

Lecture 2:

Breast Lesions



Radiology Team
Med433

● Slides

● Explanation

● Notes

● Additions

● Important

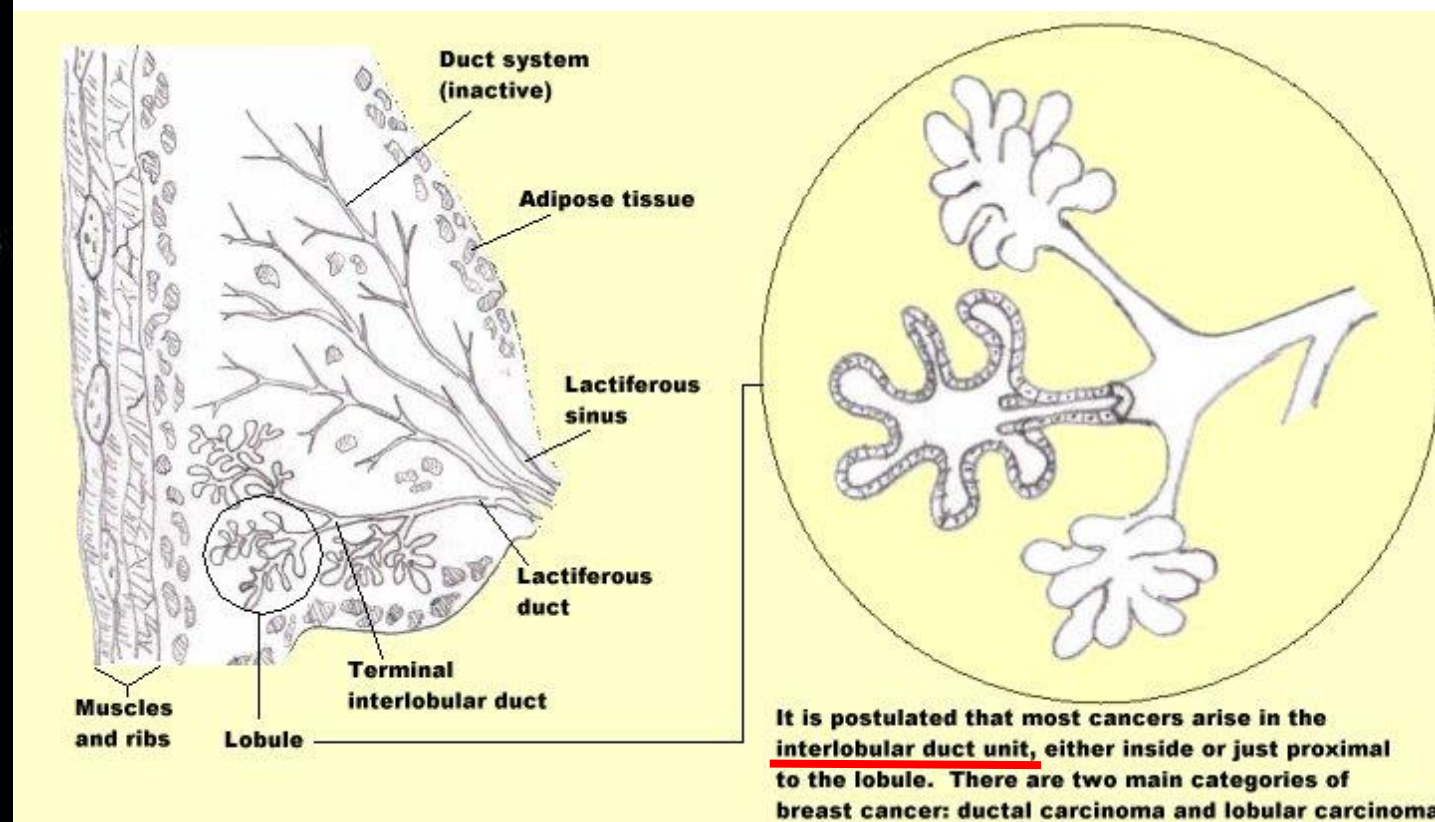
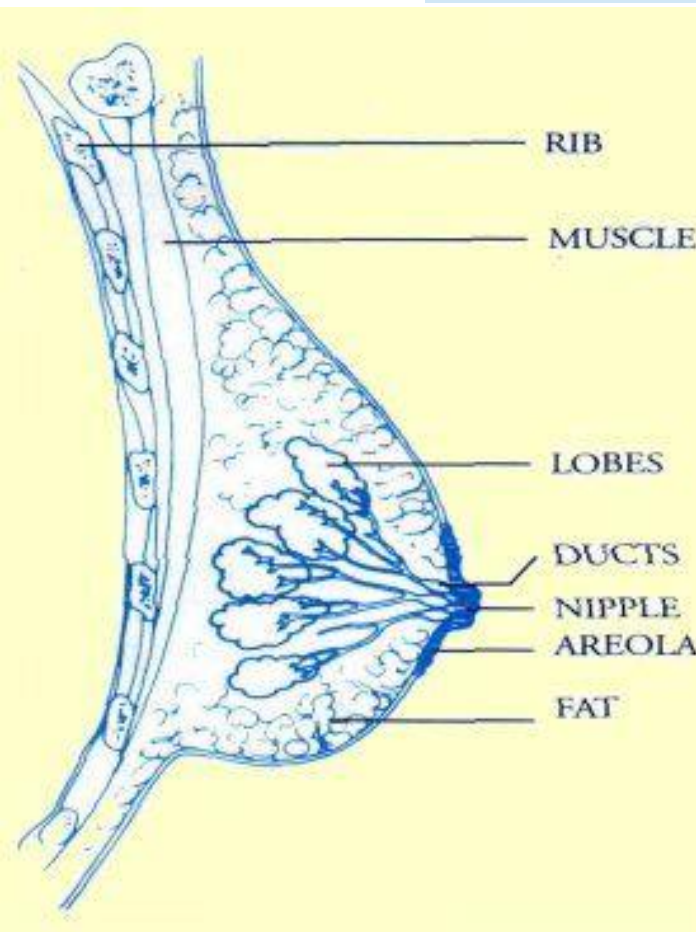
Objectives

- TO UNDERSTAND the **ANATOMY** of the breast radiology/imaging based.
- To highlight the **SUITABLE MODALITY** for **AGE** and disease of the breast.
- To understand the **ROLE OF RADIOLOGY** in diagnosing breast lesions particularly breast cancer.



Anatomy:

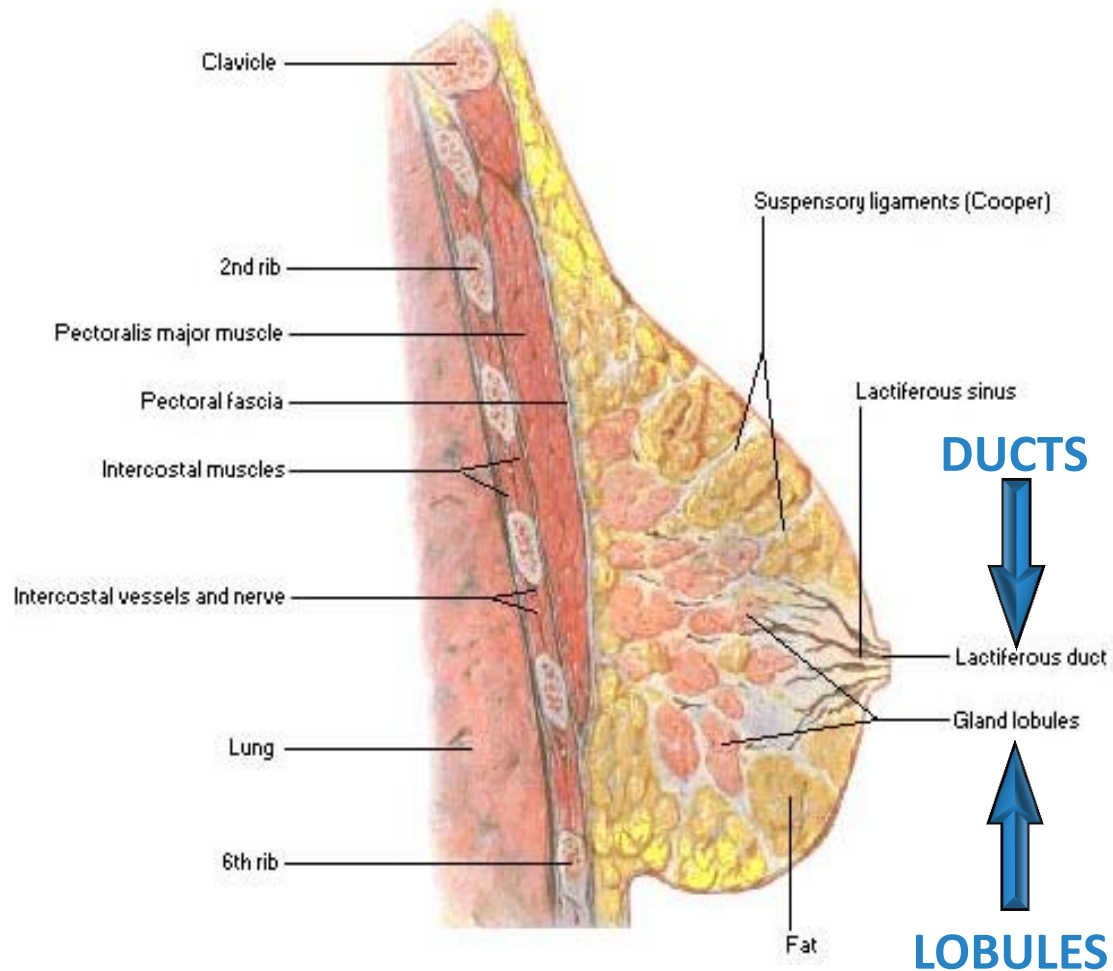
Breast is a glandular tissue secreting milk protected by surrounding fat and chest wall(rib and muscle) all of these attach to the chest wall by ligament. In mammography, what you can see in grey or dark is the fat, while the glandular tissue is dense(white) in malignancy and lactating. The more the glandular tissue the patient has, the denser the breast in young patient .



The smallest part in the glandular tissue is interlobular duct unit (terminal lobular duct unit) which is connected to the lobules directly. 95% of malignancy arising from interlobular duct unit. 5% of malignancy arising from surrounding area.

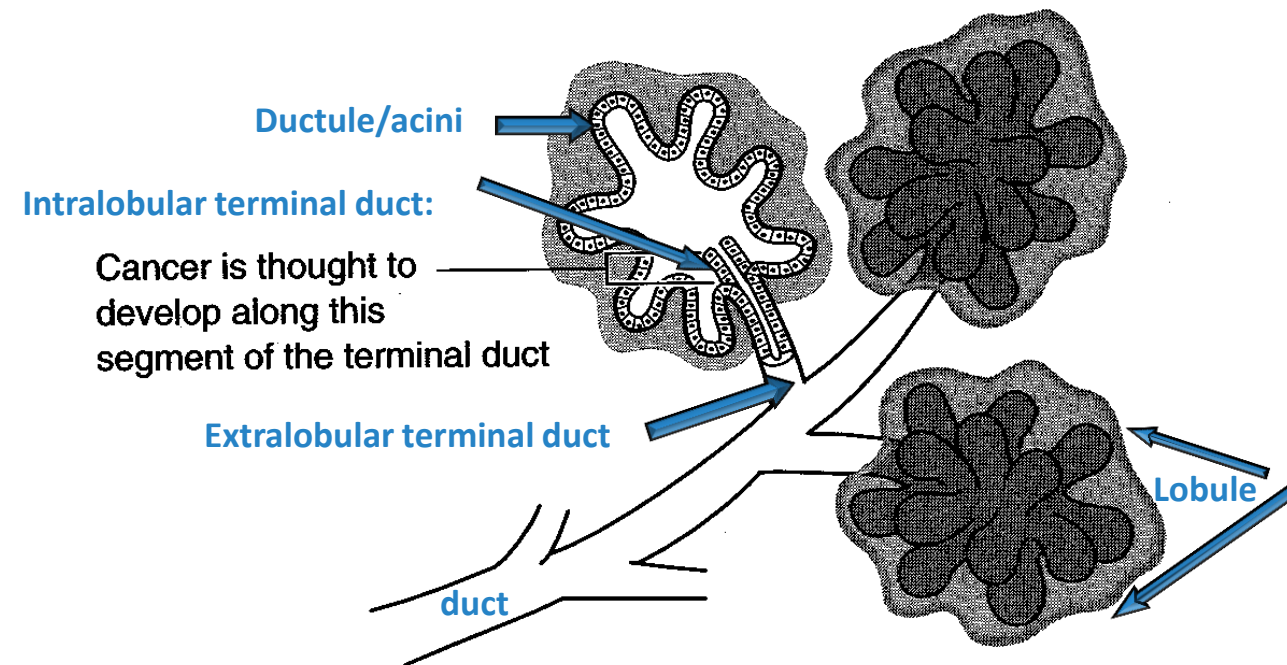
Breast Cancer:

Where in the breast does cancer develop?

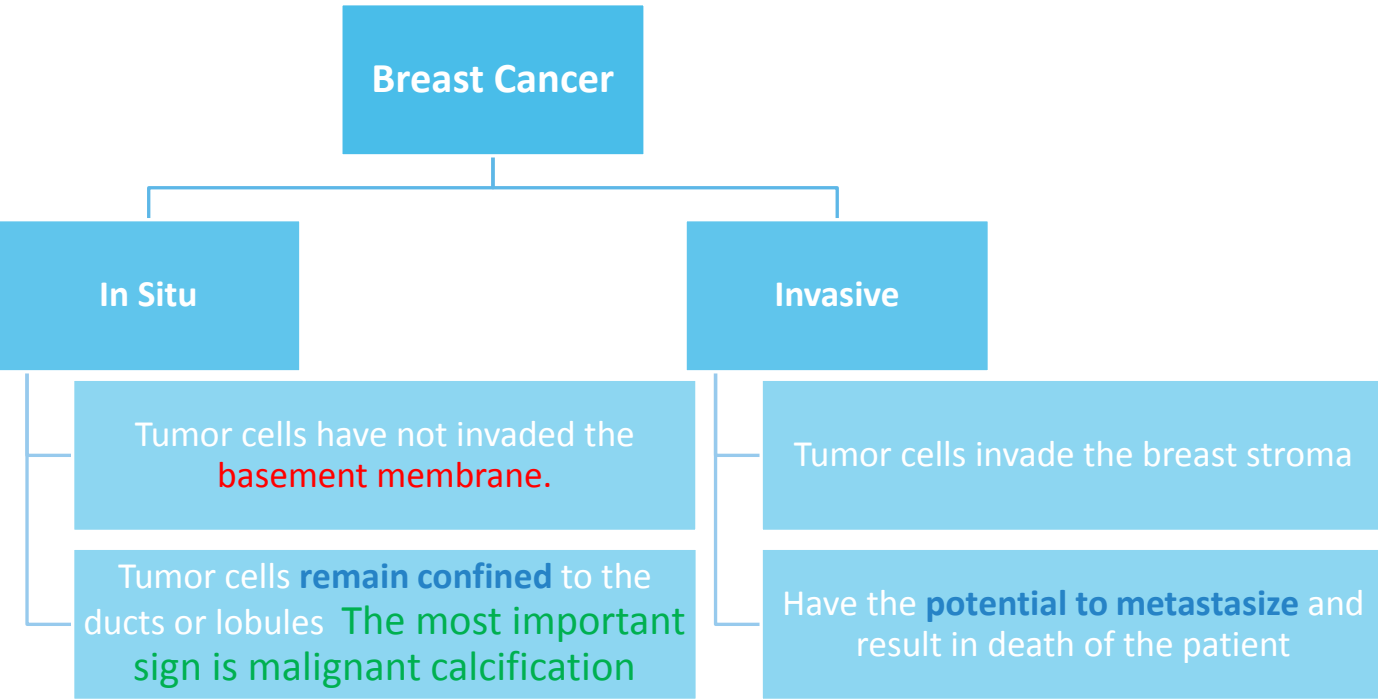


Most breast cancer develops in the **“terminal ductal lobular unit” (TDLU)**

- The epithelium inside the lobules is histologically distinct from the epithelium in the extralobular ducts.



Breast Cancer:



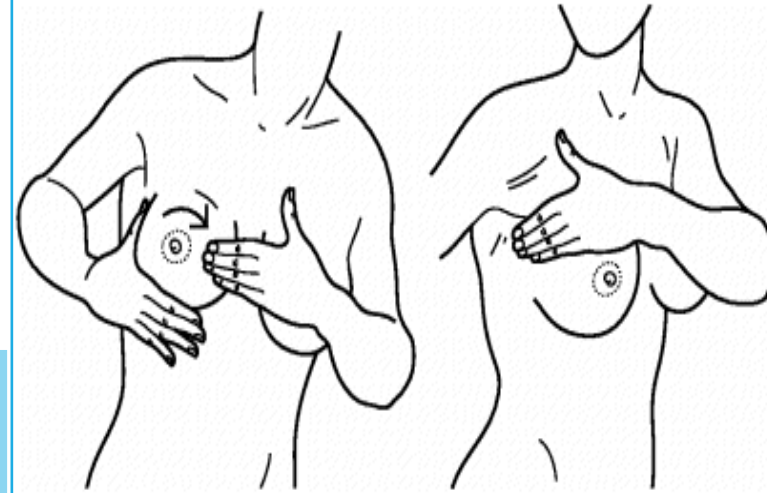
Ductal cancer evolves over time.

Clinical and molecular research have demonstrated that there is likely often a linear progression of sequential stages of epithelial proliferation.

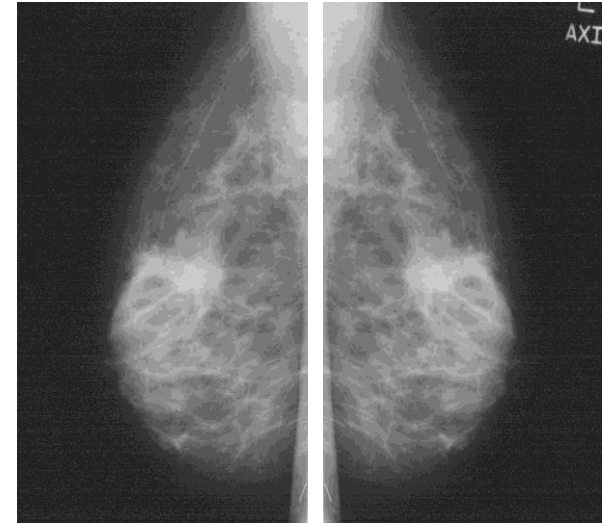


Responding to hormonal changes that will lead to ADH

The Four Pillars of Diagnosis



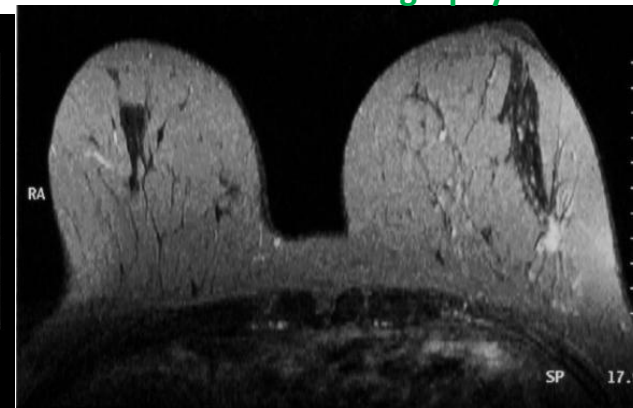
Clinical or Self Examination (PE)



Mammography (MG) (the gold standard) except for patient lactating and is very young and having very dense breast do not do mammography



Ultrasound (US)



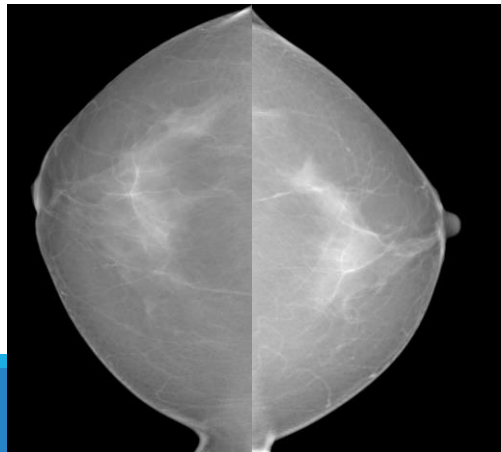
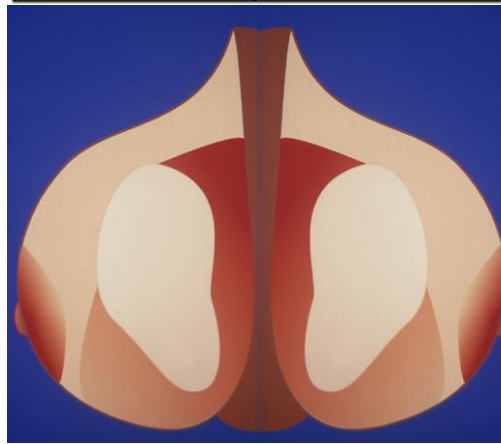
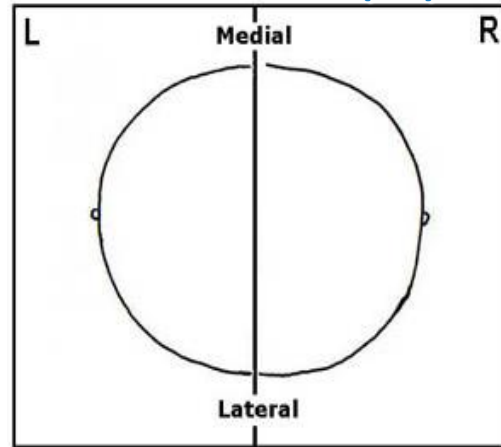
MRI

With aging, the breast becomes more fatty. Menopausal patients don't have a lot of glandular tissue so you can detect malignancies much easier by using Mammography

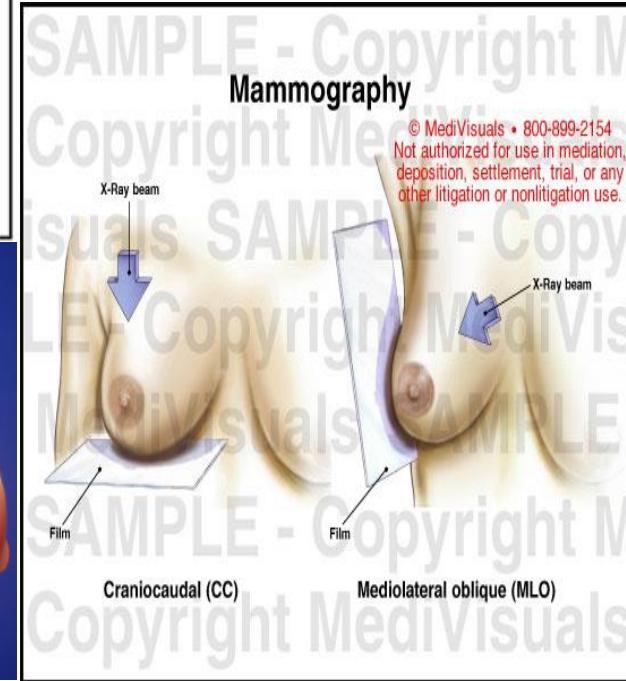
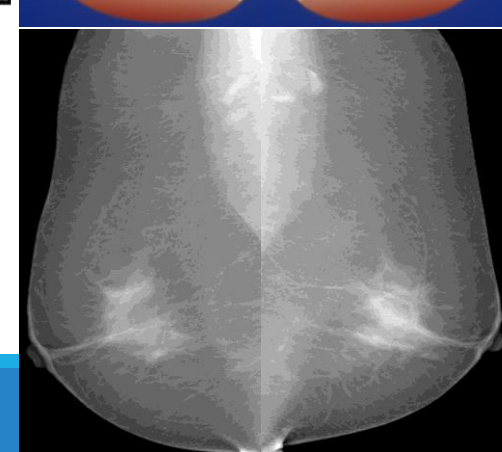
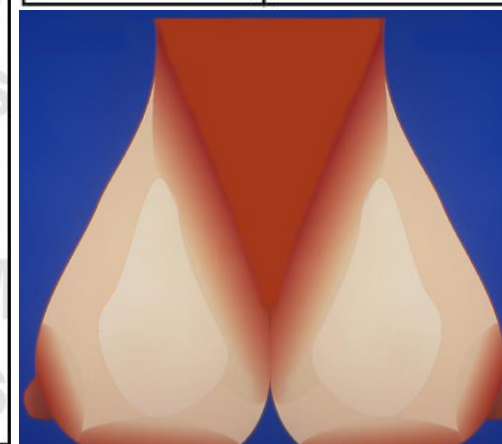
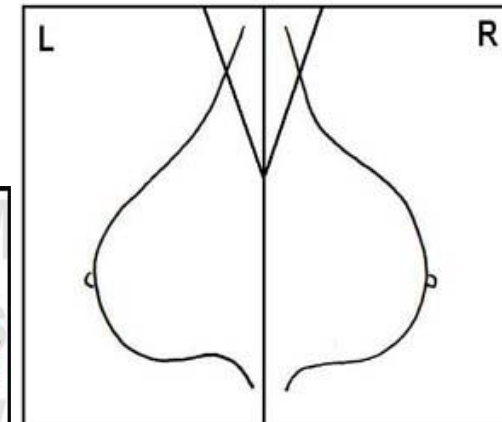
Tests:

- Mammography: Can rule IN cancer, but can not rule it OUT.
- Ultrasound (in pregnant or lactating)
- CT scan (with and without contrast) not for diagnosis but for staging
- MRI (with and without contrast/ Gold standard with contrast)
- Ultrasound- or MR-guided biopsy and wire localization
- Bone radionuclide scan (helps to detect malignancy metastasis and does not diagnose malignancy but it diagnose the complications and the effect the of malignancy)
- Lymphscintigraphy

Cranio-caudal (CC)



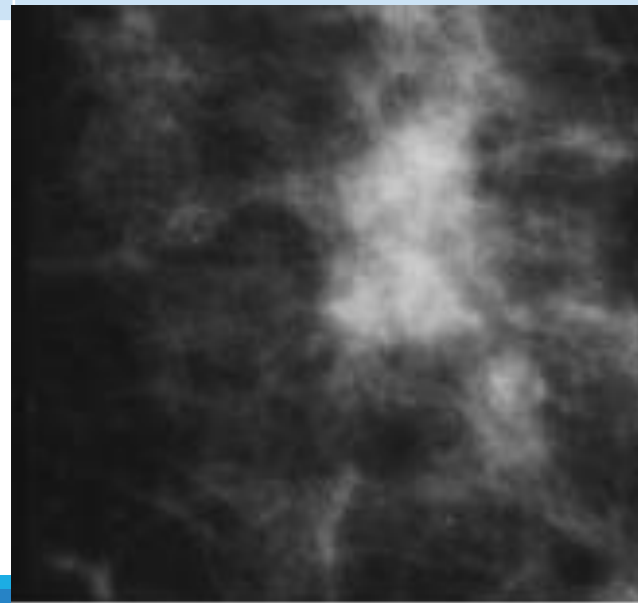
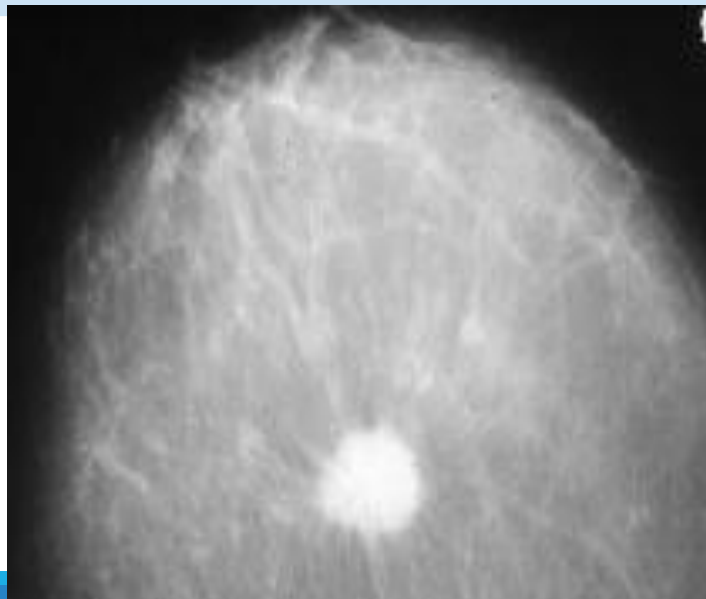
Viewing Methods: Mediolateral obliques (MLO)



Exhibit# 200084-01X

First, decide if there is a mass (compare both breasts)

Mass (IF mass is palpable at the site of focal asymmetry → biopsy)	Asymmetrical Density
CONVEX borders	ill-defined or irregular
Denser towards center	Amorphous (not dense in the centre)
Distorts related parenchyma(mass affect)	No mass affect
Seen in multiple projections (3 dimension)	No (3 dimension)
Still seen in focal compression view	Tissues spread over it



Indications for Breast Ultrasound:

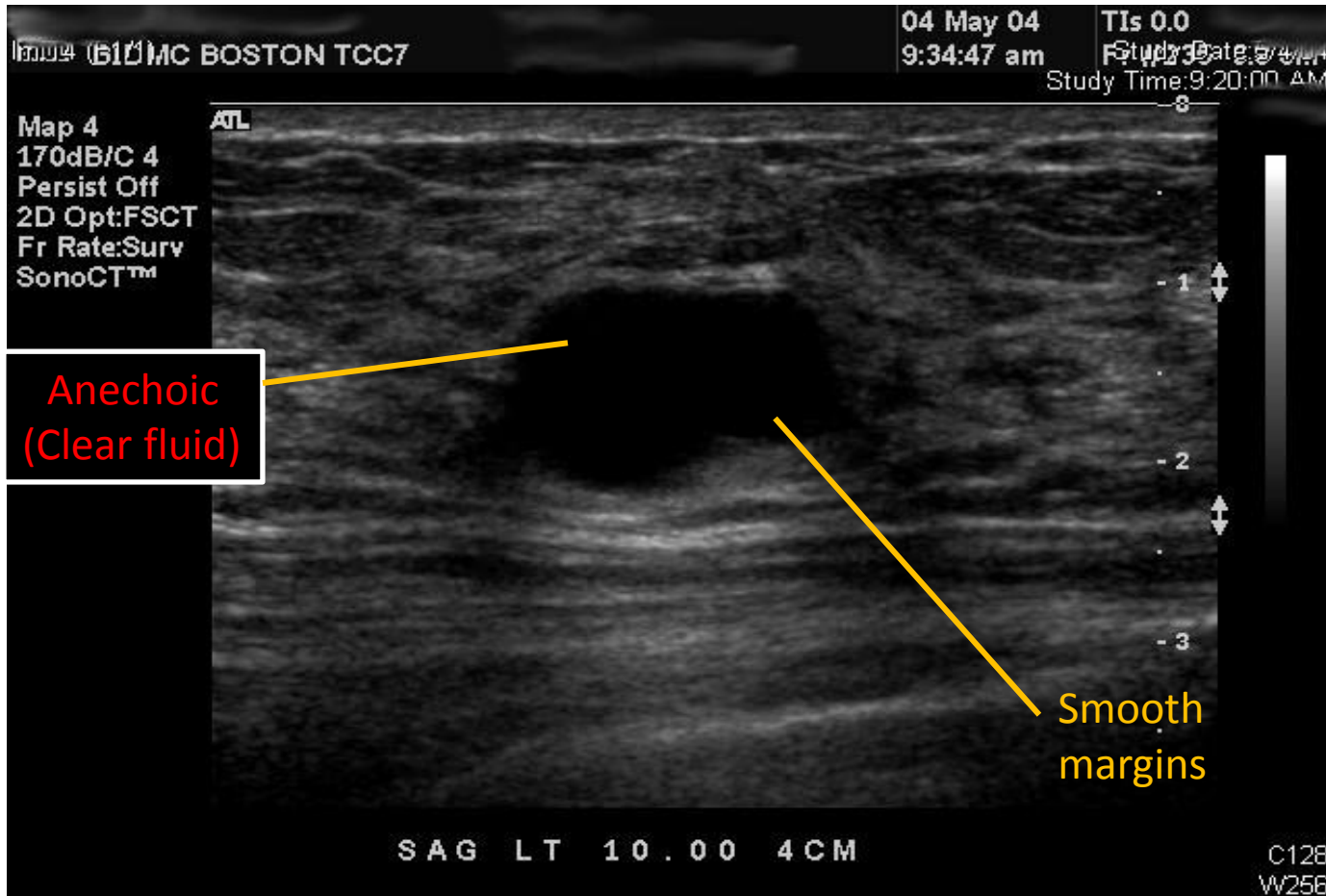
- Differentiation of both palpable and mammographic lesions as either: **cystic** (benign lesion, nothing has to be done) or **solid** (could be benign or malignant) .
- Subsequent **characterization and classification of solid nodules** according to certain sonographic features.
- **Evaluation of palpable breast mass in patient younger than age 30.** (if there was a mass, the next step is **MRI**. While for older patient, the next step is **Mammography**)
- Interventional procedures (BIOPSY) (helps in localizing the mass for whoever going to take a biopsy)
- Always do a US for pregnant patient if you suspect a mass then do a biopsy

Methods: Identification of Malignant Features:

First, they identified lesions with any of the following malignant features:

- **Spiculation** (most important sign)
 - **Angular margins**
 - **Hypoechoogenicity**
 - Shadowing
 - Calcification
 - Duct extension
 - Branch pattern
 - **Microlobulation**
- } — Most important features

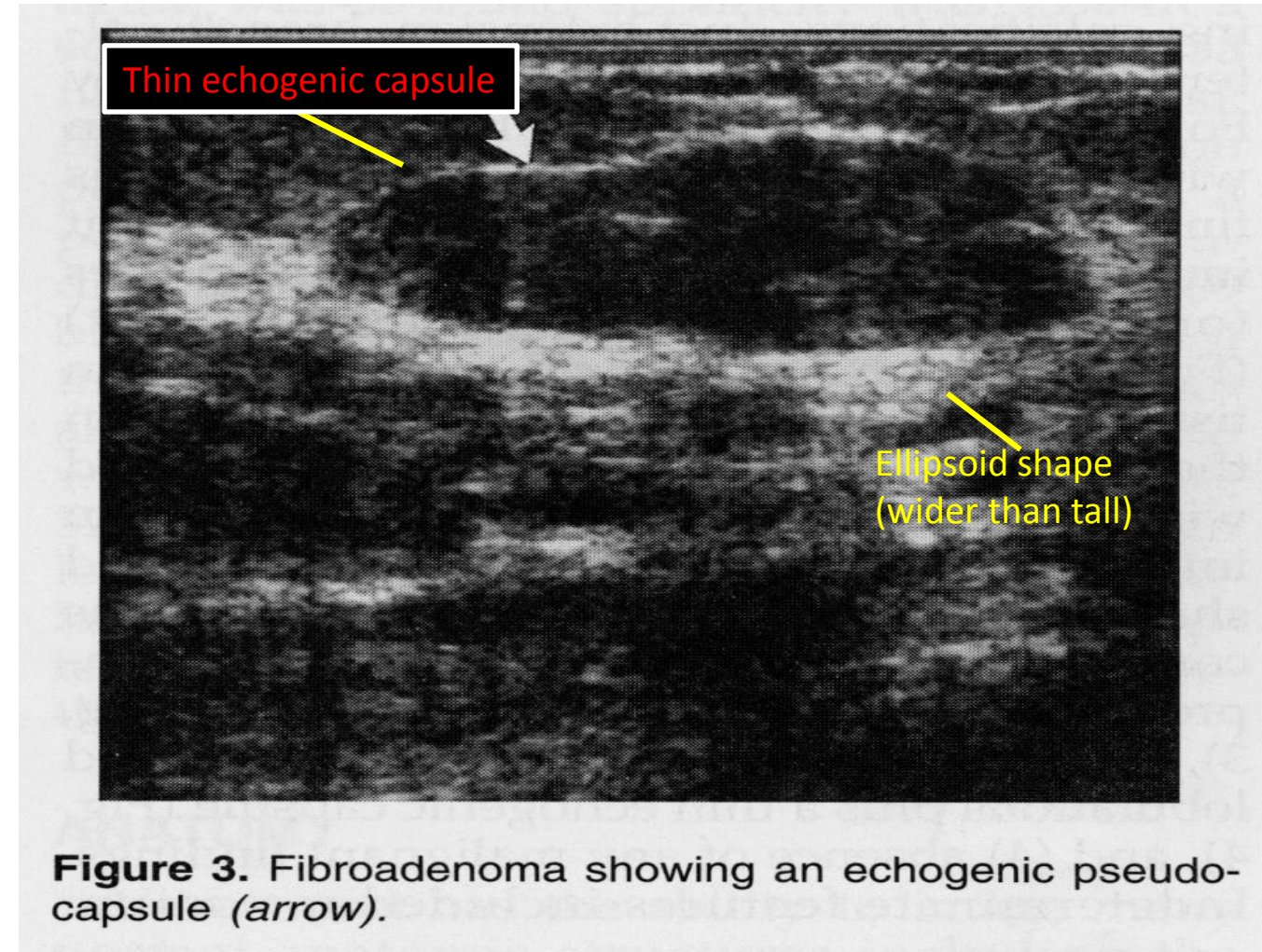
Example of Simple Cyst on Breast Ultrasound:



- If it was in a young girl, it's probably a benign cyst.
- If it was in a lactating women, it's probably a lactiferous lesion.
- If the patient was feverish and the fluid was unclear, it's probably an ulcer.

Example of Benign Fibroadenoma on Ultrasound:

- Most common** benign solid mass of the breast.



Tests (CONT.):

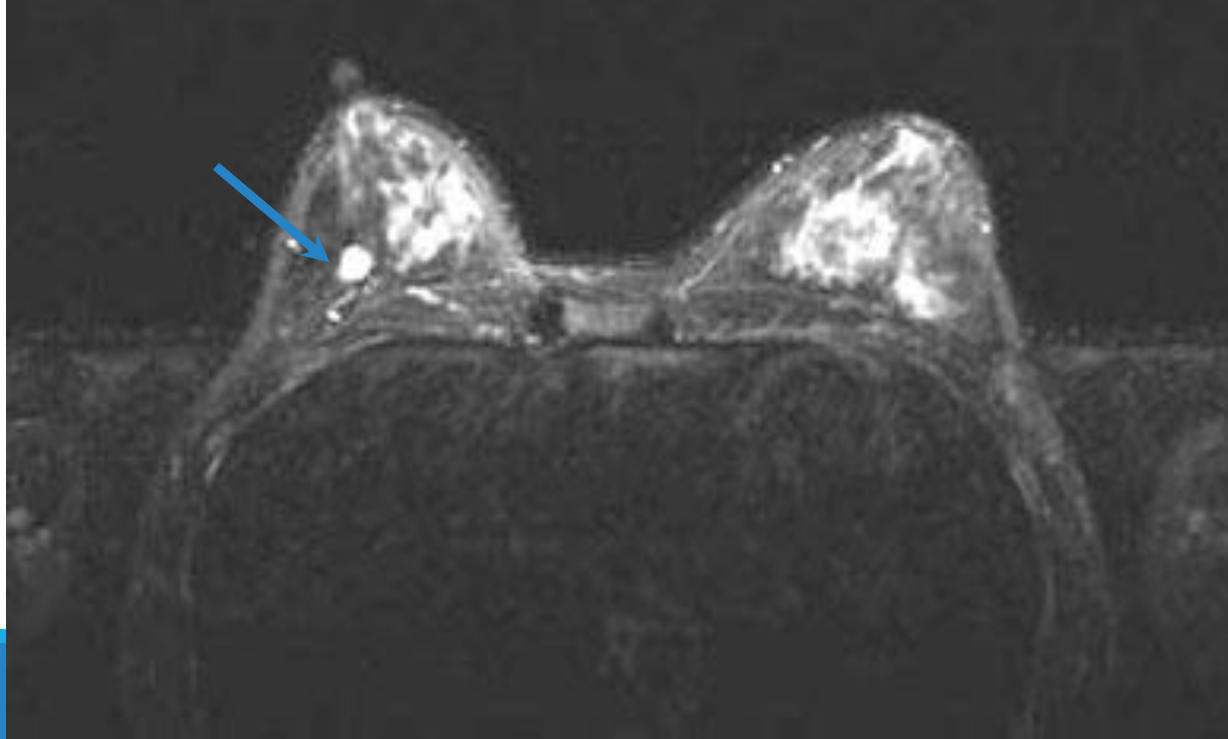
MRI of Breast:

High-field strength (1.0 – 1.5 Tesla) necessary, resulting in:

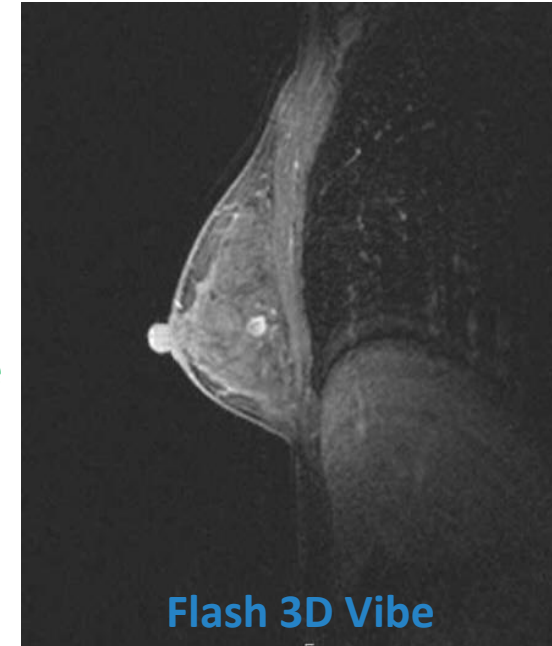
- a higher signal-to-noise-ratio
- shorter acquisition time
- **better separation of fat and water peaks**
- better contrast characteristics (T1 time increase)
- The patient has to be in a **prone position** for long time, that's why it's not very favorable by patients.
- IV contrast has to be injected, therefore we better use **ultrasound in case of pregnancy**.

Static Imaging:

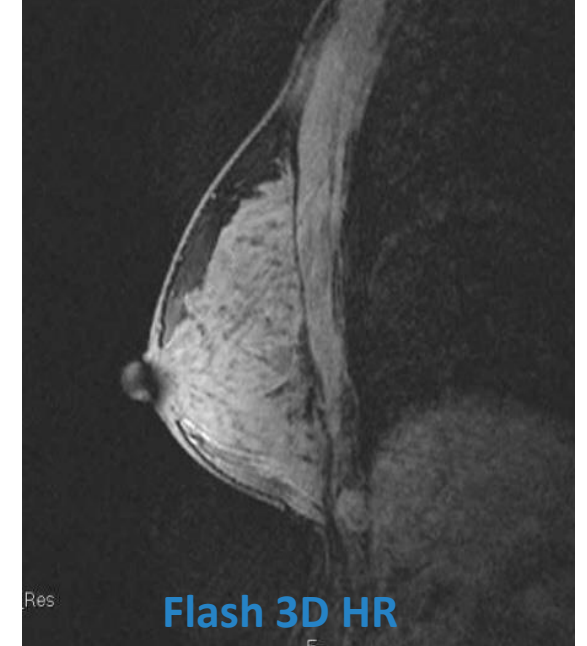
STIR (Short tau inversion recovery)



High Resolution Imaging:

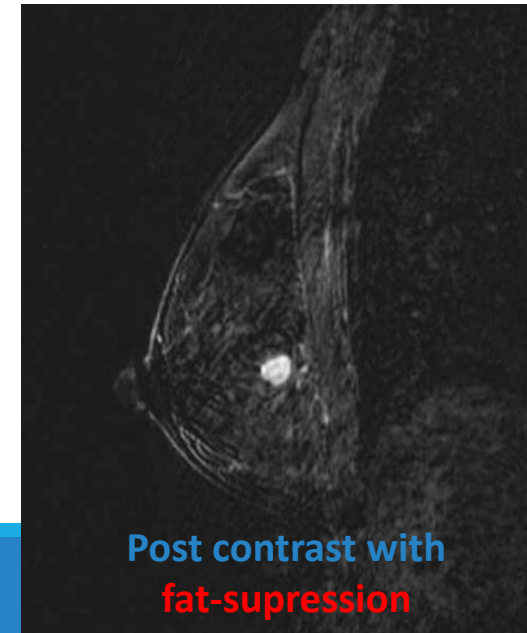


Flash 3D Vibe

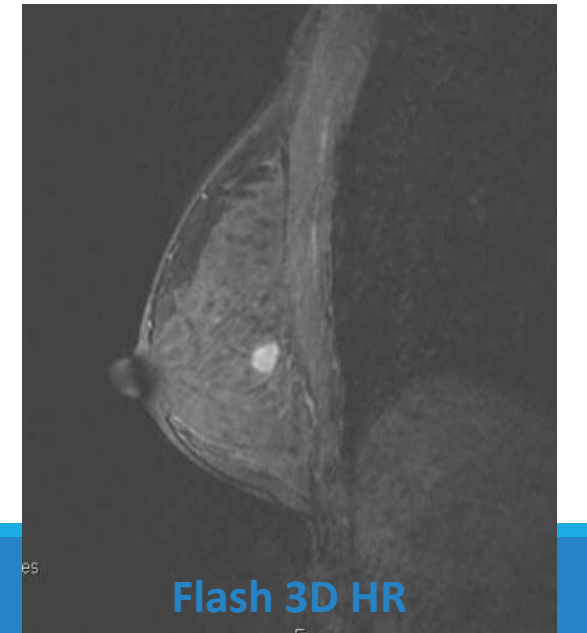


Flash 3D HR

Dynamic Imaging:



Post contrast with
fat-suppression



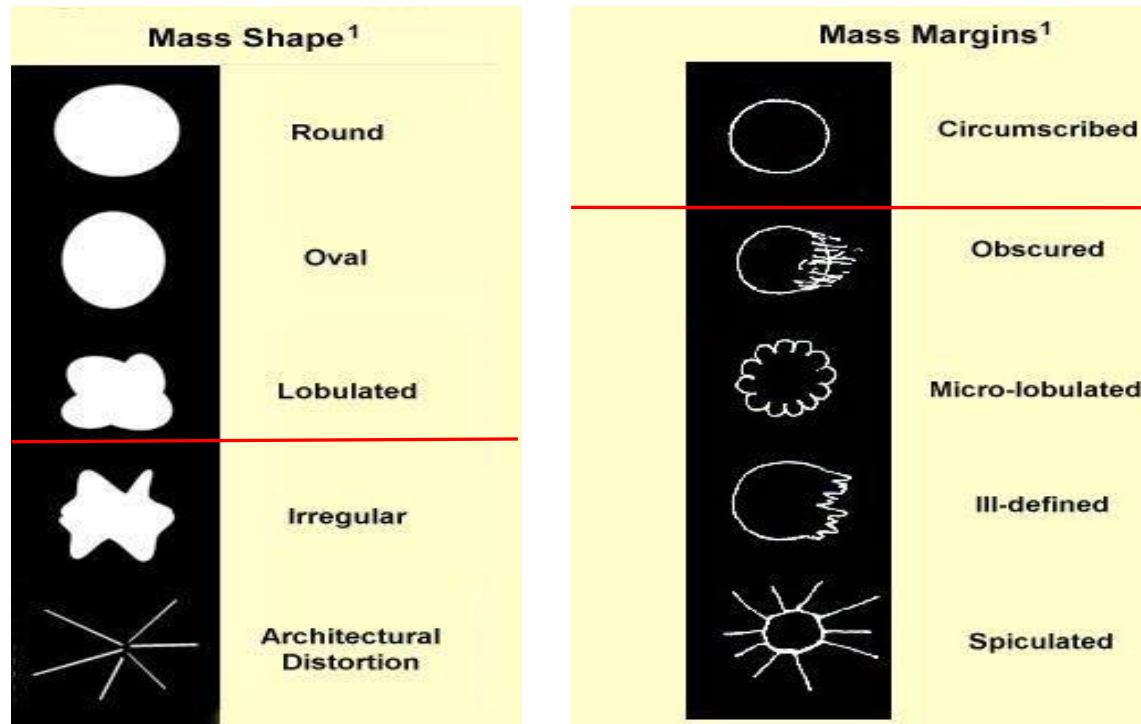
Flash 3D HR

Search for malignancy:

- 1- Characters of masses
- 2- Characters of calcifications

1- Mass:

Characters of masses:



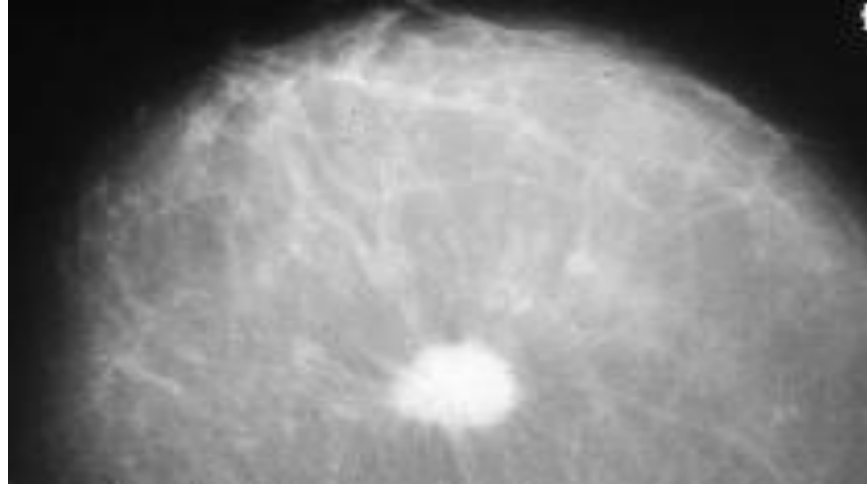
Number of masses:

- Multiple well-defined masses are probably benign.
 - Multiple primary malignant lesions are obviously ill-defined or stellate lesions.
 - **Benign and malignant lesions can coexist**
-
- Mass margin is more important than shape in characterization of a mass.
 - Well-Circumscribed mass is most likely to be benign.
 - **Spiculated mass + hypoechogenicity + angular margins = malignant.**

Margins:

- Most important character.
- If margins are obscured by breast tissues → **Compression / magnification views.**

Cranio-caudal view

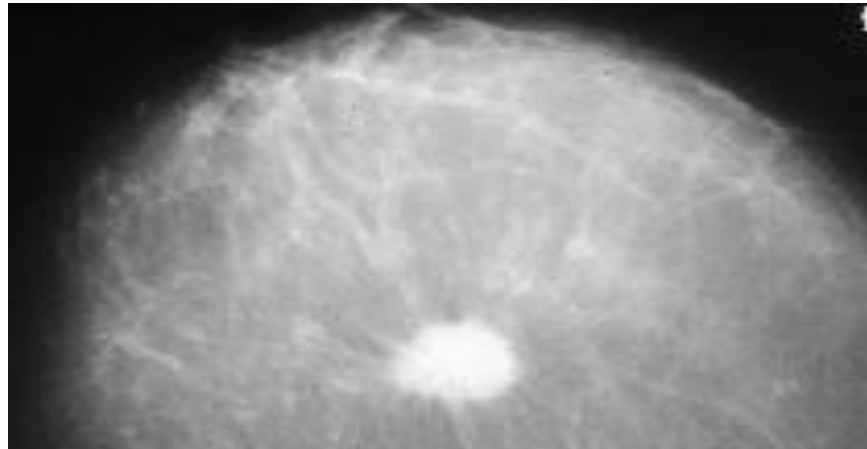


a-speculated classical carcinoma:

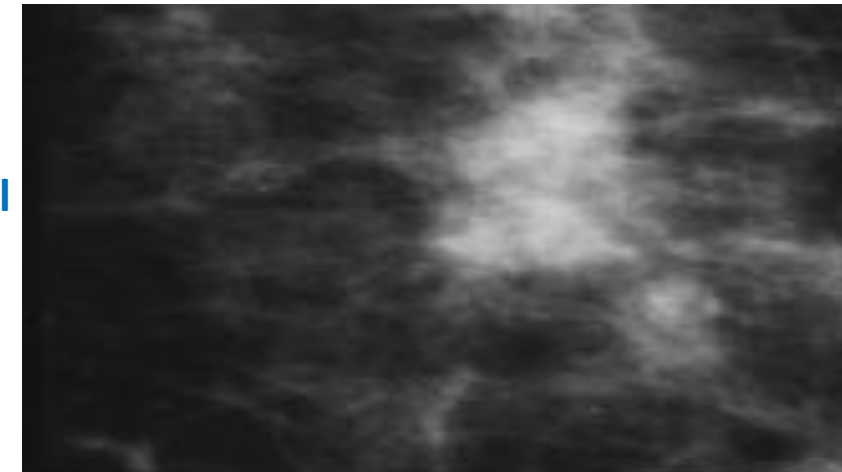
more common in :
invasive > tubular > lobular



Compression/magnification view



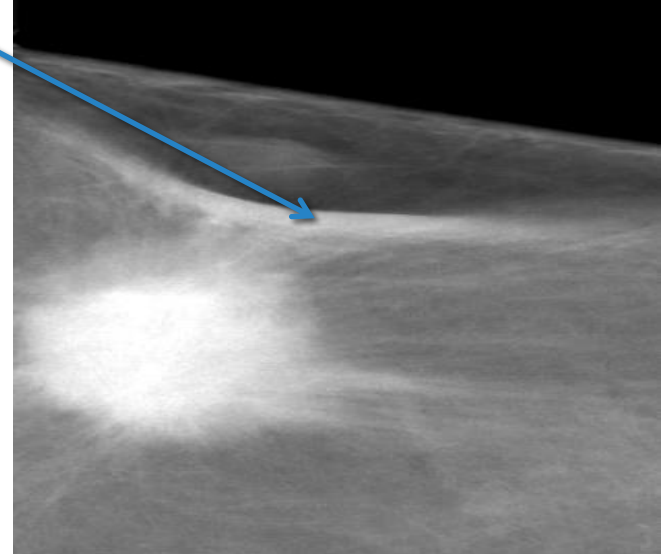
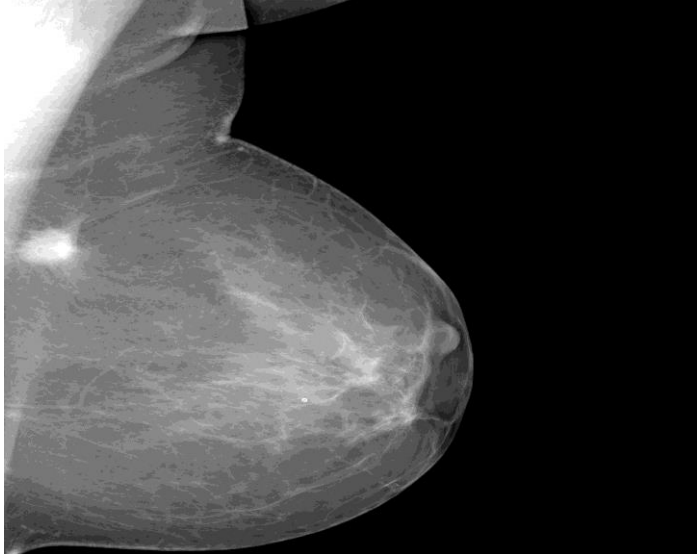
b- Speculated Invasive ductal carcinoma:



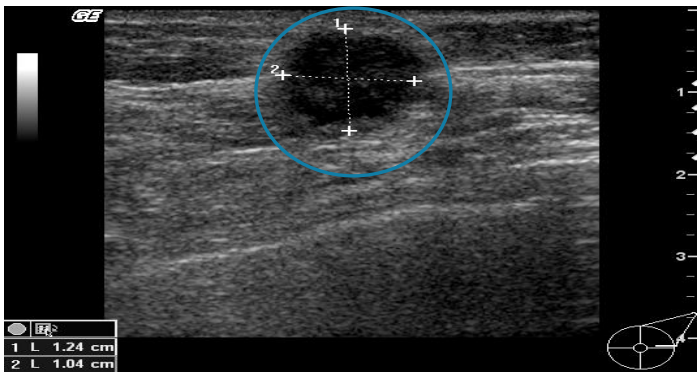
Hypo dense area
inside

★ c- speculated margin:

Speculated mass with skin dimpling



Ultrasound:



Rounded margin and is not speculated and clear capsule this is a typical for fibroadenoma



speculated margins:

DD :

FAT necrosis (previous surgical biopsy)

SCARS (previous surgery)

Radio-opaque mark

Previous scar

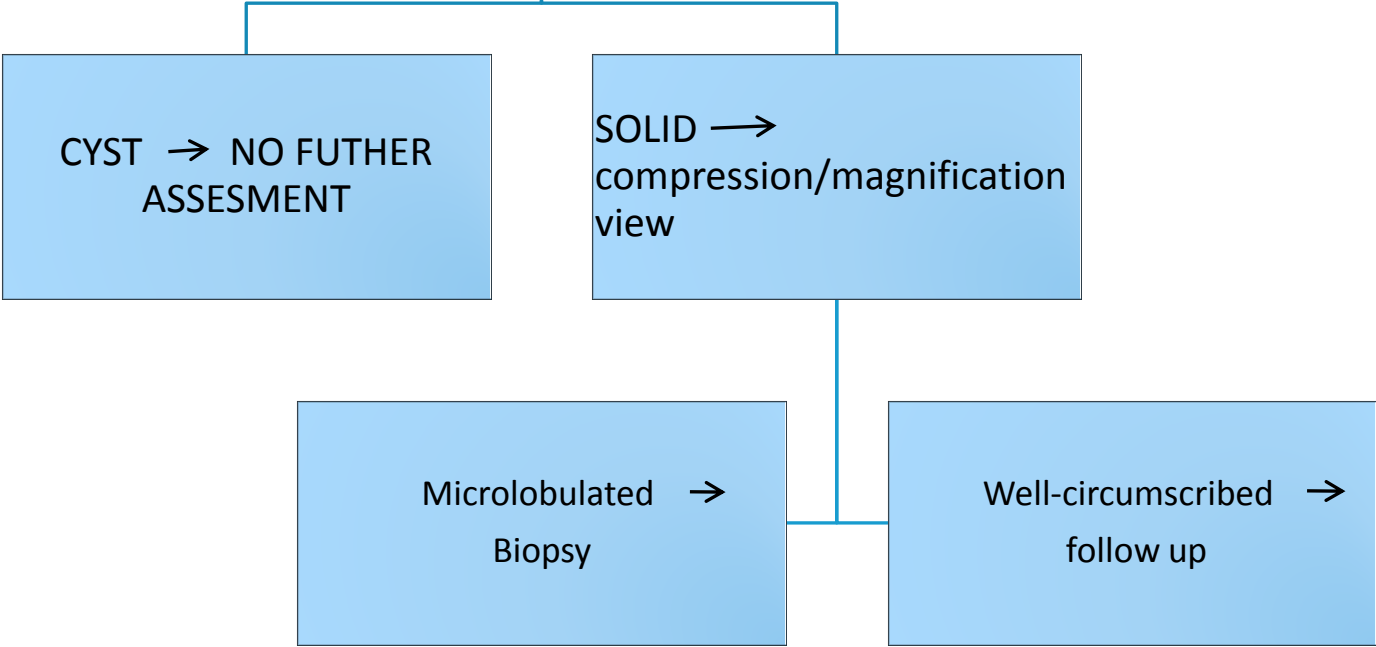
Any increase in size----> biopsy

RADIAL SCAR (complex sclerosing lesions)

2-Well-circumscribed (well-defined) margins:

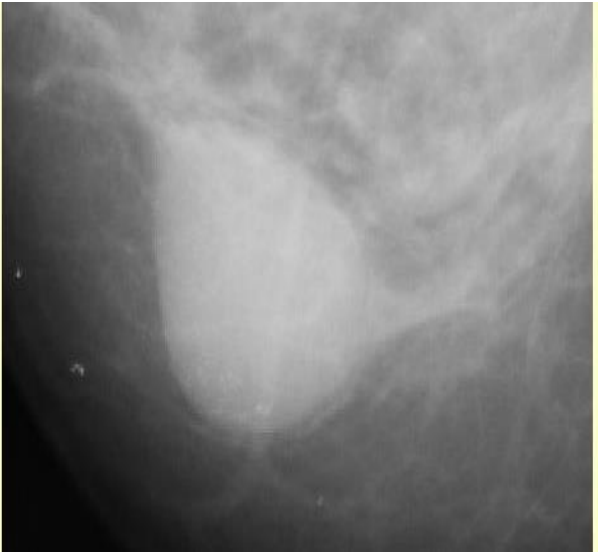
- Almost always **benign**
- 5% of them may be malignant

Ultrasound



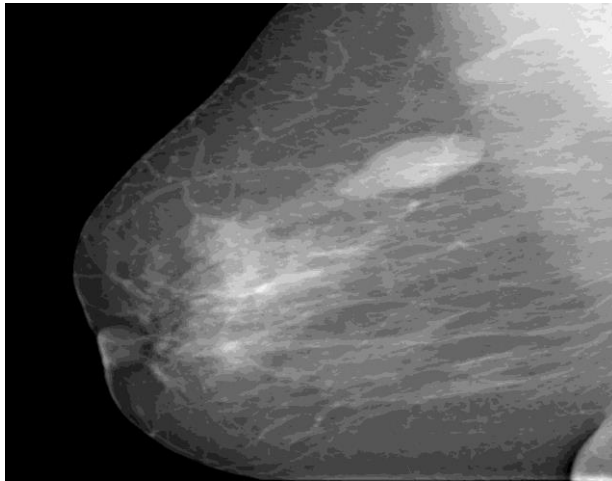
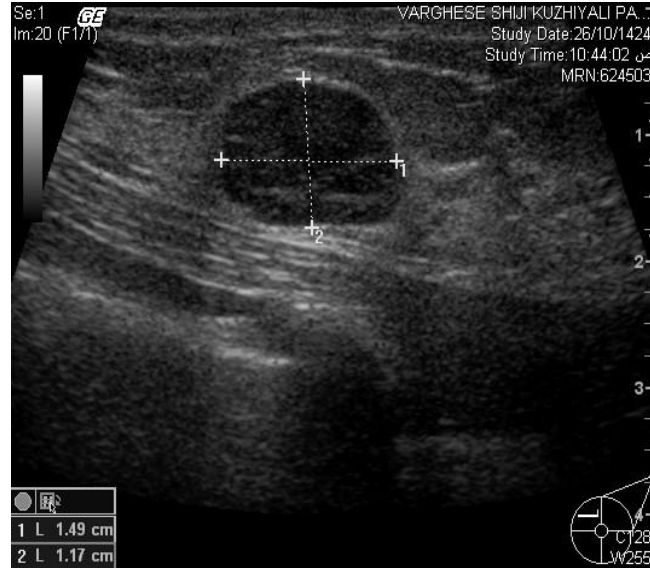
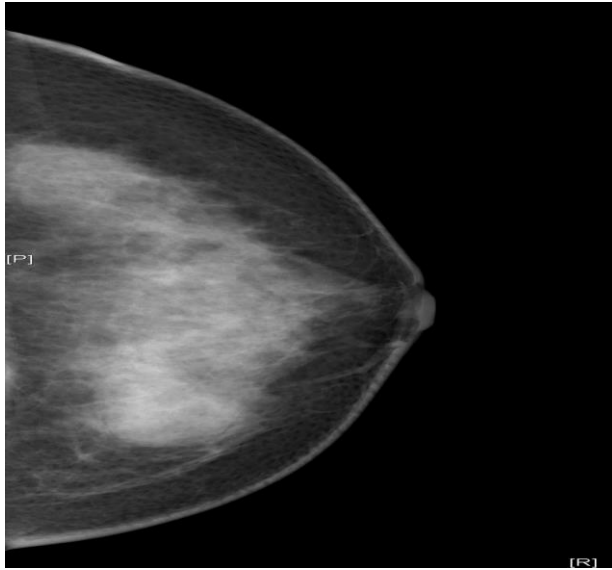
Examples:

a- oval well circumscribed :
Benign lesion





b- fibroadenoma benign:



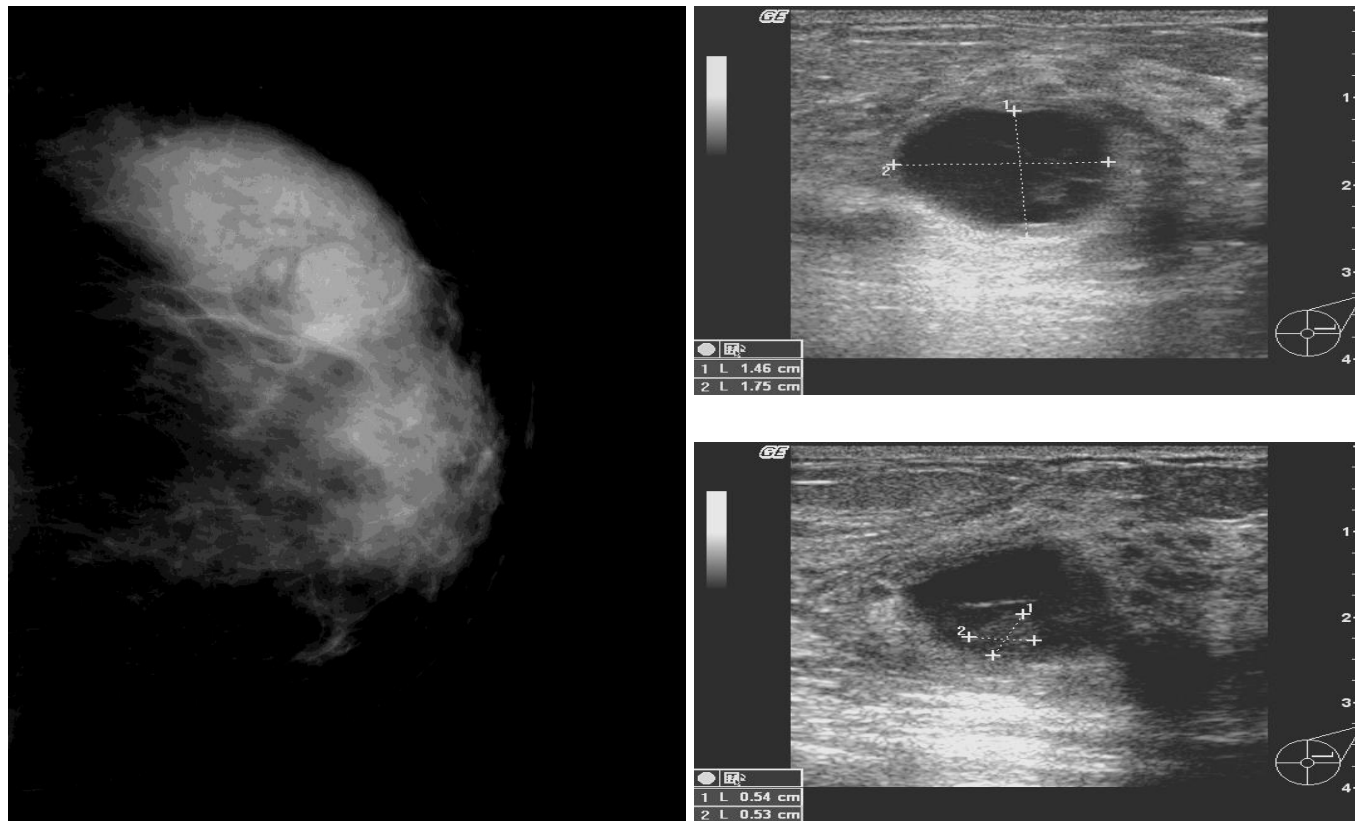
c-Hamartoma(fibroadenolipoma):



At US, a sharply defined, heterogeneous oval mass is seen, or the lesion may manifest as normal glandular tissue

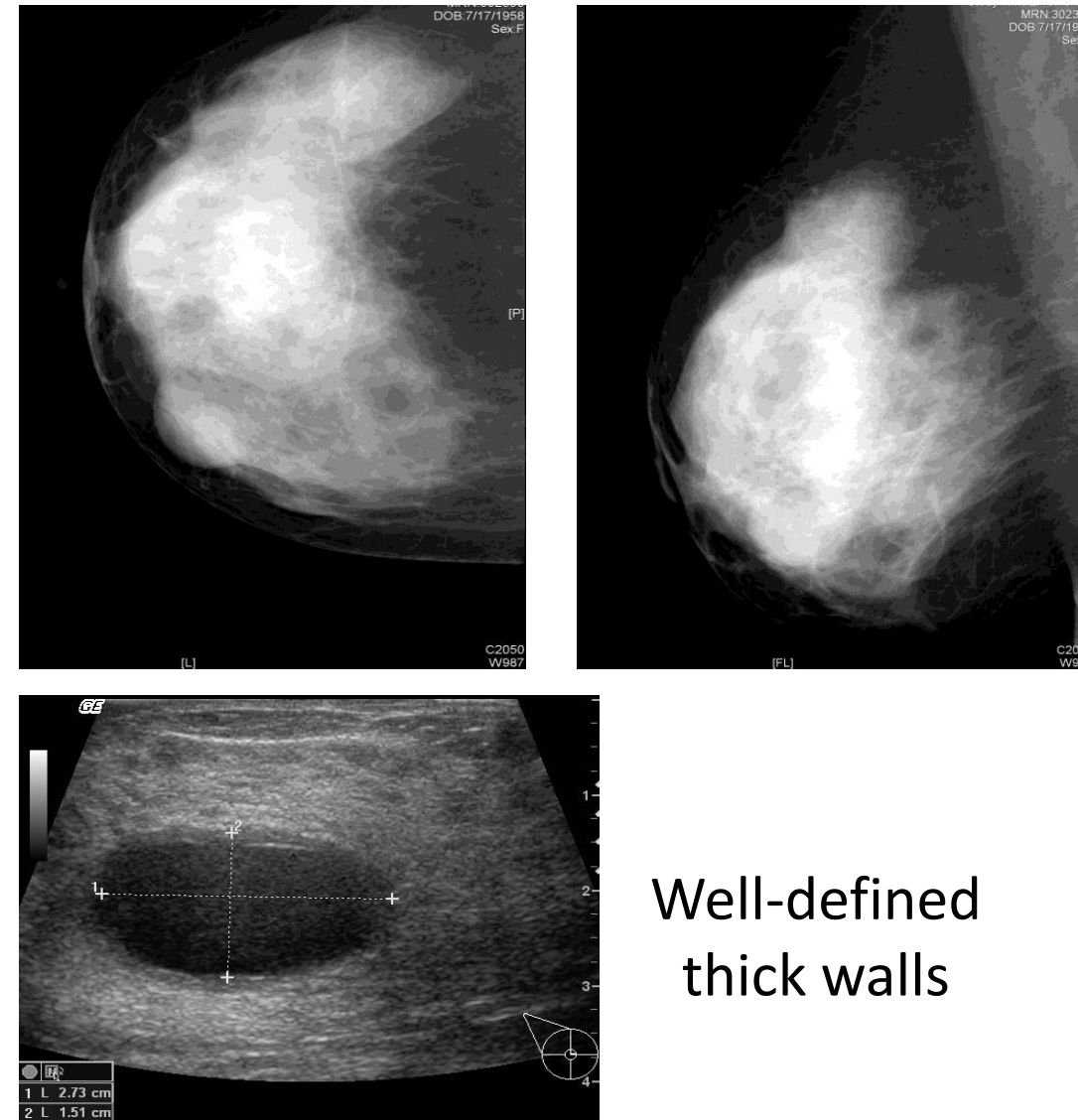


d-CYSTS:



Hemorrhagic cyst in dense breast

Complicated cysts:



Well-defined
thick walls



The density categories used:

• **High density:** clearly higher than surrounding, suspicious.

Equal density: density not appreciably different, neutral significance.

Low density: density lower, but not fat containing, neutral significance

calcifications :

•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.

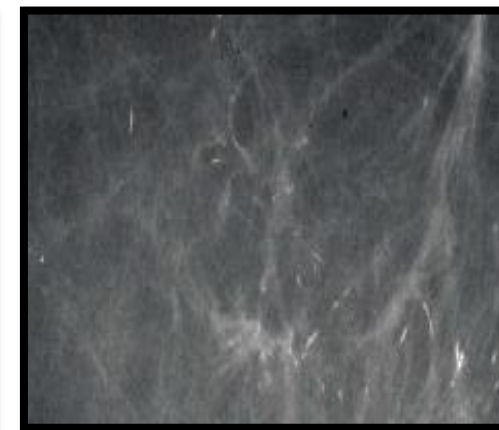
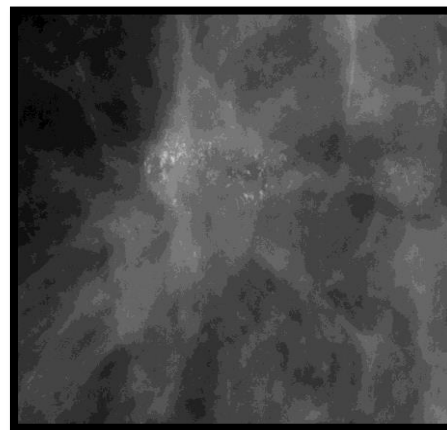
• It has been described that calcifications associated with a malignant process resemble small fragments of broken glass and are rarely round or smooth

•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

MALIGNANT MICROCALCIFICATION:



CLUSTERED : > 5 in 1cm²

Branching interrupted ill-defined ductal .

Thank You!

We hope you found this helpful and informative.

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