BREAST LESIONS

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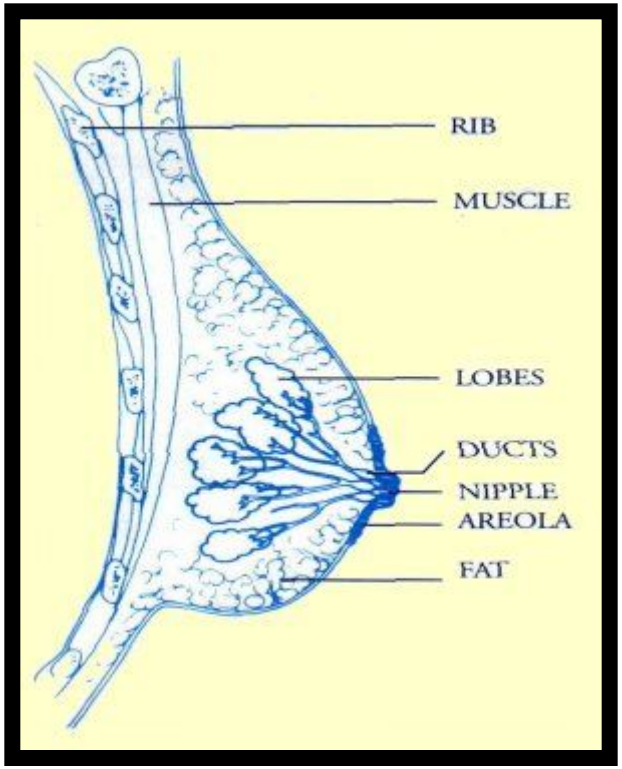
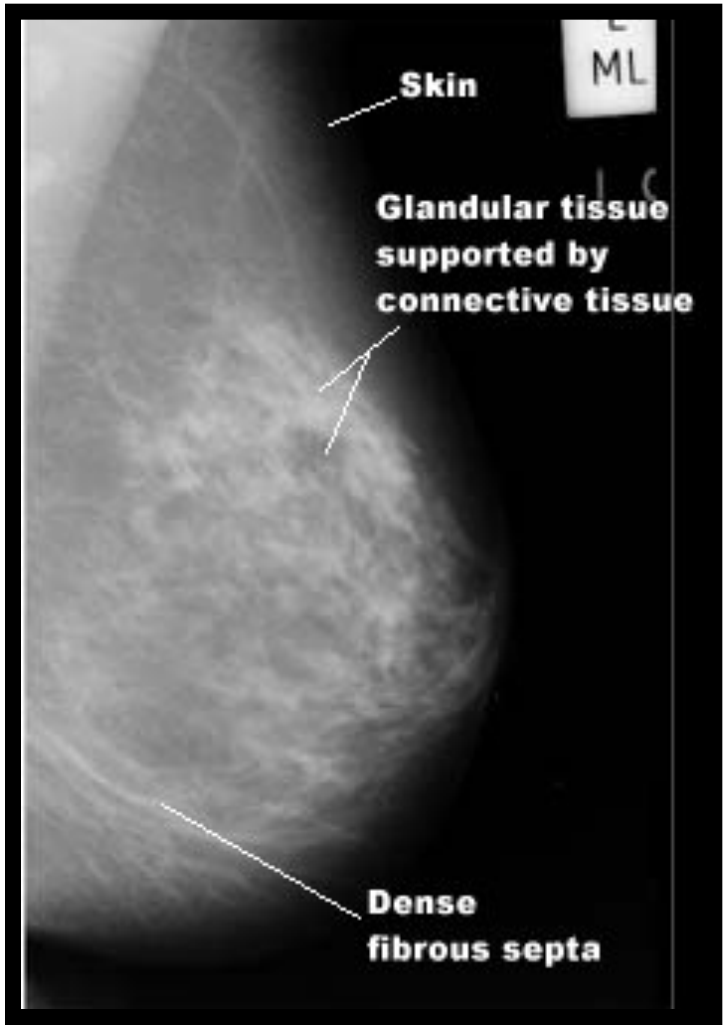
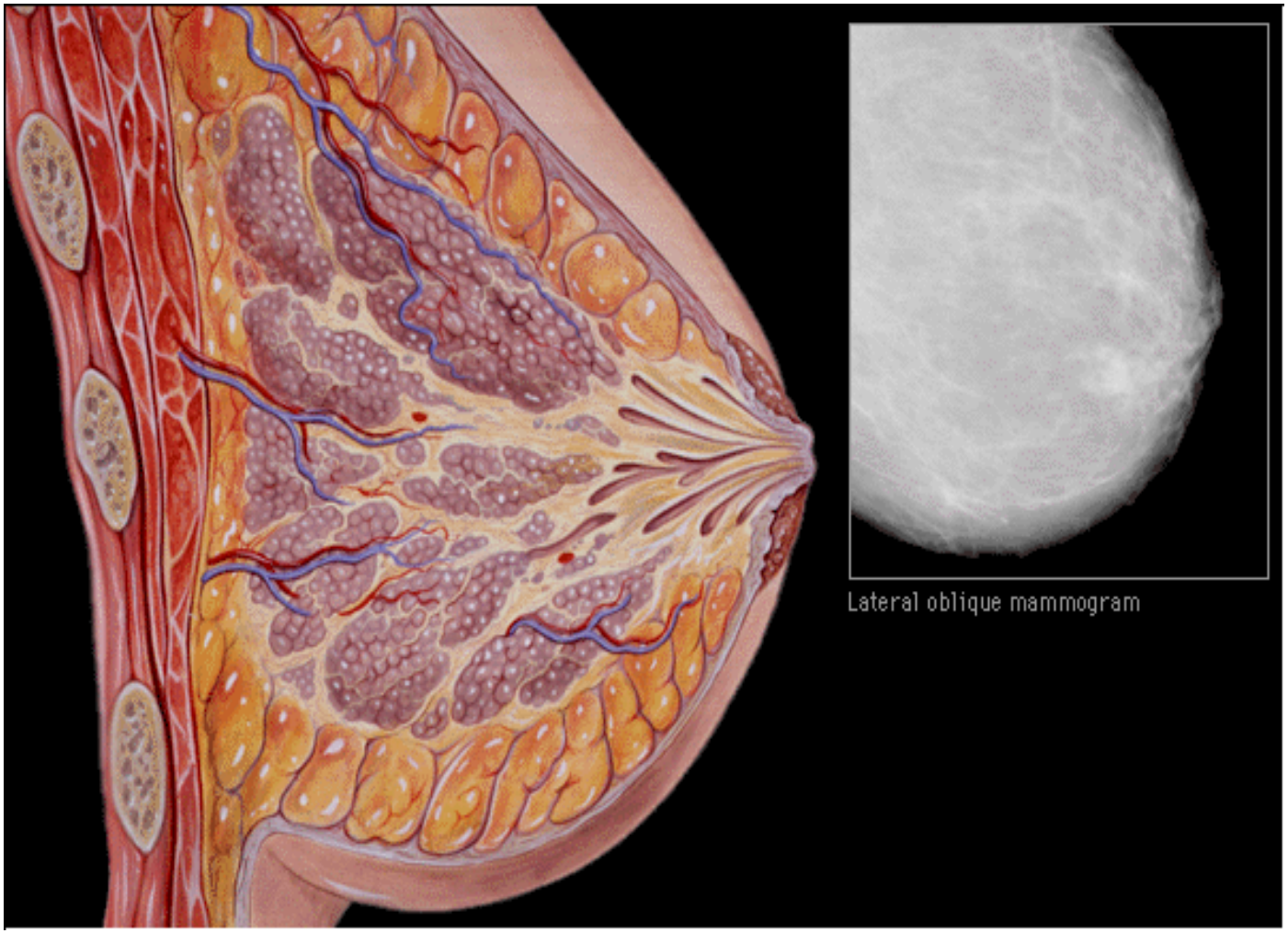
OBJECTIVES

- 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

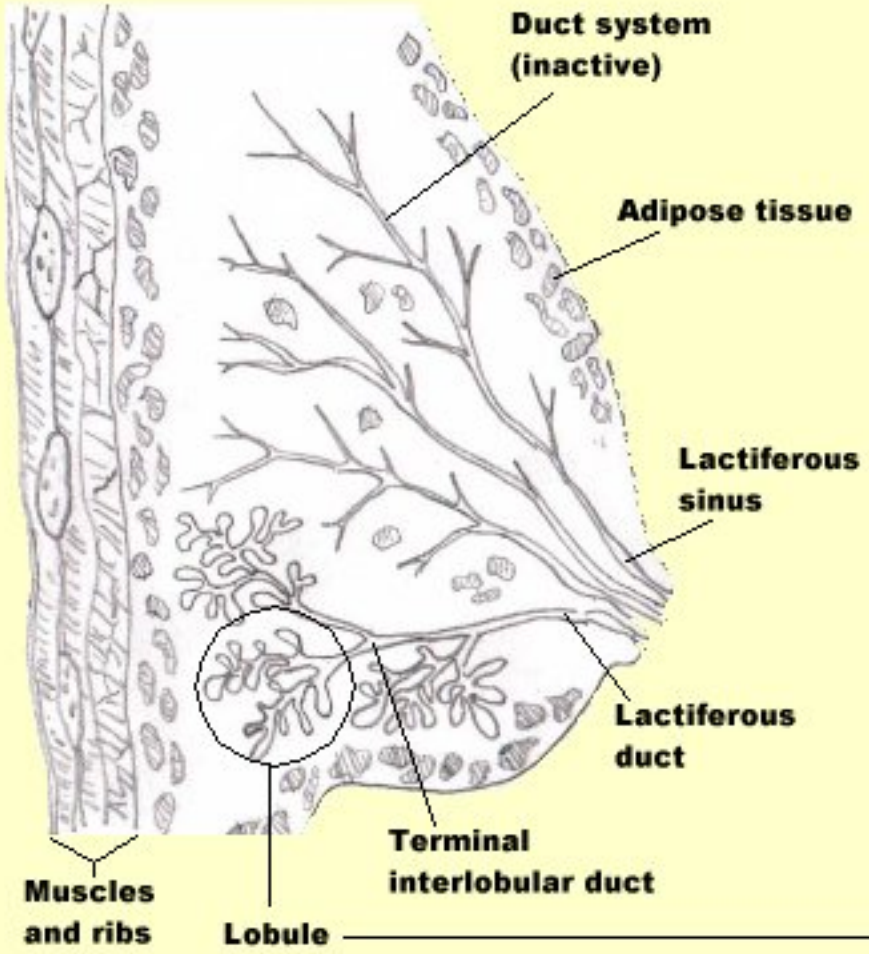

RIB
MUSCLE
LOBES
DUCTS
NIPPLE
AREOLA
FAT

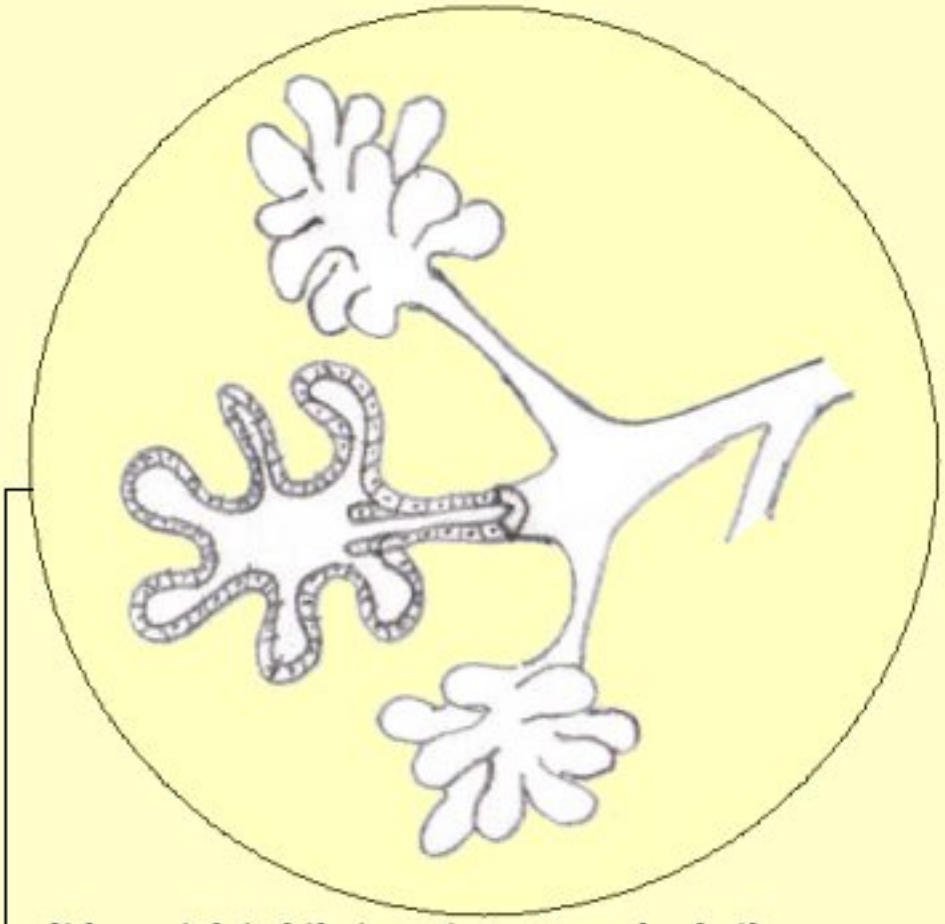

ML
Skin
Glandular tissue
supported by
connective tissue
Dense
fibrous septa



Lateral oblique mammogram

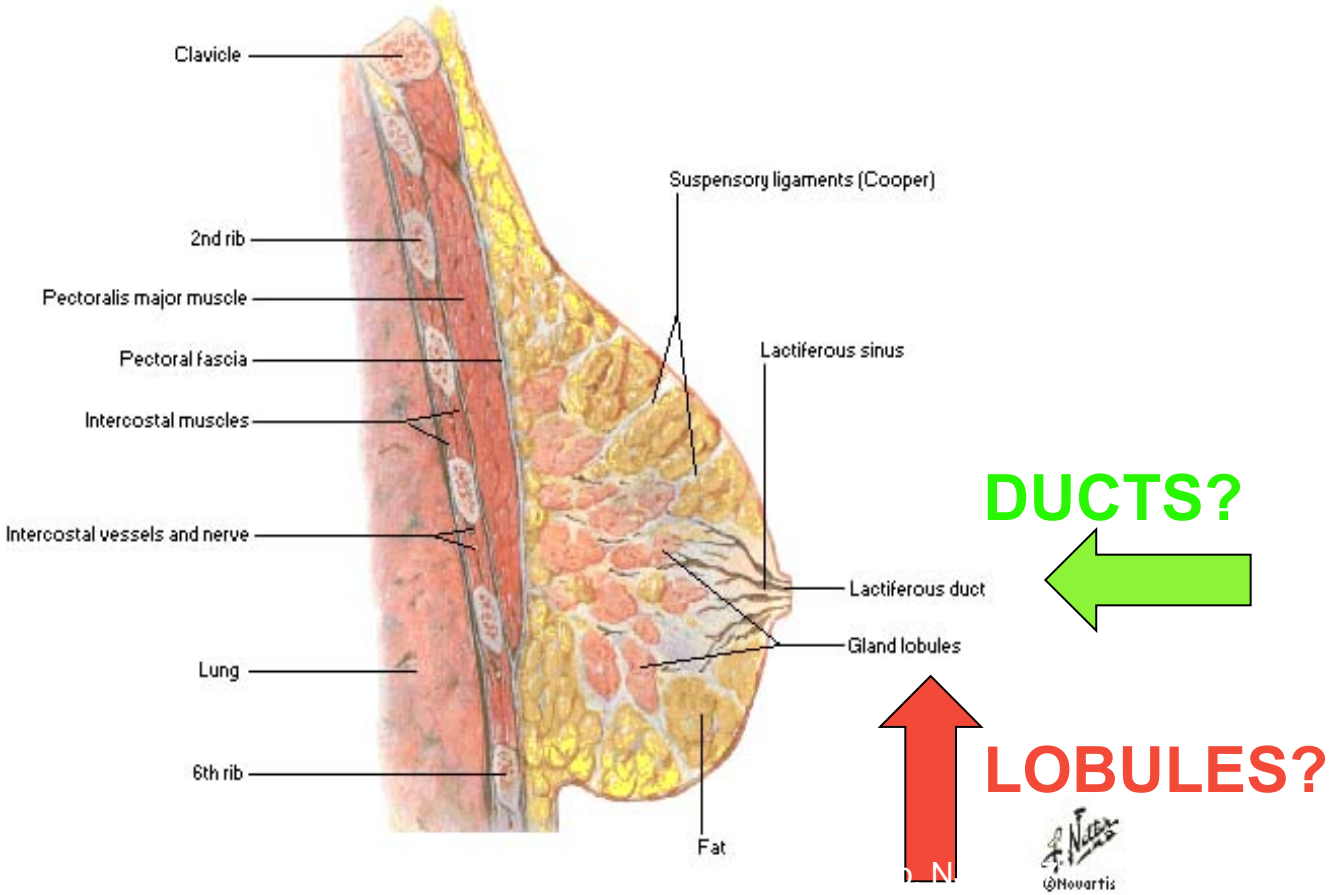
Anatomy



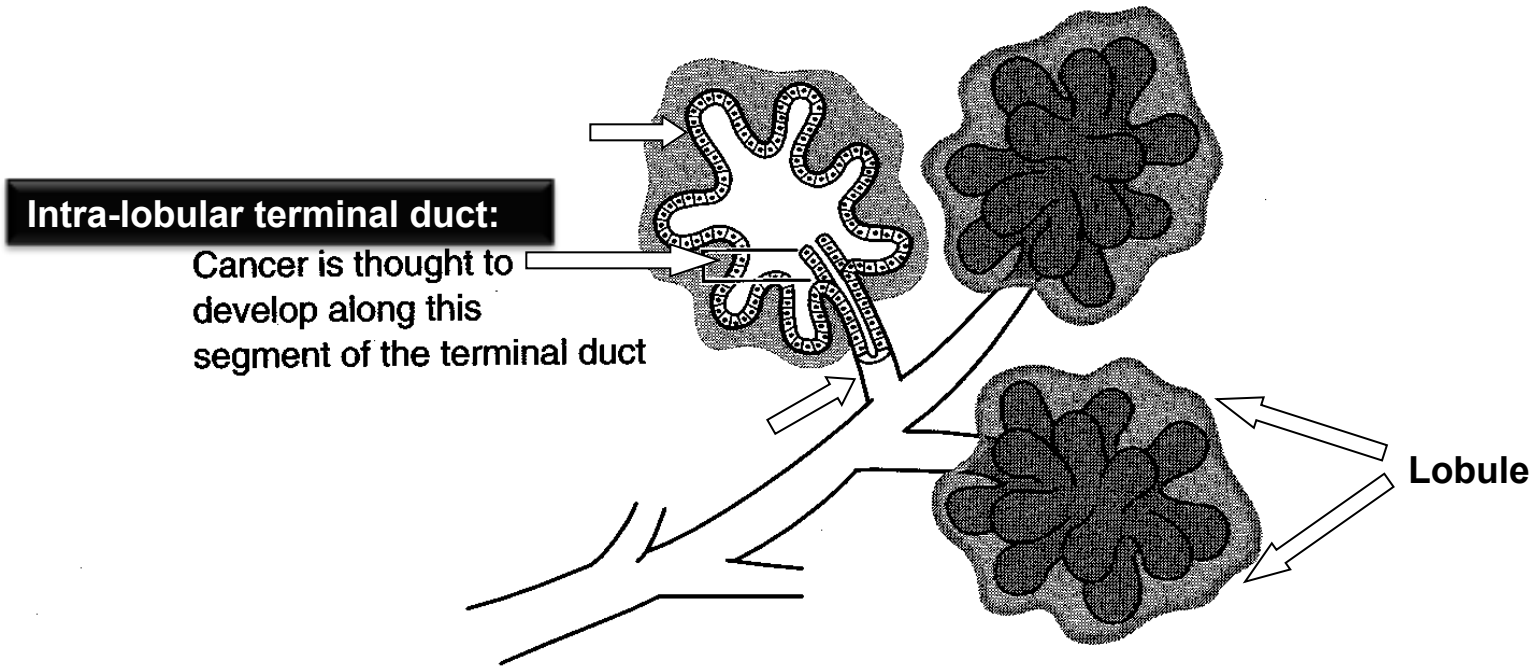


It is postulated that most cancers arise in the interlobular duct unit, either inside or just proximal to the lobule. There are two main categories of breast cancer: ductal carcinoma and lobular carcinoma.

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.

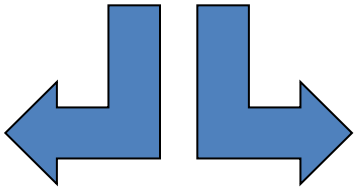
Kopans, D. Breast Imaging: Second Edition. Lippincott-Raven: Philadelphia. 1998

Breast cancer can be divided into two major groups.

IN SITU

Tumor cells have not invaded the basement membrane.

tumor cells remain confined to the ducts or lobules



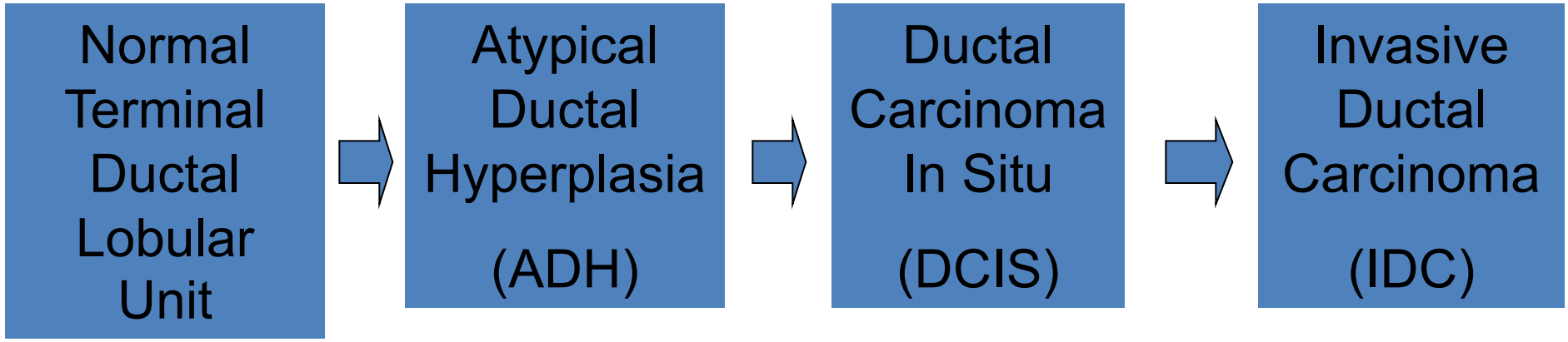
INVASIVE

Tumor cells invade the breast stroma.

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

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.



Breast Imaging Made Brief and Simple

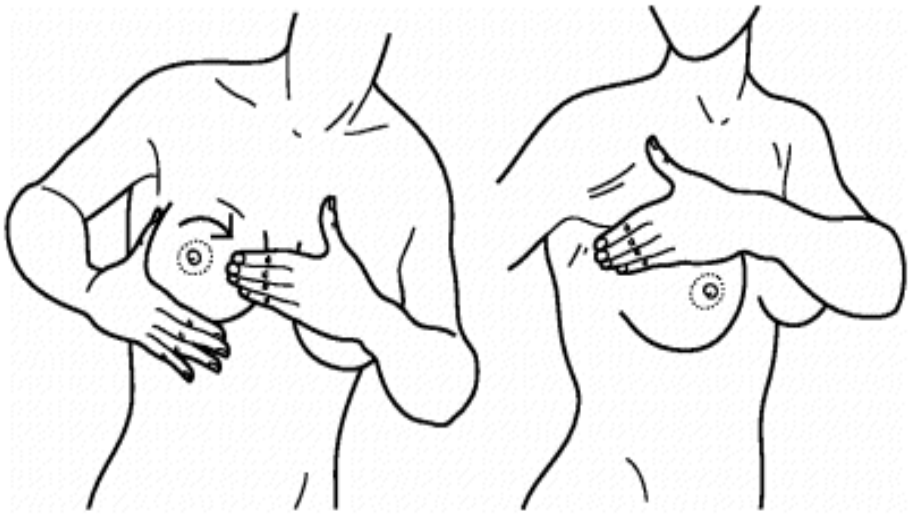
BI-RADS

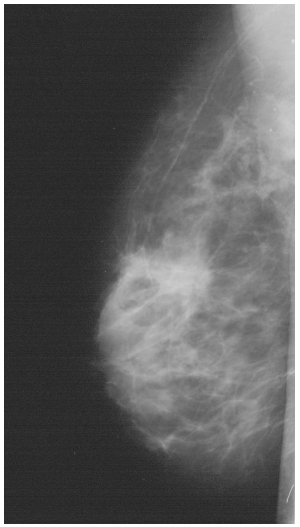
BI-RADS is an assessment scale indicating the likelihood of breast cancer for mammographic findings.

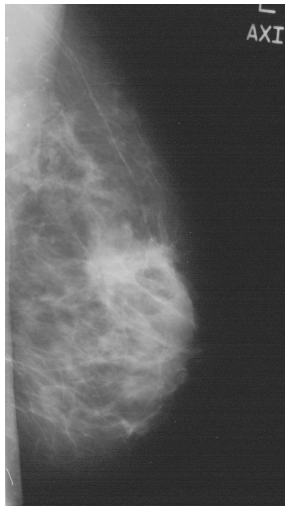
Breast Imaging Made Brief and Simple

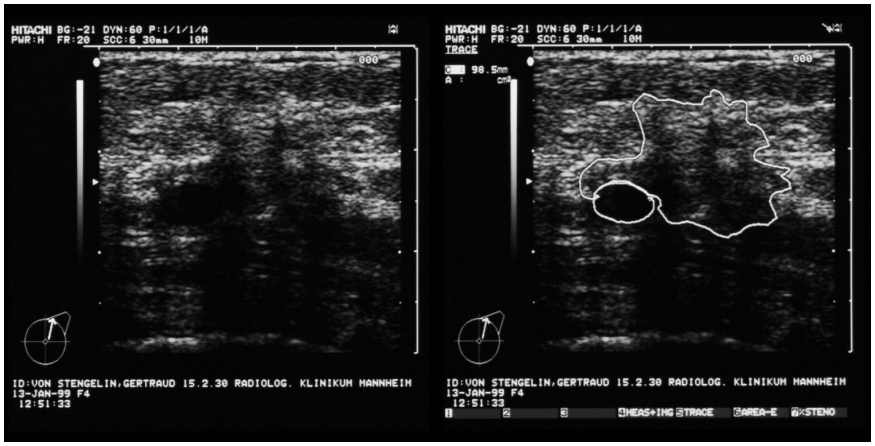
- 0 Further information needed to put in assessment category
- 1 Normal
- 2 Benign finding
- 3 Probably benign-6 mo followup
- 4 Suspicious-biopsy
- 5 Malignant-biopsy

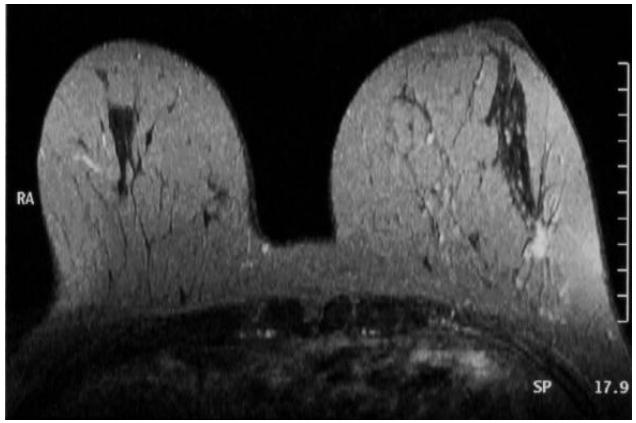
The Four Pillars of Diagnosis

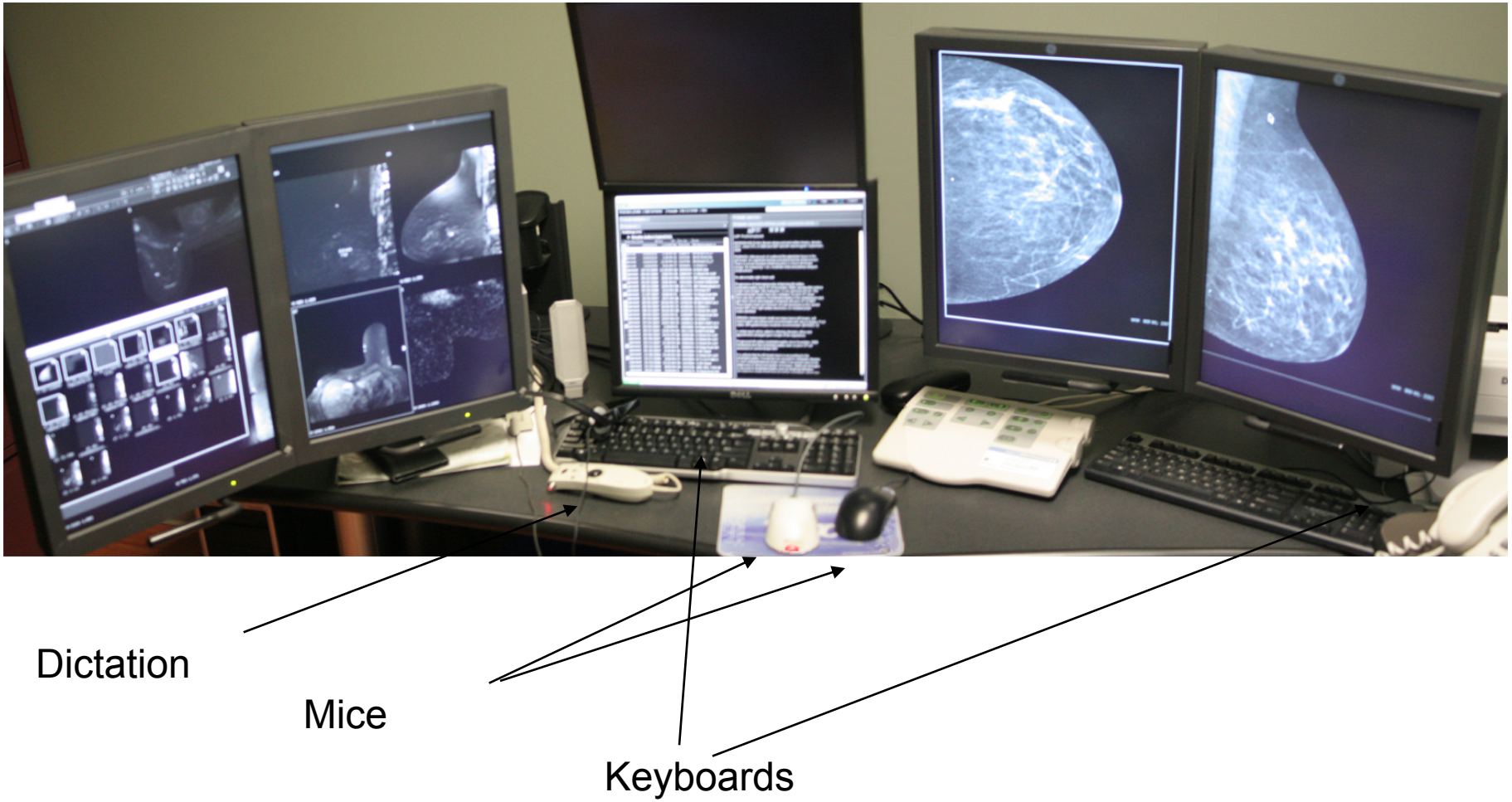










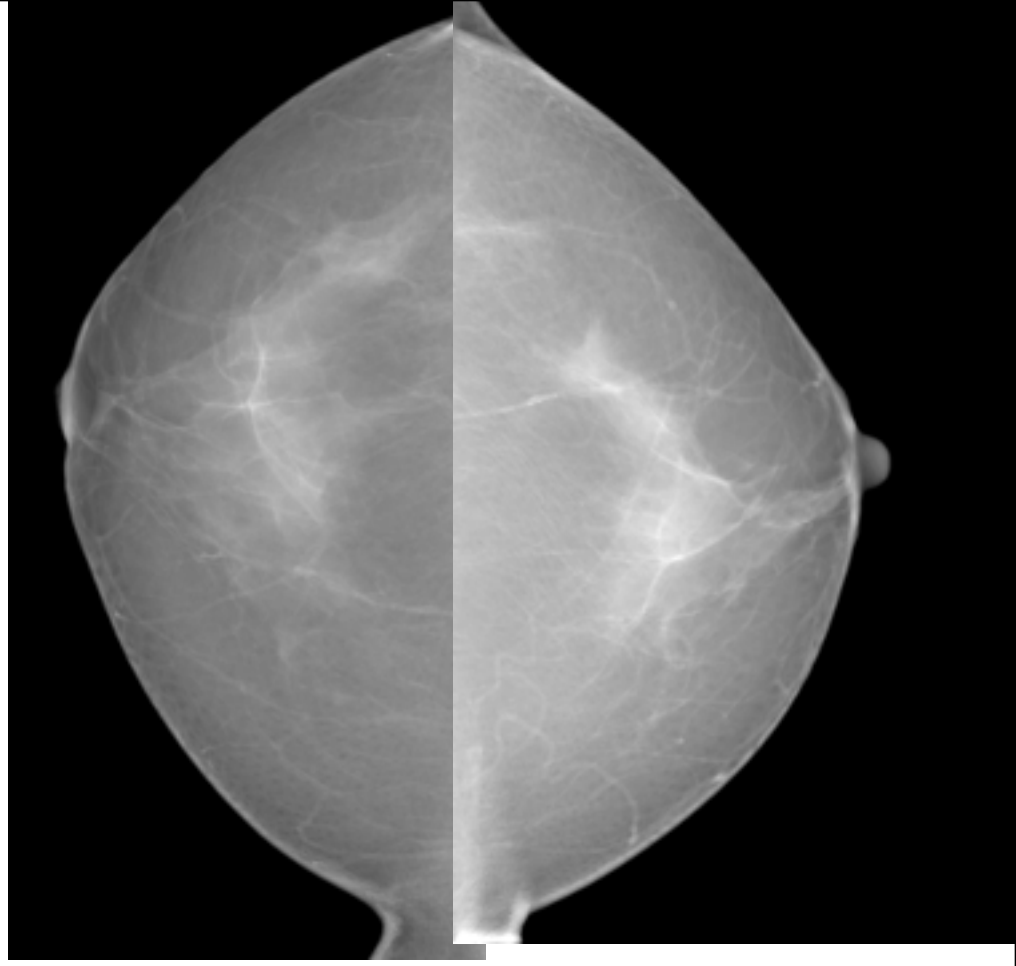

Dictation
Mice
Keyboards

Menu of Tests

- Mammography:

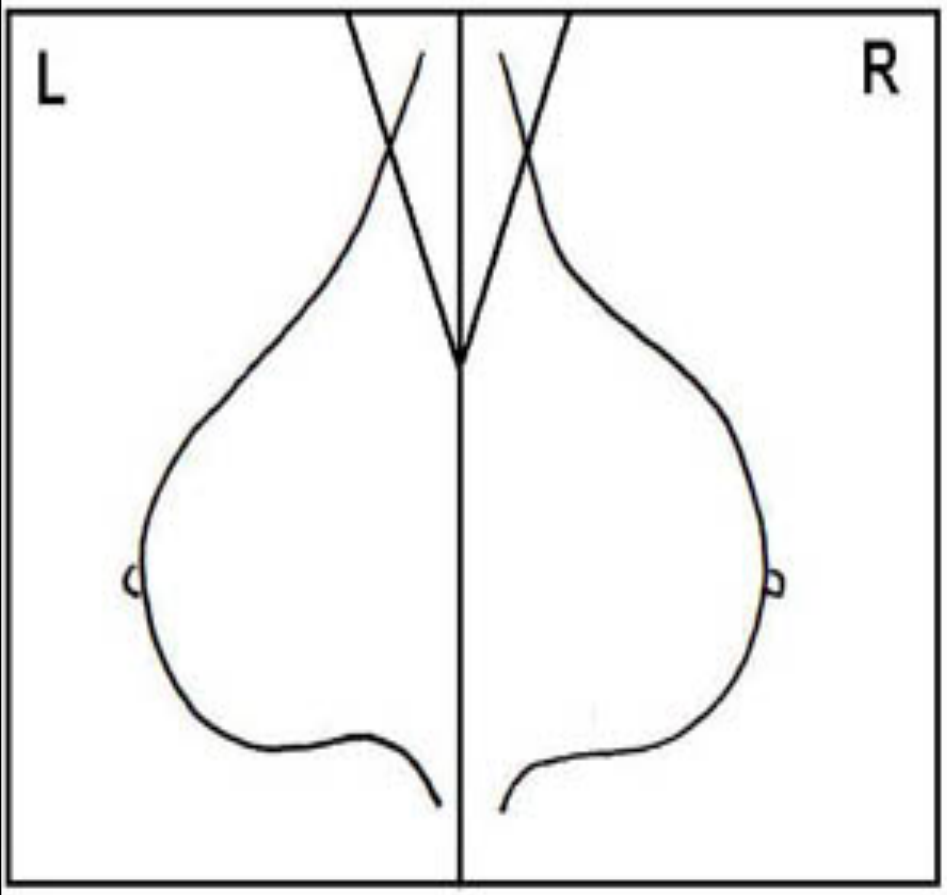
  Can rule IN cancer, but can not rule it OUT.
- Ultrasound
- CT scan (w/ and w/o contrast)
- MRI (w/ and w/o Gd contrast)
- Ultrasound- or MR-guided biopsy and wire localization
- Bone radionuclide scan
- Lymphscintigraphy

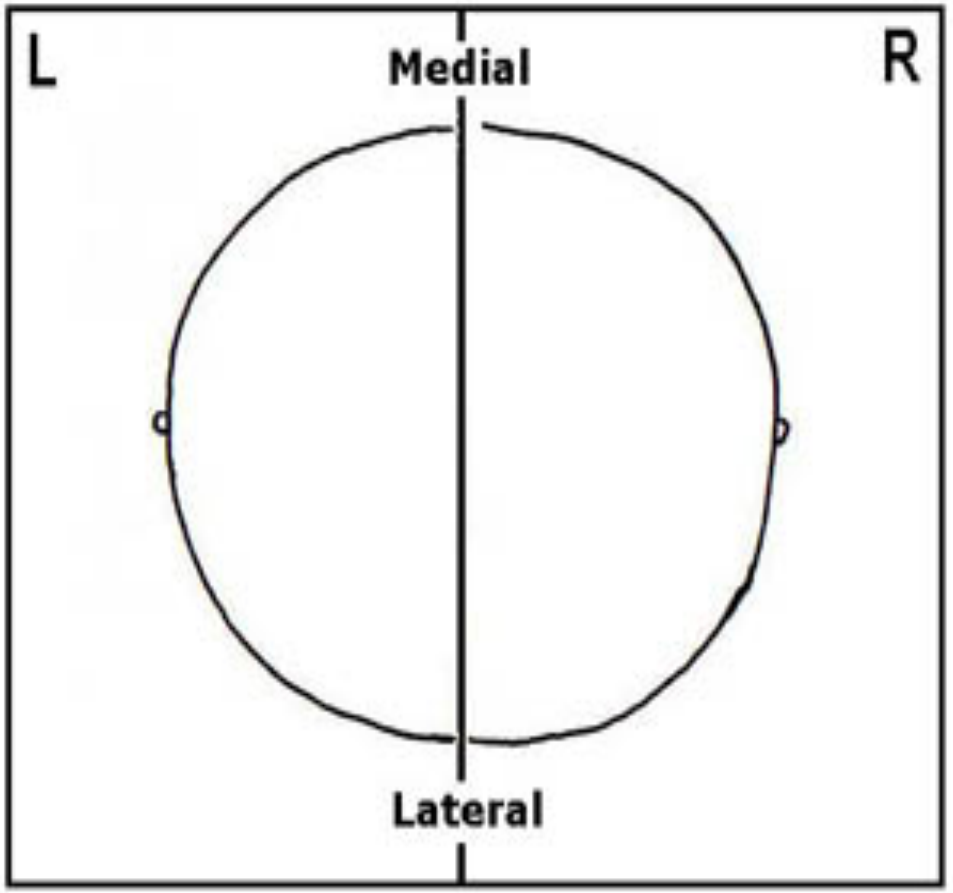
MLO



CC

Viewing method

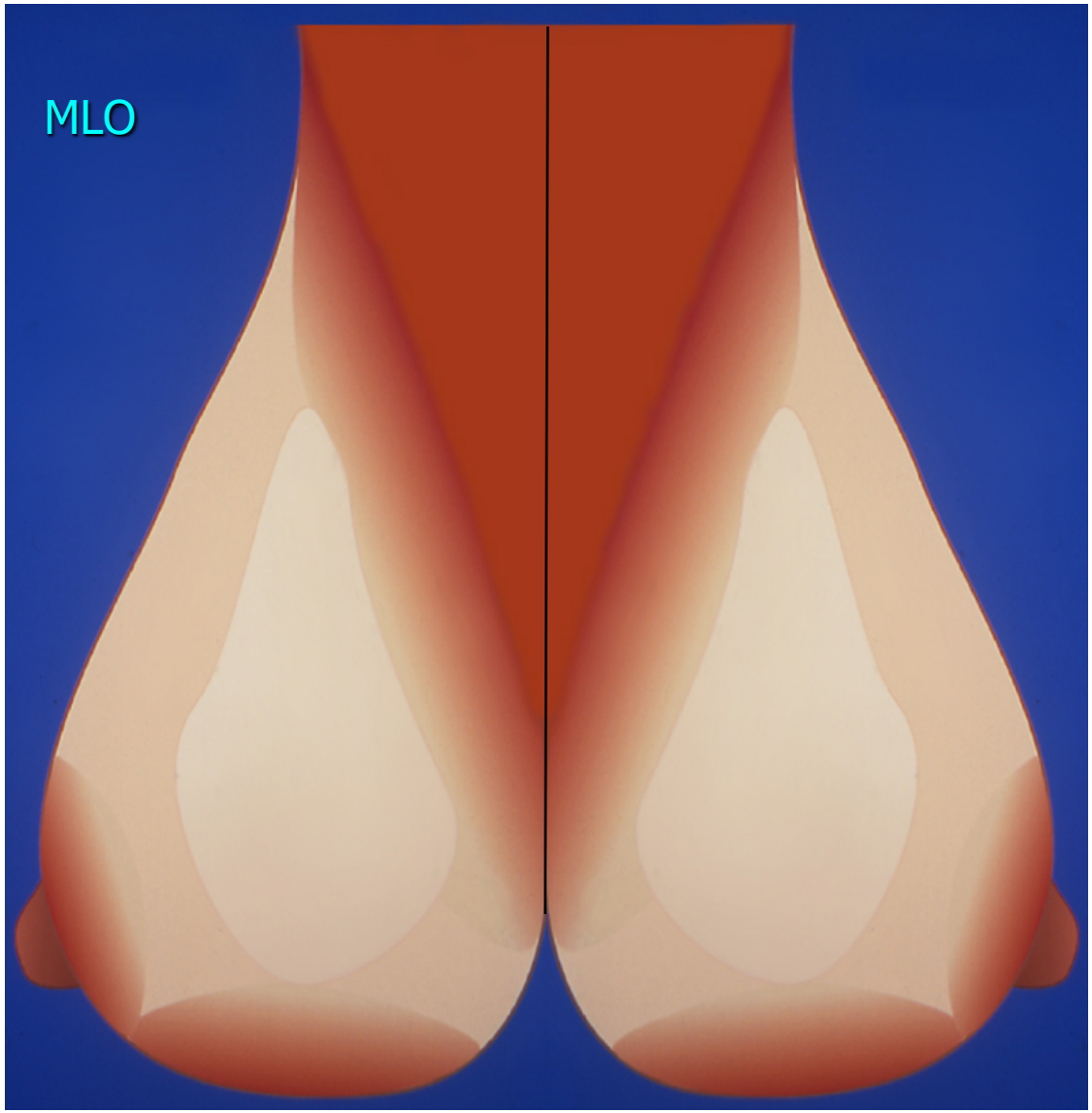




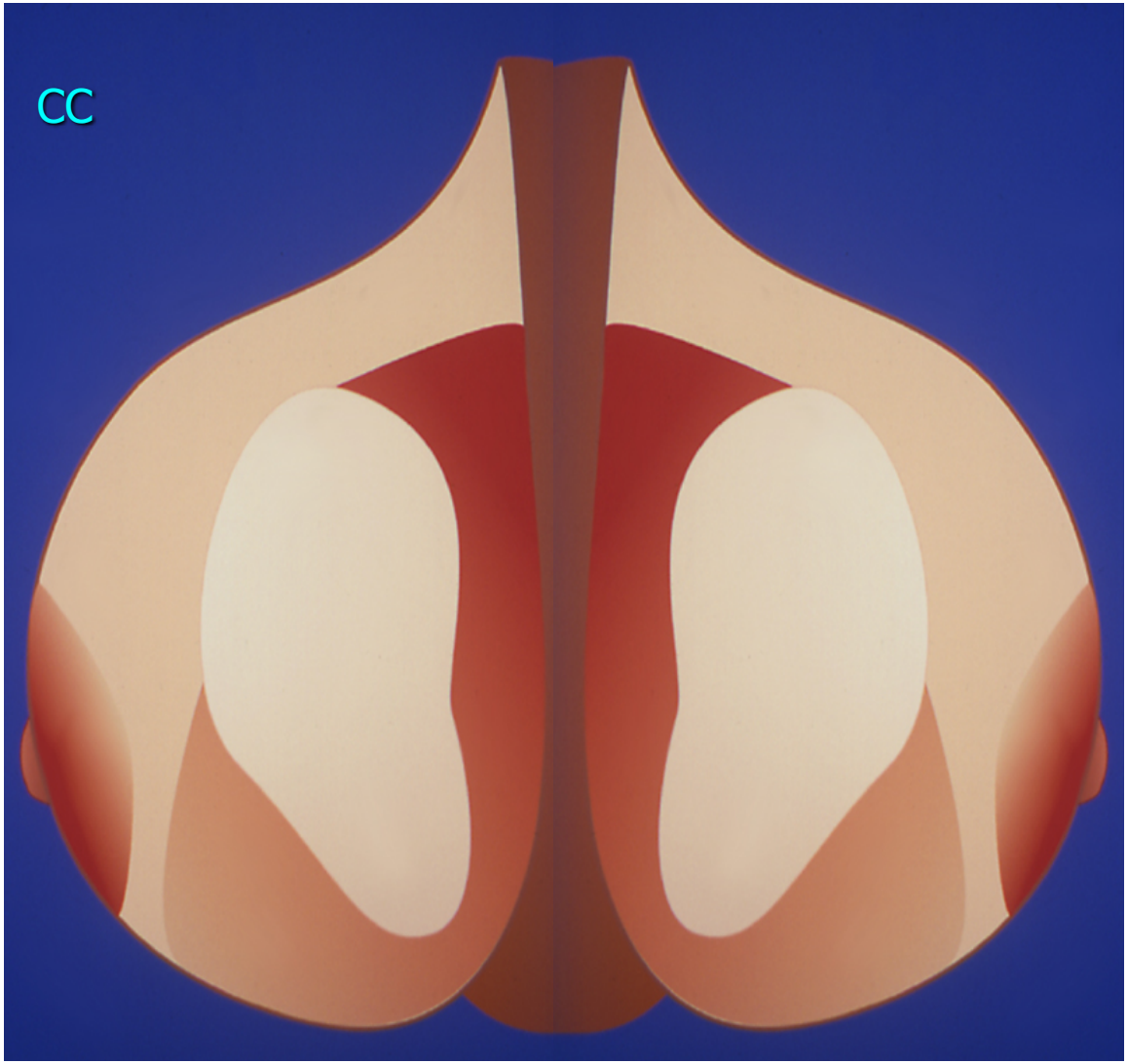
Mediolat.obliques

cranio-caudal views

Review Areas



Review Areas

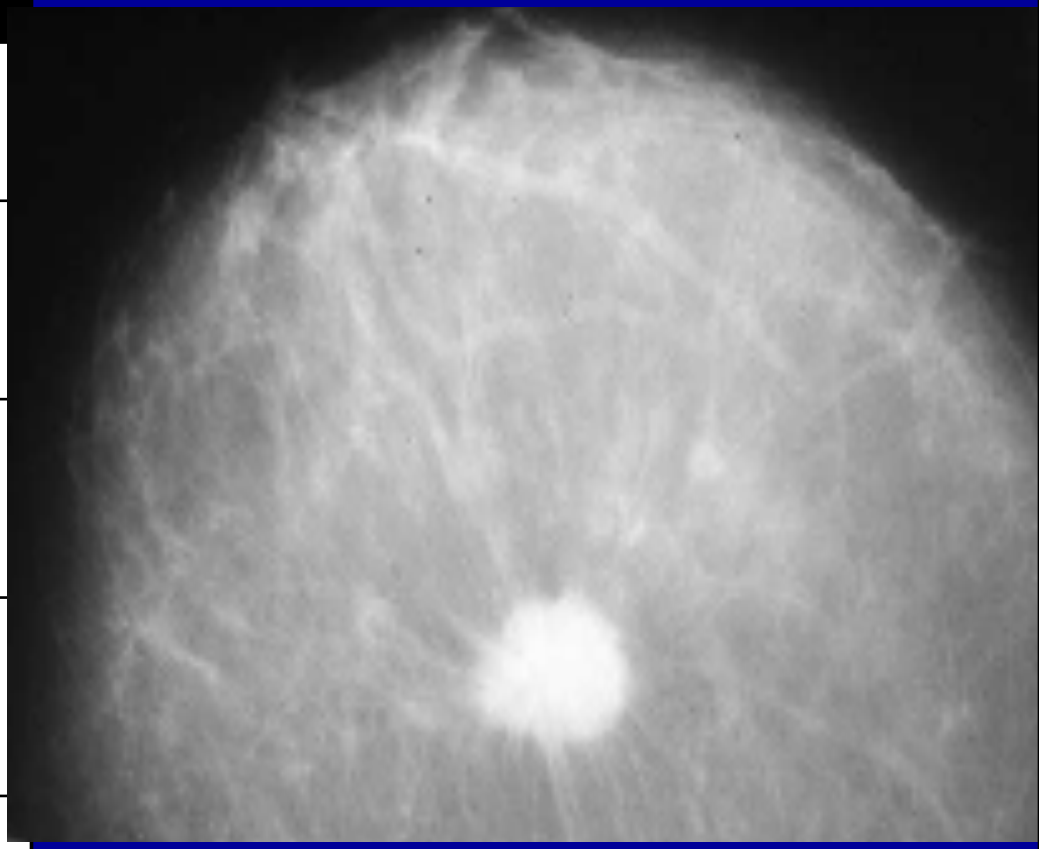


Mammographic findings of breast cancer

1-MASS

FIRST Decide if there is a mass (compare both breasts)

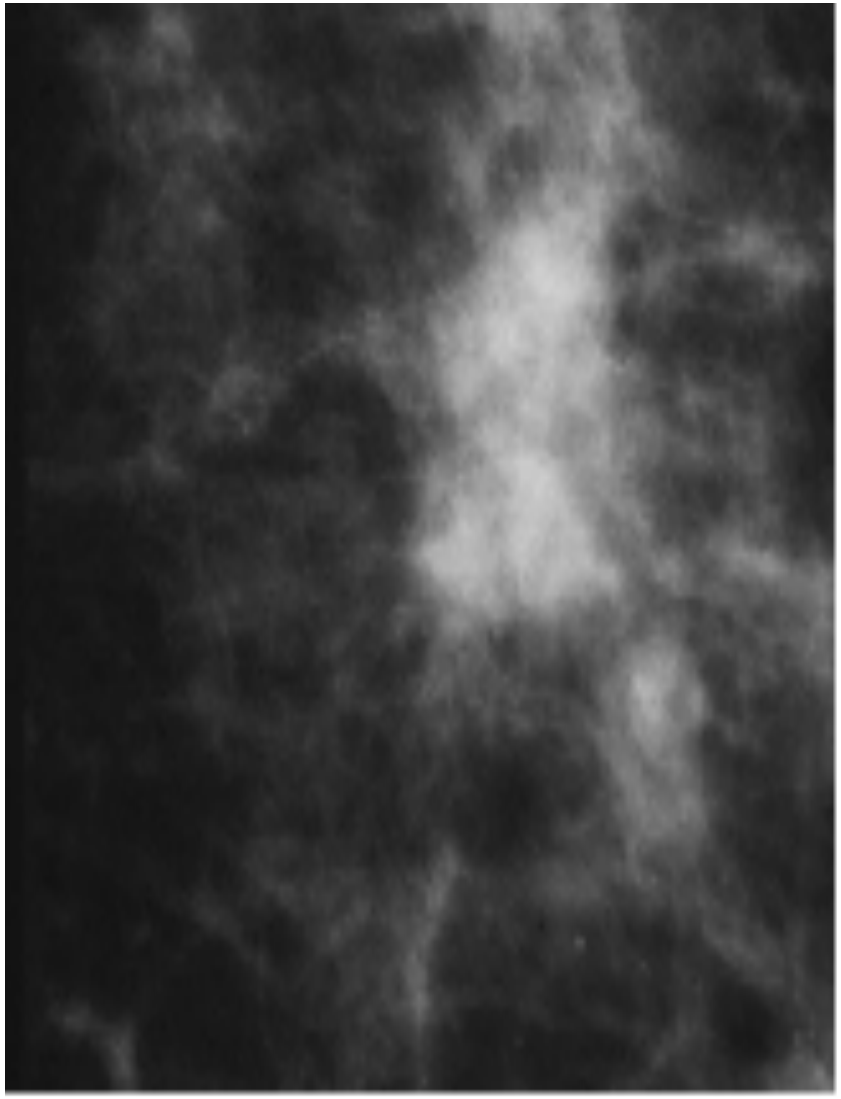
MASS
CONVEX borders
Denser towards center
Distorts related parenchyma
Seen in **multiple projections**
Still seen in focal compression view



FIRST Decide if there is a mass (compare both breasts)

MASS	ASSYM.DENSITY
CONVEX borders	Ill-defined or irregular
Denser towards center	Amorphous
Distorts related parenchyma	No
Seen in **multiple projections**	No
Still seen in focal compression view	Tissues spread over it.

FIRST Decide if there is a mass (compare both breasts)



IF mass is palpable at the at the site of focal asymmetry

Biopsy

Indications for Breast Ultrasound

- Differentiation of both palpable and mammographic lesions as either **cystic or solid**
- Subsequent characterization and classification of solid nodules according to certain sonographic features
- Evaluation of palpable breast mass in patient younger than age 30
- Interventional procedures (BIOPSY)

Smith, DS. Radiologic clinics of North America 2001; 39:485-496.

Methods: Identification of Malignant Features

- **First, they identified lesions with any of the following malignant features:**
- **Spiculation**
- **Angular margins**
- **Hypoechogenicity**
- **Shadowing**
- **Calcification**
- **Duct extension**
- **Branch pattern**
- **Micro-lobulation**

Stavros, et al. *Radiology 1995; 196:123-134.*

Example of benign fibroadenoma on ultrasound

Thin echogenic capsule

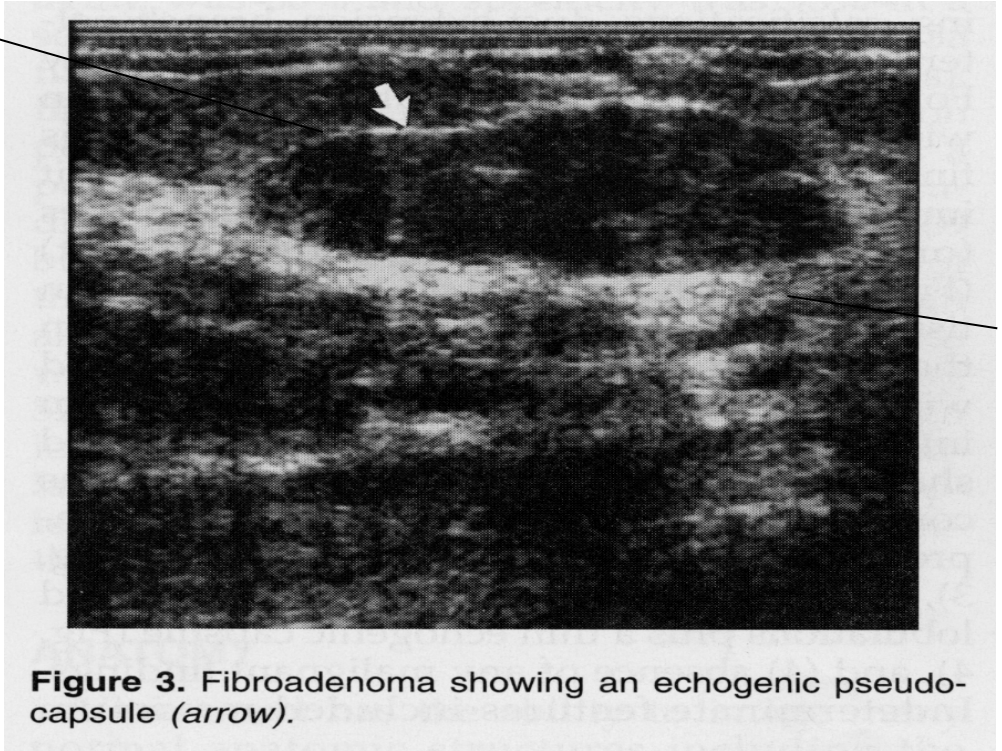


Figure 3. Fibroadenoma showing an echogenic pseudocapsule *(arrow)*.

Ellipsoid shape (wider than tall)

Most common benign solid mass of the breast

Smith, DS. *Radiologic clinics of North America* May 2001; 39(3)

Example of simple cyst on breast ultrasound

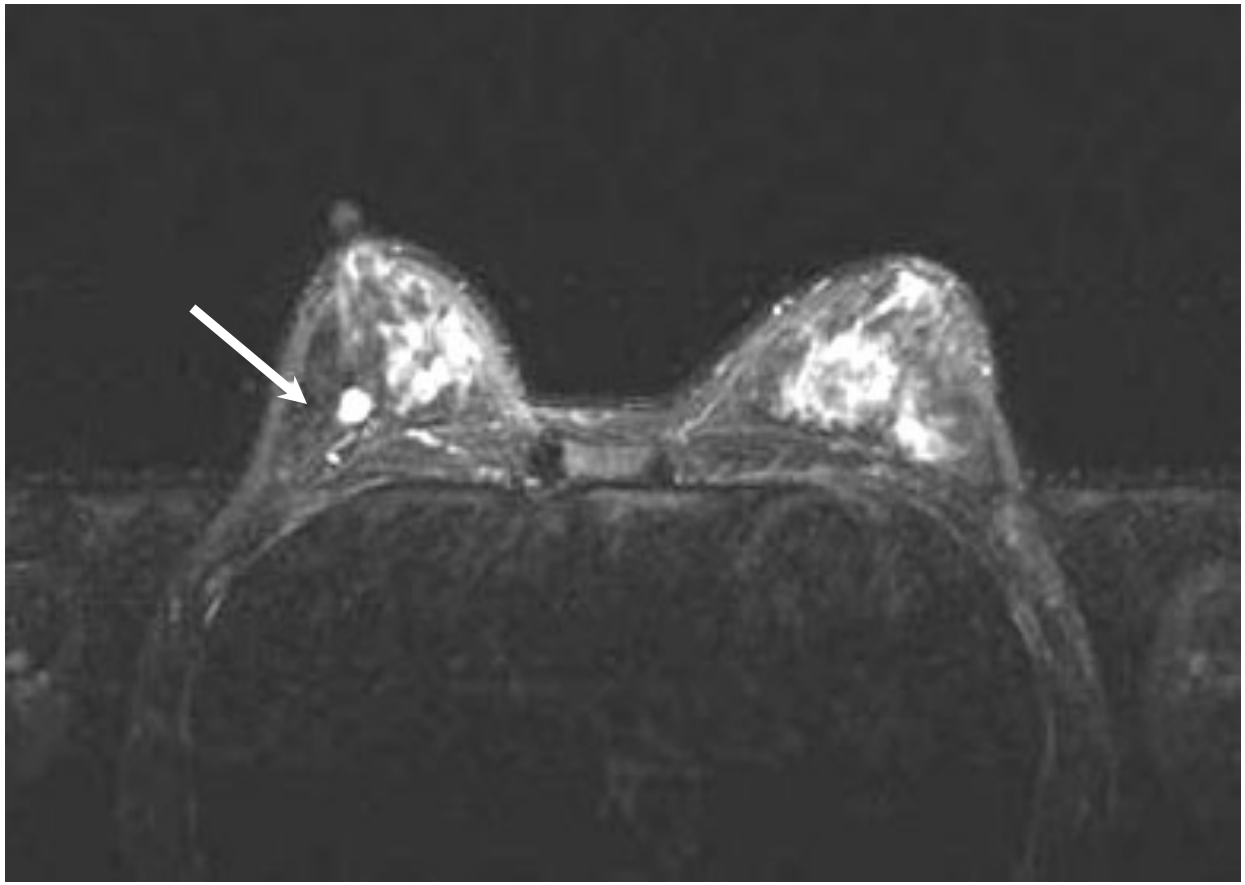
Anechoic

Smooth margins

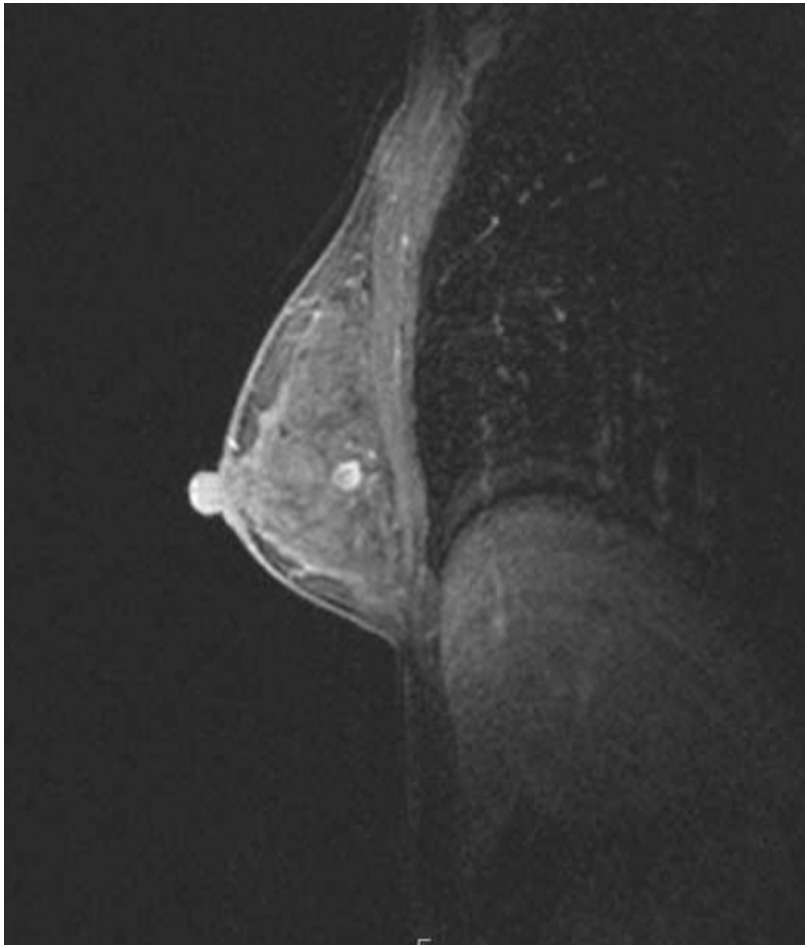
MRI breast

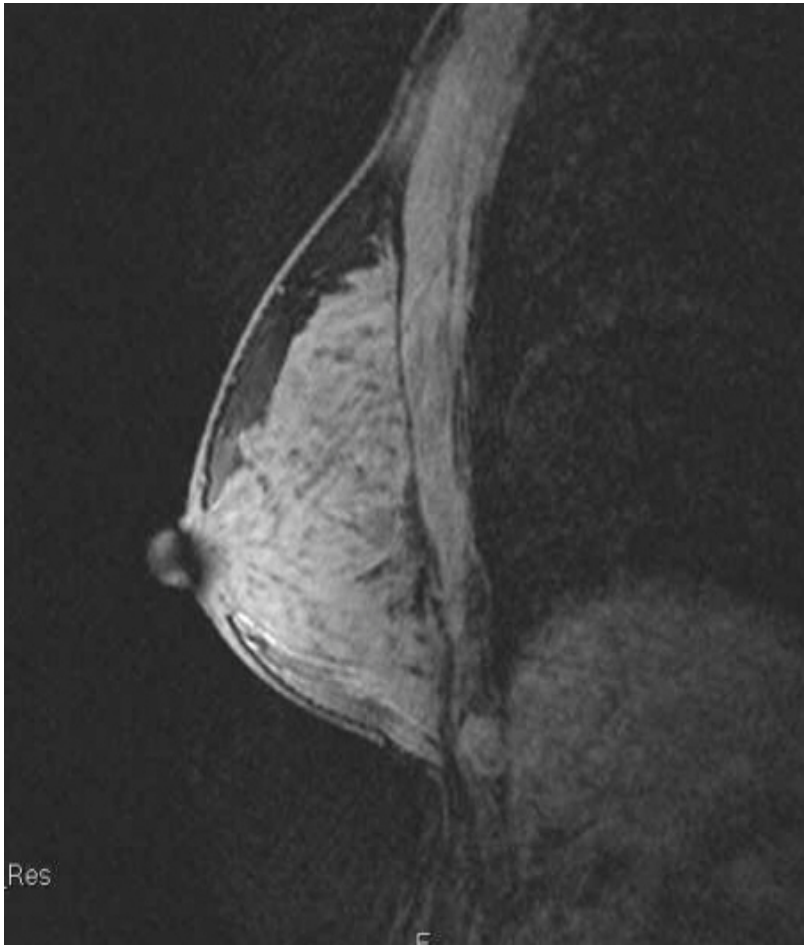
Contra-indicated in
Claustrophobia
Cardiac pacemaker

Static Imaging

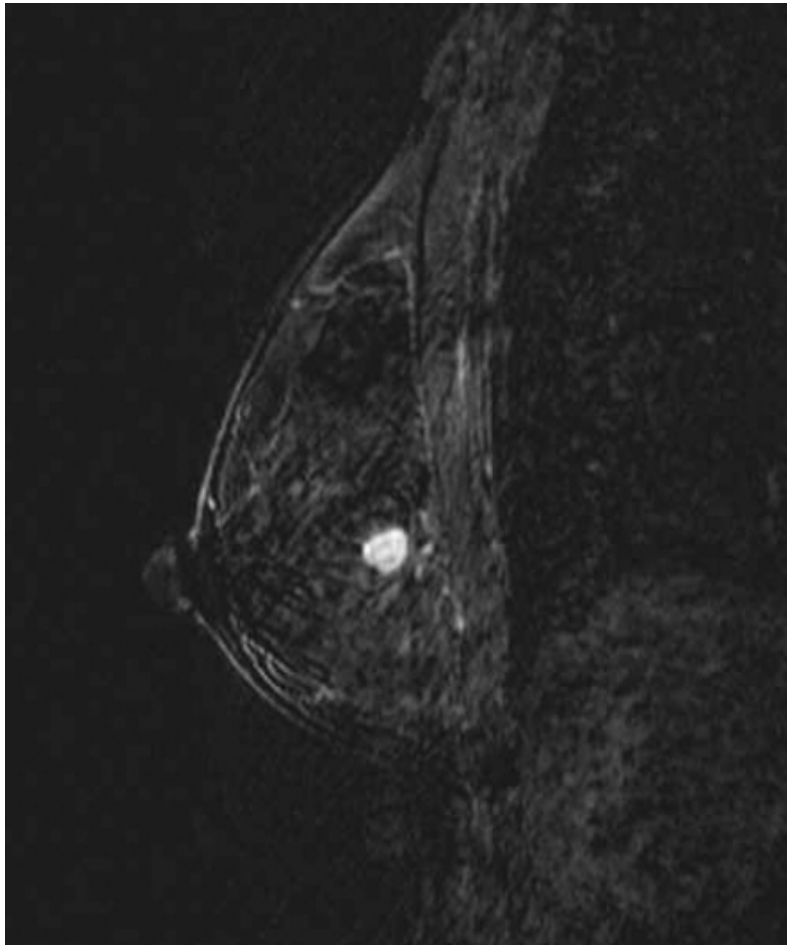


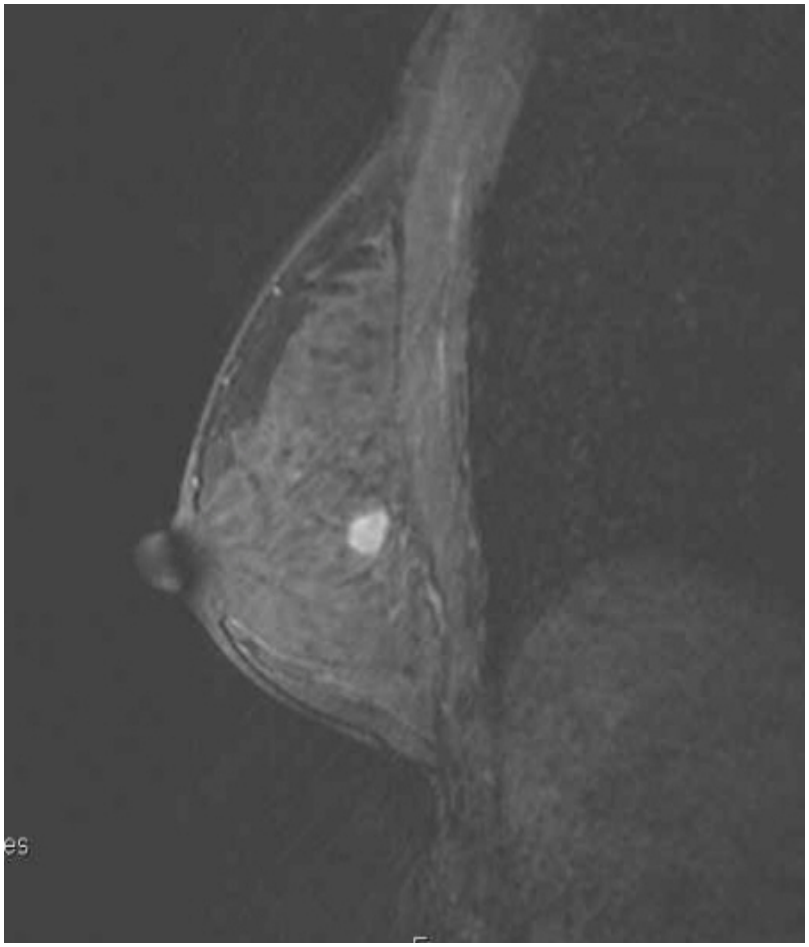
High resolution Imaging





Dynamic Imaging





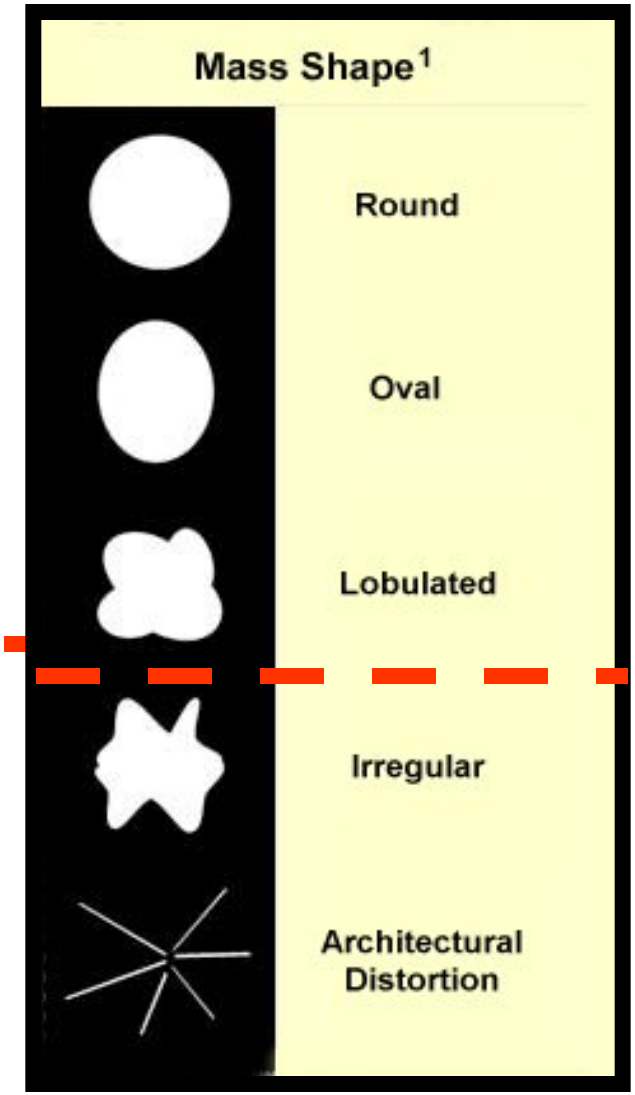
IN THE search of MALIGNANCY

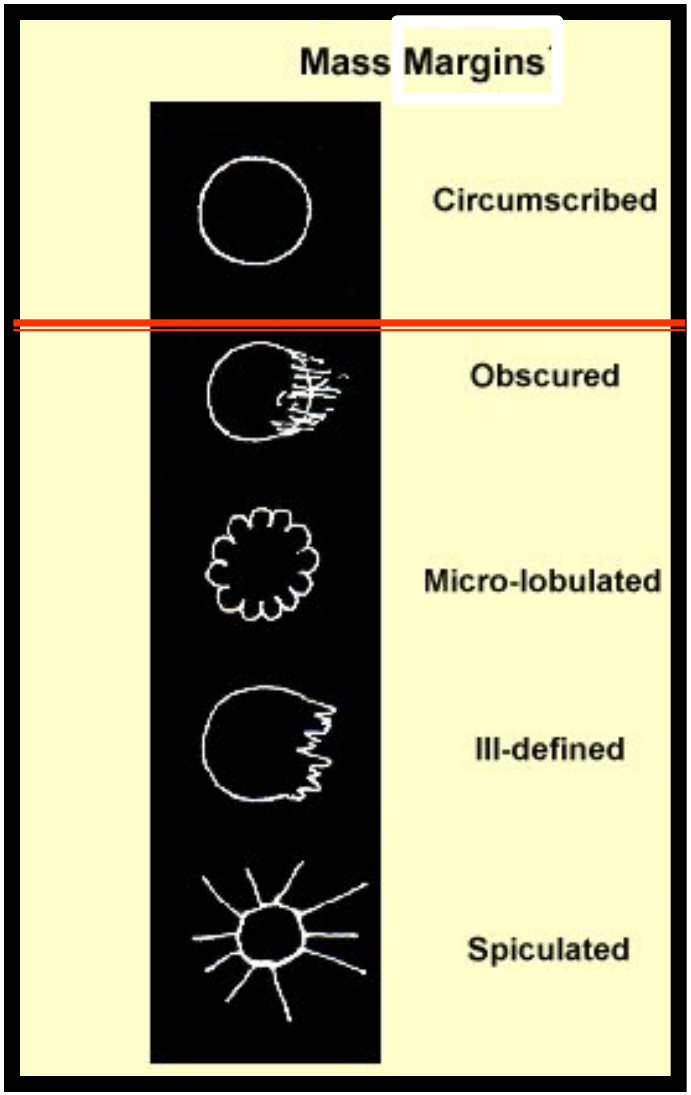
1- mass--→ characters

2- calcification--→ characters

MASS

Characters of masses



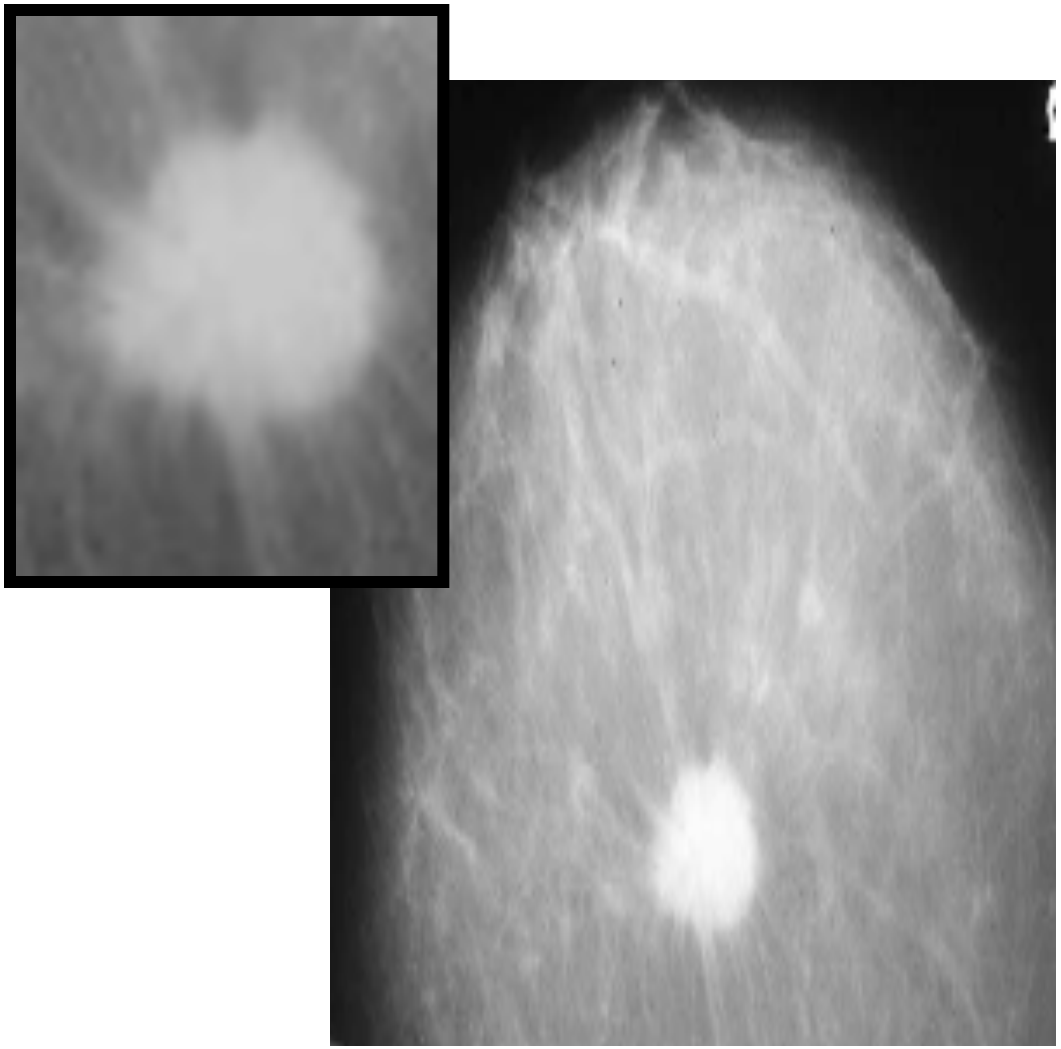


Margins

- Most important character .
- If margins are obscured by breast tissues

Compression /magnification views

Margins (cont.)



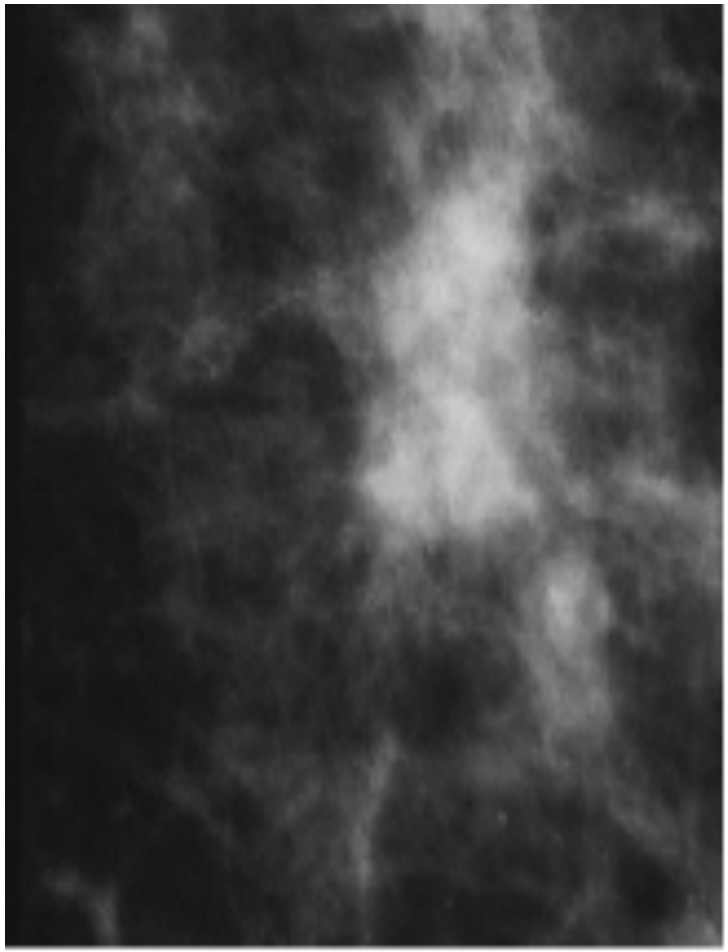
1-Spiculated

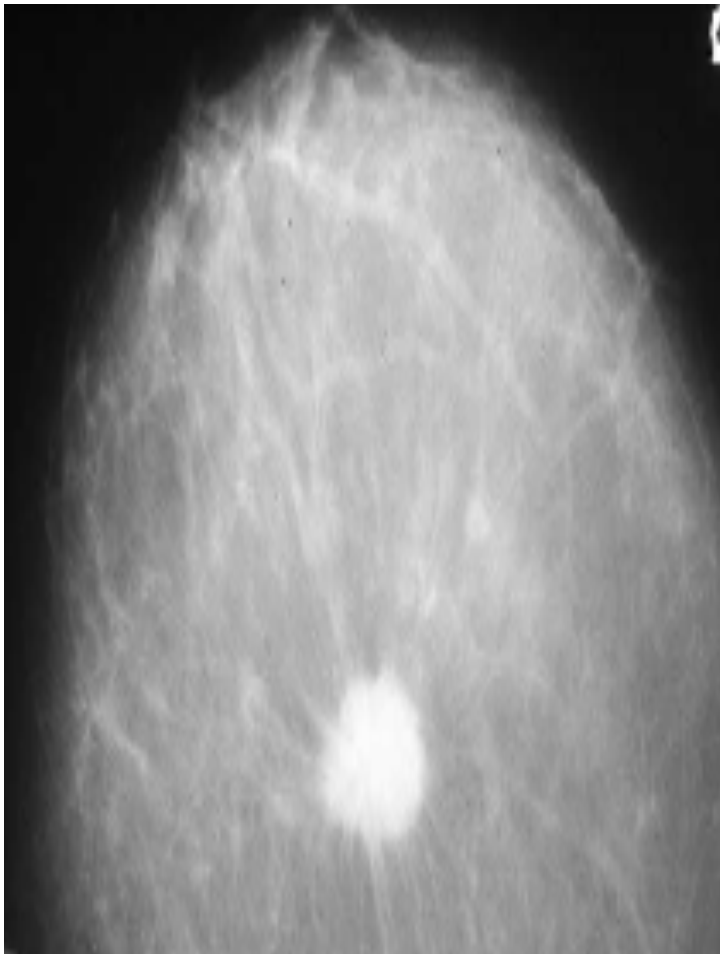
Classical carcinoma.

More common in :

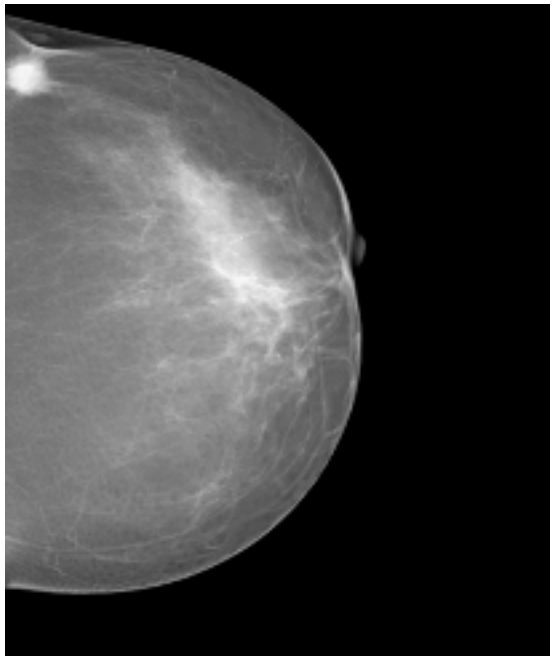
invasive>tubular>lobular.

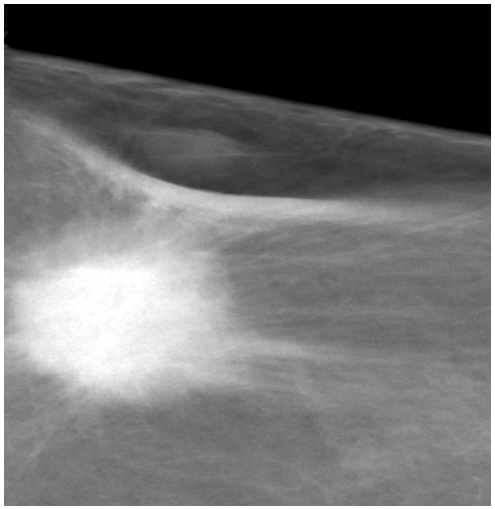
Spiculated mass
Invasive ductal ca

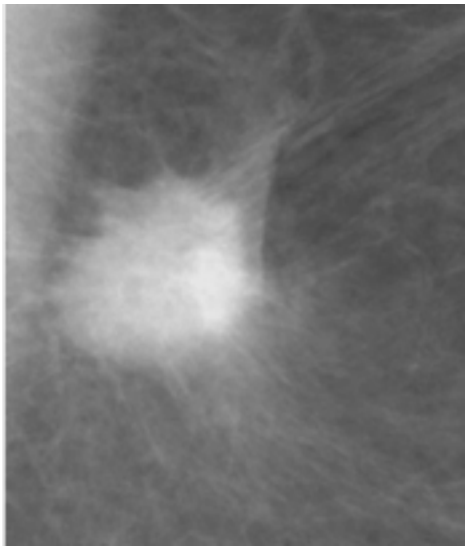


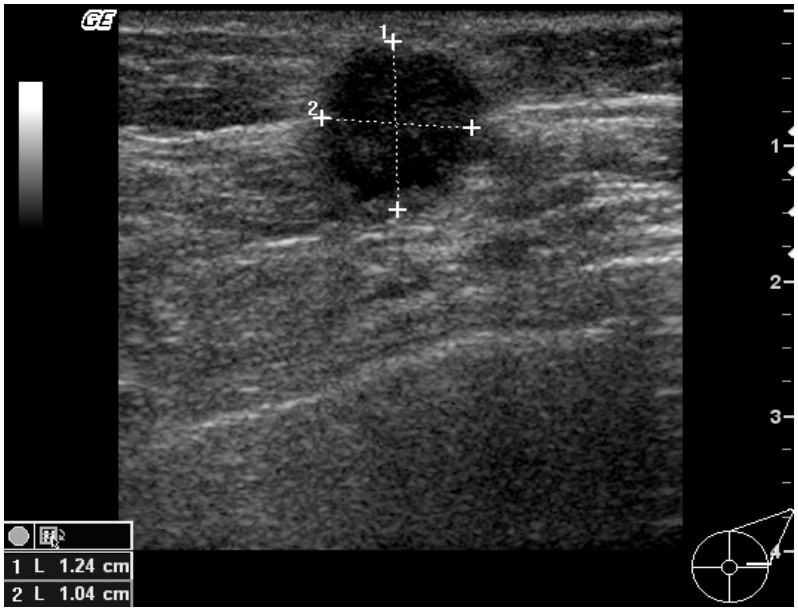


Spiculated margins









Spiculated Margins (cont.)

- DD :

FAT necrosis (previous surgical biopsy)

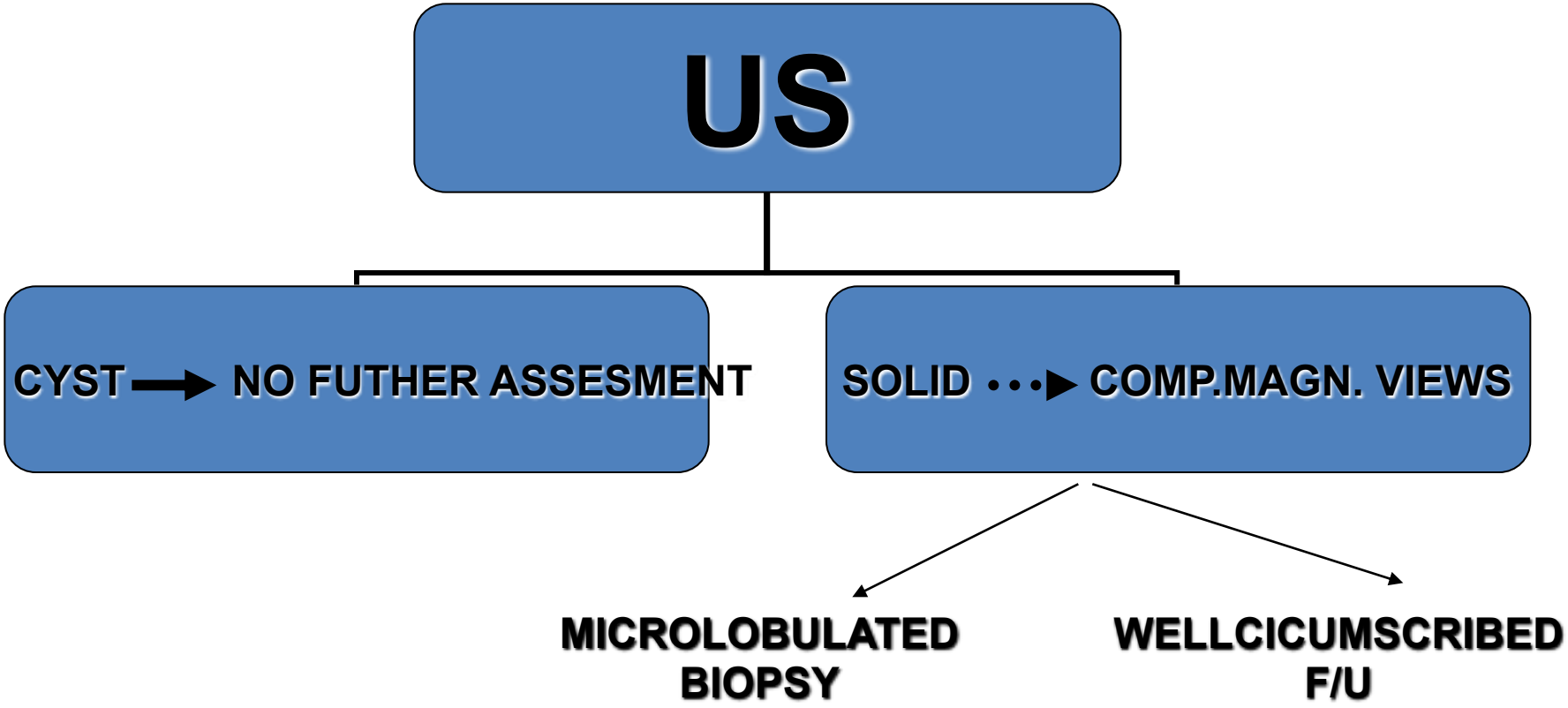
SCARS (previous surgery)

- Radio-opaque mark
- Previous scar
- Any increase in size----> biopsy

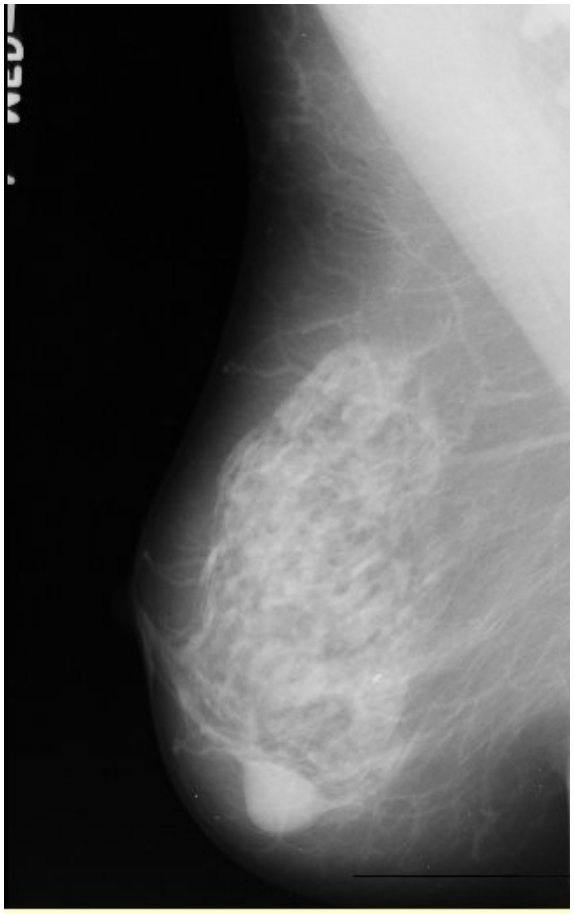
RADIAL SCAR (complex sclerosing lesions)

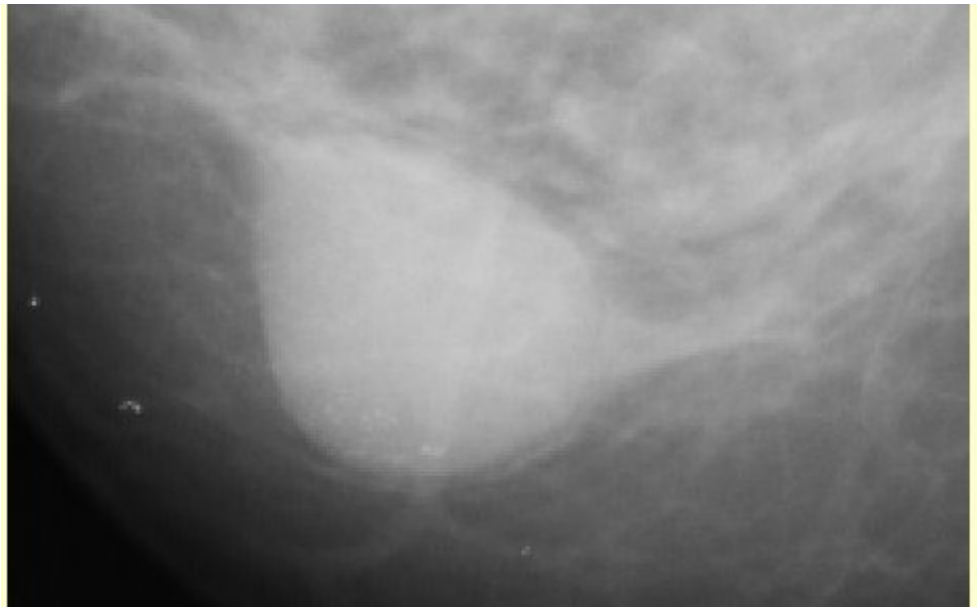
3-Well-circumscribed (well-defined) margins

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

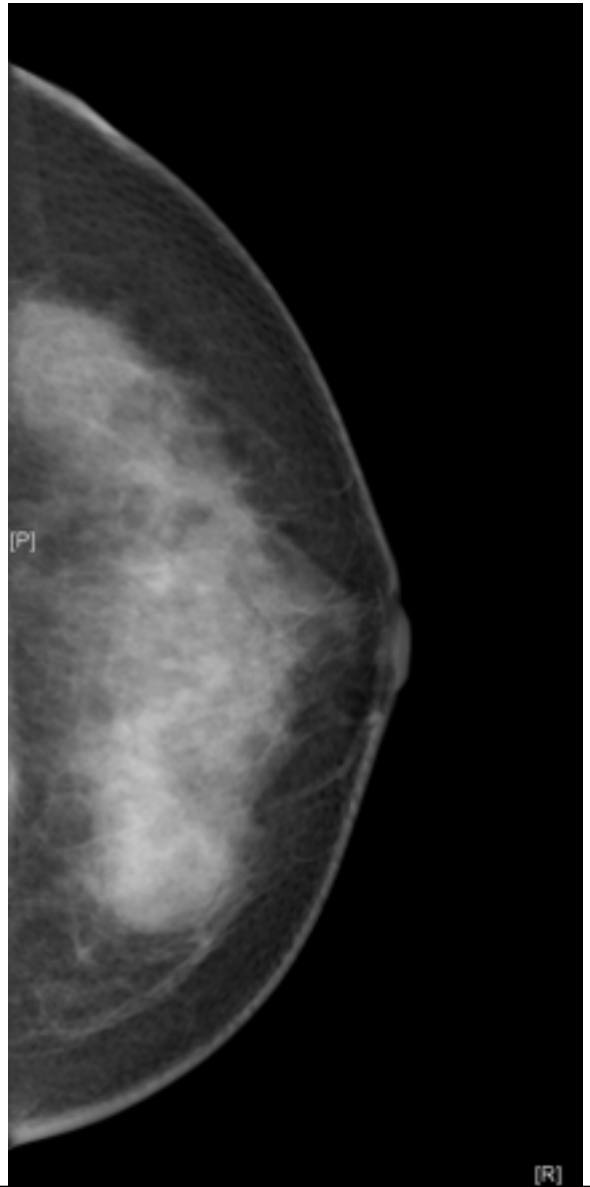


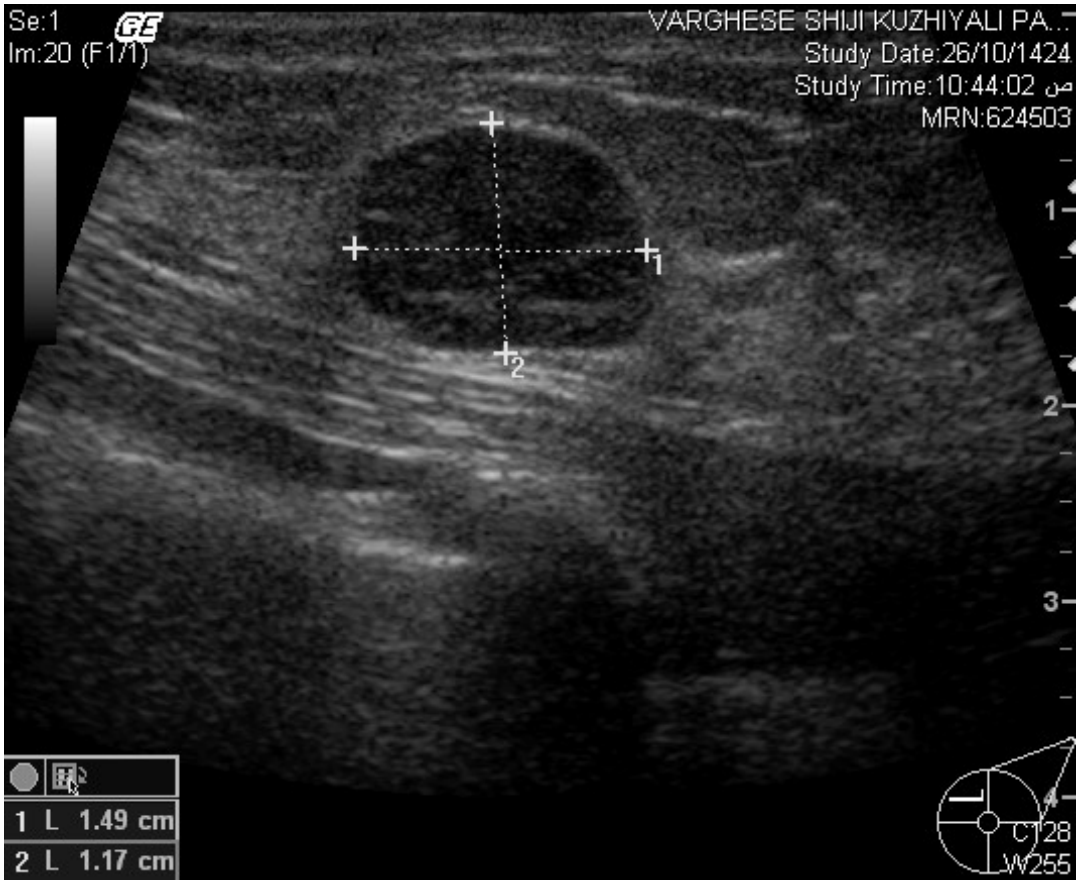
EXAMPLE
OVAL WELL-CIRCUMSCRIBED



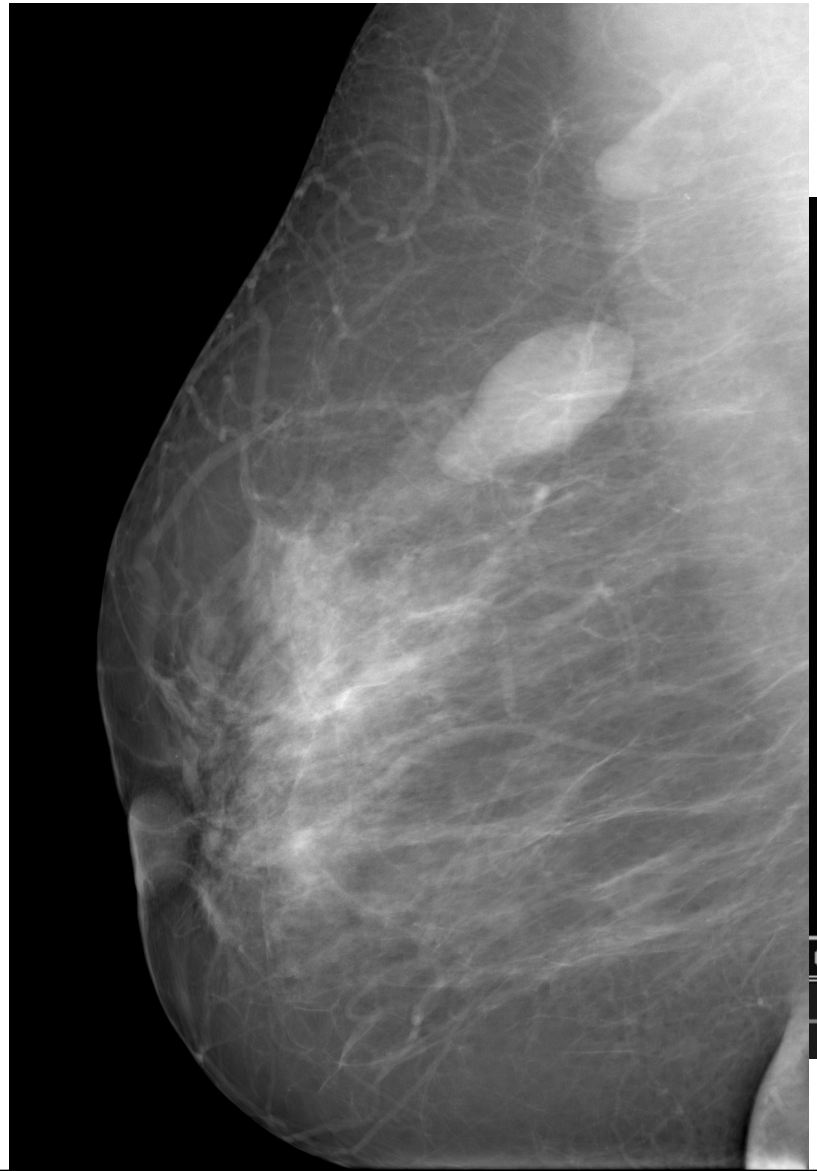


Large Fibroadenoma
BENIGN

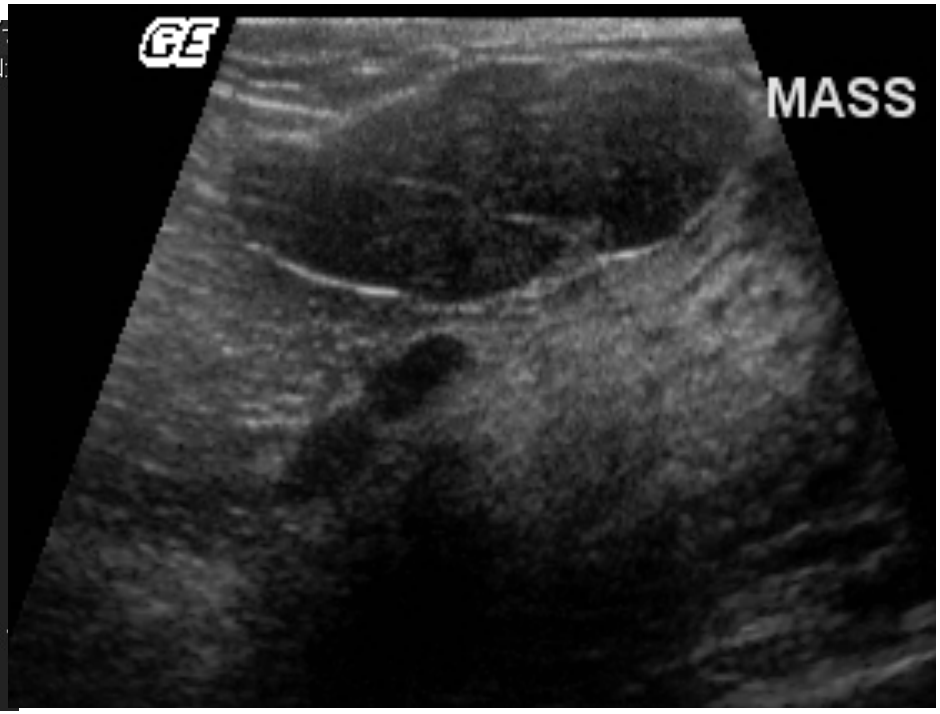




FIBROADENOMA
BENIGN

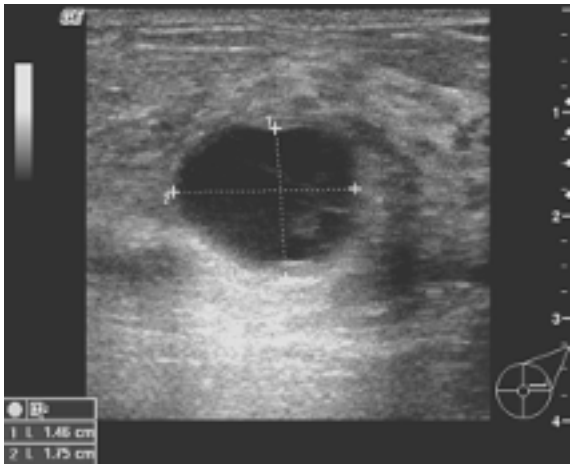


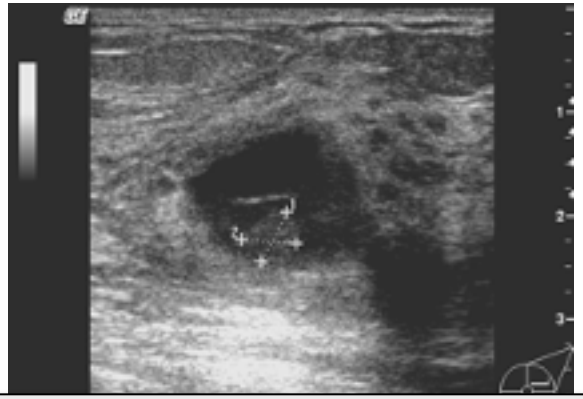
Hamartoma(fibroadenolipoma)



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

CYSTS





Hemorrhagic cyst in dense breast

The density categories used

- **<u>High density</u>: clearly higher than surrounding, suspicious.**
- **<u>Equal density</u>: density not appreciably different, neutral significance.**
- **<u>Low density</u>: density lower, but not fat containing, neutral significance.**

NUMBER OF MASSES

- **FACT**

MULTIPLE WELLDEFINED MASSES are probably benign

.

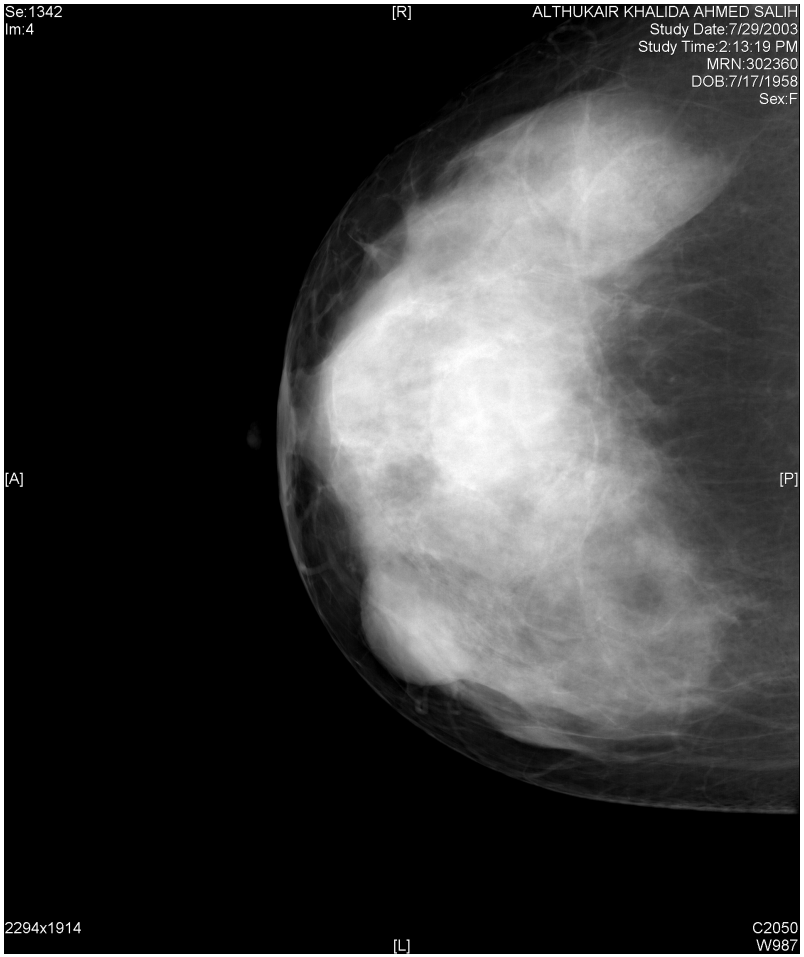
- **FACT**

MULTIPLE PRIMARY MALIGNAT LESIONS ARE OBVIUOUSLY ILL-DEFINED OR STELLATE LESIONS.

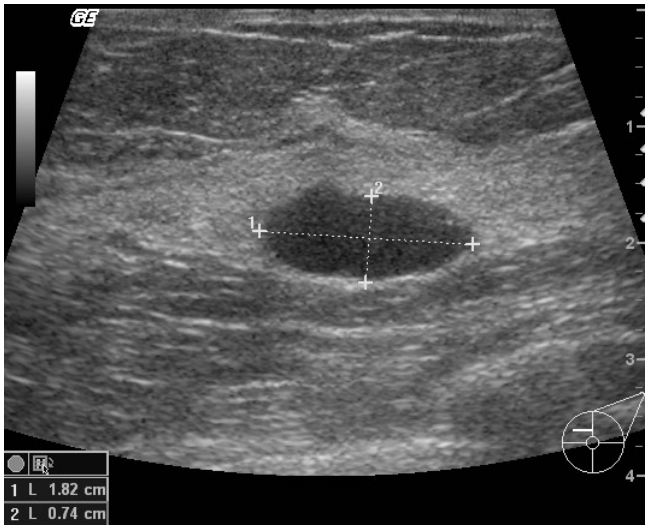
- **FACT**

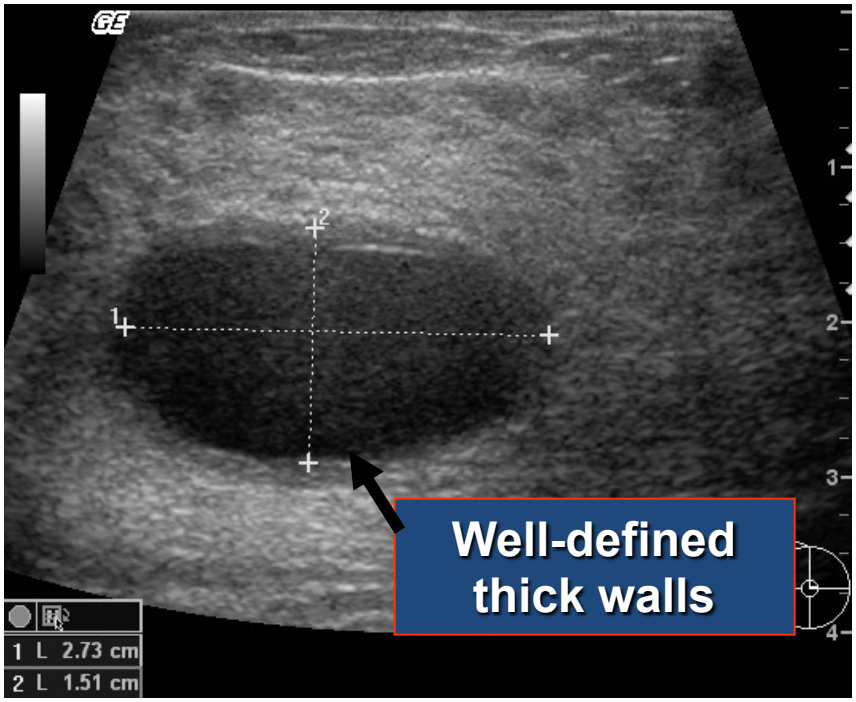
BENGIN AND MALIGNANT LESIONS CAN COEXIST !!!

Complicated cysts MAMMOGRAPHY !!!



Complicated cysts US





Mammographic findings of breast cancer

2-Micro-calcification

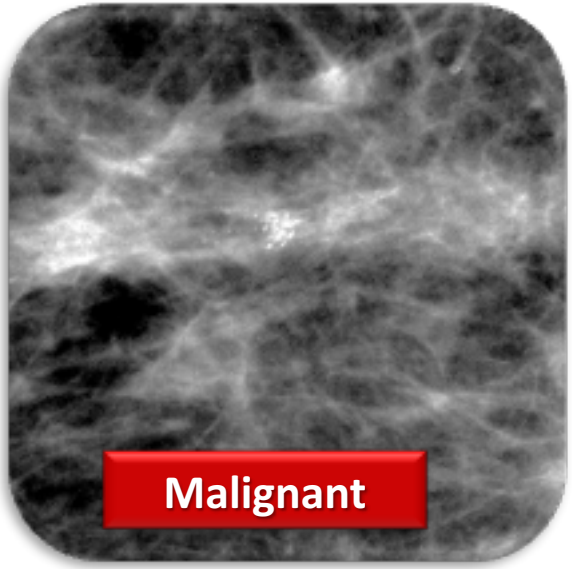
Calcifications

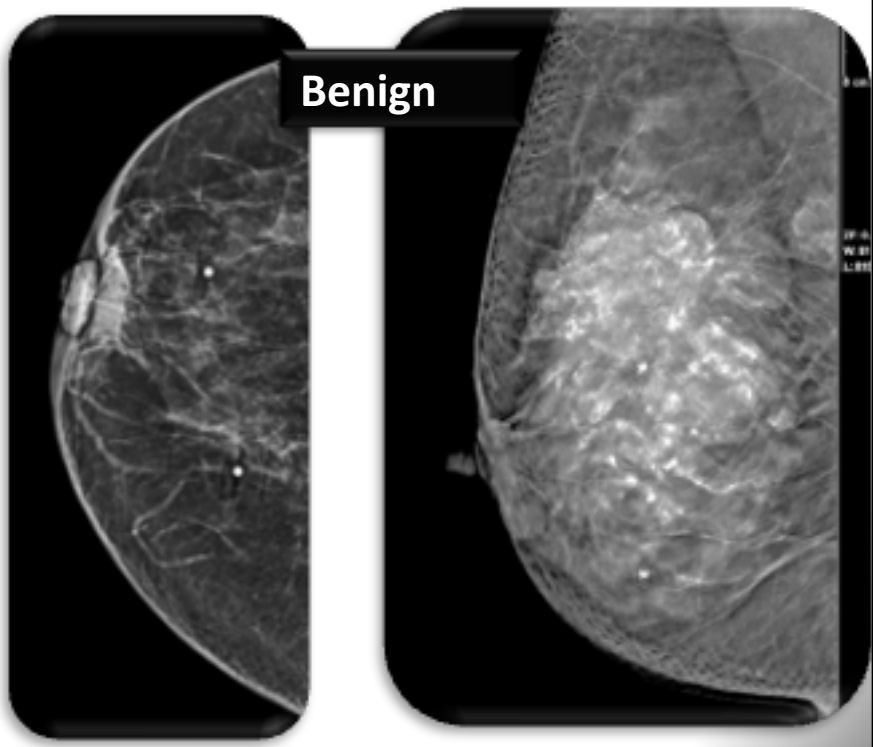
Size

- Micro calcifications are associated with a malignant process
- Macro calcifications usually associated with a benign process .
- 0.5 mm or less **Micro calcifications** to have a high probability of association with cancer .
- 2.0 mm or larger **Macro calcifications** are typical of a benign process.
- The smallest visible calcifications on a mammogram is approximately 0.2 - 0.3 mm.

Not all calcifications are malignant

1. **Micro-calcifications:** 0.5 mm or less
2. **CLUSTERED** : > 5 microcalc. in $1cm_2$

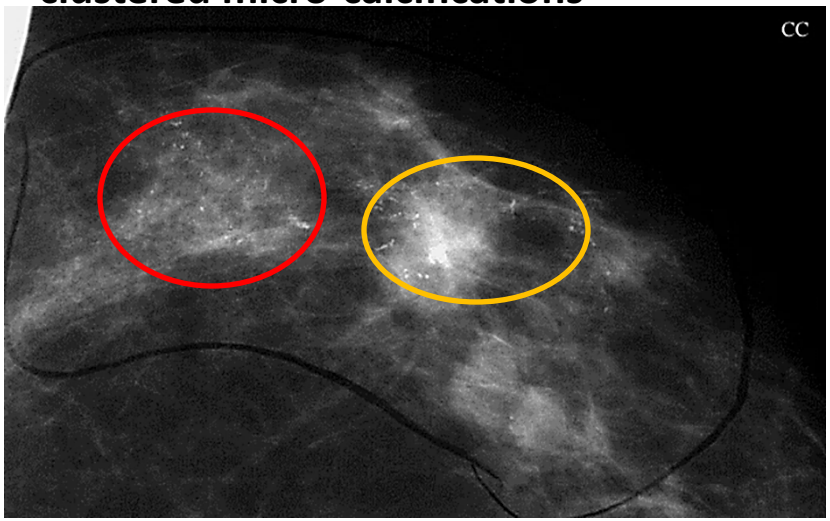


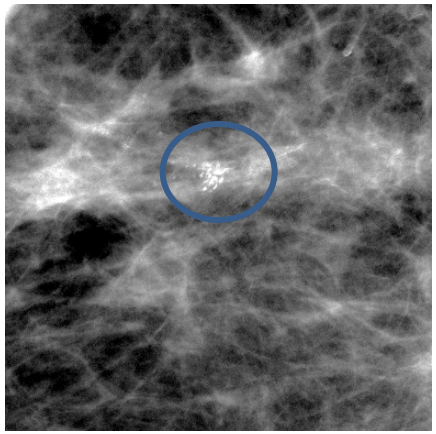


calcifications

Malignant

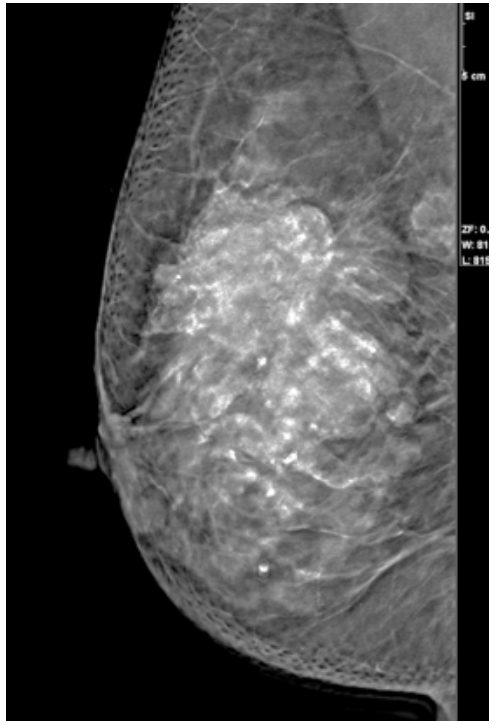
clustered micro-calcifications





Benign

scattered macro-calcifications



Calcifications (cont.)

Number

- Any number of calcifications less than four will rarely lead to the detection of breast cancer in and of itself.
- Two or three calcifications may merit greater suspicion if they exhibit worrisome morphologies.

Calcifications

Morphology

- **<u>Most important indicator in differentiating benign from</u>**

- 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.

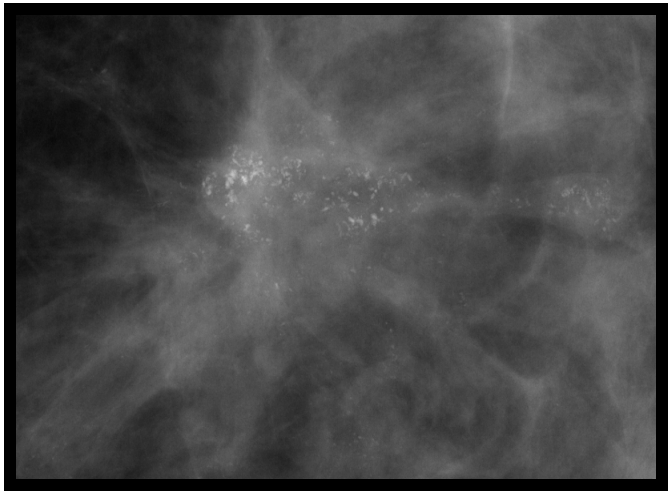
CALCIFICATIONS (CONT.)

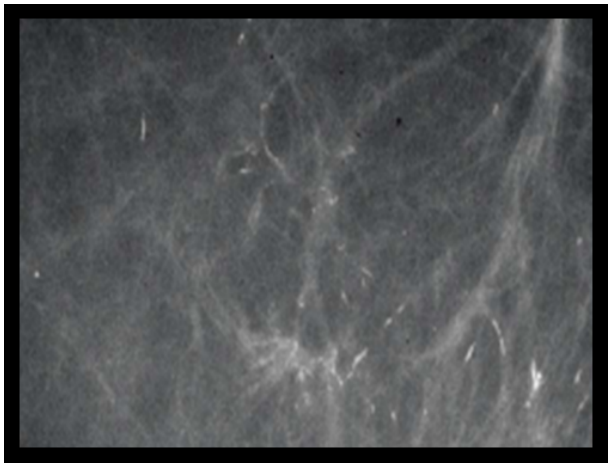
- ACR BIRADS Classification
  The American College of Radiology (ACR) Breast Imaging Reporting and Data System (BIRADS) has classified findings of calcifications into three categories:
- (1) Typically benign;
- (2) Intermediate concern; and
- (3) Higher probability of malignancy.

CALCIFICATIONS

- 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.
- The pages that follows will describe the type of calcifications that fall into these categories.

Typical MALIGNANT **micro-calcification**





- **CLUSTERED** : > 5 in $1cm_2$
- Branching interrupted ill-defined ductal .

Mammographic findings of breast cancer

3- **mass and micro-calcification**

THANK YOU

DR M SHERIF ELSHARKAWY