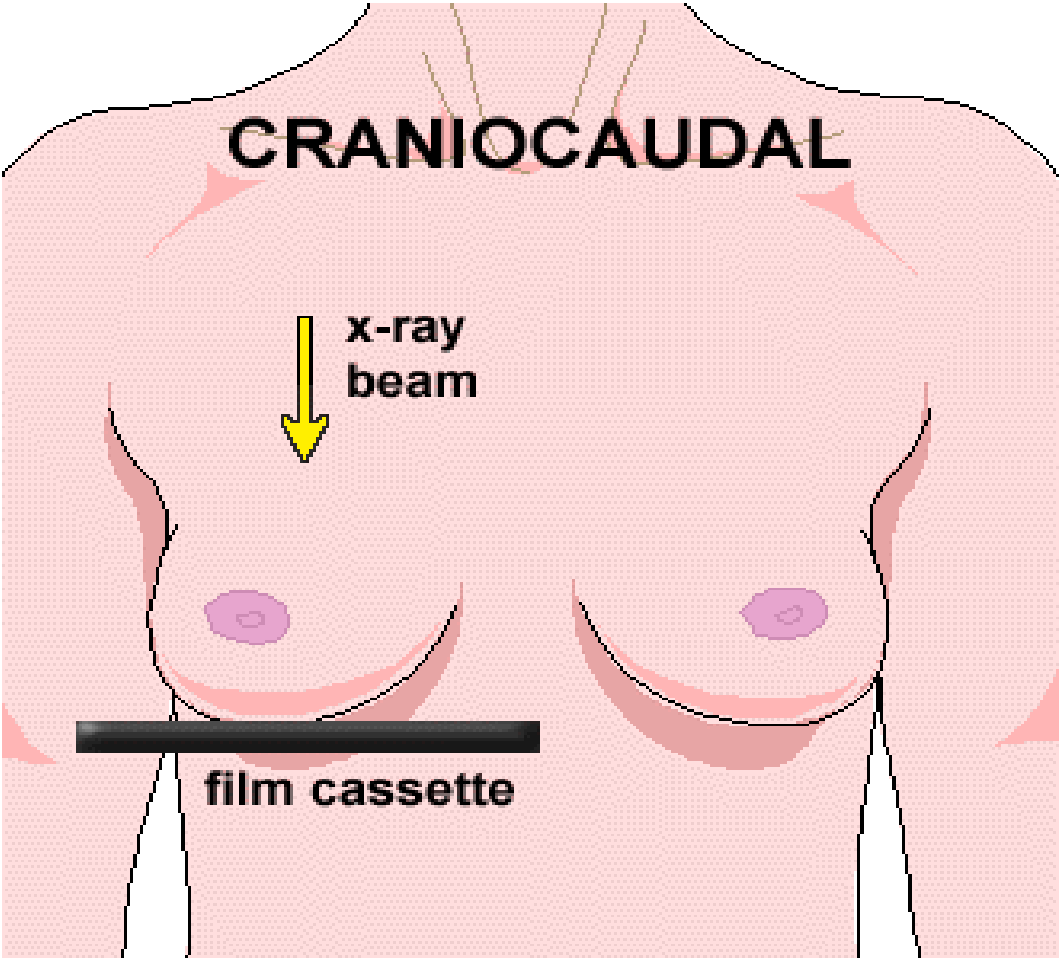


**MLO**

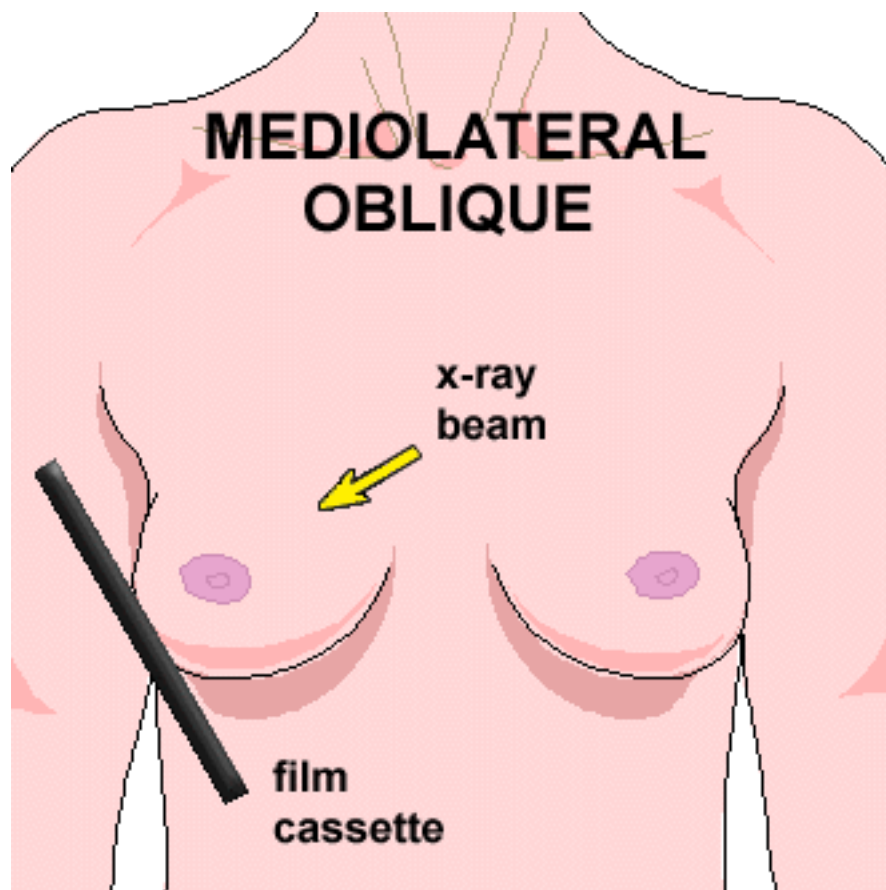


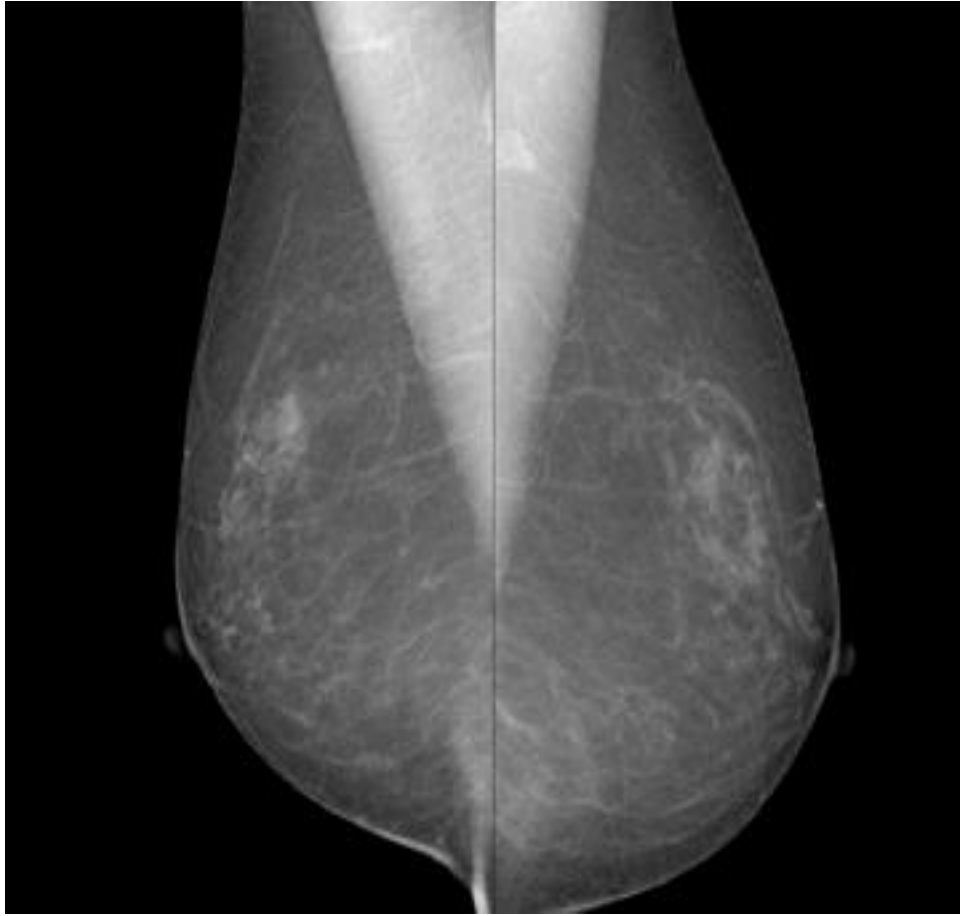
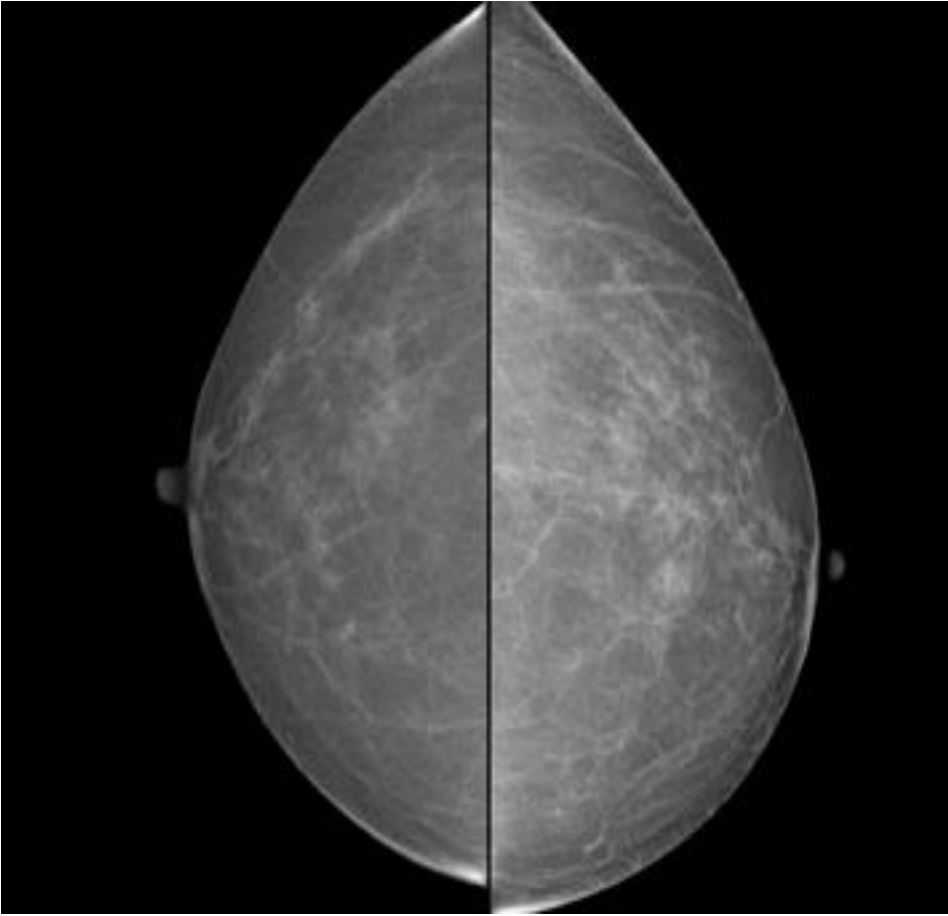
**CC**

# CC view

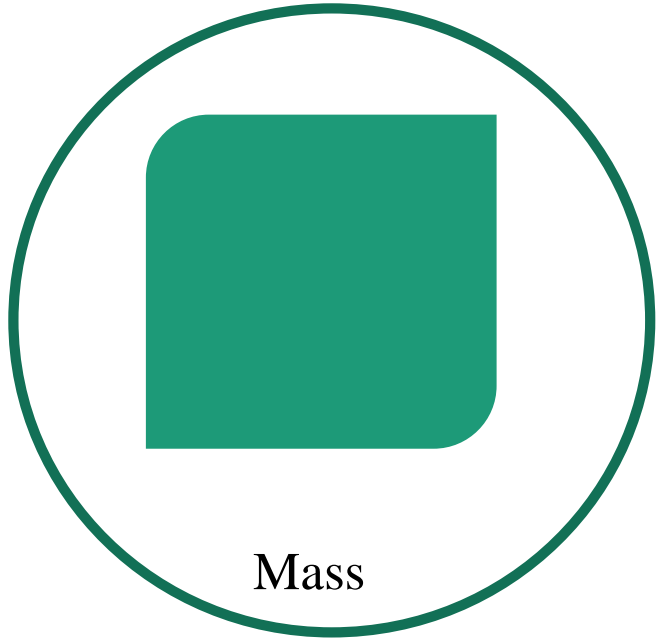


# MLO view





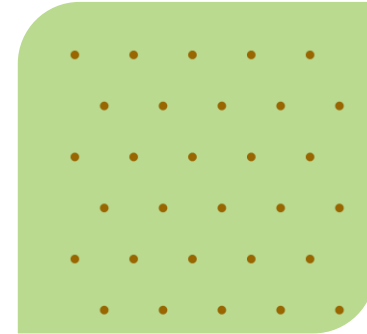
# BREAST ABNORMALTY



Mass



Architectural distortion.



Calcifications.



**Skin thickening**



**Nipple retraction**



**Axillary lymph nodes**

# MASS

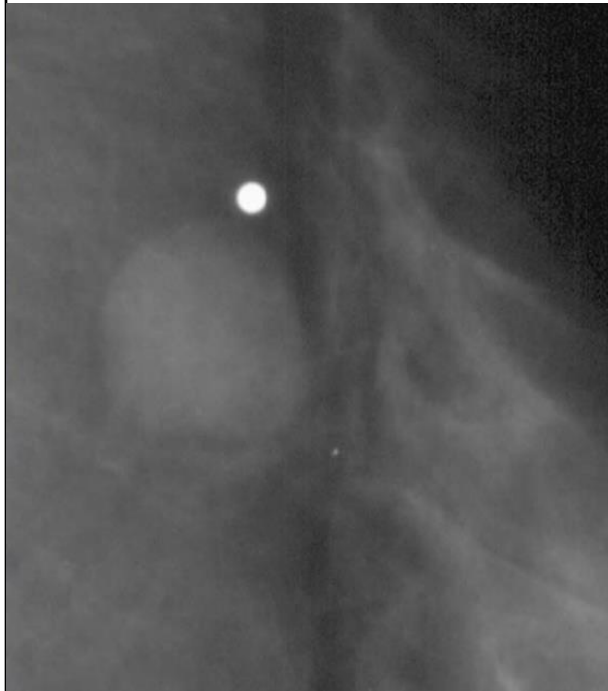
- Both views CC & MLO
- Persrsist (spot compression view)



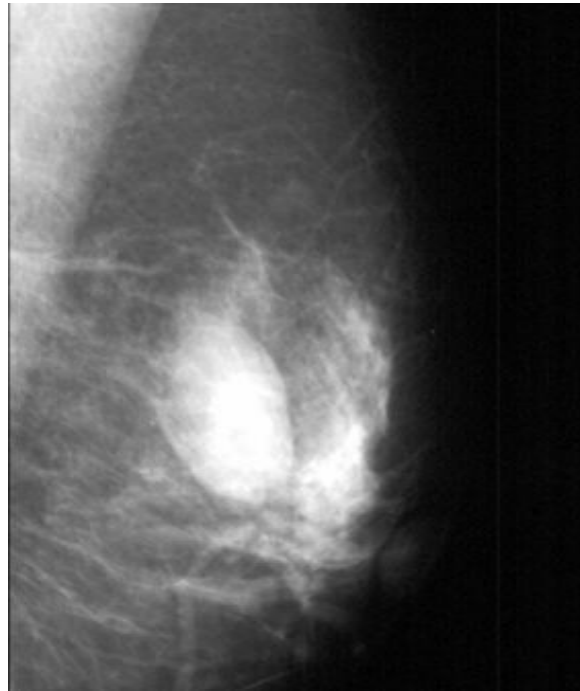


# MASS SHAPE

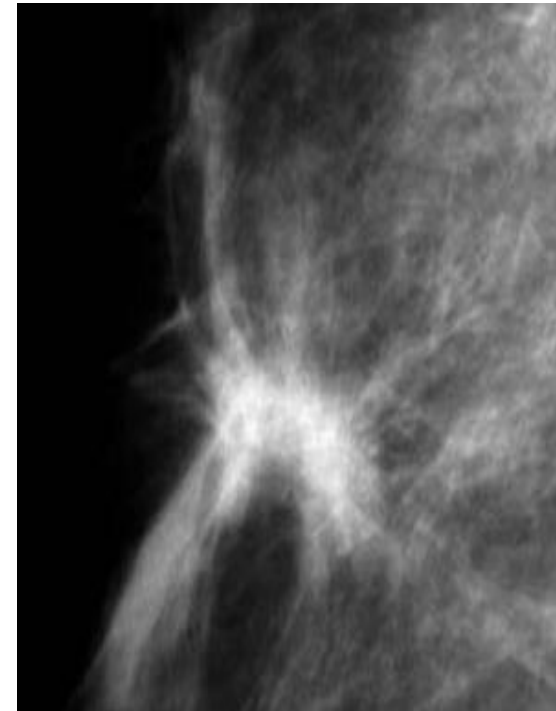
**ROUNDED**



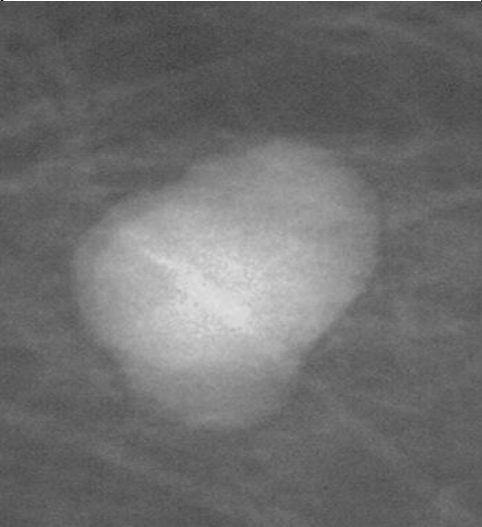
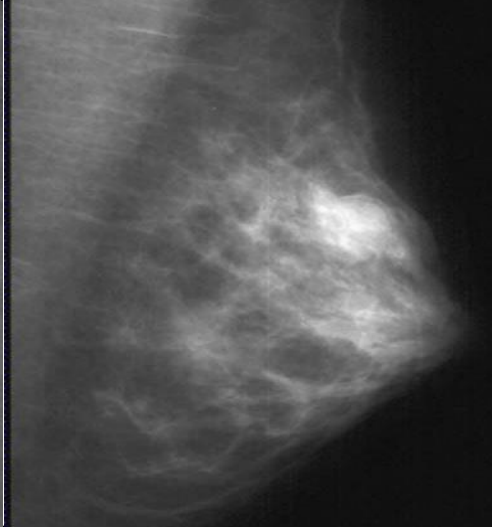
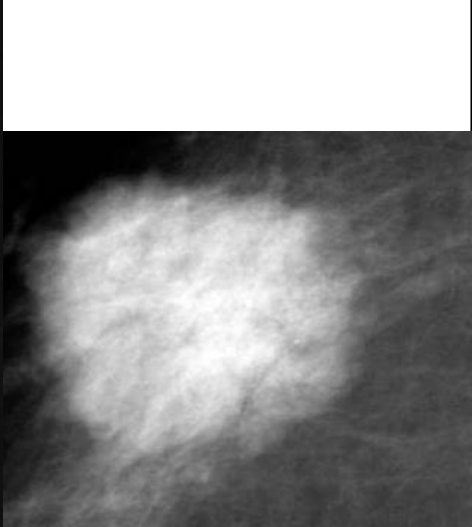
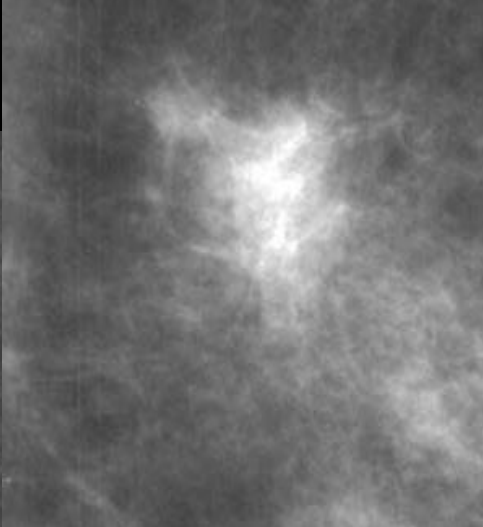
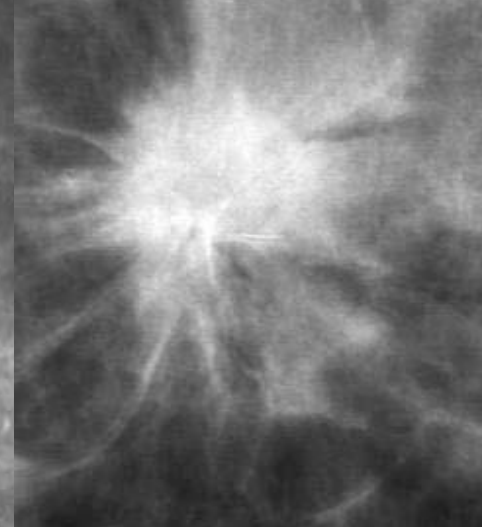
**OVAL**



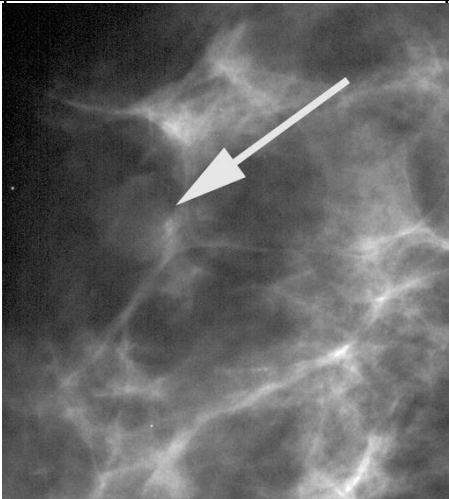
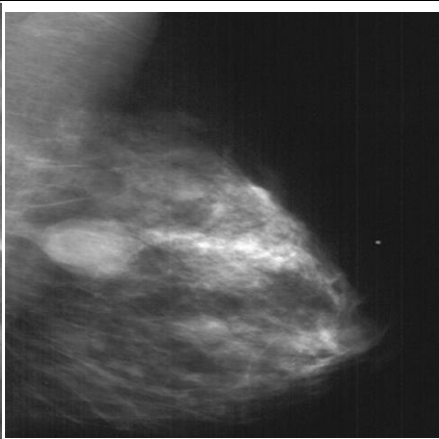
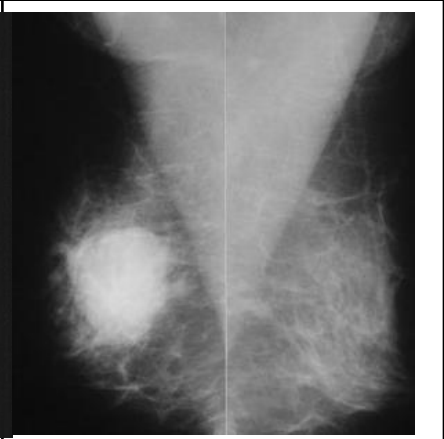
**IRRIGULAR**



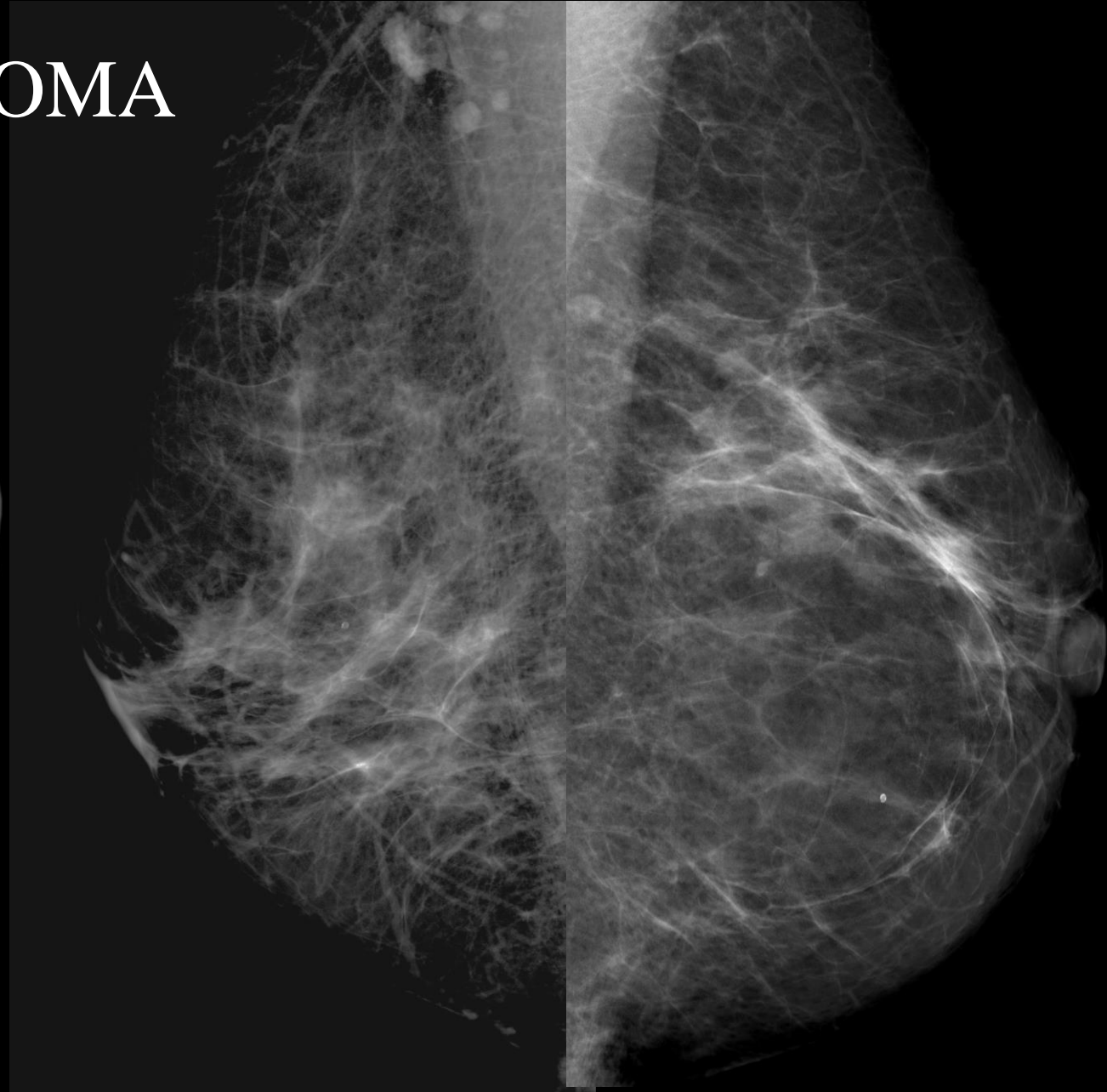
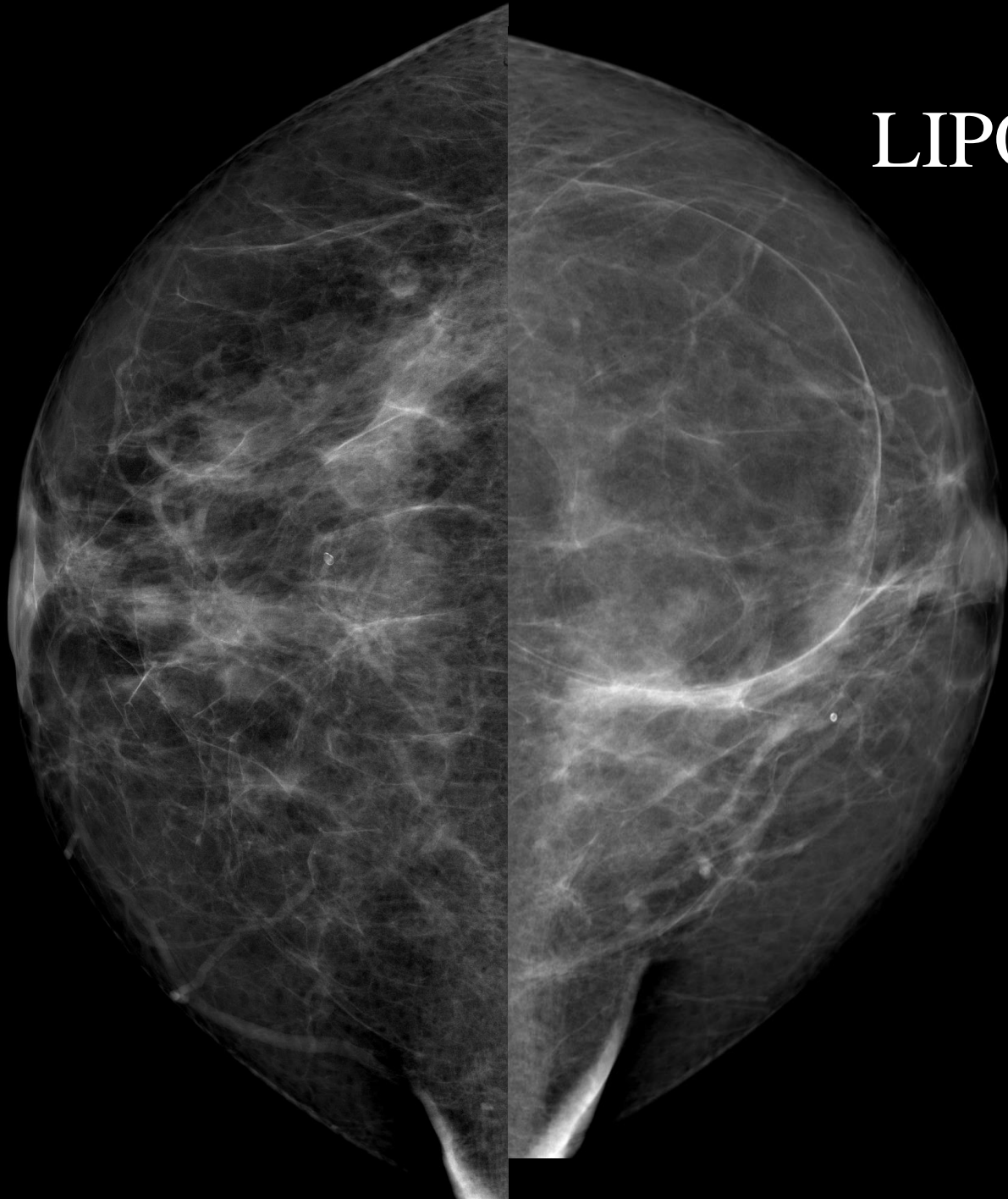
# MASS MARGIN

<b>Circumscribed</b>	<b>Obscured</b>	<b>Microlobulated</b> ●	<b>Indistinct</b> ●	<b>Spiculated</b> ●
<p>Abrupt transition between lesion and tissue.</p>	<p>Margins (suspected to be circumscribed) hidden by adjacent</p>	<p>Margin undulated with short cycle 1-2 mm.</p>	<p>Ill defined. Possible infiltration.</p>	<p>lines radiating from margins of a mass.</p>
				

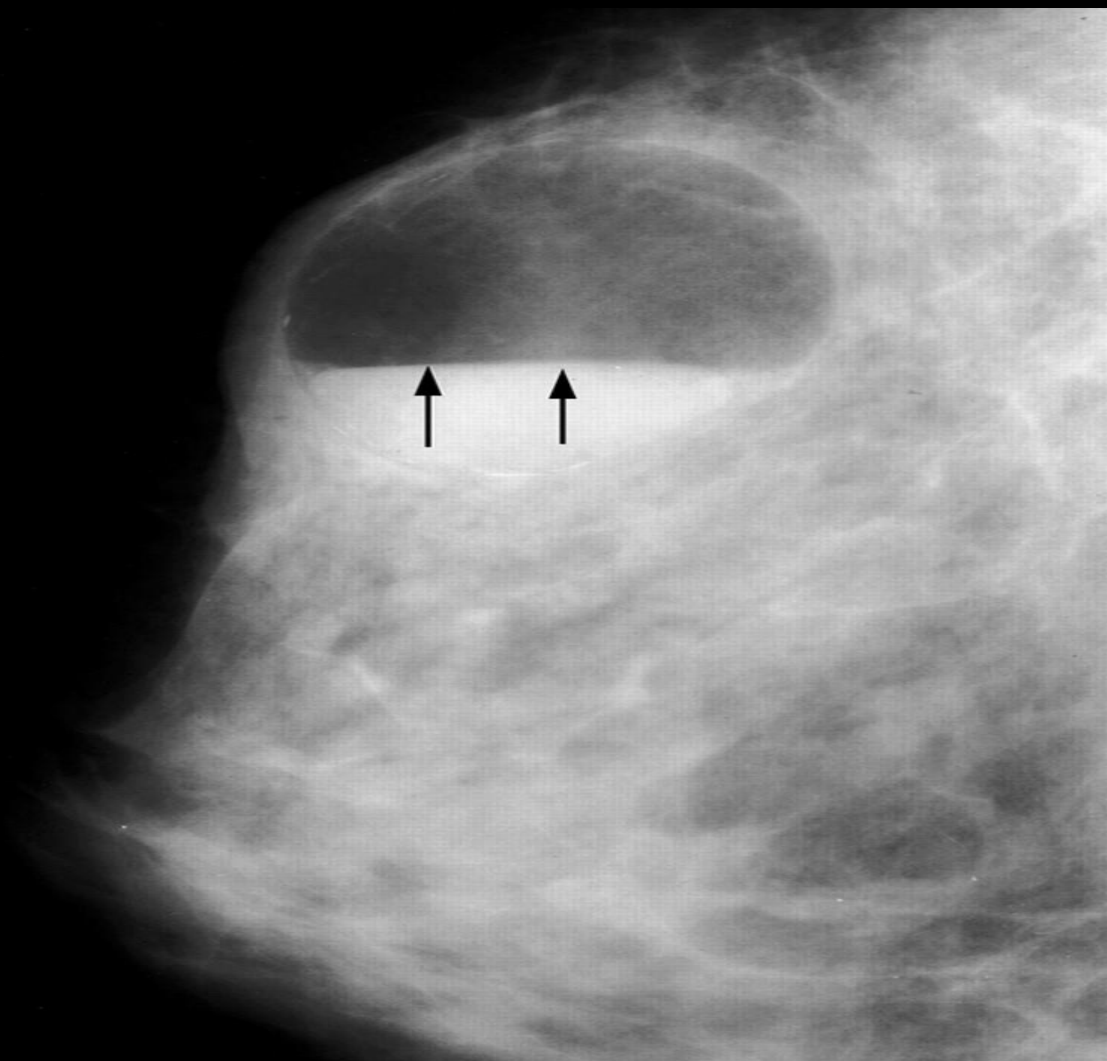
# MASS DENSITY

Fat only	Mixed density	Low dense	Equal dense	High dense <span style="color: red;">●</span>
<ol style="list-style-type: none"><li>1. Oil cyst/fat necrosis.</li><li>2. Lipoma.</li></ol> <p data-bbox="341 979 901 1190"><b>If you see fat in a mass, it is benign!!</b></p>	<ol style="list-style-type: none"><li>1. Hamartoma</li><li>2. Lymph node</li><li>3. Fat necrosis</li><li>4. Galactocele</li></ol>	 <p data-bbox="1105 1090 1921 1190"><b>Cancer is less likely but still possible</b></p>	 <p data-bbox="1939 1006 2364 1190"><b>Suspicious for malignancy</b></p>	

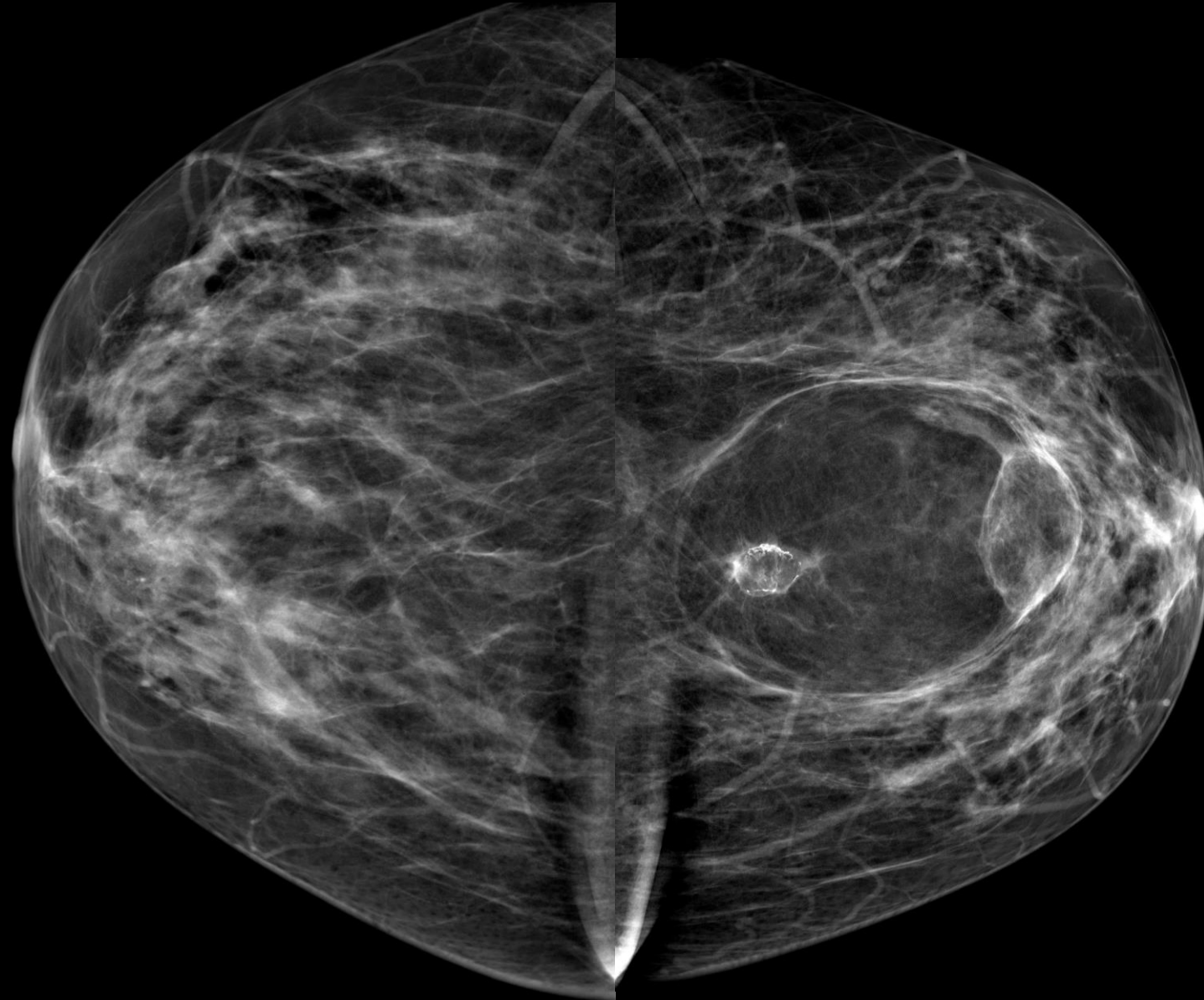
# LIPOMA



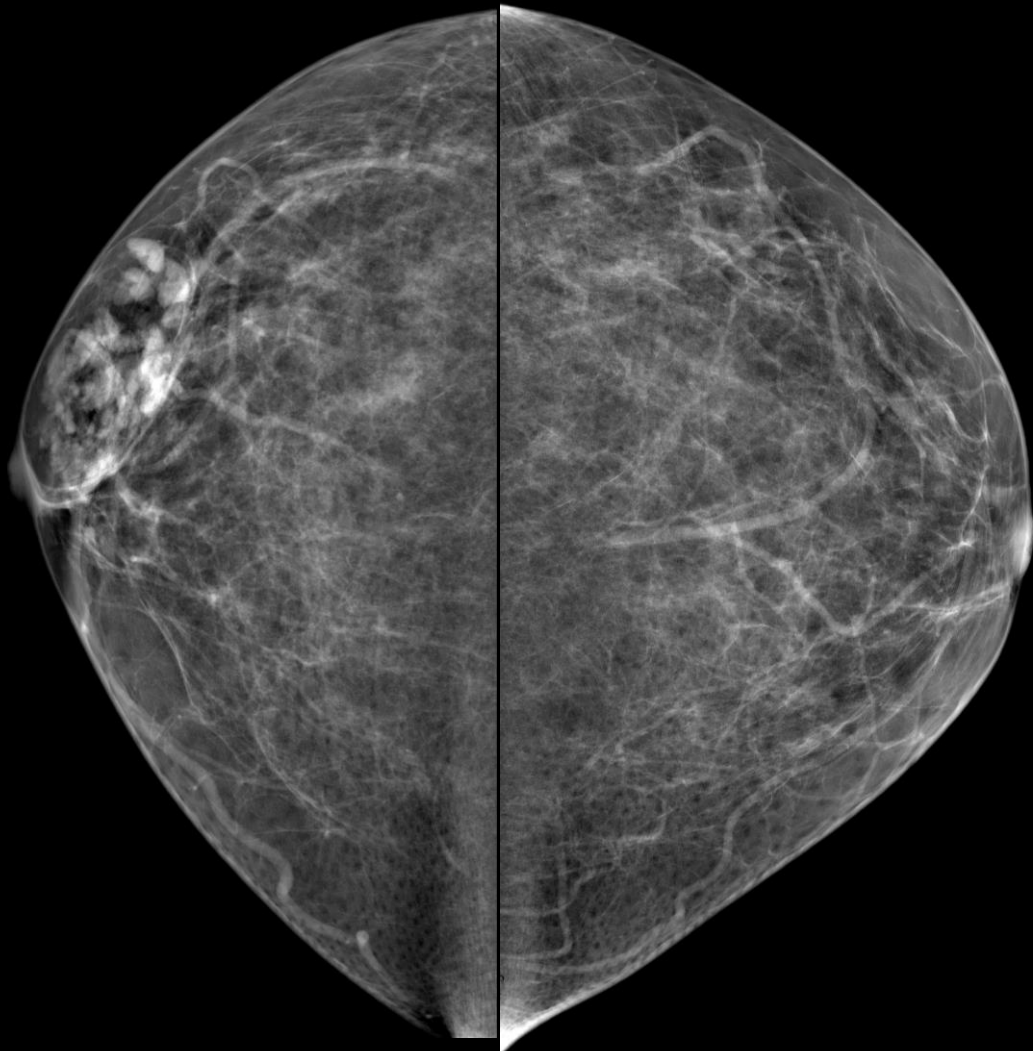
# GALACTOCELE



# FAT NECROSIS



# HAMARTOMA (fibroadenolipoma)



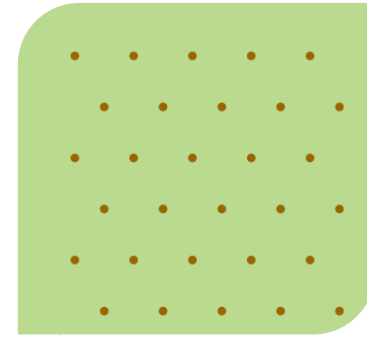
# BREAST ABNORMALTY



Mass



Architectural distortion.



Calcifications.



**Skin thickening**



**Nipple retraction**



**Axillary lymph nodes**

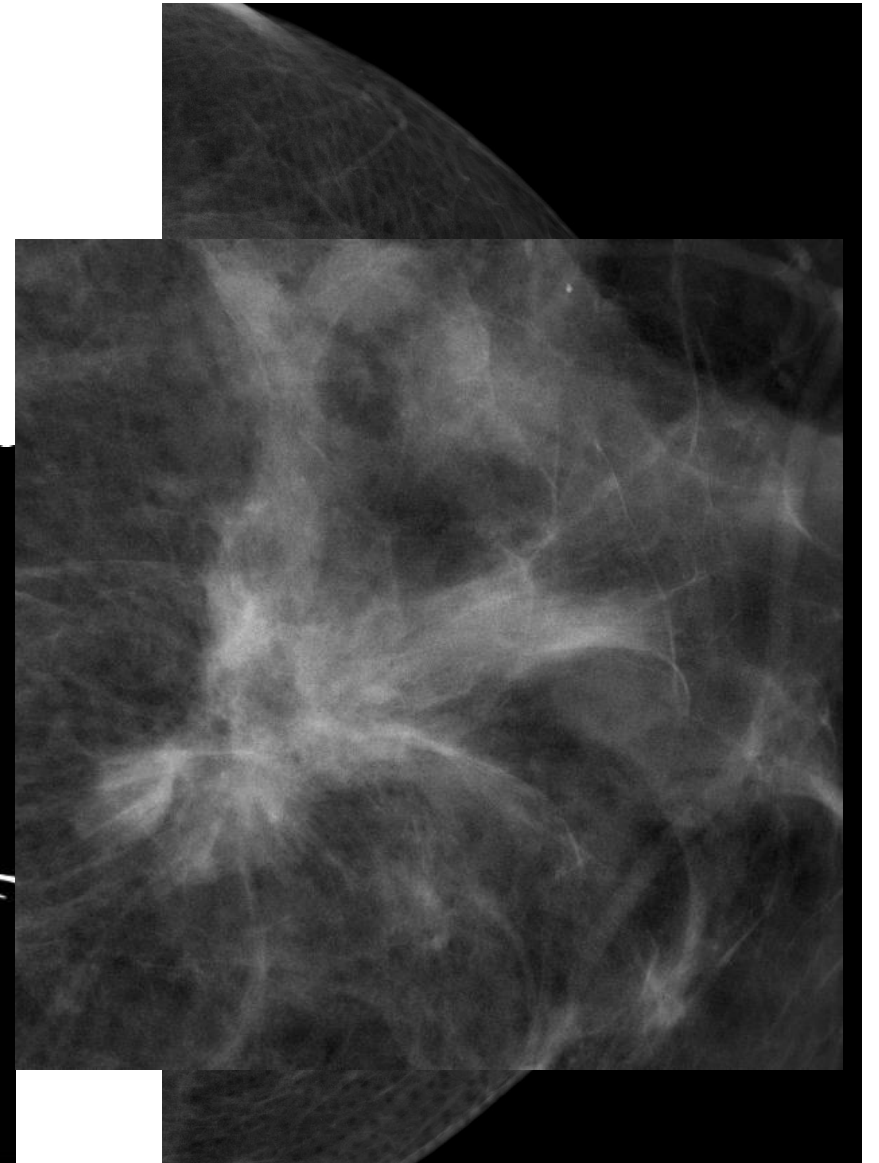
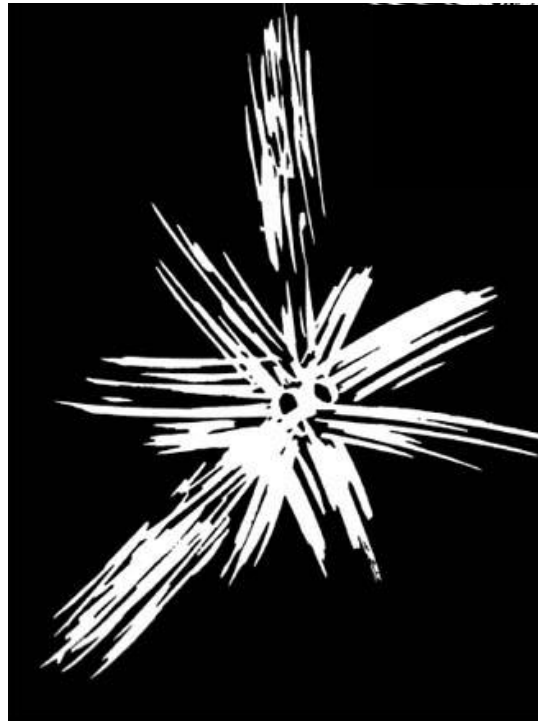


# ARCHITECTURAL DISTORTION

- ☛ Lines radiating from a point.
- ☛ Focal retraction/ distortion of parenchymal edge.
- ☛ Main findings or associated findings.

## Differential diagnosis:

1. Breast cancer.
2. Radial Scar (complex sclerosing lesion).
3. Surgical Scar.



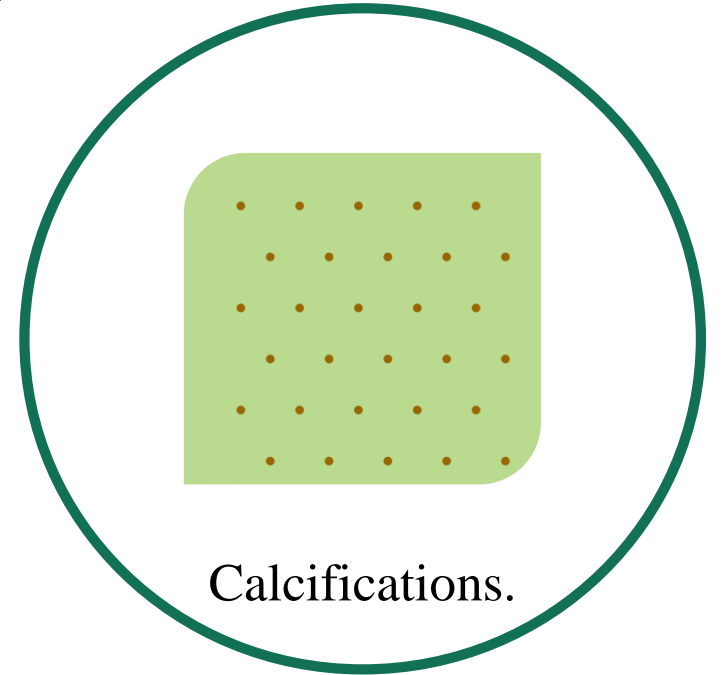
# BREAST ABNORMALTY



Mass



Architectural distortion.



Calcifications.



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**Axillary lymph nodes**

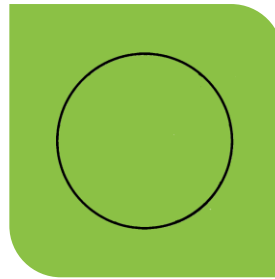
# BENIGN CALCIFICATIONS



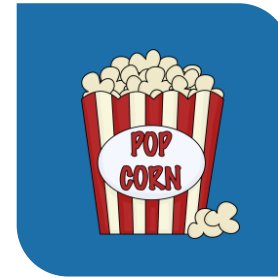
**Skin**



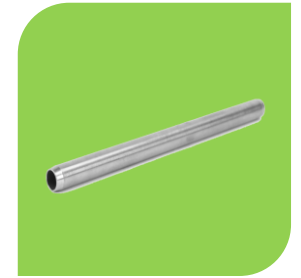
**Vascular**



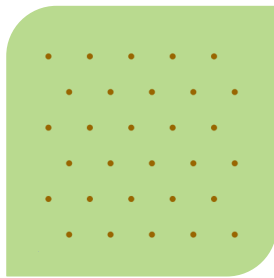
**Rim**



**Popcorn**



**Rod-Like**



**Punctate**



**Milk of calcium**

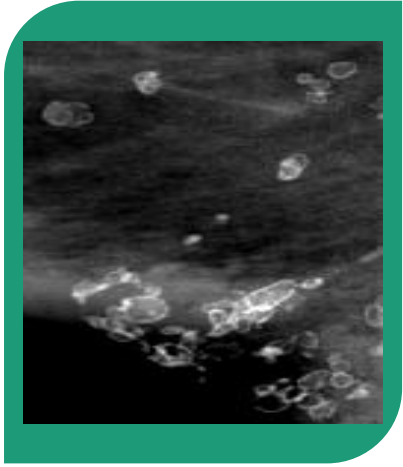


**Suture**

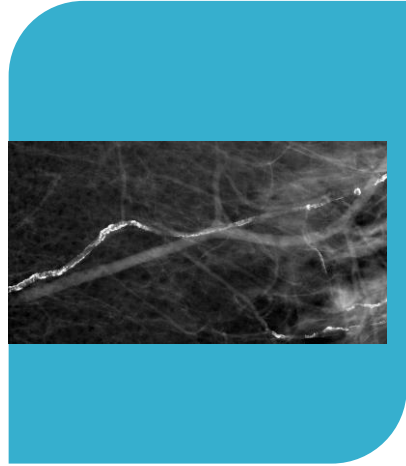


**Dystrophic**

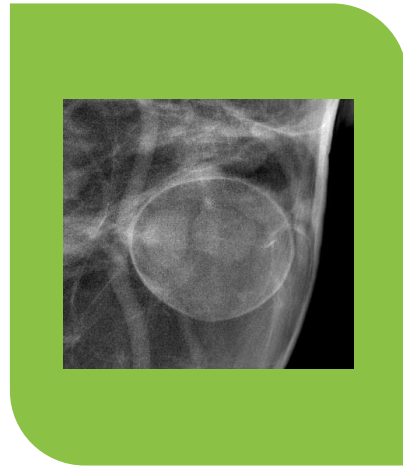
# BENIGN CALCIFICATIONS



**Skin**



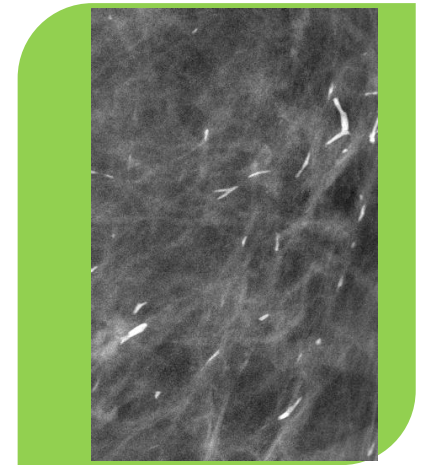
**Vascular**



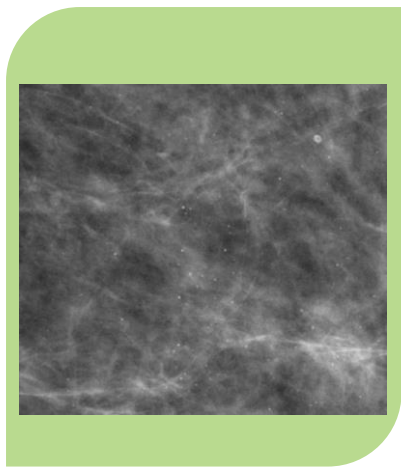
**Rim**



**Popcorn**



**Rod-Like**



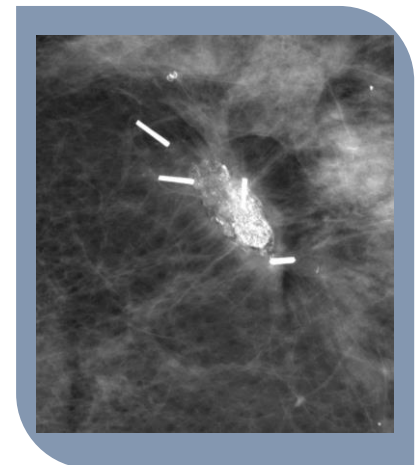
**punctate**



**Milk of calcium**



**Suture**



**Dystrophic**

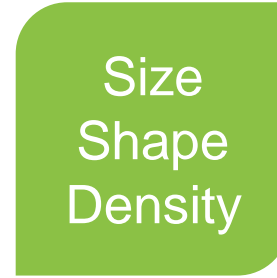
# Suspicious Calcifications



**Amorphous**



**Coarse  
heterogenous**

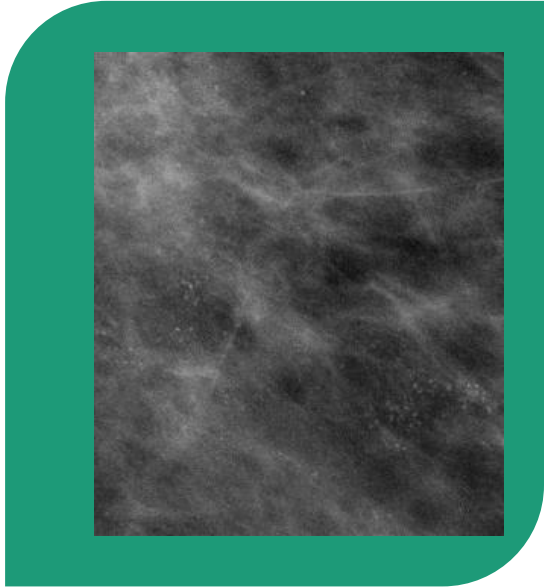


**Fine  
Pleomorphic**



**Fine Branching  
and linear branching**

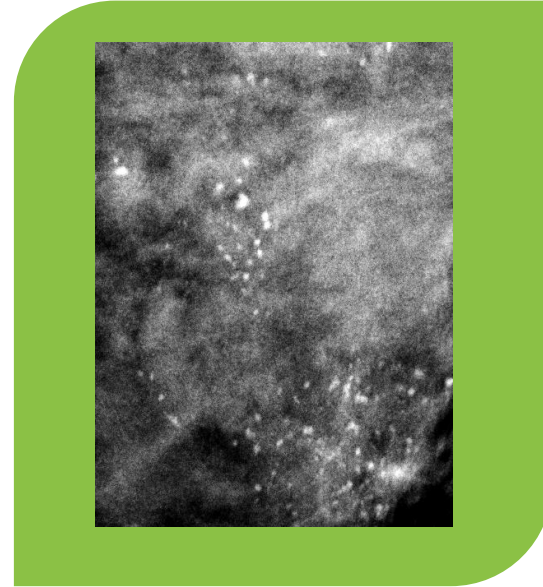
# Suspicious Calcifications



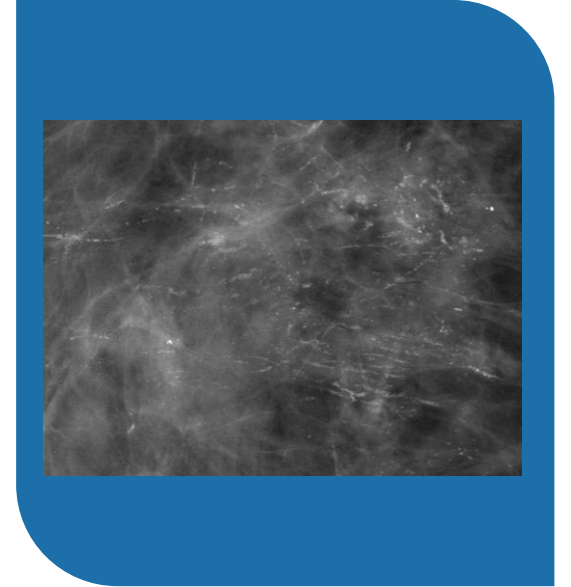
**Amorphous**



**Coarse  
Heterogeneous**



**Fine  
Pleomorphic**



**Fine Branching  
and linear branching**

# DISTRIBUTION



## Grouped

< 2 cm  
5 Calcifications  
or more

## Linear

## Segmental

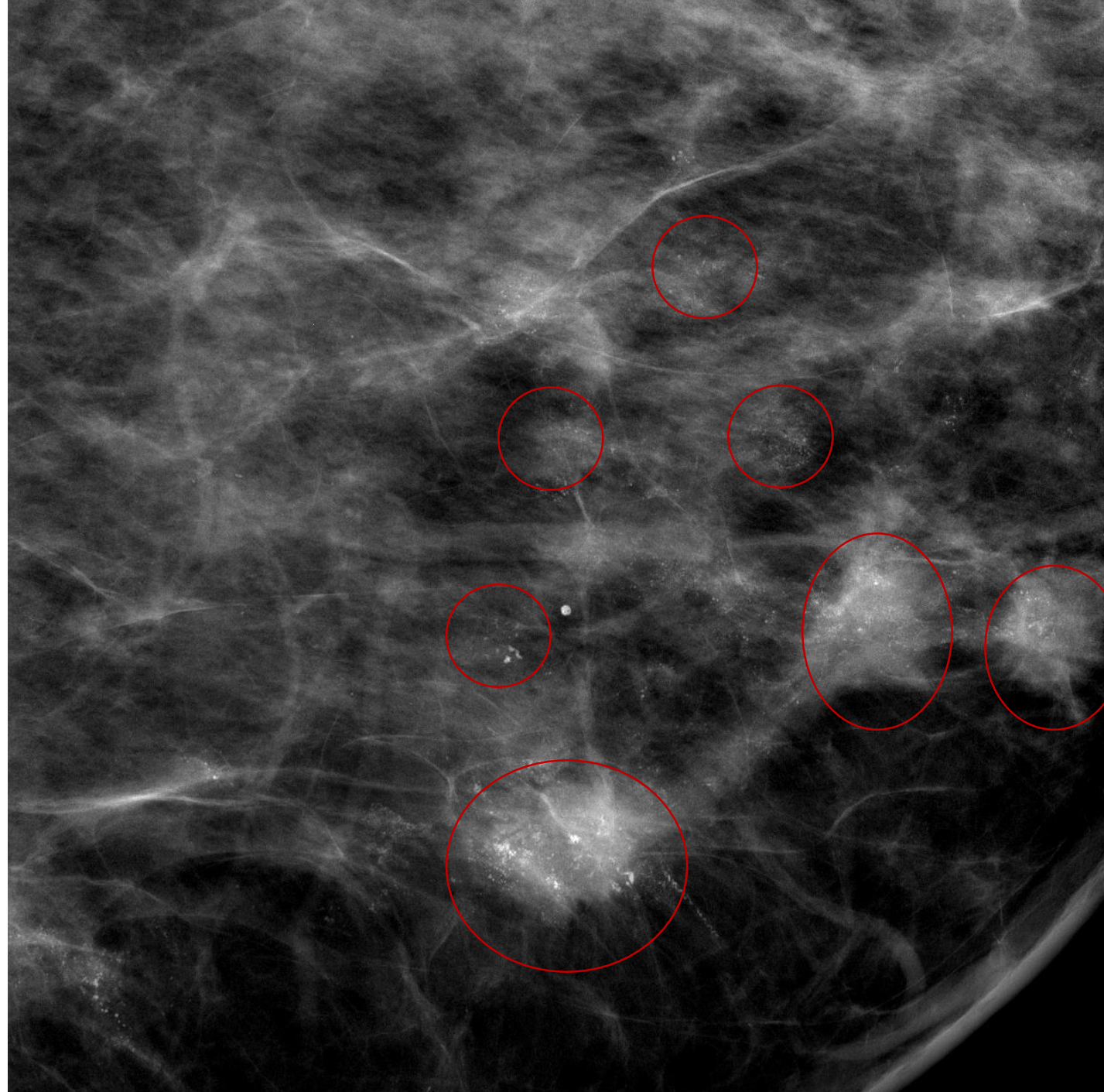
## Regional

> 2 cm

## Diffused

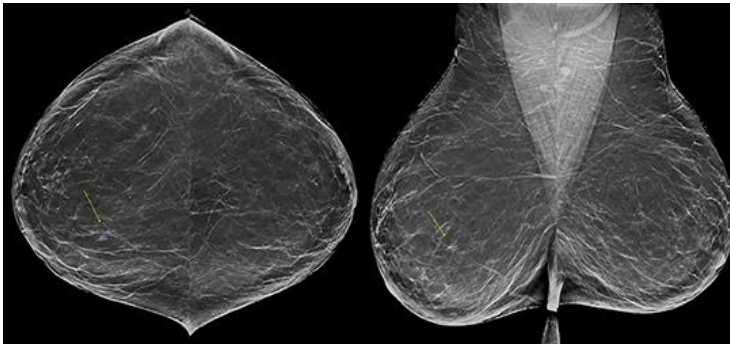
Entire breast

**GROUPED**

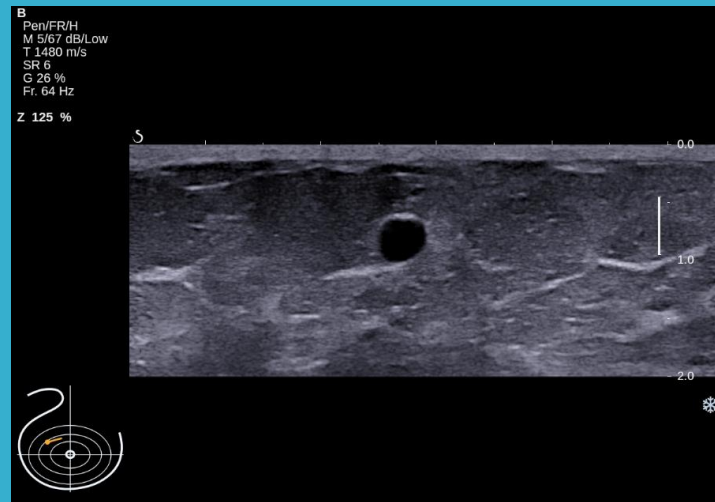




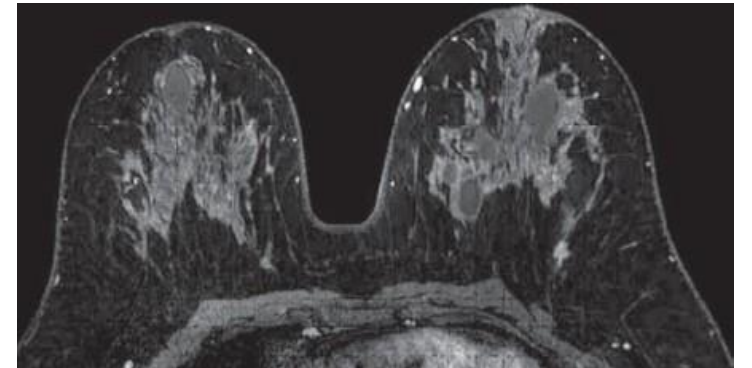
# BREAST IMAGING



Mammogram



Ultrasound



MRI

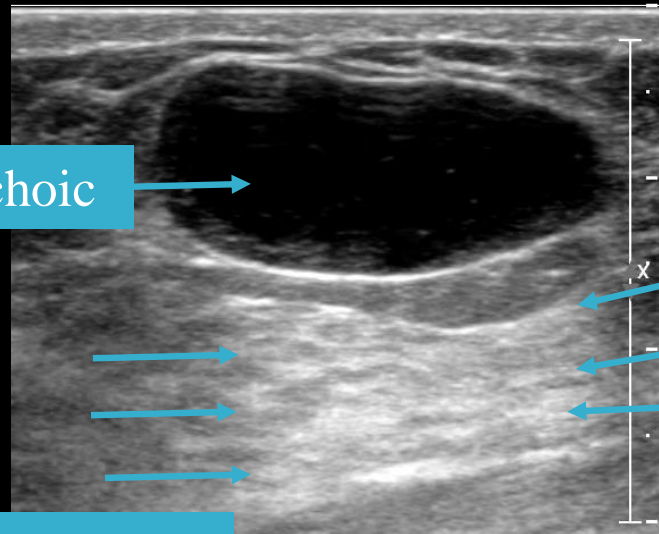
# BREAST US INDICATIONS

1. Differentiation of both palpable and mammographic lesions as either cystic or solid.
2. Evaluation of solid masses according to certain sonographic features.
3. Initial imaging evaluation of palpable breast masses in patients under 30 years and in lactating and pregnant women.
4. Screening for occult cancers in certain populations, including of women with heterogeneously or extremely dense breasts.
5. Follow-up of breast cancer treated with neoadjuvant chemotherapy.
6. Guidance for breast biopsy and other interventional procedures.

# MALIGNANT VS BENIGN SONOGRAPHIC FEATURES OF SOLID MASSES

MALIGNANT	BENIGN
Spiculation	Circumscribed, hyperechoic tissue
Angular margins	Parallel oriented –wider than taller
Hypoechoogenicity	Gently curving smooth lobulations
Shadowing	Thin echogenic pseudocapsule
Calcification	
Duct extension	
Branch pattern	
Microlobulation	

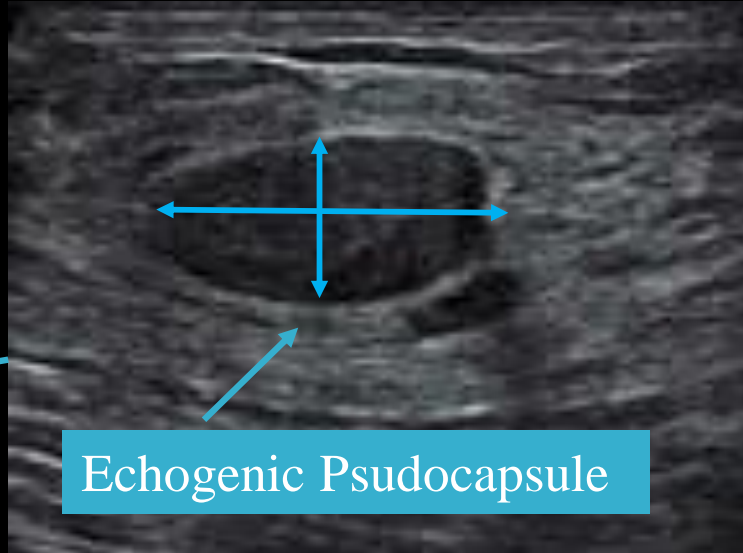
## Cyst



Anechoic

Posterior enhancement

## Solid



Echogenic Pseudocapsule

Circumscribed



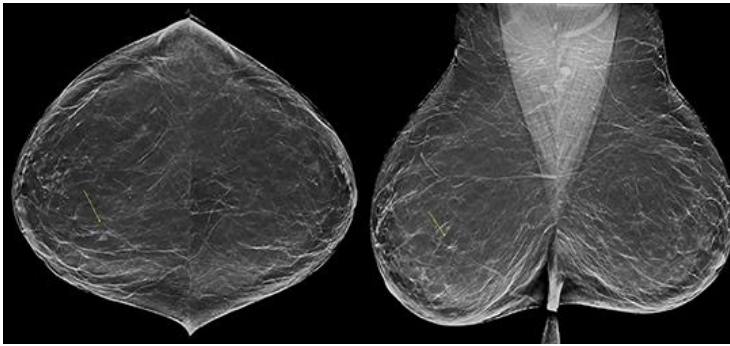
Spiculated

Shadowing

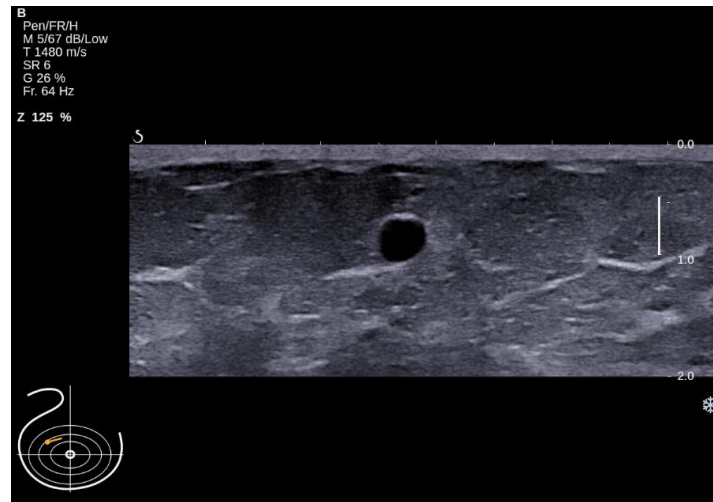
## Benign

## Malignant

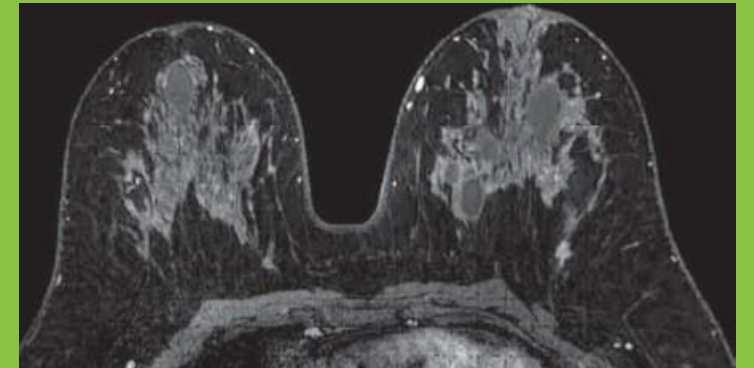
# BREAST IMAGING



**Mammogram**



**Ultrasound**



**MRI**

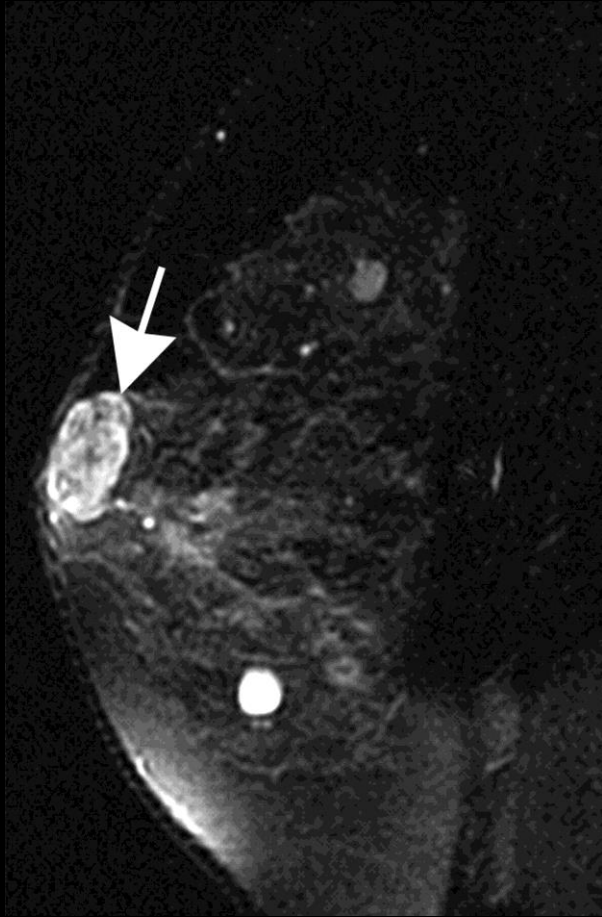
# MRI INDICATIONS

1. Staging.
2. High risk patients.
3. Response to therapy.
4. Post operative to differentiate surgical scar versus recurrence
5. Occult breast cancer.
6. Assess the contralateral breast.
7. Breast implant.

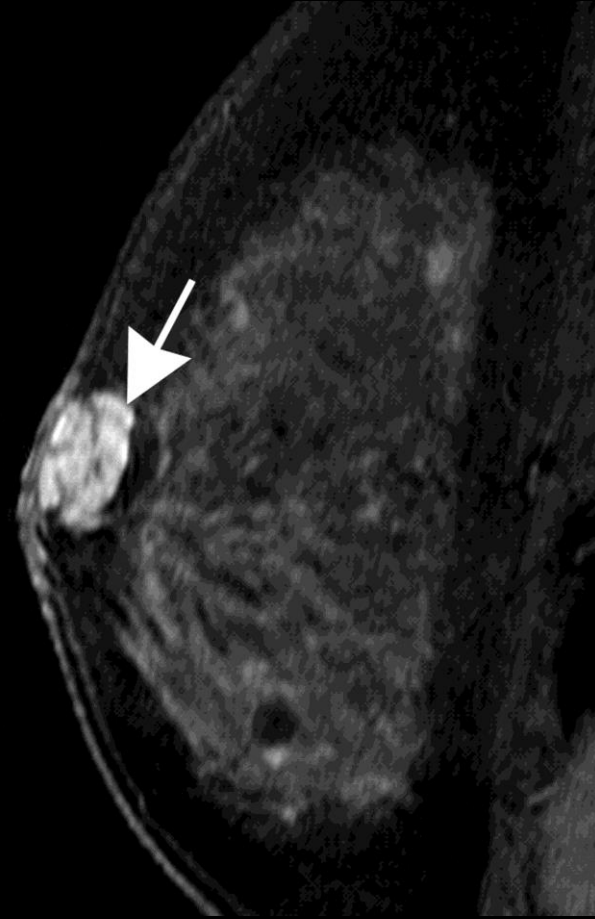
# MRI breast- Minimum equipment

- System with field strengths 1.5 T
- Dedicated bilateral breast surface coil
- Prone positioning.
- Images obtained prior to gadolinium and multiple phases following gadolinium administration (Dynamic).





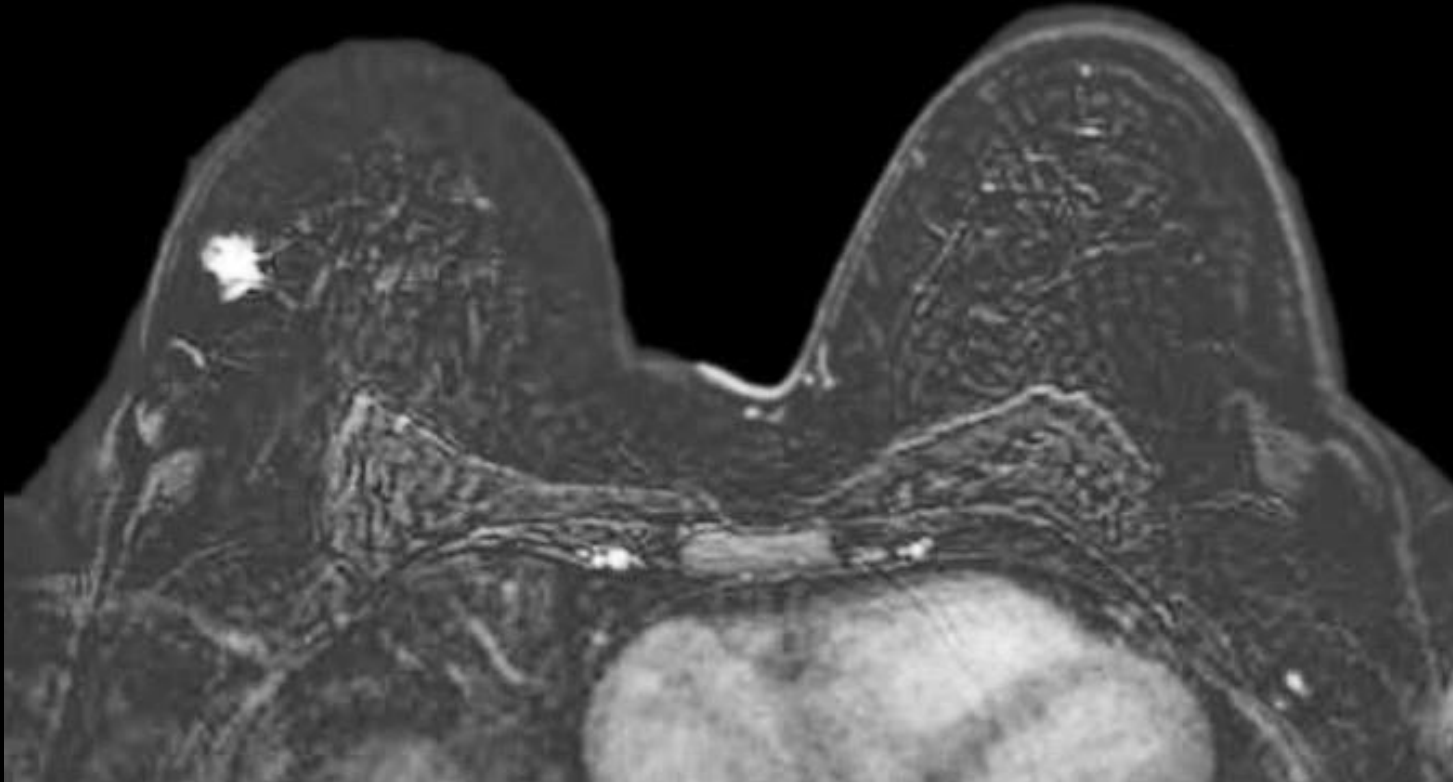
T2 Fat Saturation



T1 fat sat with Gadolinium



**Subtracted images = Enhanced – Unenhanced Images**



# BI-RADS

## Breast Imaging Reporting And Data System

- 0 = **Incomplete** Additional imaging/view.
- 1 = **Negative** Routine screening recommended.
- 2 = **Benign** Routine screening recommended.
- 3 = **Probably Benign** (< 2% malignant); six-month short interval follow-up.
- 4 = **Suspicious of Malignancy** ( $\geq 2$  to 95%); biopsy should be considered.
- 5 = **Highly Suspicious of Malignancy** (> 95%); take appropriate action.
- 6 = **Known Biopsy-Proven Malignancy**



THANK YOU

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Questions?