



# Radiology Team

## Lecture 2

# Breast Imaging

Make sure you check the [Correction File](#) before going through the lecture!

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### Color Index:

- **Important**
- **Females' notes**
- **Explanations**
- **432 Teamwork**

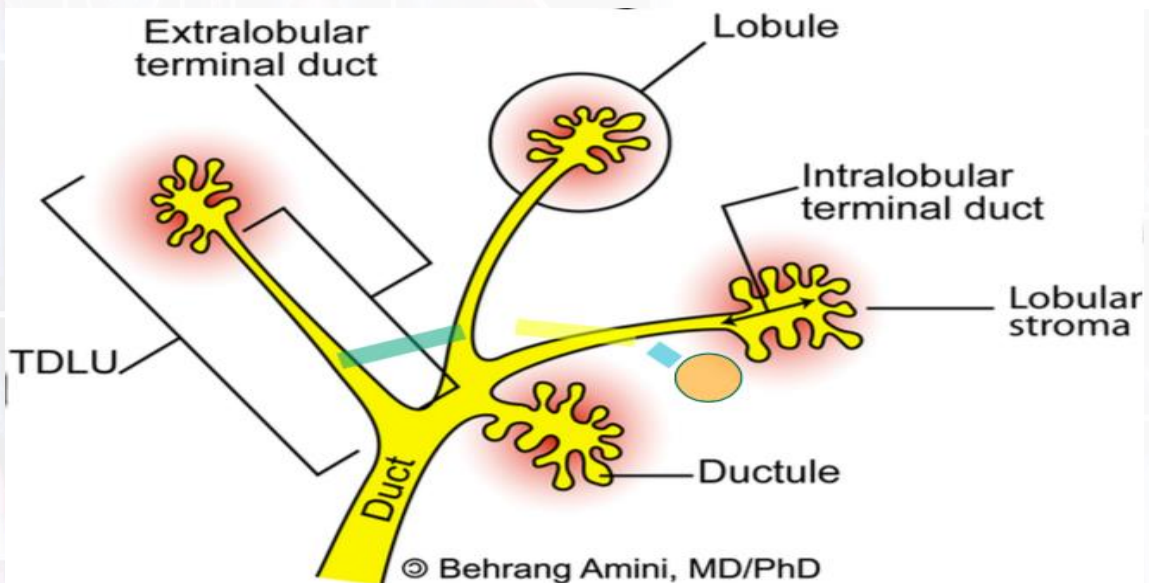
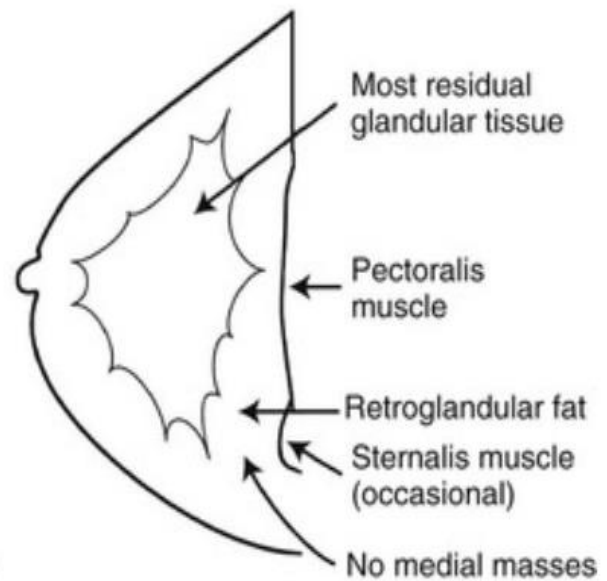
# Anatomy of the Breast:

- **Breasts (mammary glands):** are modified sebaceous glands. The breast extends from the 2nd to the 6th ribs and transversely from the lateral border of the sternum to the midaxillary line.

- **Terminal ductal lobular unit is composed of:**

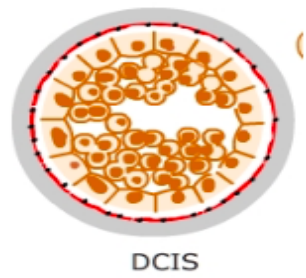
- 1- intralobular terminal ducts
- 2- acini

**TDLU** is the most important unit because most of breast lesions develop out of this unit!

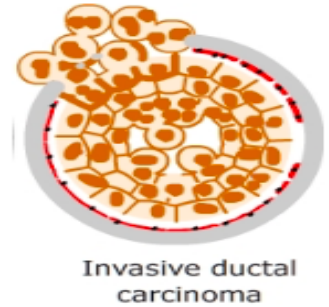


# Breast cancer can be divided into two major groups:

**1-In Situ:** Tumor cells, they **do not** invade the basement membrane and stay confined in lobule or duct.

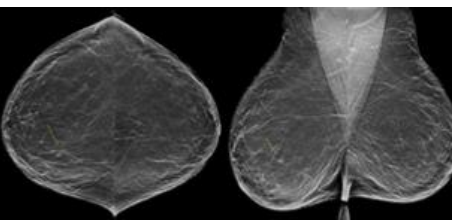


**2-Invasive:** Tumor cells **invade** the breast stroma thus have potential to metastasize and increase mortality rate

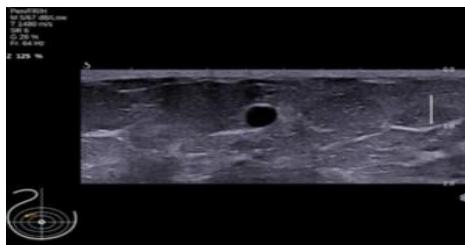


## Breasts imaging modalities:

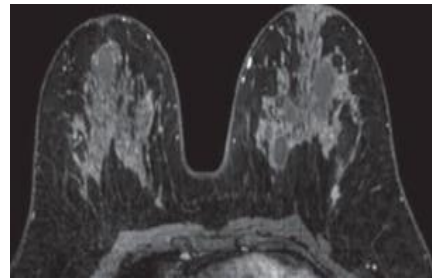
Mammogram MG



Ultrasound US



MRI



## Modality usage depends on the age: (important)



## Mammogram:

### -Indications:

#### ❖ Screening(no complain):

1) If 40 yr or older

2) family Hx [Young patient with first degree relative (Mother/ Sister) diagnosed with breast cancer]

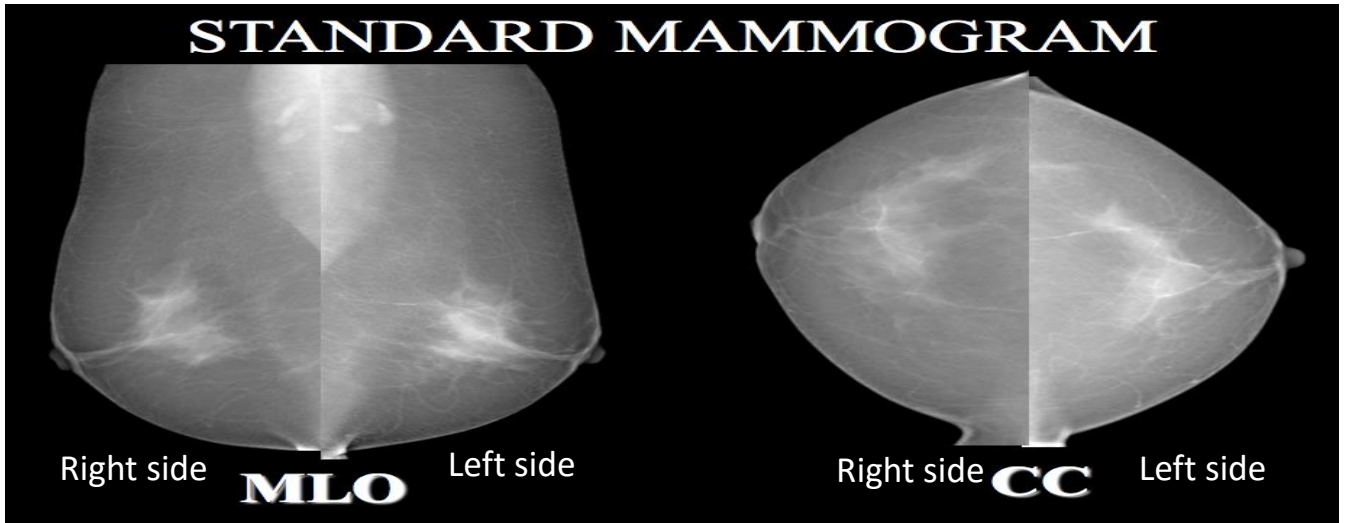
#### ❖ Diagnostic(complain):

- 1) Palpable mass
- 2) Nipple discharge
- 3) skin changes

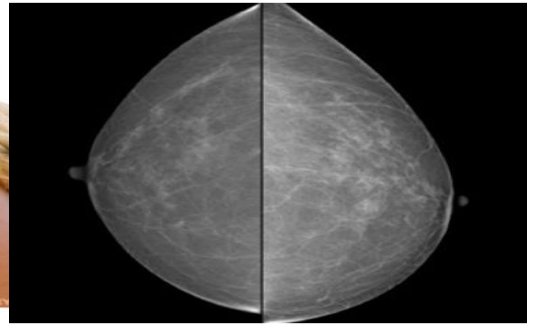
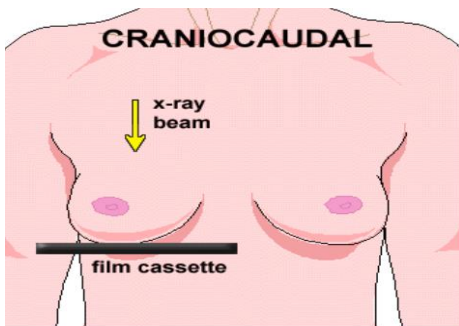


## -Views:

### STANDARD MAMMOGRAM



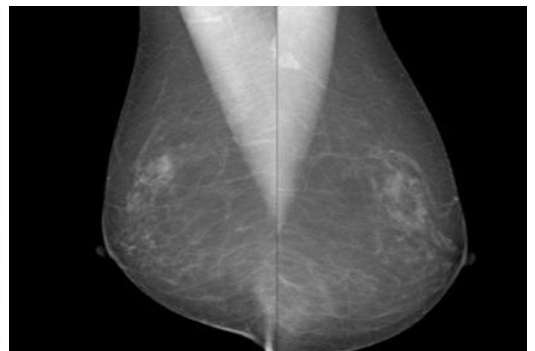
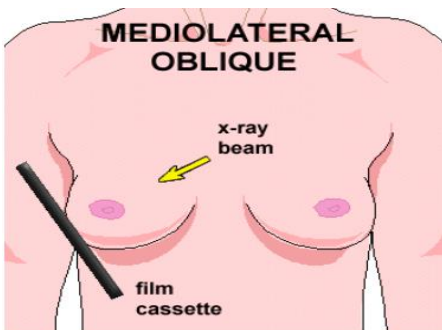
## Cranial-Caudal (CC):



## In CC:

- Only in 15-20% of cases you can appreciate Pectoralis major muscle
- The breast is compressed from up to down, with Zero angulation.

## Mediolateral-oblique (MLO):



## In MLO:

- You can appreciate Pectoralis major msc and the Axillary lymph nodes.
- The breast is compressed from medial to lateral, with 45 degree angle.


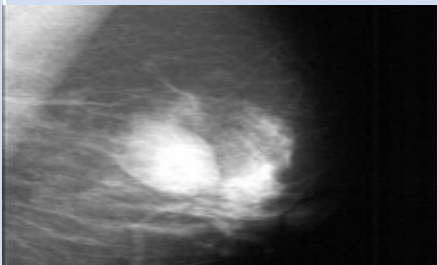
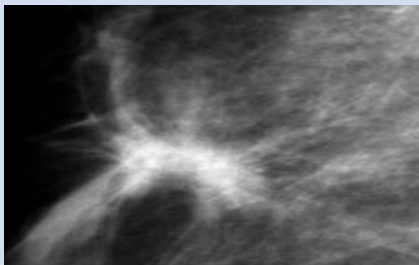
# Brest abnormalities:

## 1) Mass:

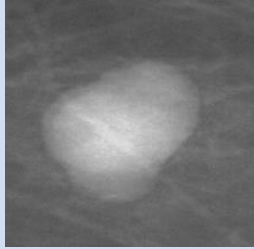
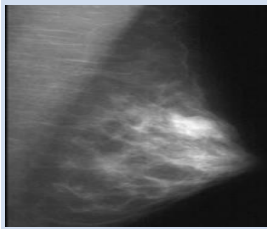
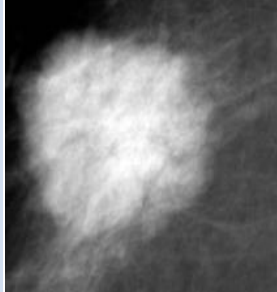
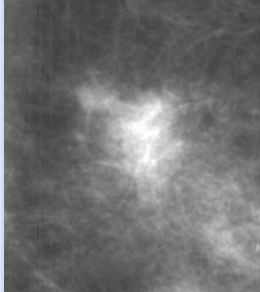
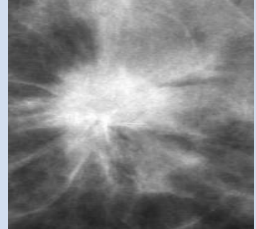
- Every patient need to do Both views CC&MLO
- Persist spot compression view (AKA compression mammogram, cone views, or focal compression views where they apply the compression to a smaller area of tissue for better evaluation)

### • Features to look at:

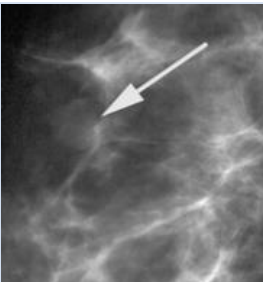
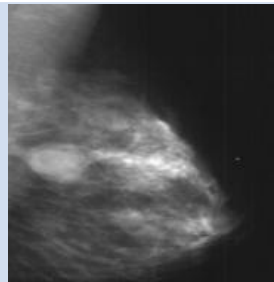
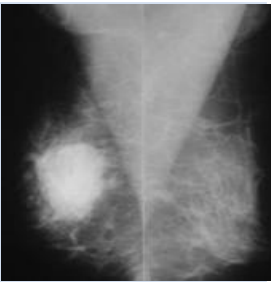
#### ❖ Mass Shape:

Round	Oval	Irregular ( <b>suspicious</b> )
		

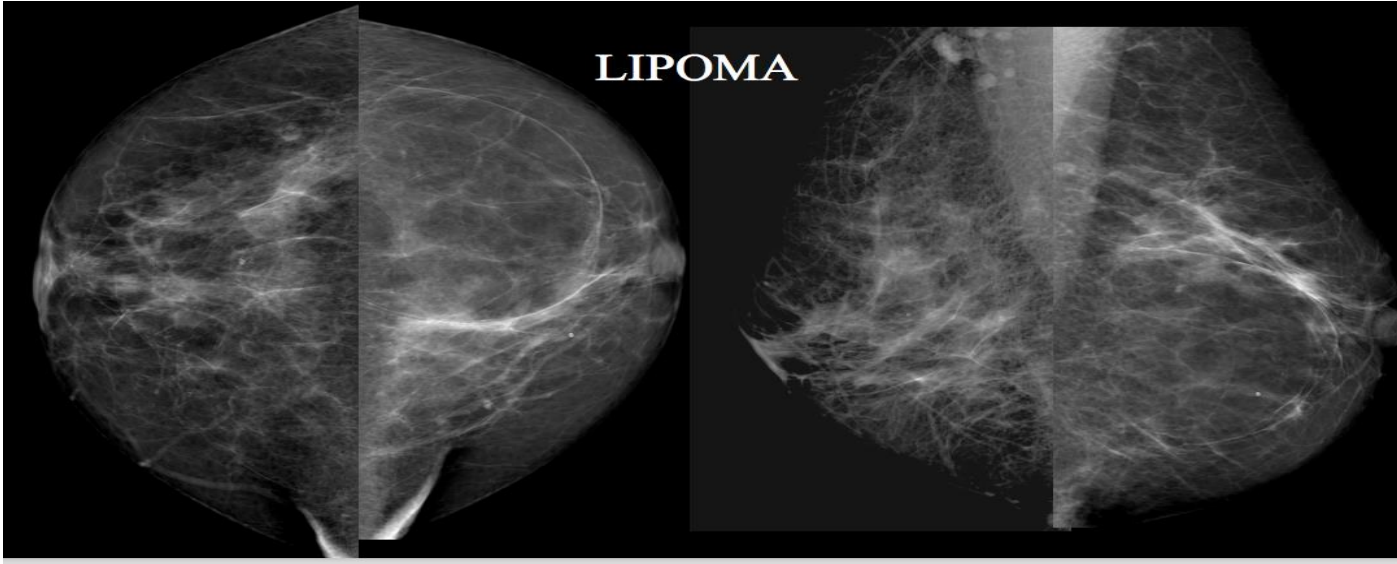
#### ❖ Mass Margin(most important feature):

Circumscribed	Obscured	Microlobulated ( <b>suspicious</b> )	Indistinct ( <b>more suspicious</b> )	Speculated ( <b>most suspicious</b> )
<p>Abrupt transition between lesion and tissue.</p> <p><b>DDx:</b></p> <p>1.Cyst</p> <p>2.Fibroadenoma</p> <p>3. Lipoma</p> 	<p>Margins (suspected to be circumscribed) <b>hidden by adjacent or superimposed normal tissue?!</b></p> <p>Ask for <b>compression or magnification views.</b></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(from a <b>DENSE</b> center).</p> <p><b>DDx</b></p> <p>1.Cancer 2.Fat necrosis (post-surgery/trauma)</p> 

#### ❖ Density:

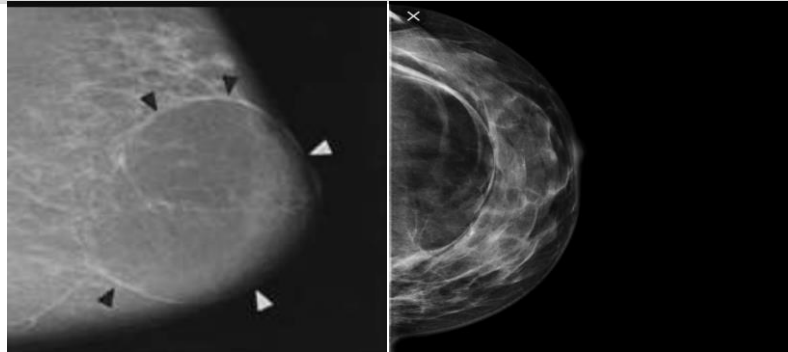
Fat only	Mixed density	Low dense	Equal dense	High dense ( <b>suspicious</b> )
<p><b>DDx:</b></p> <p>1. Oil cyst/fat necrosis.</p> <p>2. Lipoma.</p>	<p><b>DDx:</b></p> <p>1. Hamartoma</p> <p>2-Lymph node</p> <p>3-Fat necrosis</p> <p>4. Galactocele</p>			
<p><b>If you see fat in a mass, its benign!</b></p>		<p><b>Cancer is less likely but still possible</b></p>		<p><b>Suspicious for malignancy</b></p>

## LIPOMA

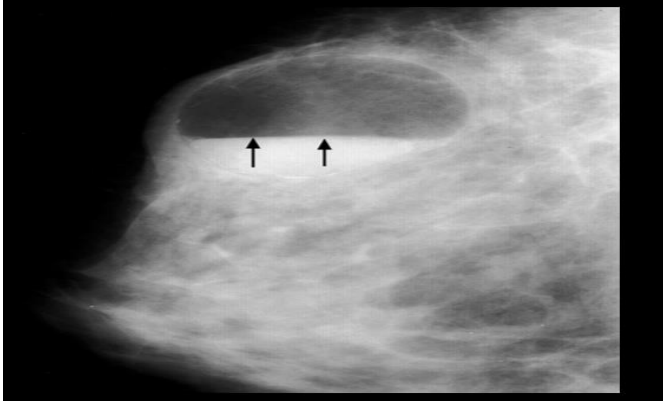


Lipoma:

lucent (gray) lesion  
with thin dense  
(white) capsule



## GALACTOCELE



Galactocele:

**Fat-Fluid Level,**

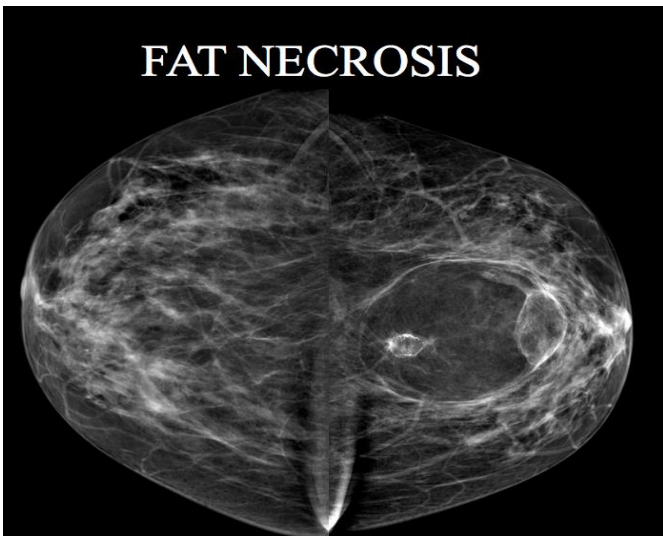
Just like water and oil

Fat is oil so it will flow

And milk which represents  
water will go down

زي لما يطفو الزيت اذا صببته على موية!

## FAT NECROSIS

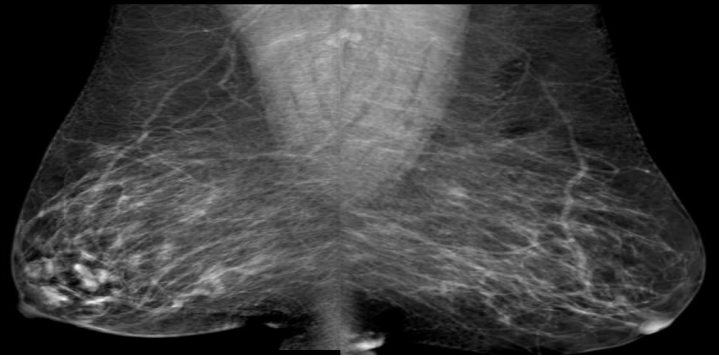
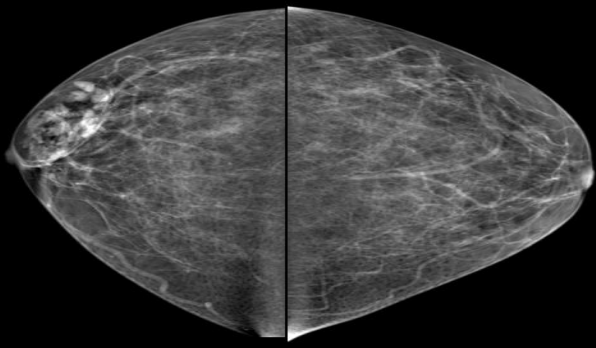


Fat necrosis:

The only difference  
between fat necrosis  
and lipoma is the  
presence of **dystrophic  
calcification** in case of  
fat necrosis.

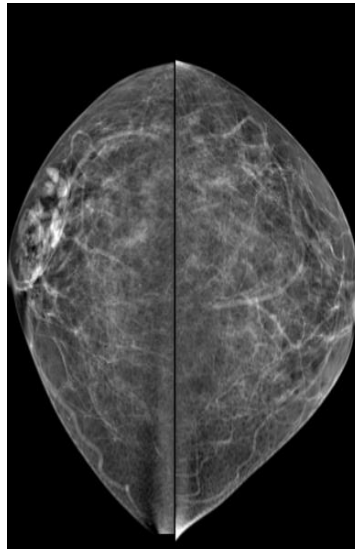


# HAMARTOMA (fibroadenolipoma)



## HAMARTOMA (fibroadenolipoma):

- Description: on mammo: Partially circumscribed oval mass with some obscured margins.
- in US, a sharply defined, heterogeneous oval mass is seen, or the lesion may manifest as normal glandular tissue
- benign lesions composed of various native fibrofatty tissues, but growing in a disorganized way.
- It is not considered a malignant tumor.
- mostly asymptomatic.



## Breast abnormality:

### 2- Architectural distortion:

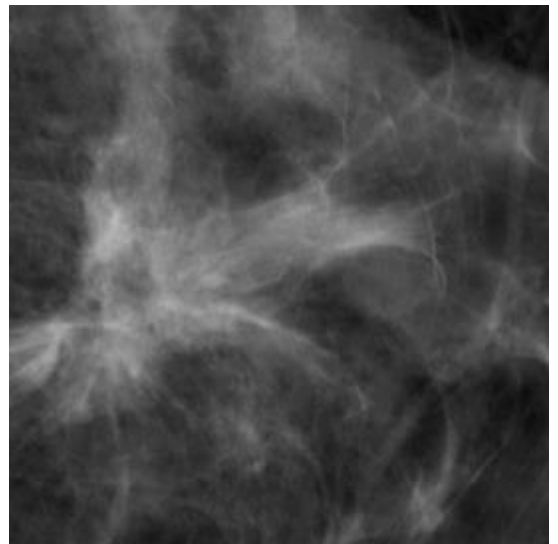
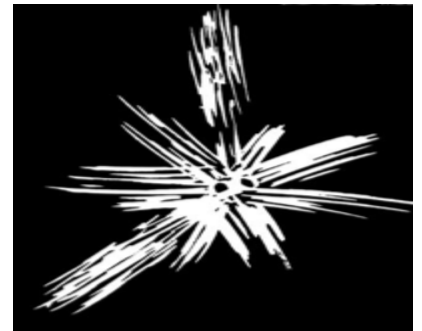
- Lines radiating from a point.
- Focal retraction/ distortion of parenchymal edge.
- Main findings or associated findings.

### Differential diagnosis:

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

How to differentiate between architecture distortion & Spiculated mass?

In architecture distortion the lines are radiating from a **LUCENT** center



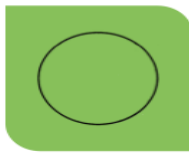
# Benign calcifications:



**Skin**



**Vascular**



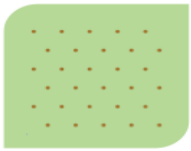
**Rim**



**Popcorn**



**Rod-Like**



**Punctate**



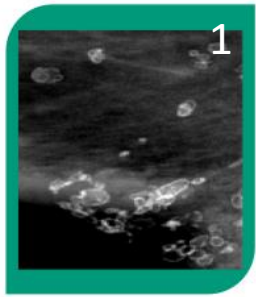
**Milk of calcium**



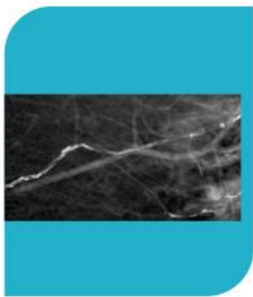
**Suture**



**Dystrophic**



**Skin**



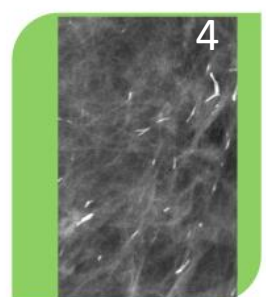
**Vascular**



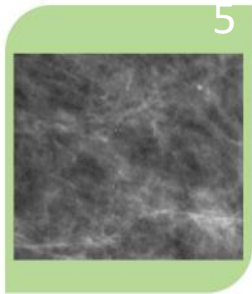
**Rim**



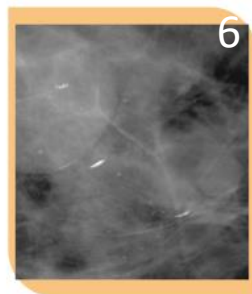
**Popcorn**



**Rod-Like**



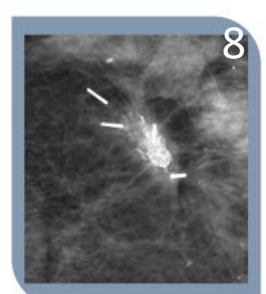
**punctate**



**Milk of calcium**



**Suture**



**Dystrophic**

1- Ring-like with central lucency

2-DDx: Fat necrosis/Oil cyst

3-Involuted fibroadenoma

4-Sharply demarcated

5-Tiny dots



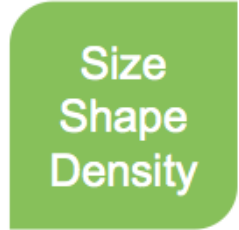

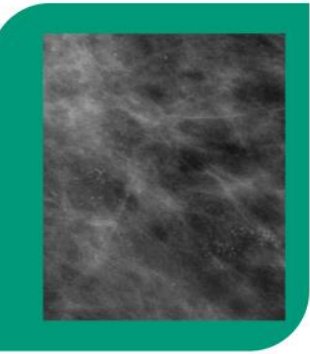

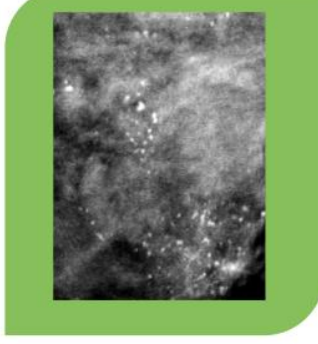
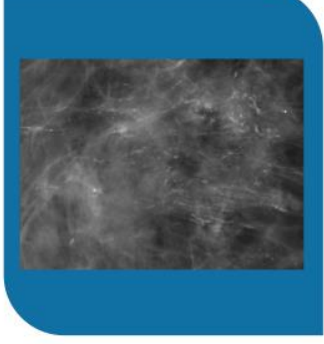
6-Layering

7-Post surgery

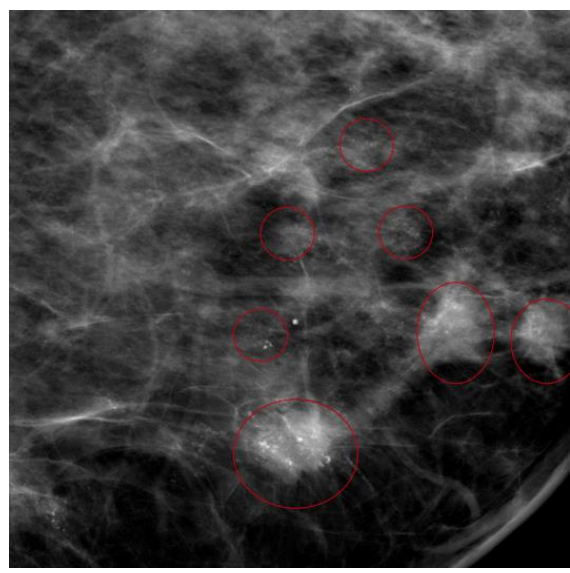
8-Fat necrosis



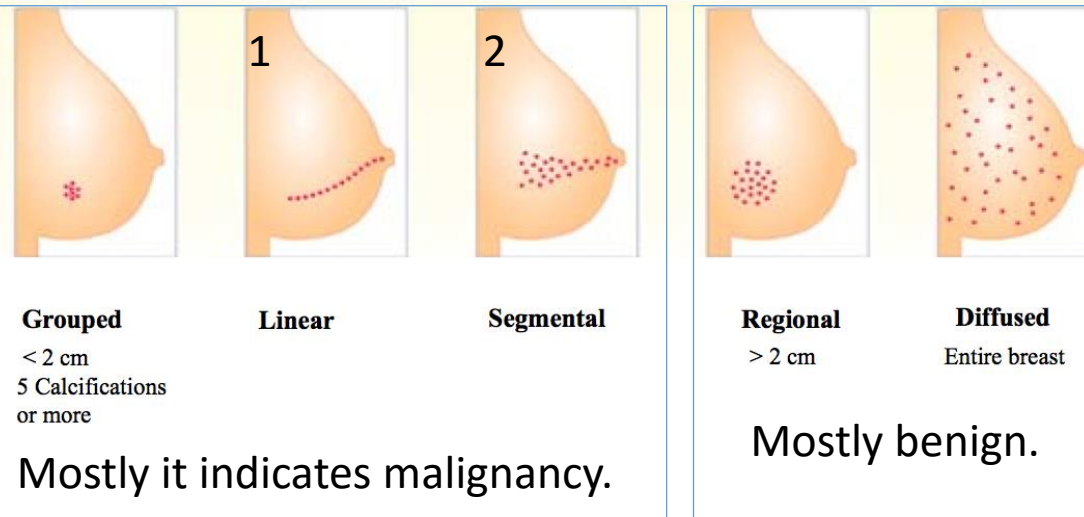
# Suspicious calcification:

 <p><b>Amorphous</b></p>	 <p><b>Coarse heterogenous</b></p>	 <p><b>Fine Pleomorphic</b></p>	 <p><b>Fine Branching and linear branching</b></p>
 <p><b>Amorphous</b></p> <p>The dots here are smaller than in the punctuate calcification</p>	 <p><b>Coarse Heterogenous</b></p> <p>Irregular in shape</p>	 <p><b>Fine Pleomorphic</b></p> <p>Different in density shape and size</p>	 <p><b>Fine Branching and linear branching</b></p> <p><b>The most suspicious</b></p>

## Grouped calcification:



### 3-calcifications (Distributio):



1- involve only one duct.

2-Involve more than one duct and it's triangular in shape.

#### •Size:

Micro calcifications are associated with a malignant process Macro calcifications are associated with a benign process . 0.5 mm or less to have a high probability of association with cancer .

2.0 mm or larger are typical of a benign process.

The smallest visible calcifications on a mammogram is approximately 0.2 - 0.3 mm.

#### •Morphology:

- important indicator in differentiating benign from malignant.
- Round and oval shaped calcifications that are also uniform in shape and size are likely benign.
- Irregular in shape and size **CALCIFICATIONS** fall closer to the malignant end of the spectrum.
- It has been described that calcifications associated with a malignant process resemble small fragments of broken glass and are rarely round or smooth

#### •ACR BIRADS Classification

The American College of Radiology (ACR) Breast Imaging Reporting and Data System (BIRADS) has classified findings of calcifications into three categories:

- (1) Typically benign; (2) Intermediate concern; and (3) Higher probability of malignancy

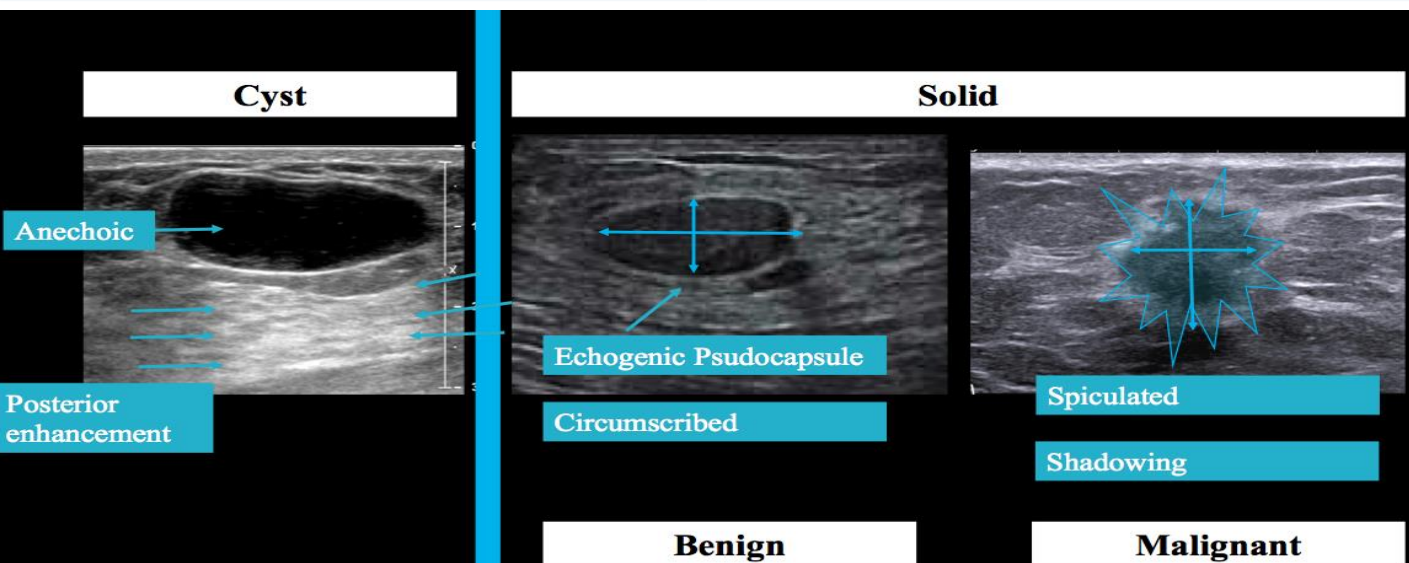
## Second step after mammogram is Ultrasound.

### BREAST Ultrasound 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
Hypoechogenicity	Gently curving smooth lobulations
Shadowing	Thin echogenic pseudocapsule
Calcification	
Duct extension	
Branch pattern	
Microlobulation	





# MRI INDICATIONS

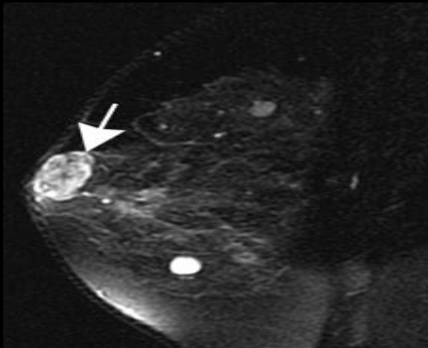
1. Staging.
2. High risk patients.
3. Response to therapy.
4. Post operative to differentiate surgical scar versus recurrence
5. Occult breast cancer.

6. Assess the contralateral breast.
7. Breast implant.

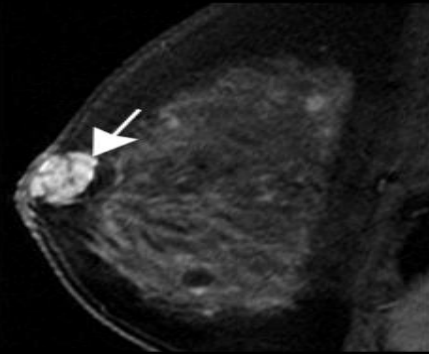


## MRI breast- Minimum equipment

- 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**).



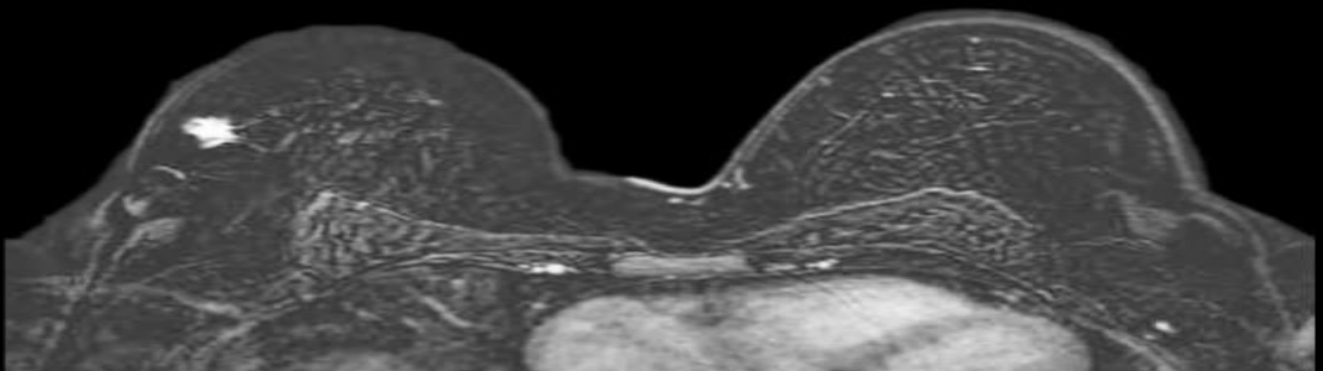
**T2 Fat Saturation**



**T1 fat sat with Gadolinium**

*Fluid will appear hypointense which indicates cyst!*

**Subtracted images = Enhanced – Unenhanced Images**



## BI-RADS

### Breast Imaging Reporting And Data System :

0= **Incomplete**

1= **Negative**

2= **Benign**

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**

★ (4-5) biopsy should be done!

