BREAST LESIONS

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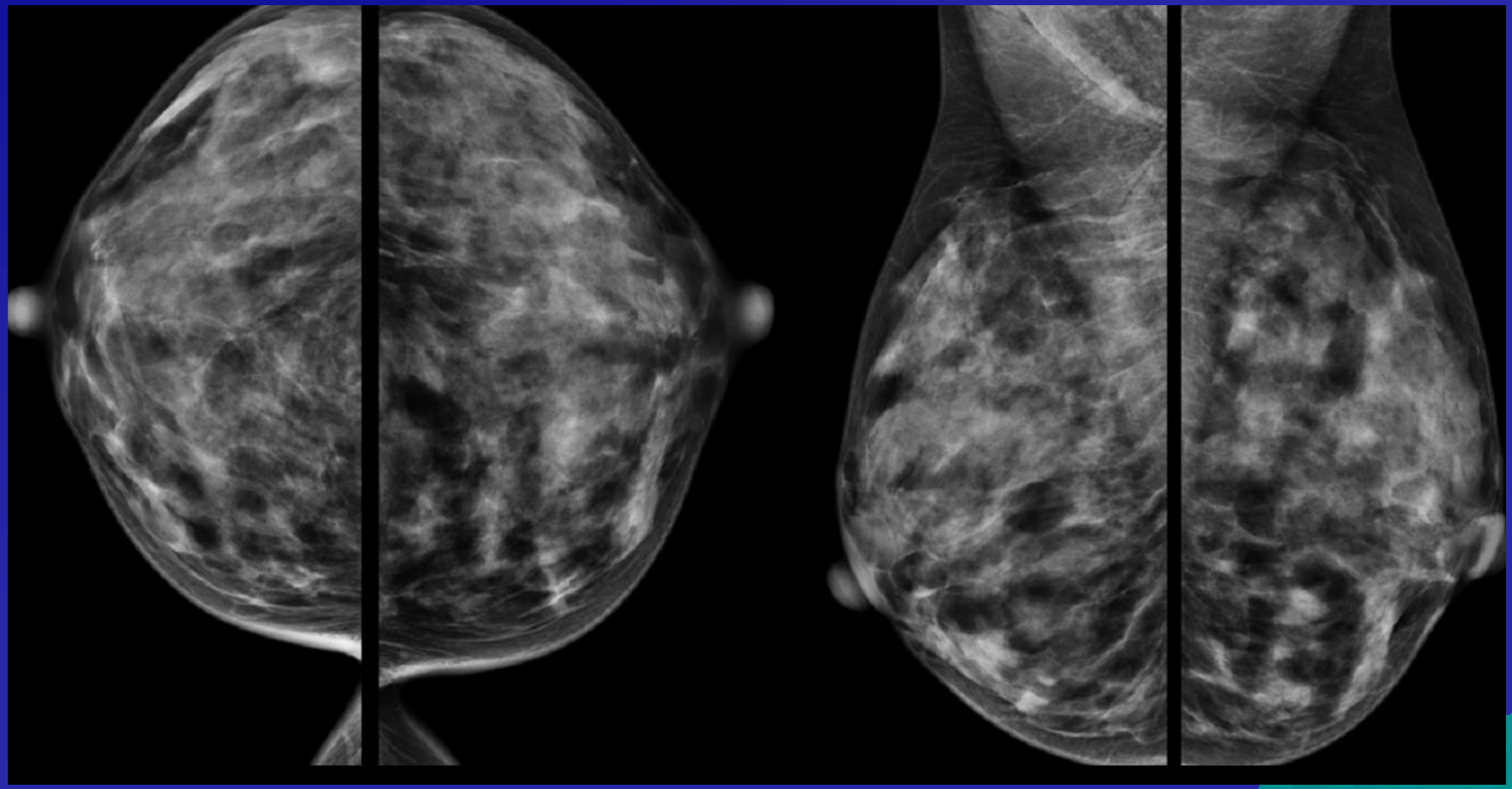
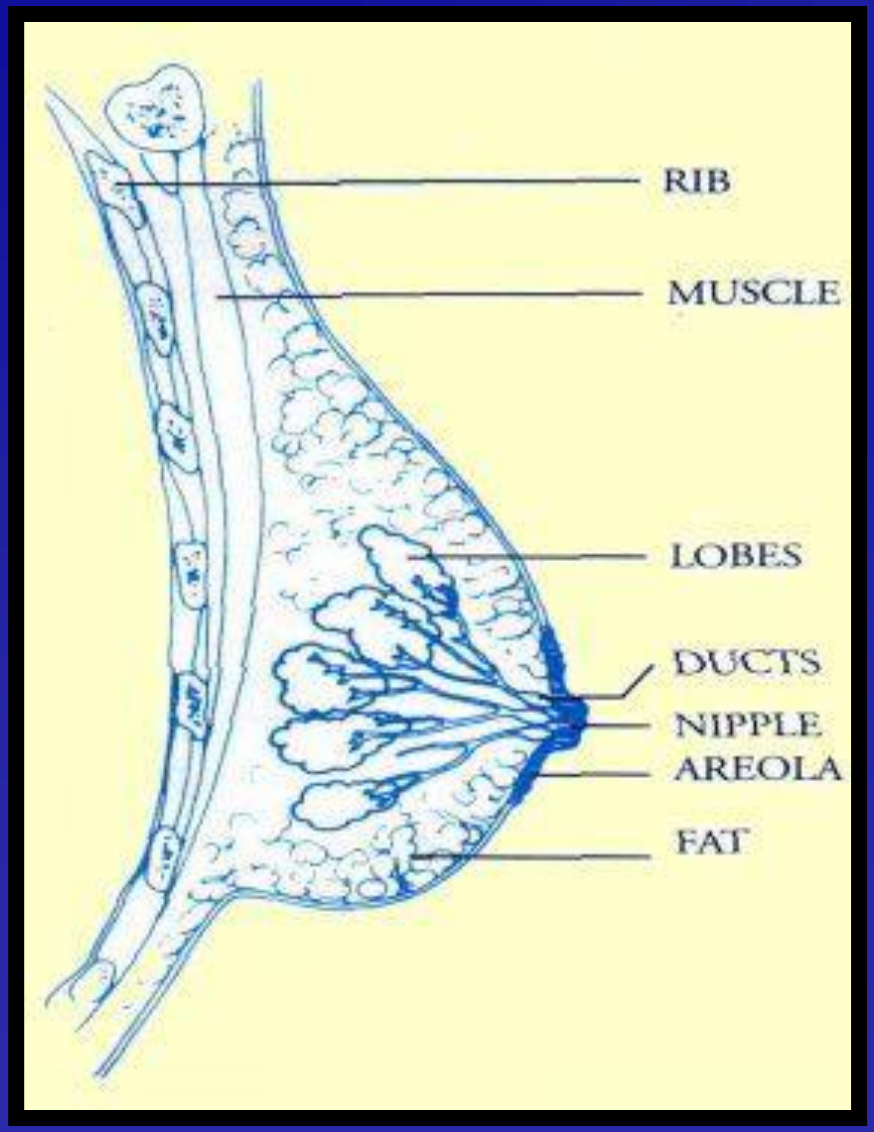
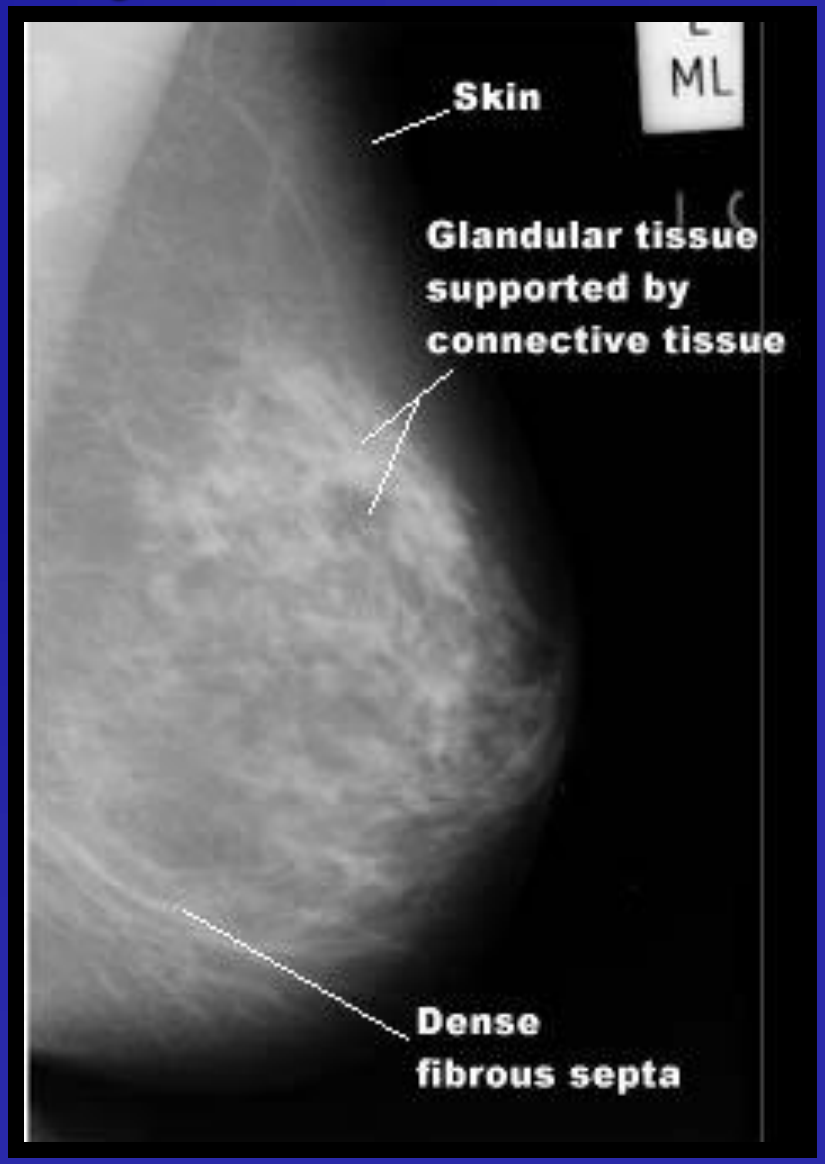


OBJECTIVES

- 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.

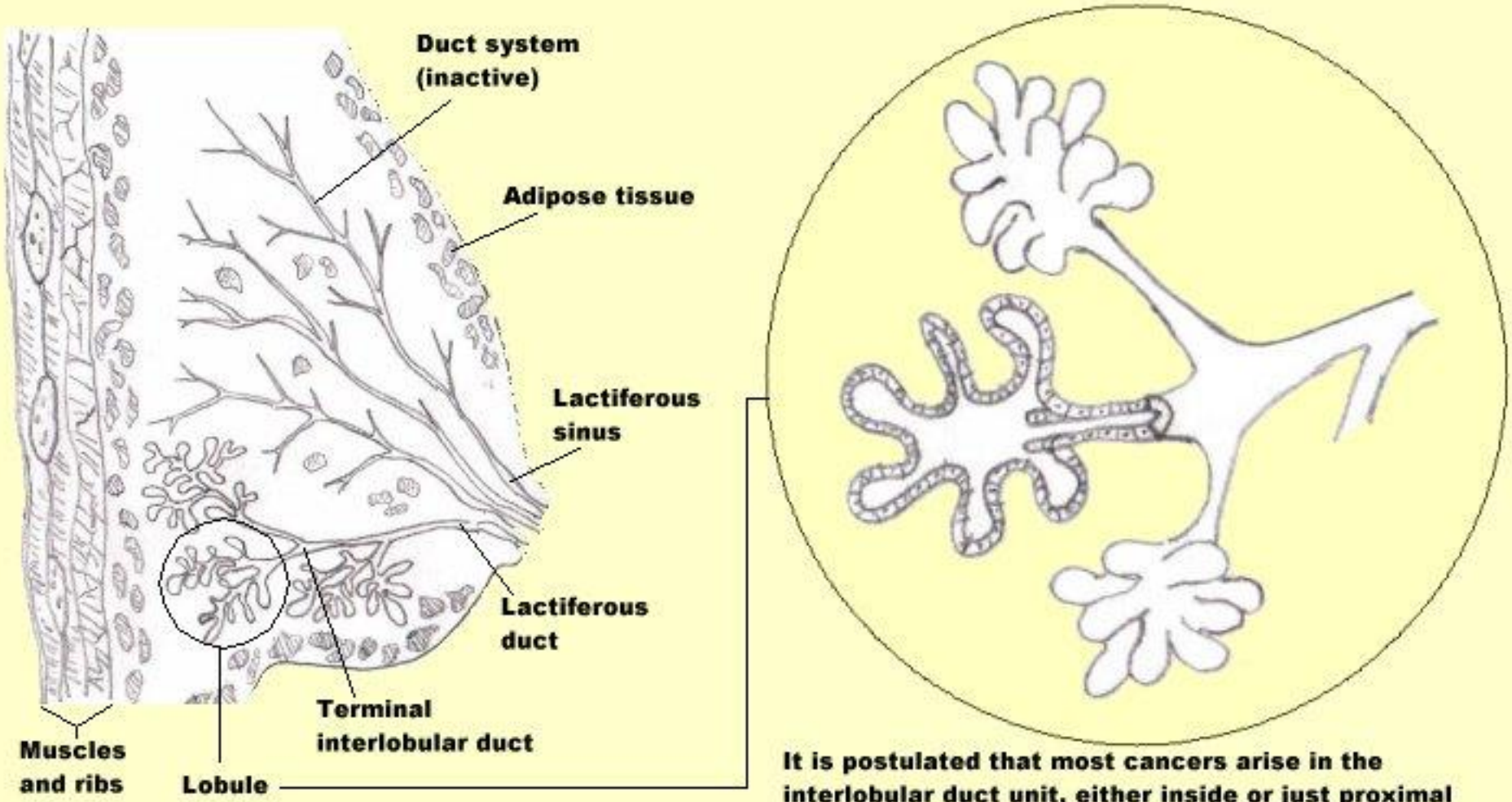
Anatomy


RIB
MUSCLE
LOBES
DUCTS
NIPPLE
AREOLA
FAT

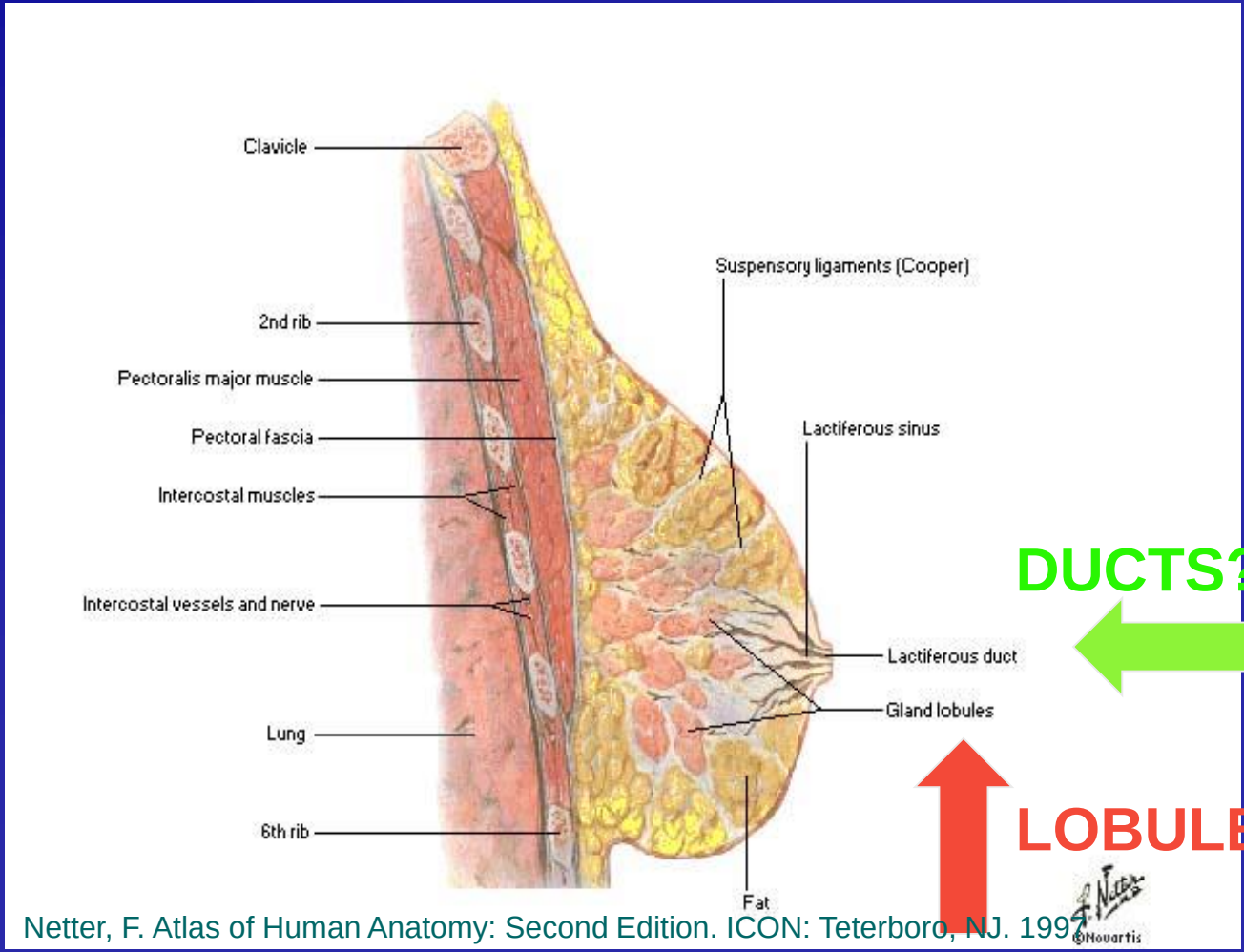

ML
Skin
Glandular tissue supported by connective tissue
Dense fibrous septa


Lateral oblique mammogram

Anatomy

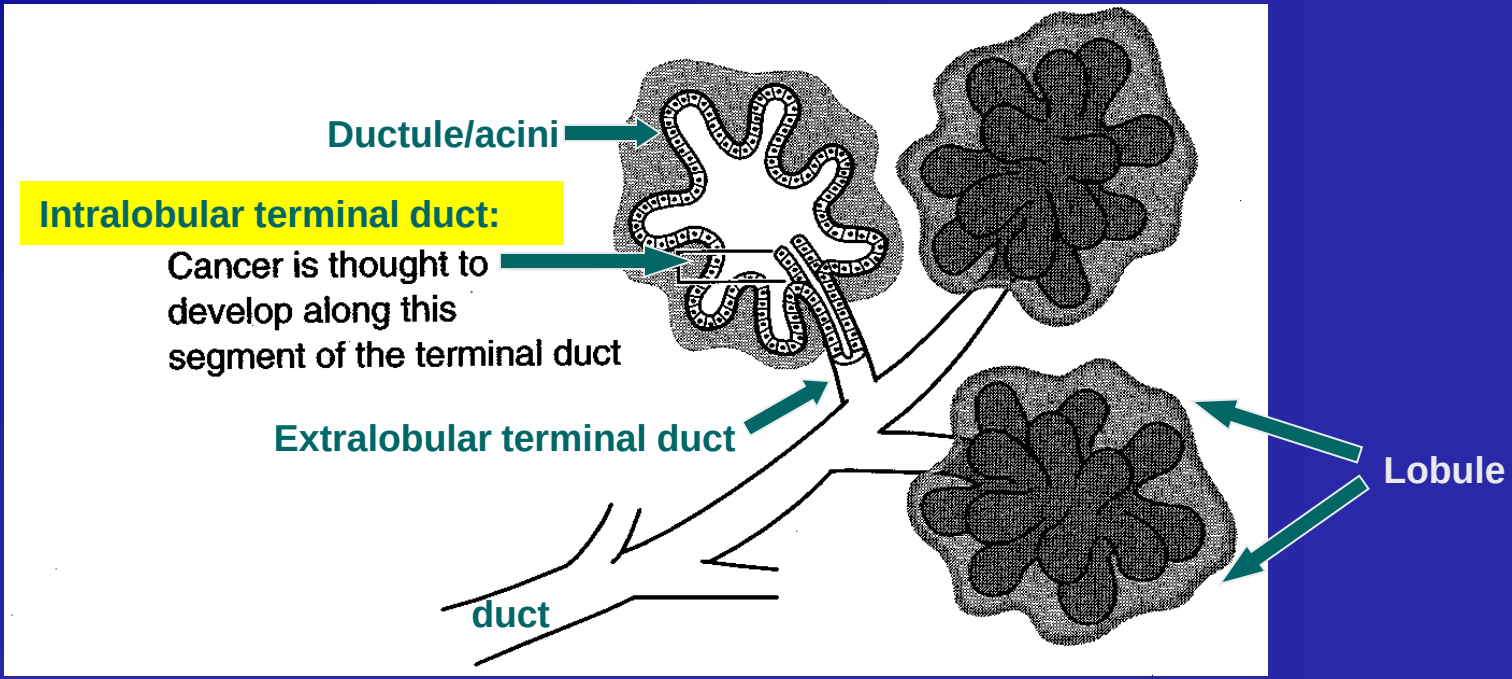

Duct system
(inactive)
Adipose tissue
Lactiferous
sinus
Lactiferous
duct
Terminal
interlobular duct
Muscles
and ribs
Lobule
It is postulated that most cancers arise in the interlobular duct unit, either inside or just proximal to the lobule. There are two main categories of breast cancer: ductal carcinoma and lobular carcinoma.

Where in the breast does cancer develop?



Netter, F. Atlas of Human Anatomy: Second Edition. ICON: Teterboro, NJ. 1997

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.

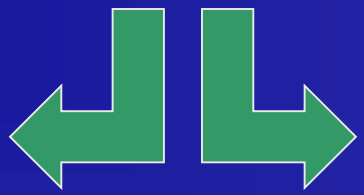
Kopans, D. Breast Imaging: Second Edition. Lippincott-Raven: Philadelphia. 1998

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



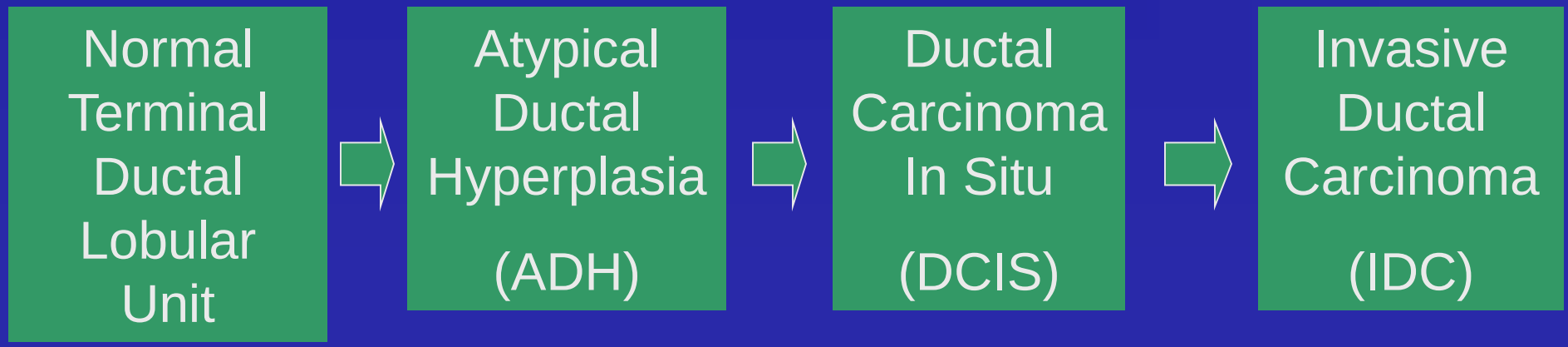
INVASIVE

Tumor cells invade the breast stroma.

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

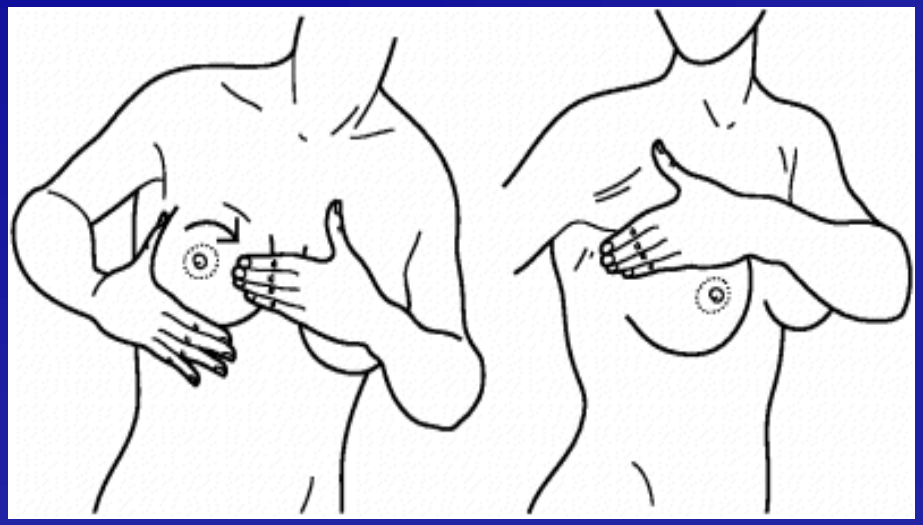
Ductal cancer evolves over time.

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

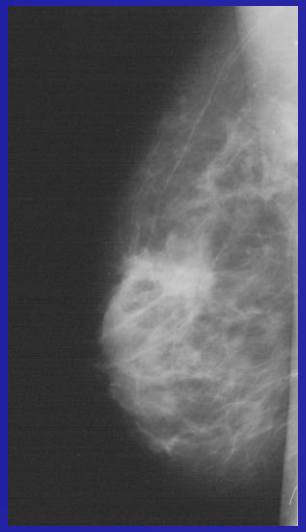


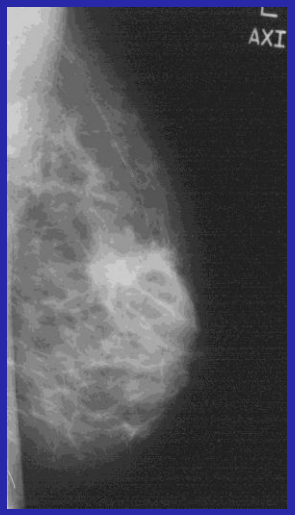
The Four Pillars of Diagnosis

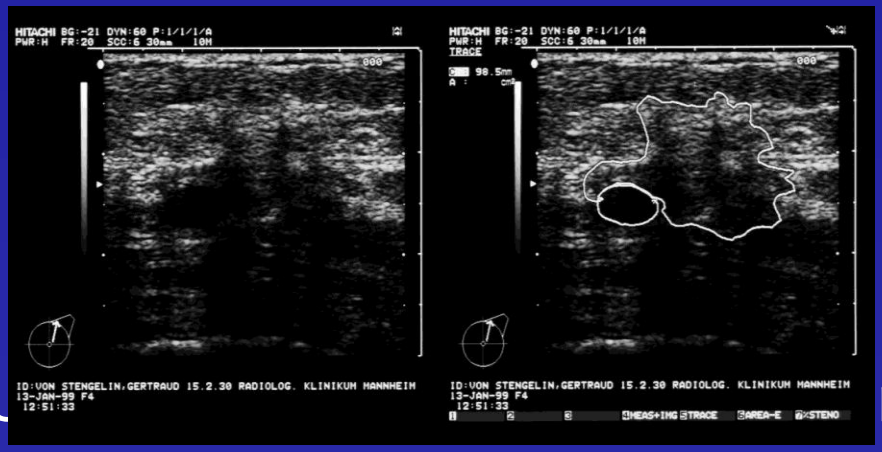
Clinical or Self Examination (PE)

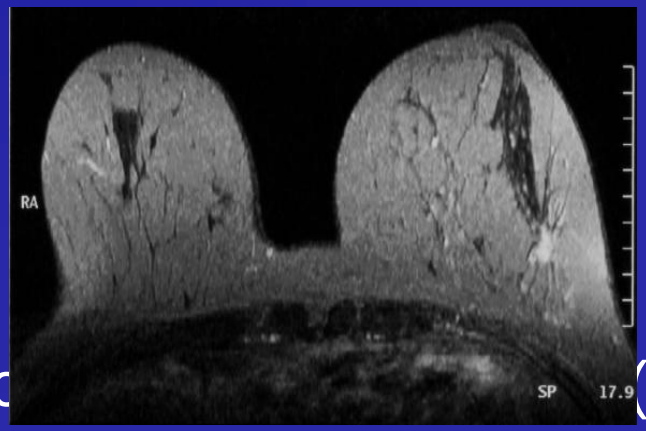


Mammography (MG)









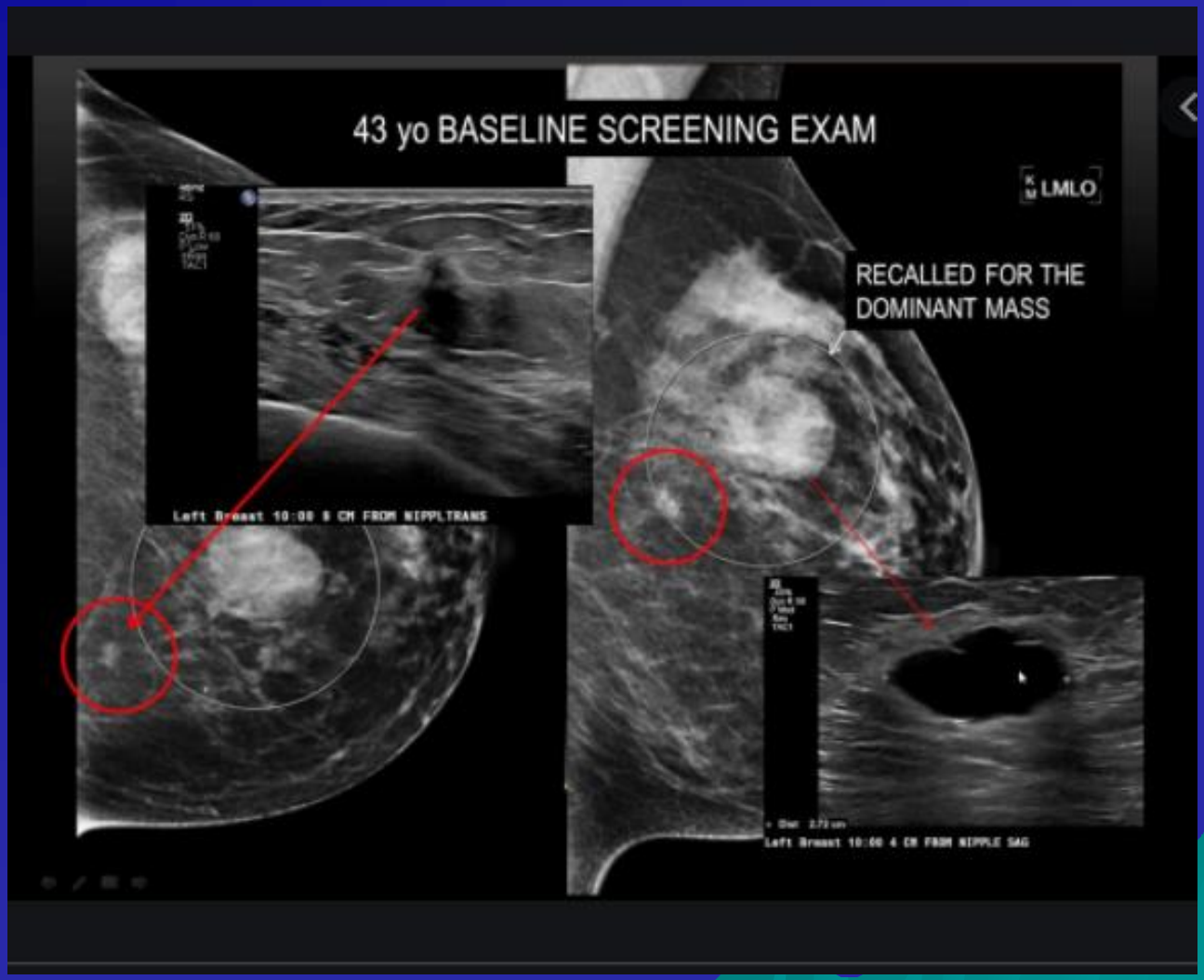
U netic (MRI)

Dictation

Mice

Keyboards

Compared modalities/images

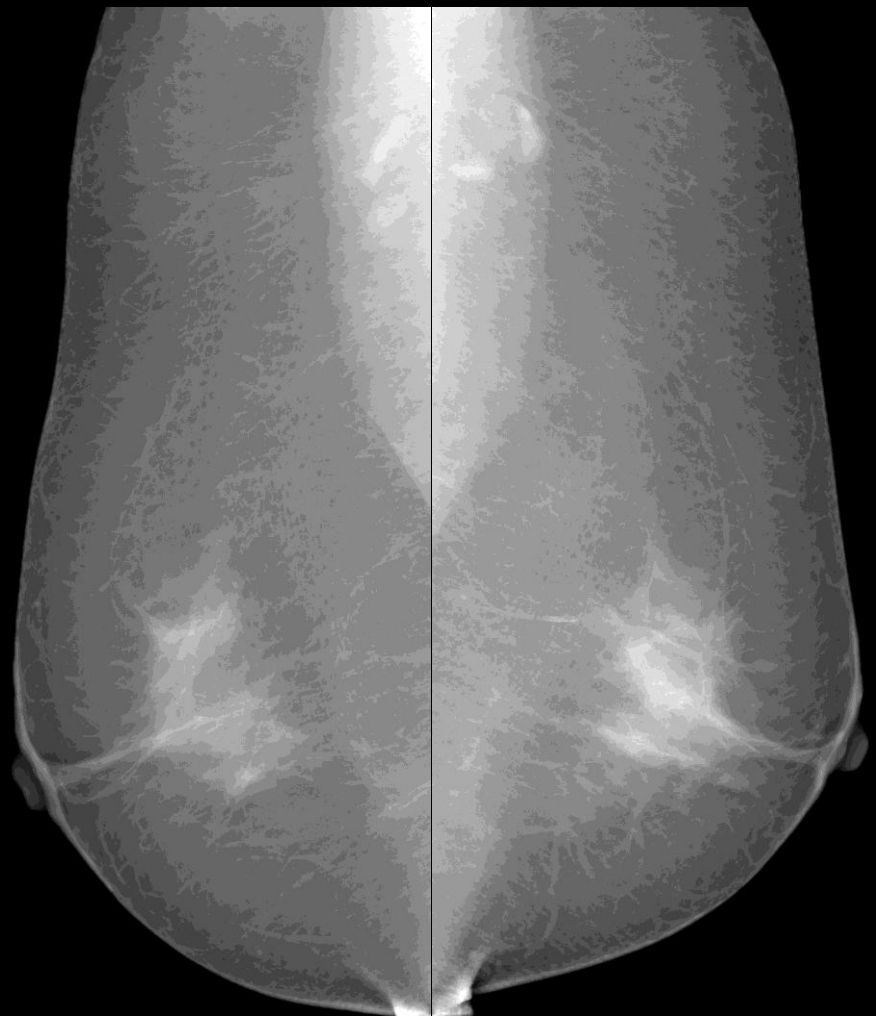


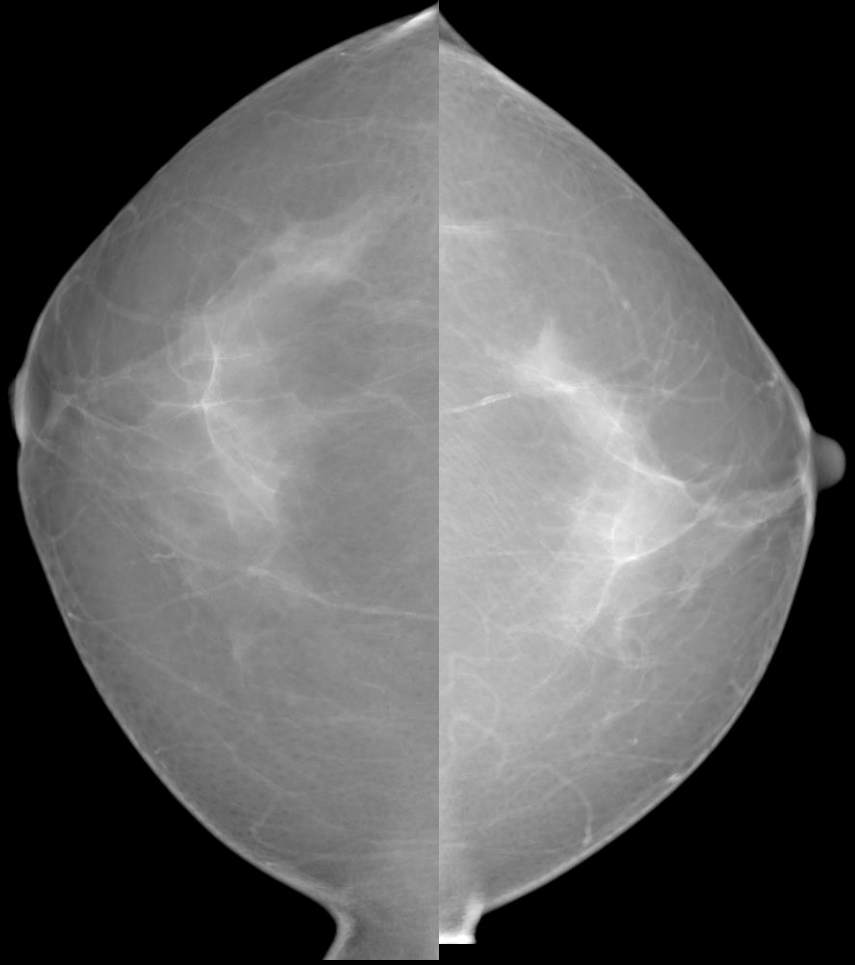
Menu of Tests

- Mammography:

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

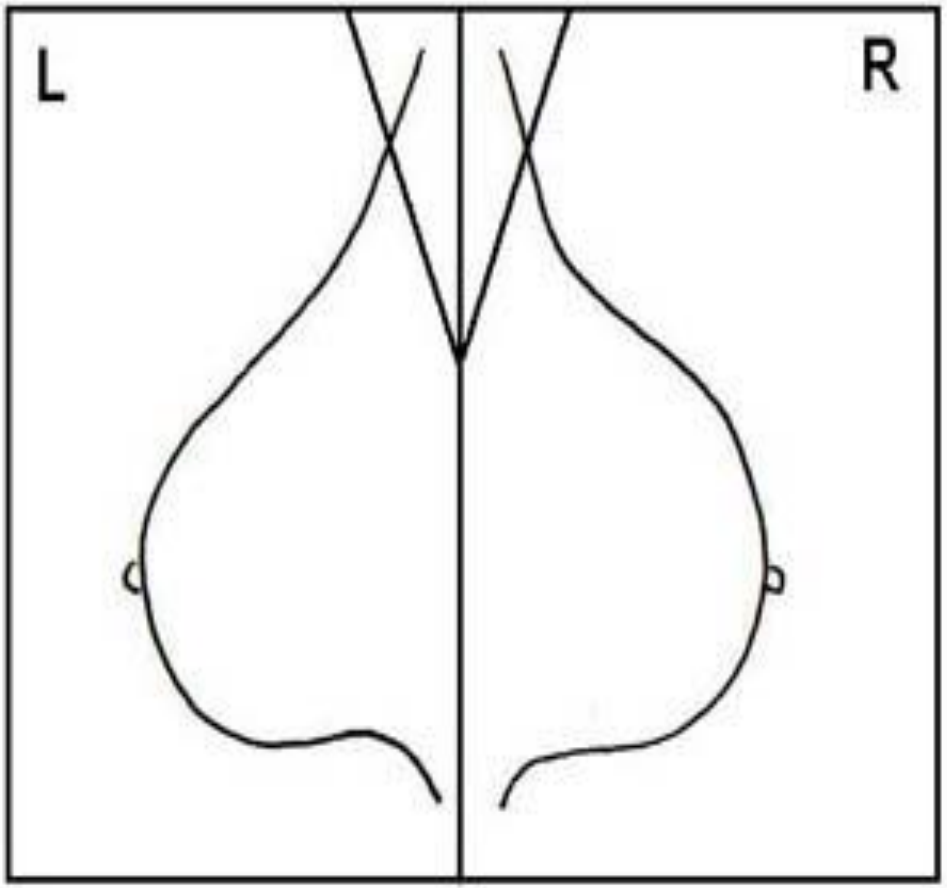
MLO

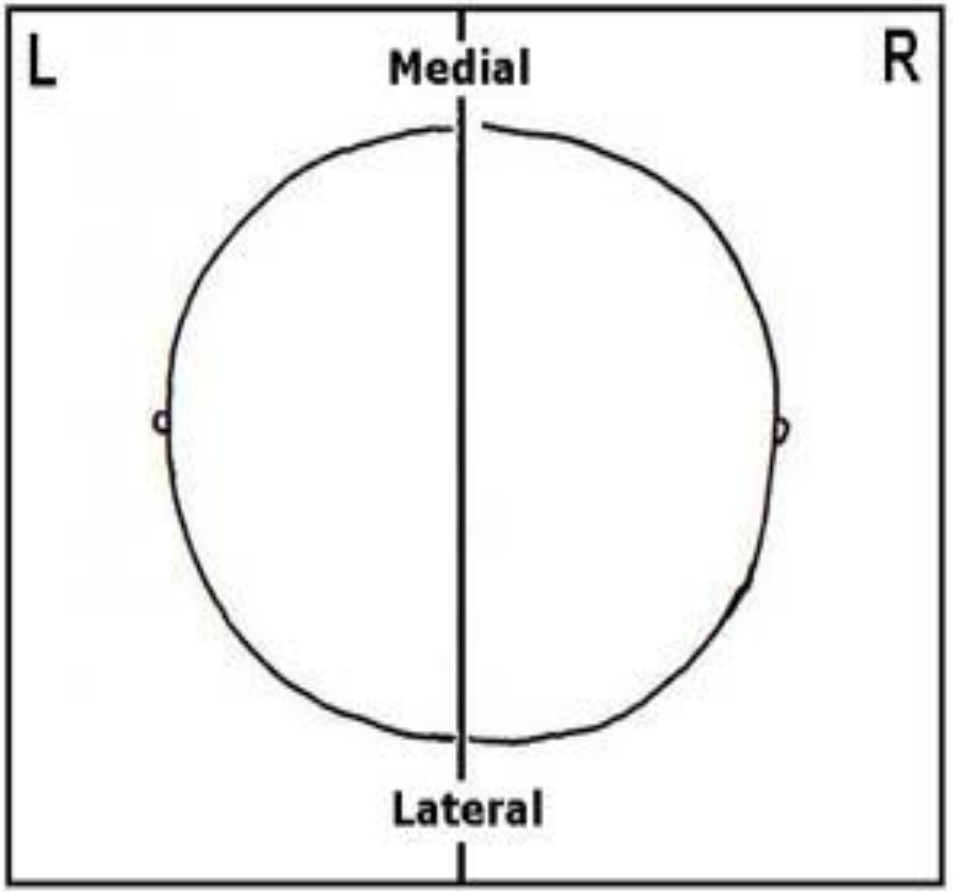




CC

Viewing method

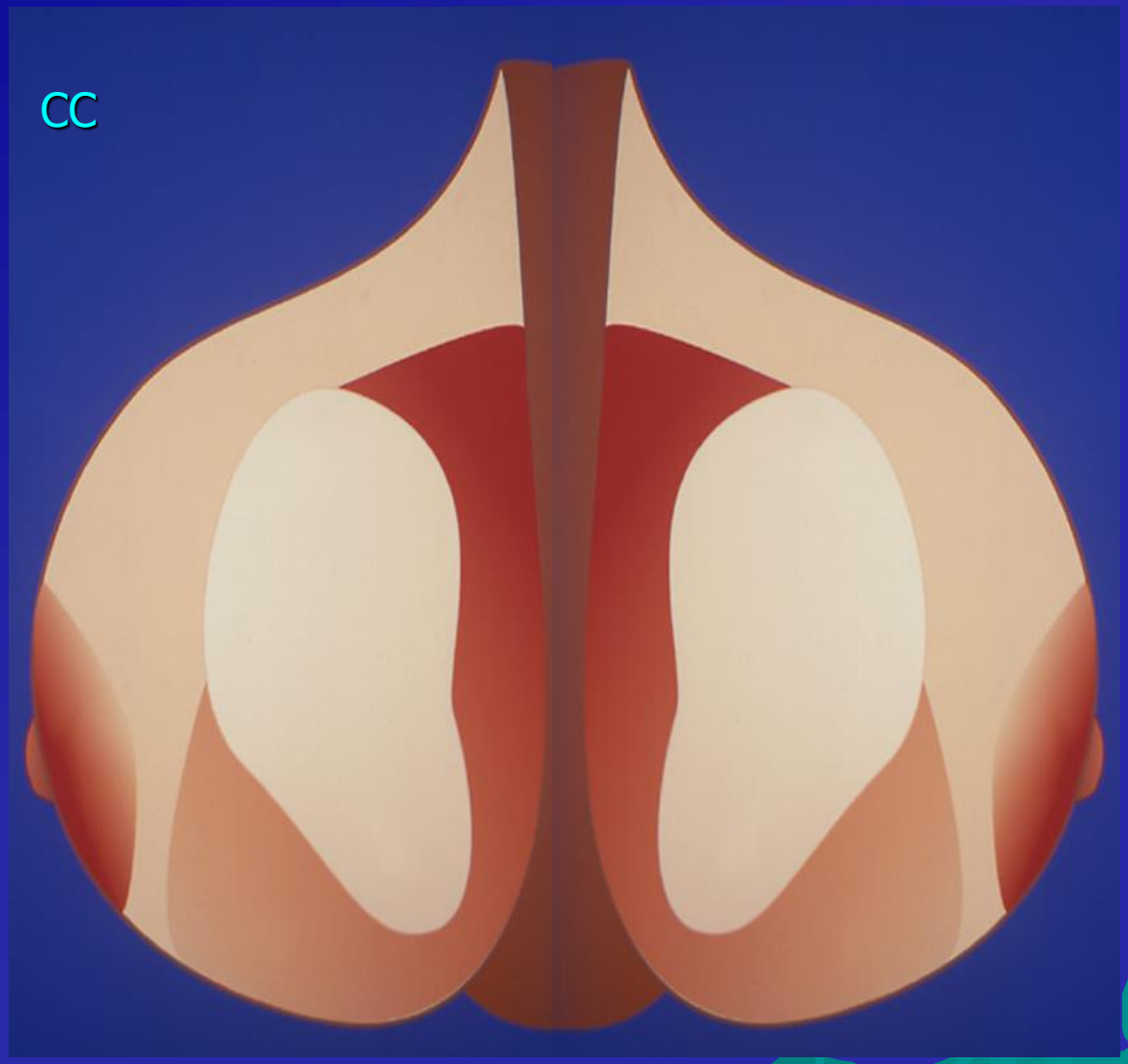




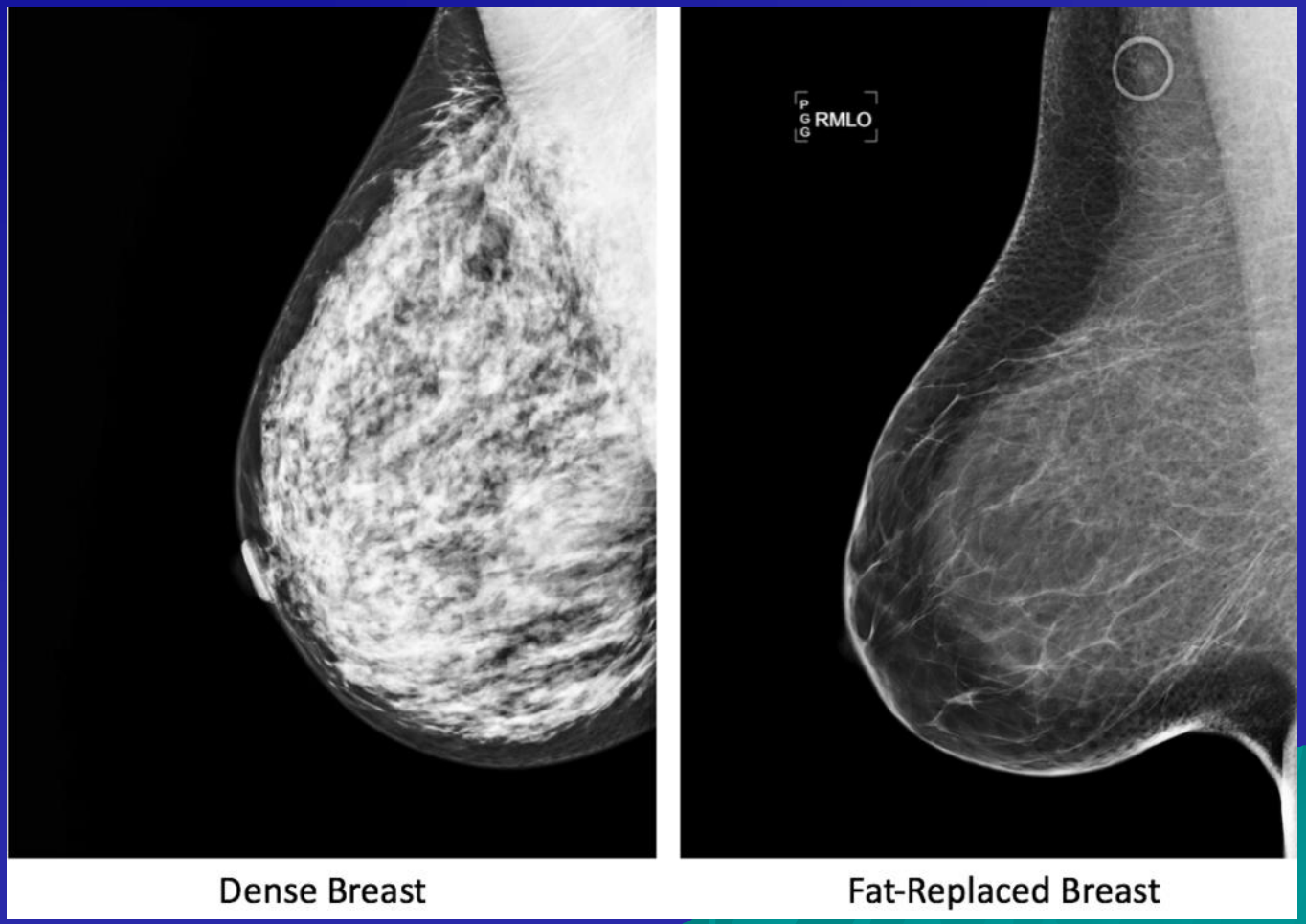
Mediolat.obliques **cranio-caudal views**

Review Areas

Review Areas

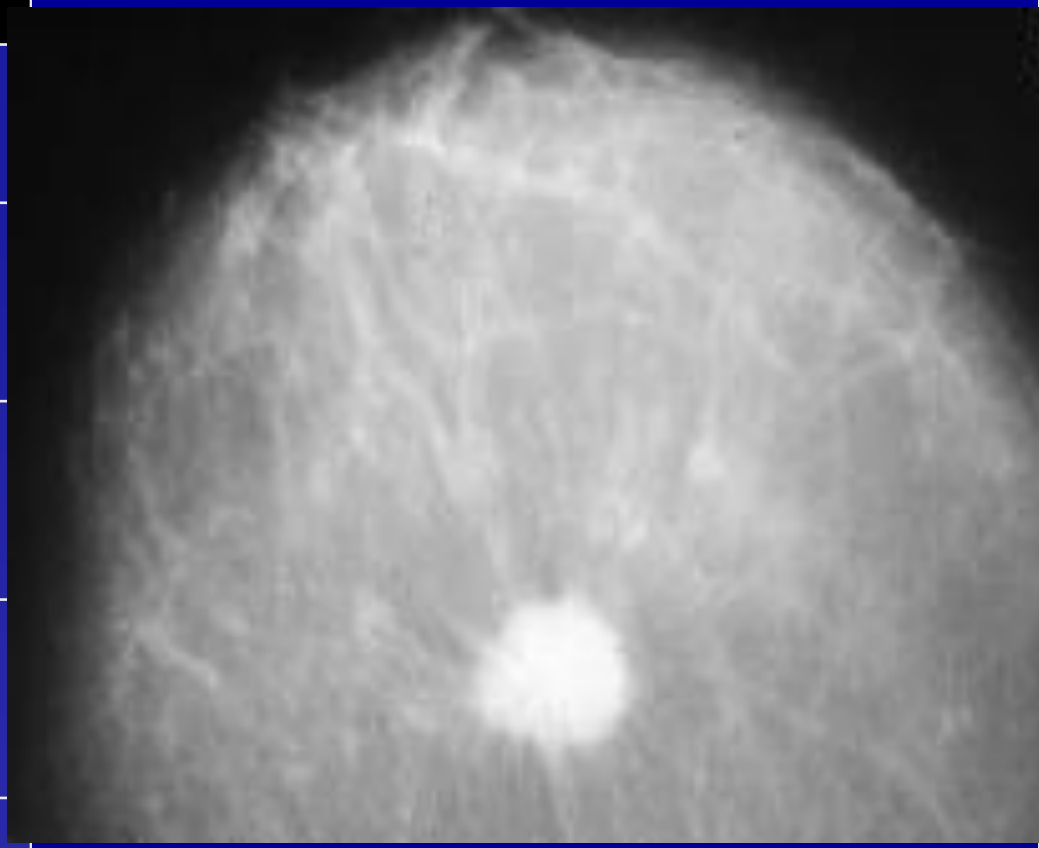


Dense breasts needs
1-extra-images
2-extra-modality

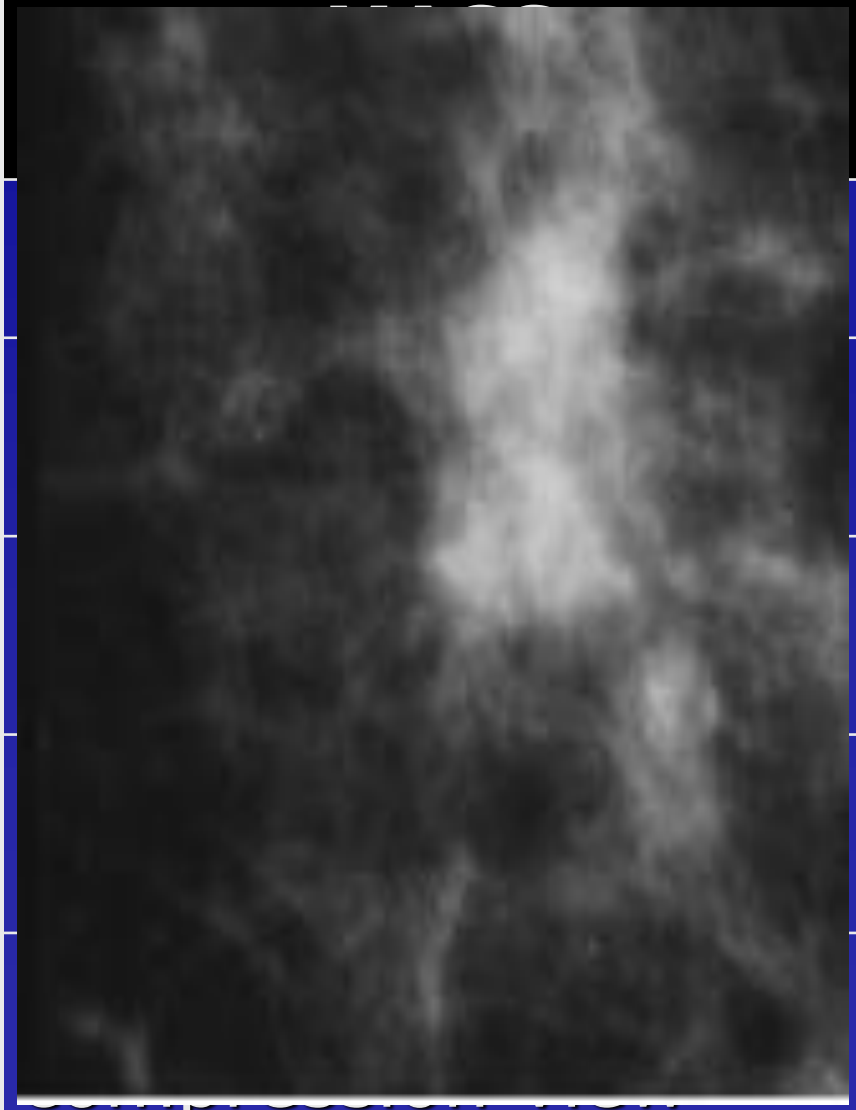


FIRST Decide if there is a mass (compare both breasts)

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)

	ASSYM.DENSITY
	Ill-defined or irregular
	Amorphous
	No
	No
	Tissues spread over it.

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 ***(very dense breast)***
- 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
- Microlobulation

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

Example of benign fibroadenoma on ultrasound

Thin echogenic capsule

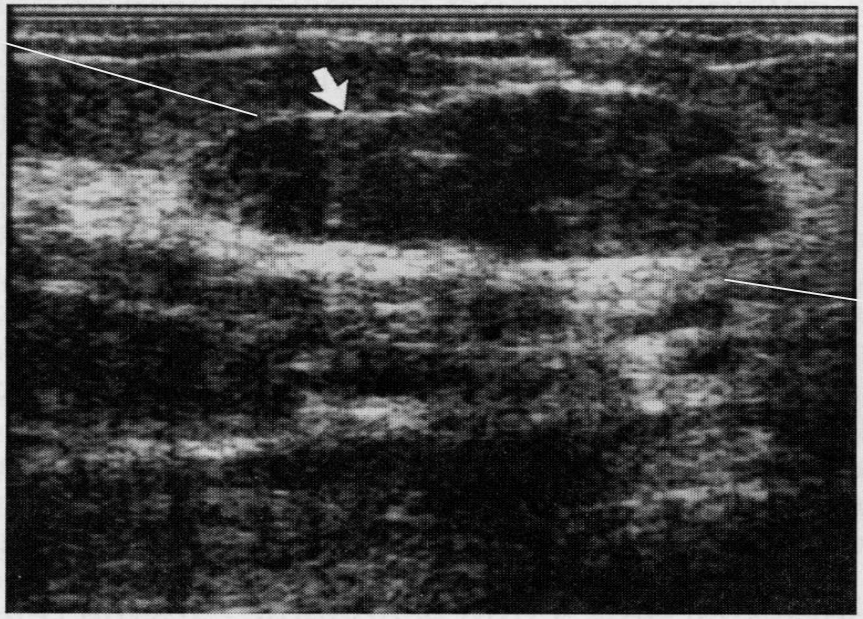


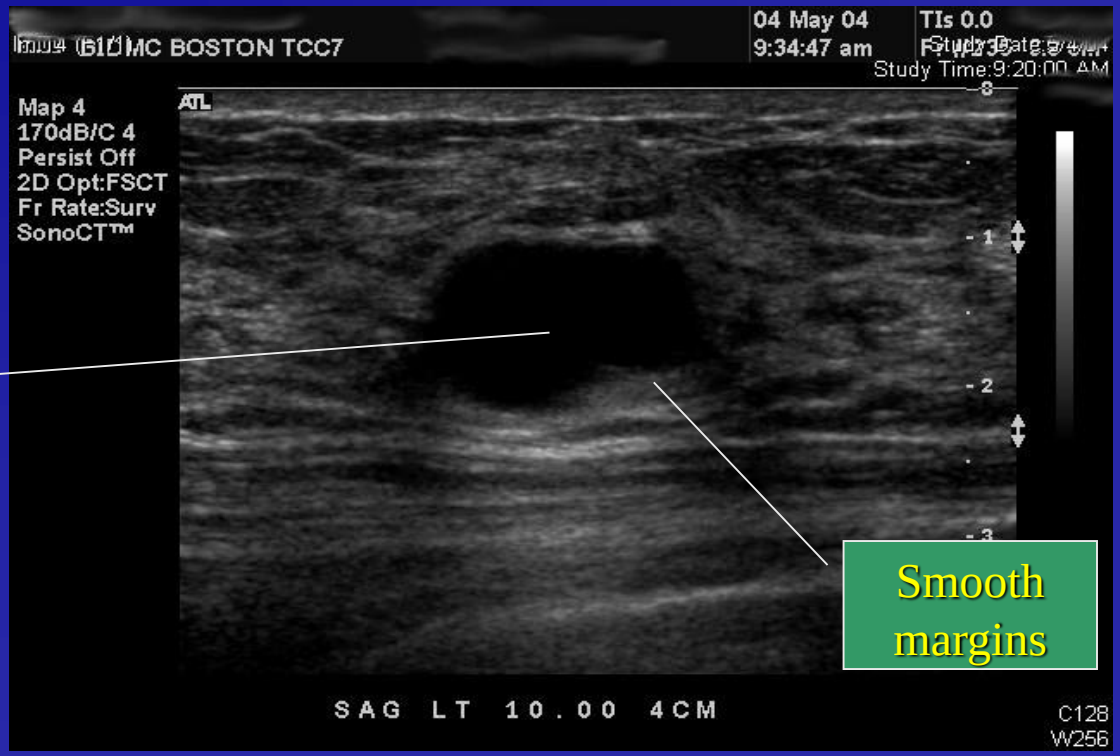
Figure 3. Fibroadenoma showing an echogenic pseudocapsule *(arrow)*.

Most common benign solid mass of the breast

Ellipsoid shape (wider than tall)

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

Example of simple cyst on breast ultrasound



Anechoic
Jet black

Smooth
margins

MRI breast

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

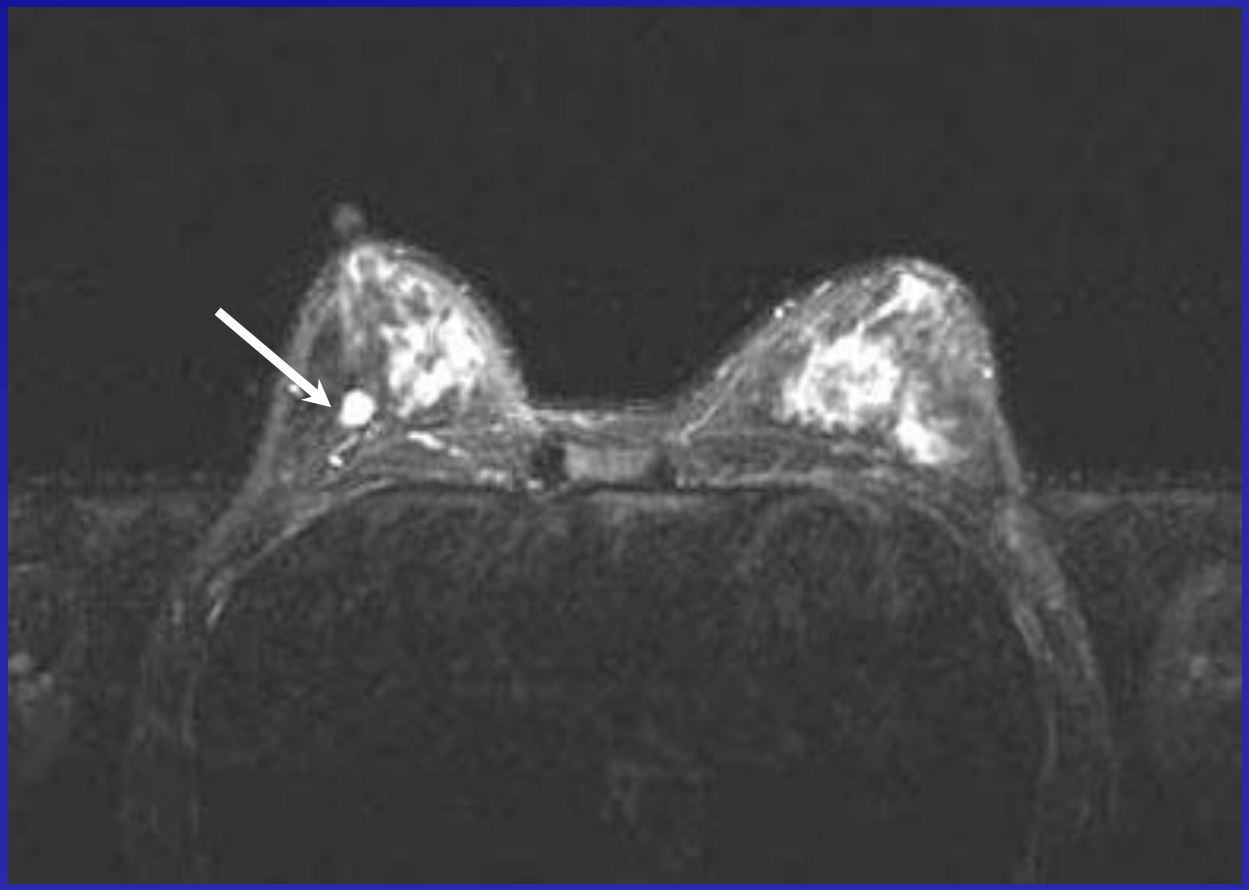
- a higher signal-to-noise-ratio
- shorter acquisition time
- better separation of fat and water peaks
- better contrast characteristics

(T1 time increase)

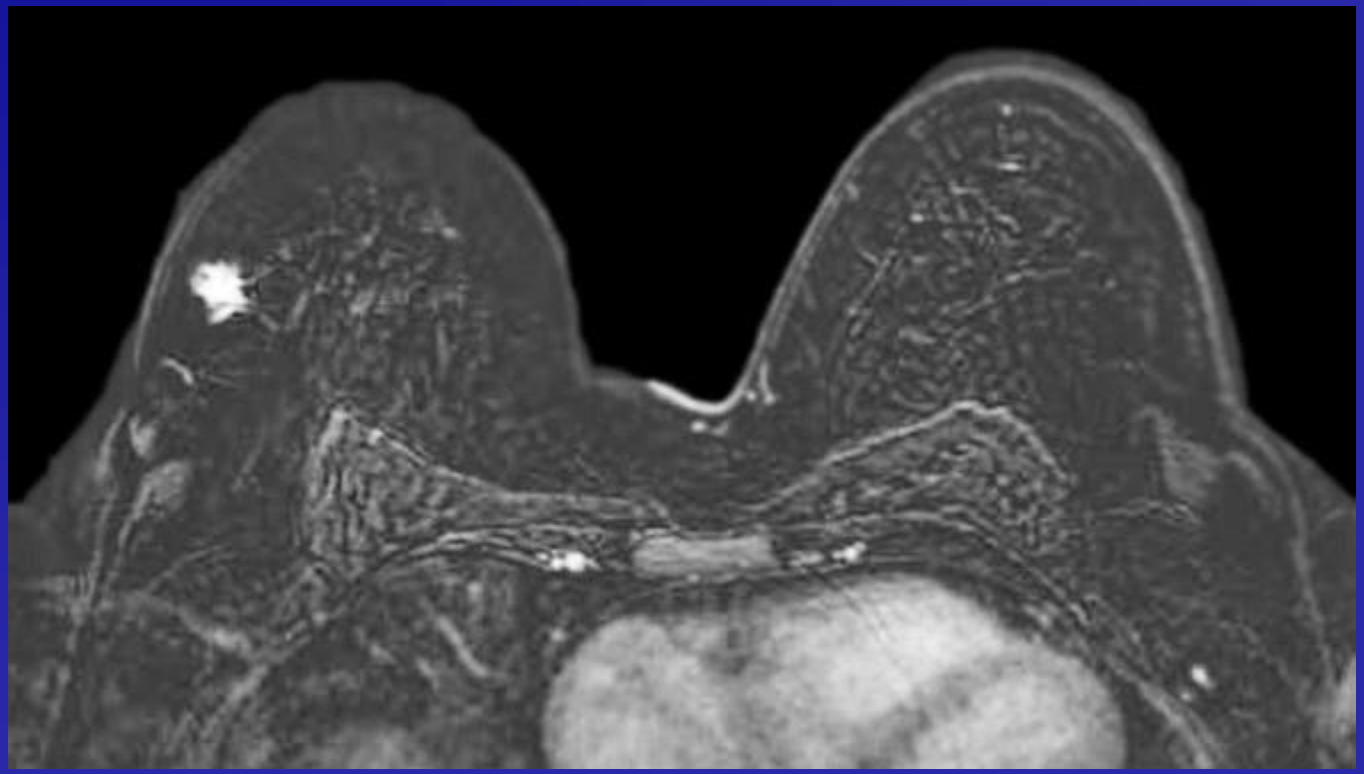
Contra-indicated in
Claustrophobia
Cardiac pacemaker or any metal prothesis

Static Imaging

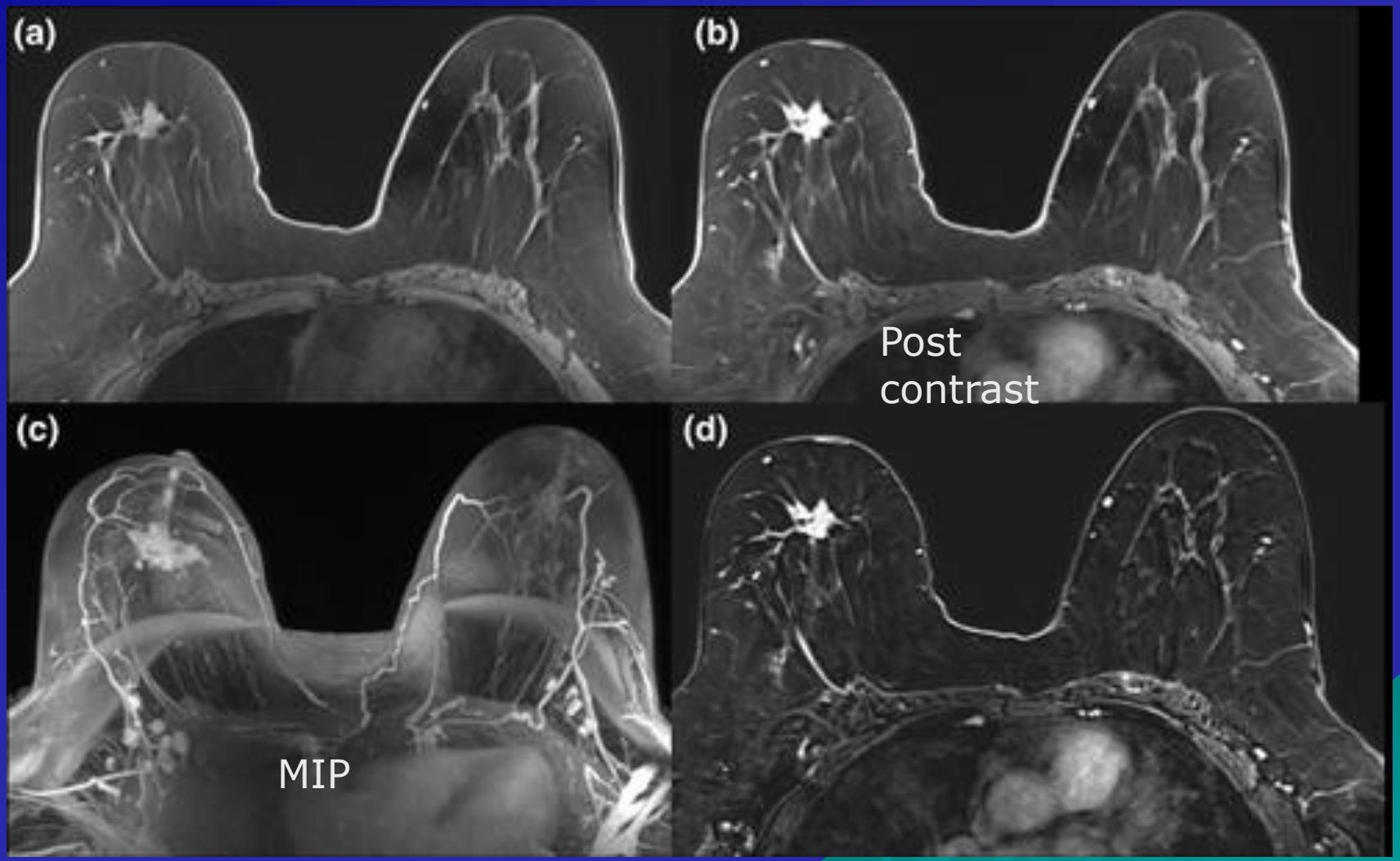
STIR (Short tau inversion recovery)



Subtraction images in mri

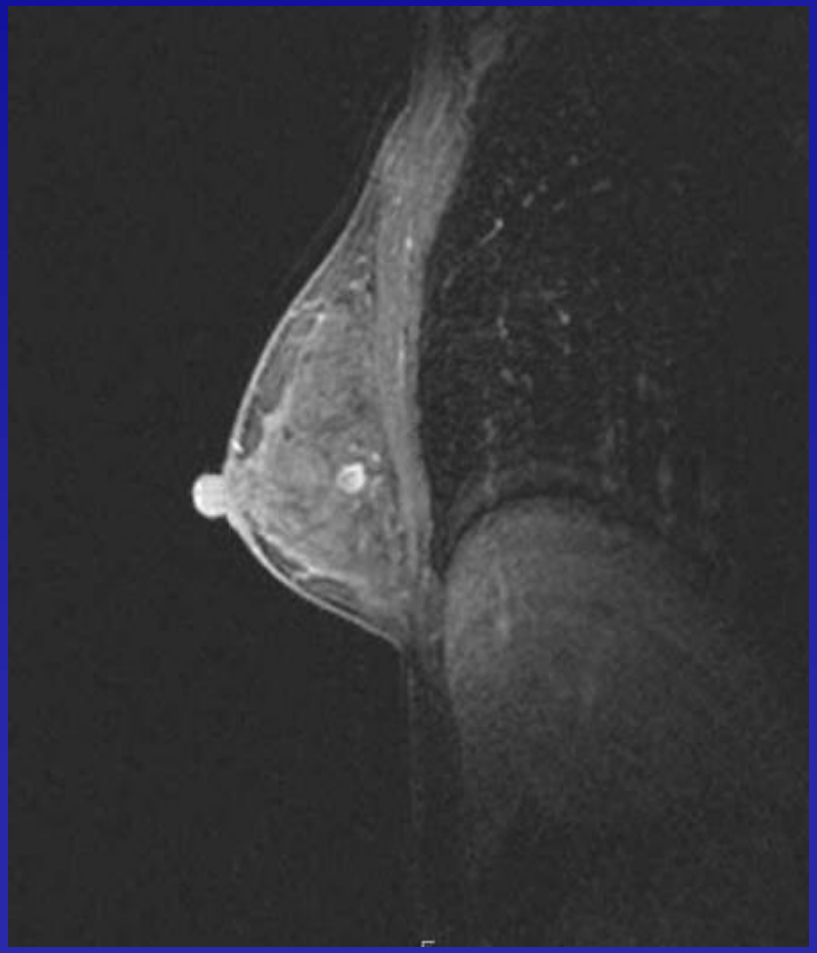


Different phases and post processing



High resolution Imaging

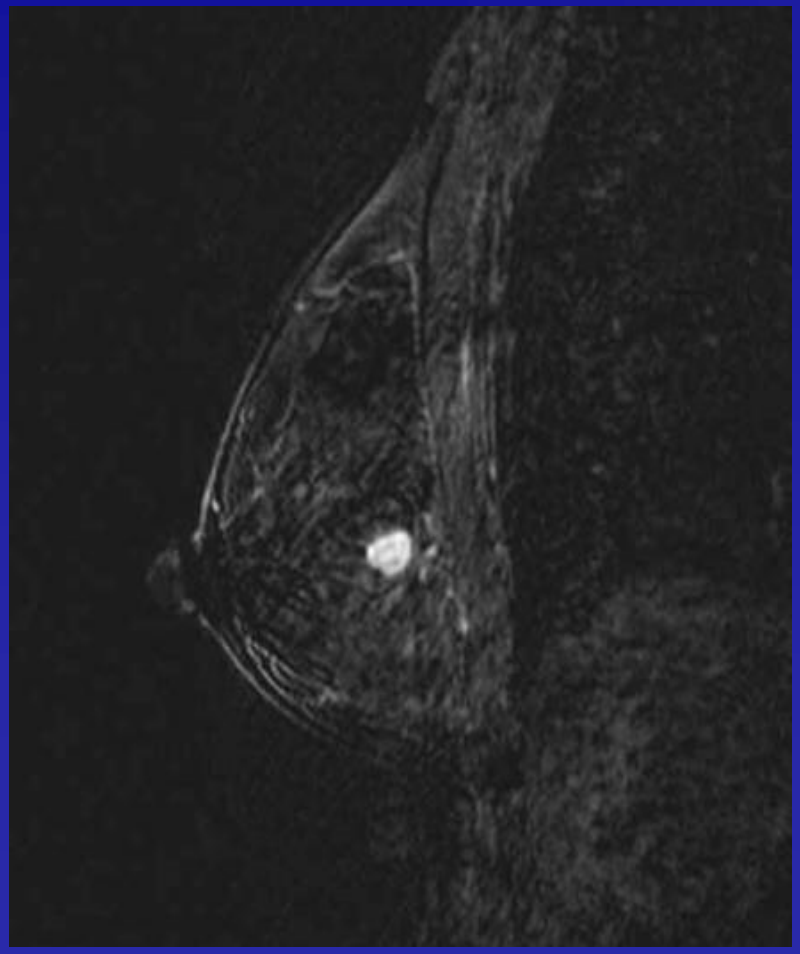
Flash 3D Vibe



Flash 3D HR

Dynamic Imaging

Post contrast with fat-supression.



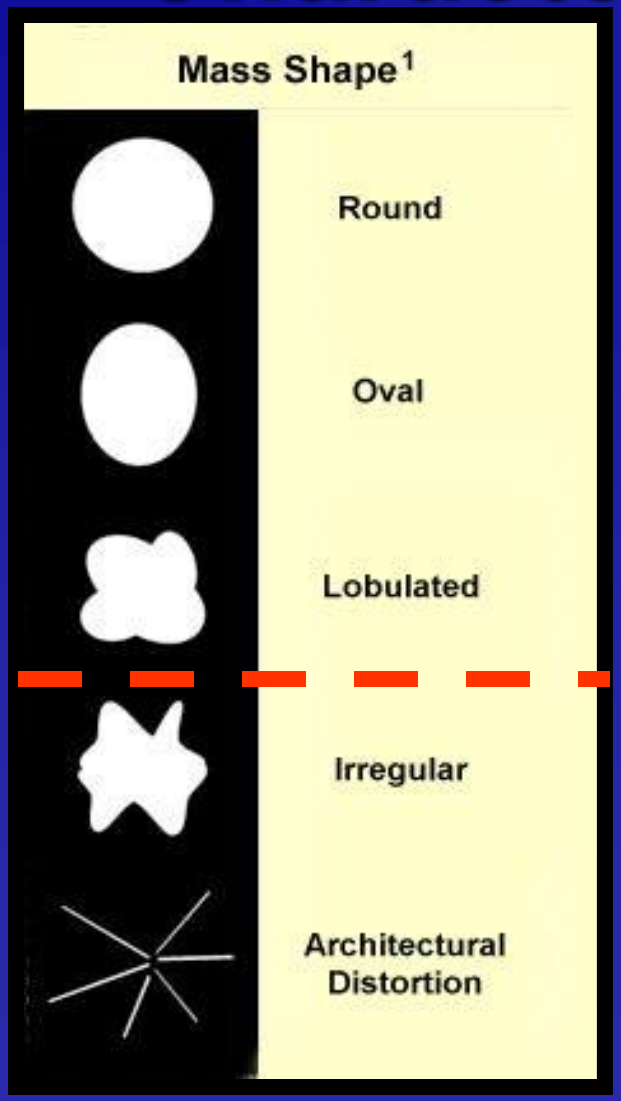
Flash 3D HR

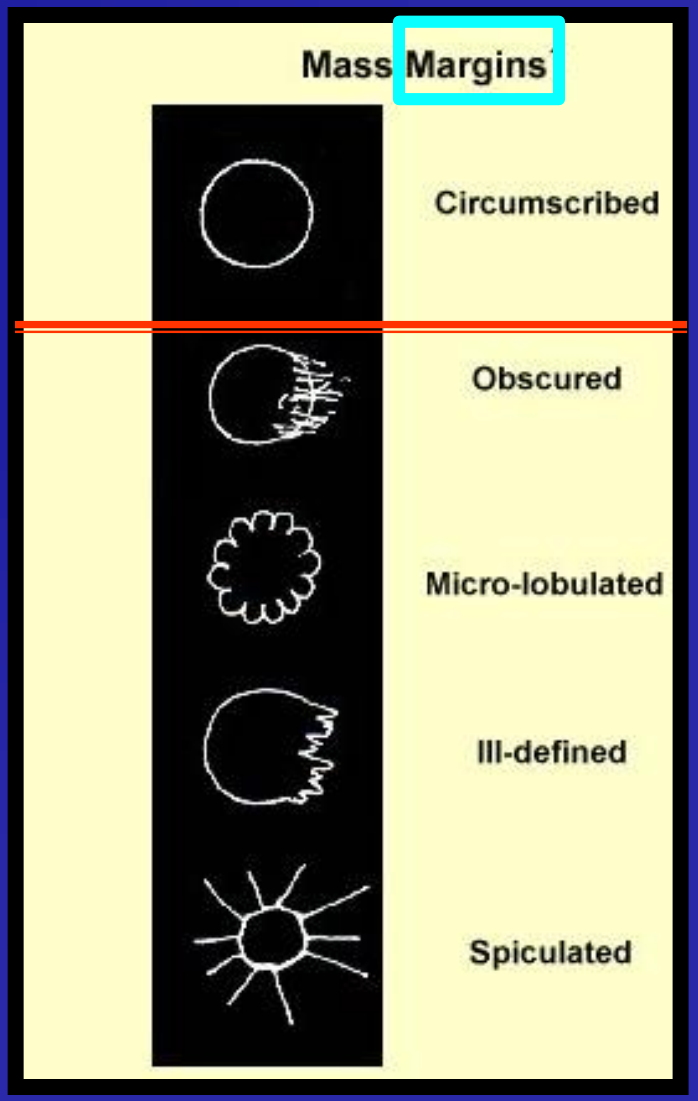
IN THE search of MALIGNANCY

1- mass--→ characters

2- calcification--→ characters

MASS
Characters of masses



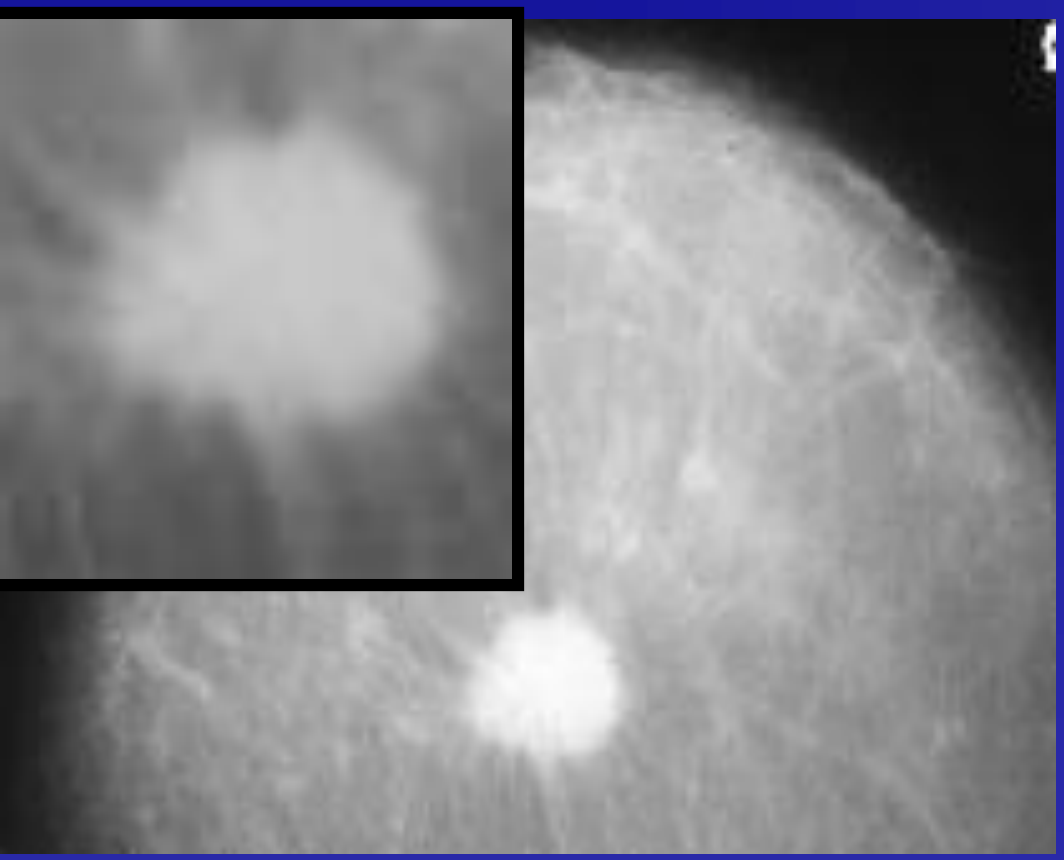


Margins

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

Compression /magnification views

Margins (cont.)



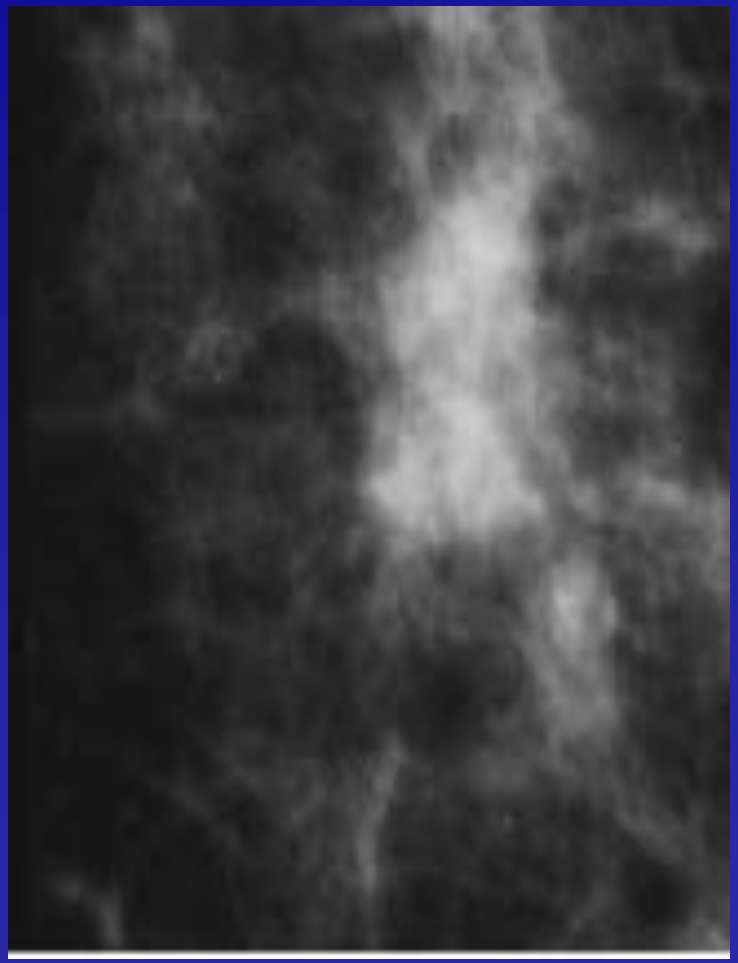
1-Spiculated

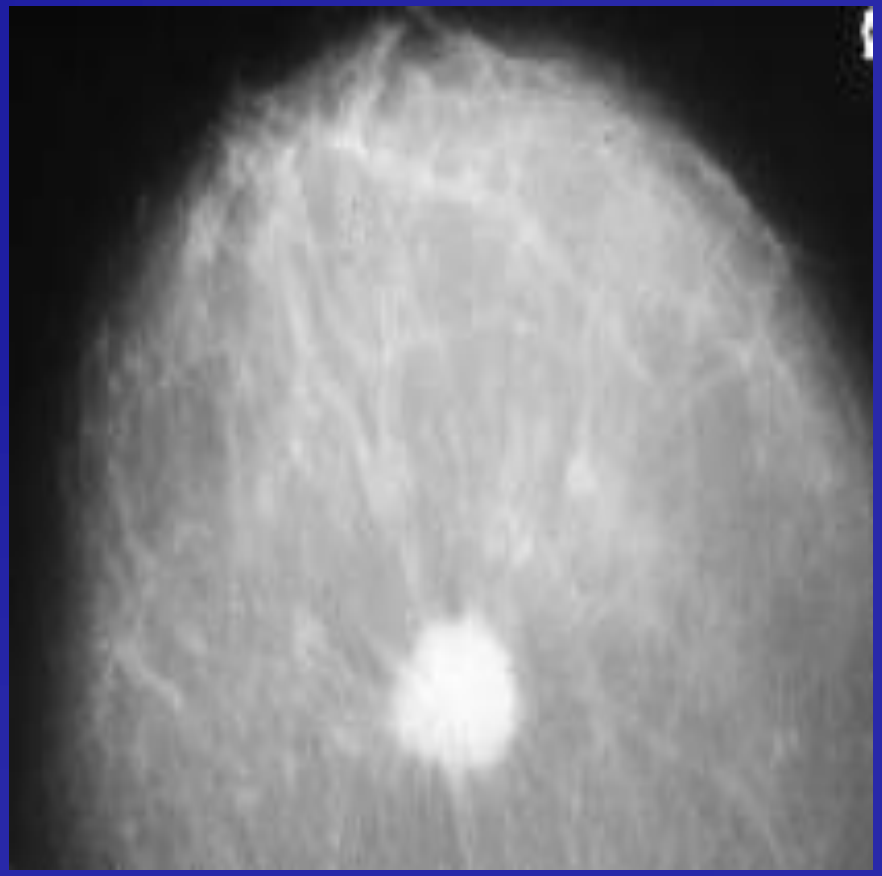
Classical carcinoma.

More common in :

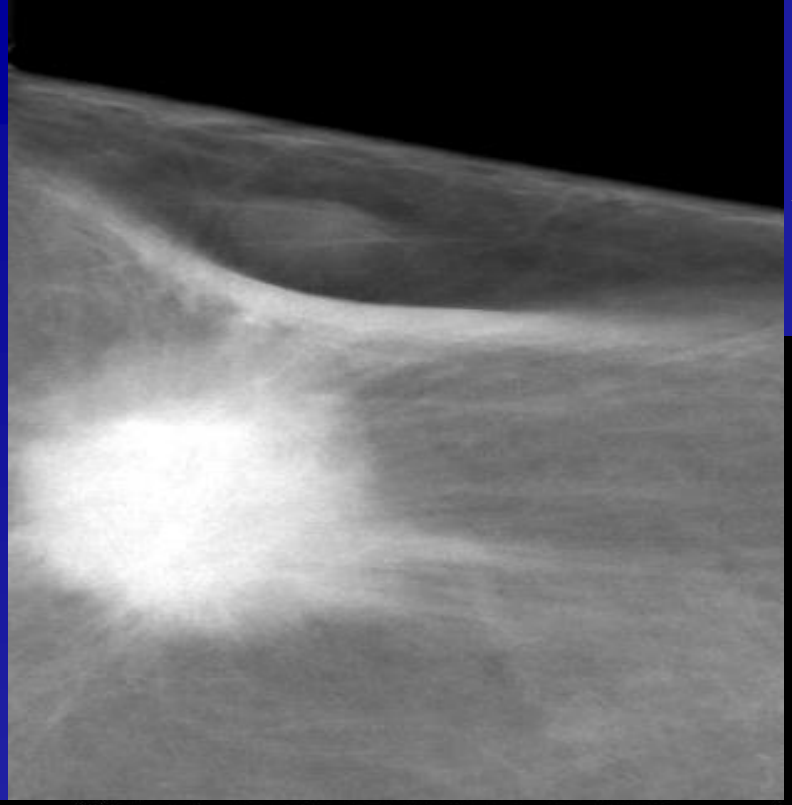
invasive>tubular >lobular.

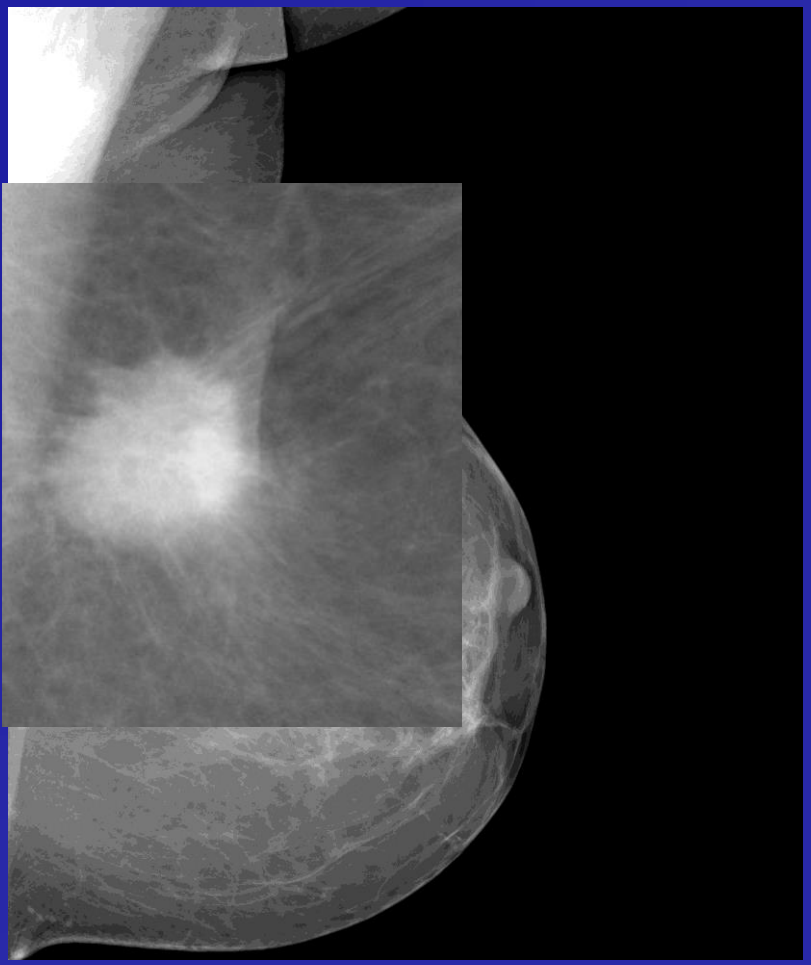
Spiculated mass
Invasive ductal ca





Spiculated margins





Spiculated Margins (cont.)

- DD :

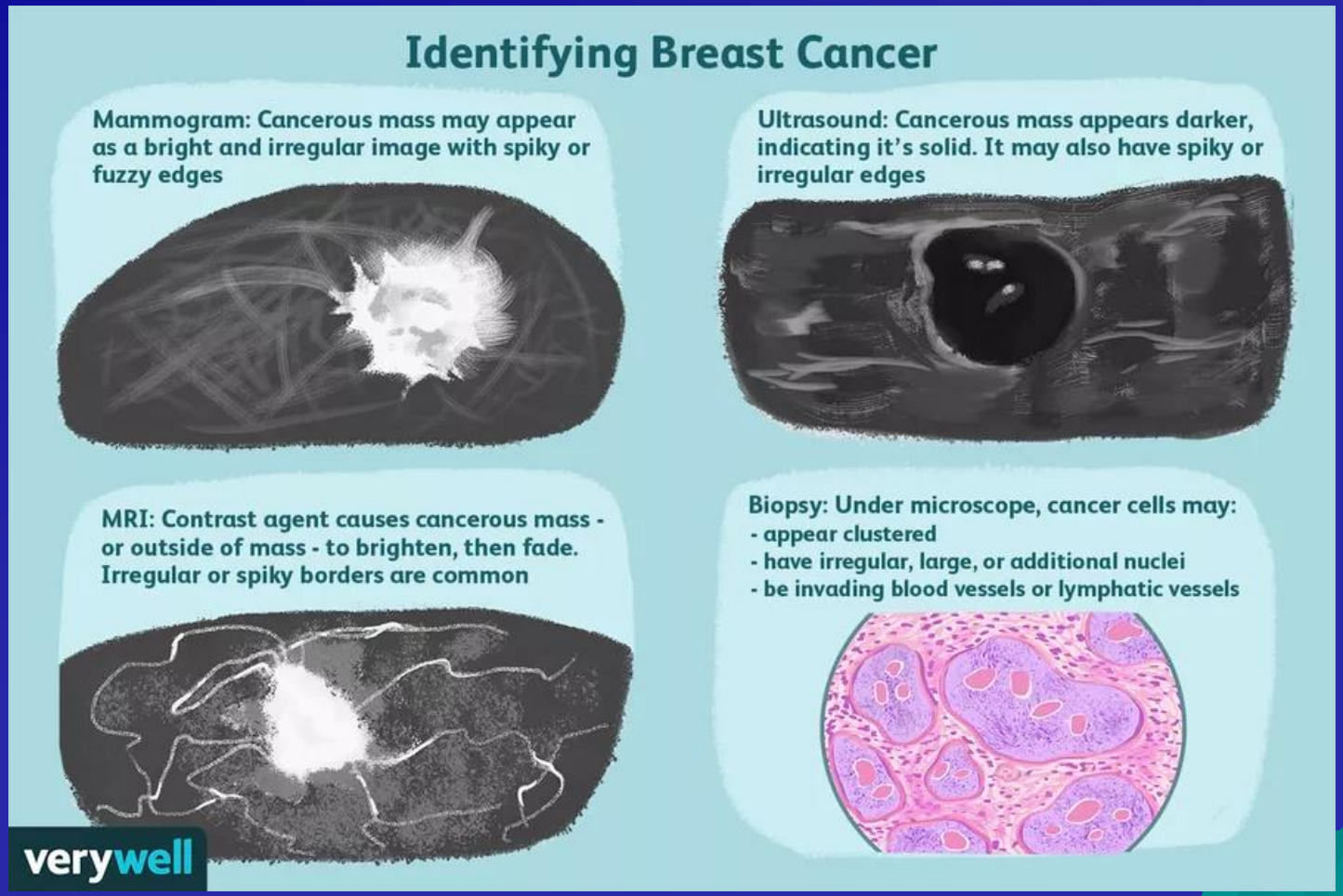
FAT necrosis (previous surgical biopsy)

SCARS (previous surgery)

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

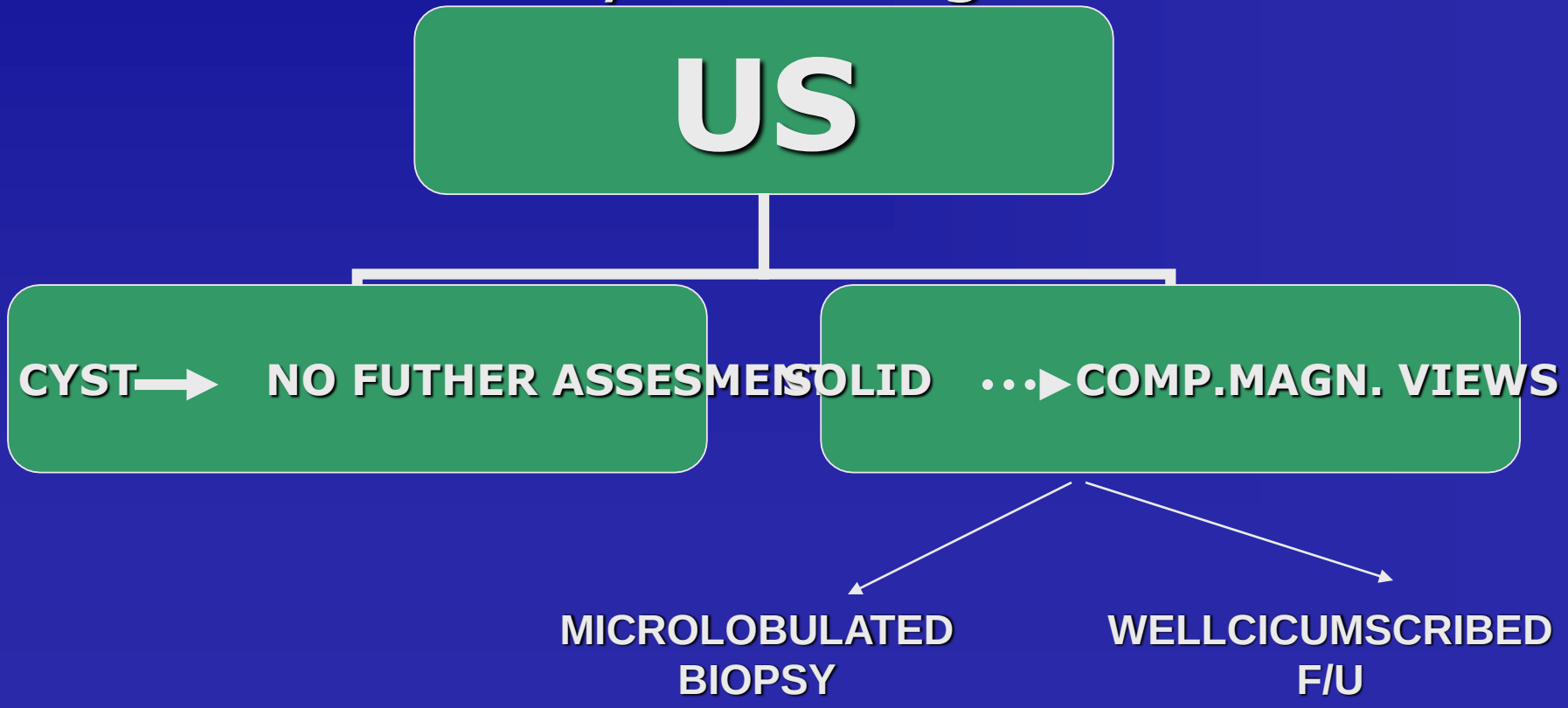
RADIAL SCAR (complex sclerosing lesions)

MASS ca

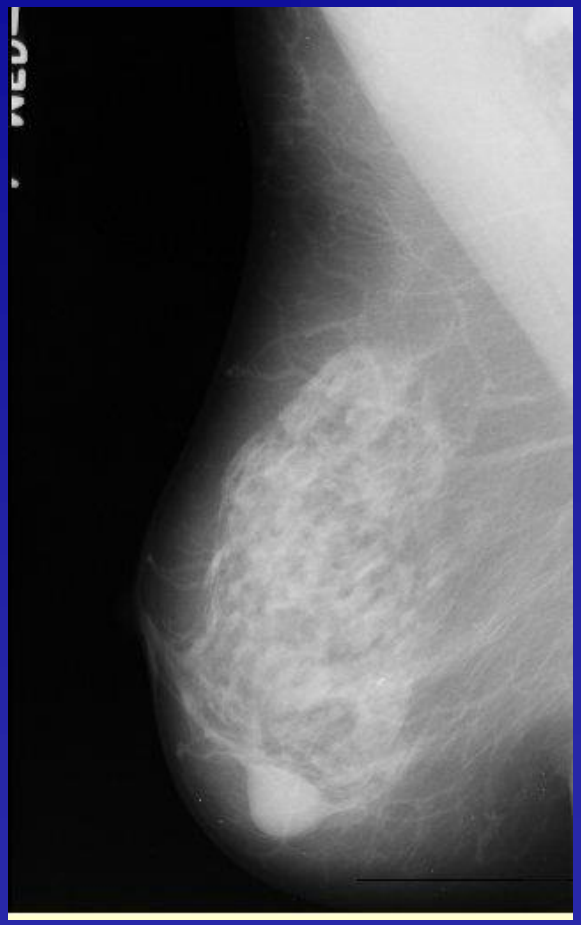

Identifying Breast Cancer
Mammogram: Cancerous mass may appear as a bright and irregular image with spiky or fuzzy edges
Ultrasound: Cancerous mass appears darker, indicating it's solid. It may also have spiky or irregular edges
MRI: Contrast agent causes cancerous mass - or outside of mass - to brighten, then fade. Irregular or spiky borders are common
Biopsy: Under microscope, cancer cells may:
- appear clustered
- have irregular, large, or additional nuclei
- be invading blood vessels or lymphatic vessels
verywell

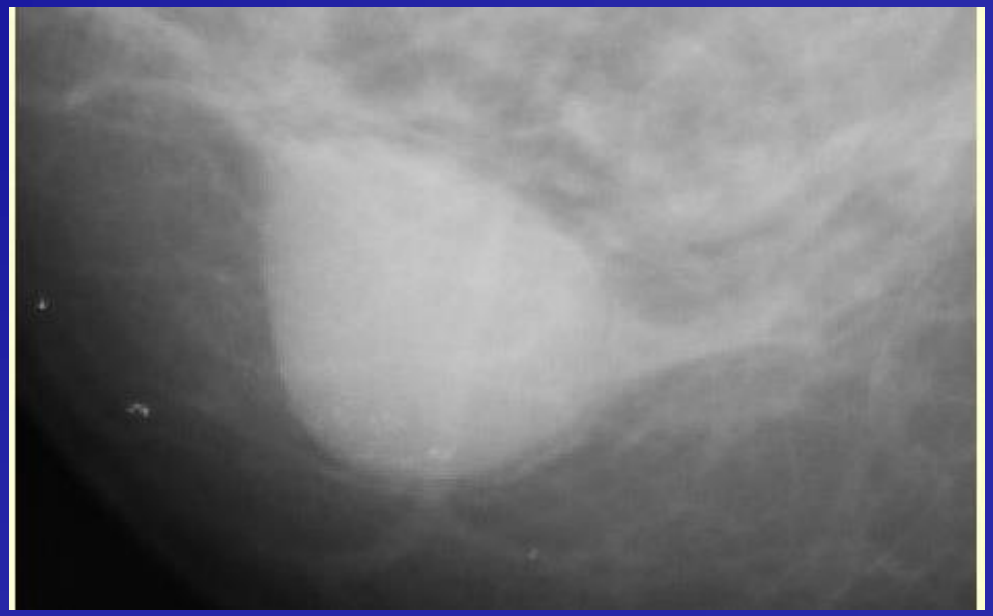
3-Well-circumscribed (well-defined) margins

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

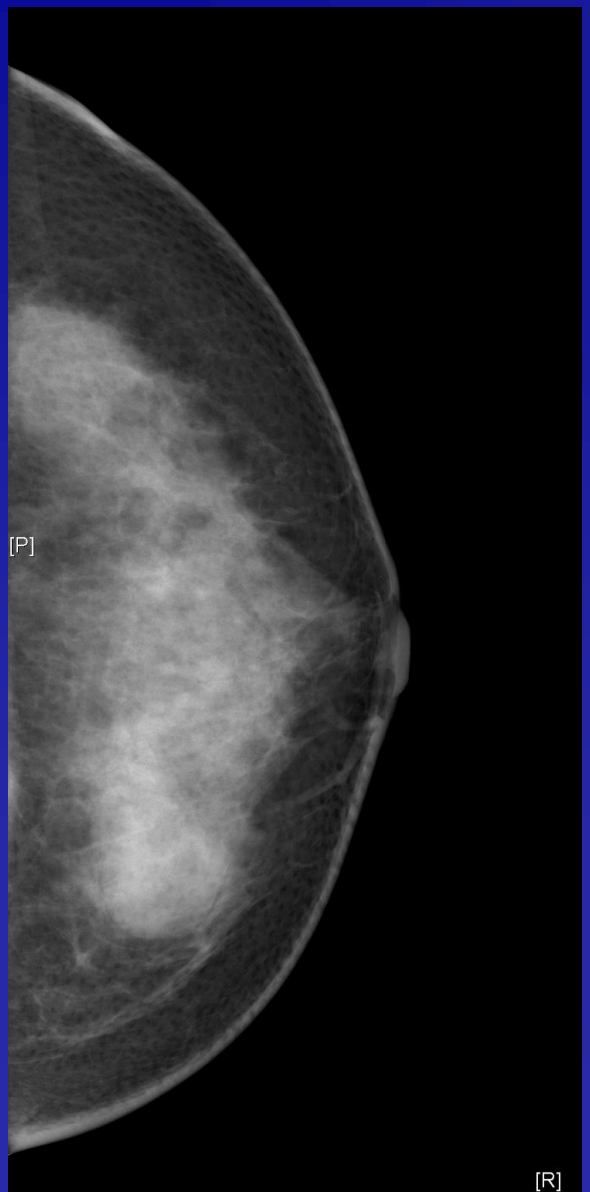


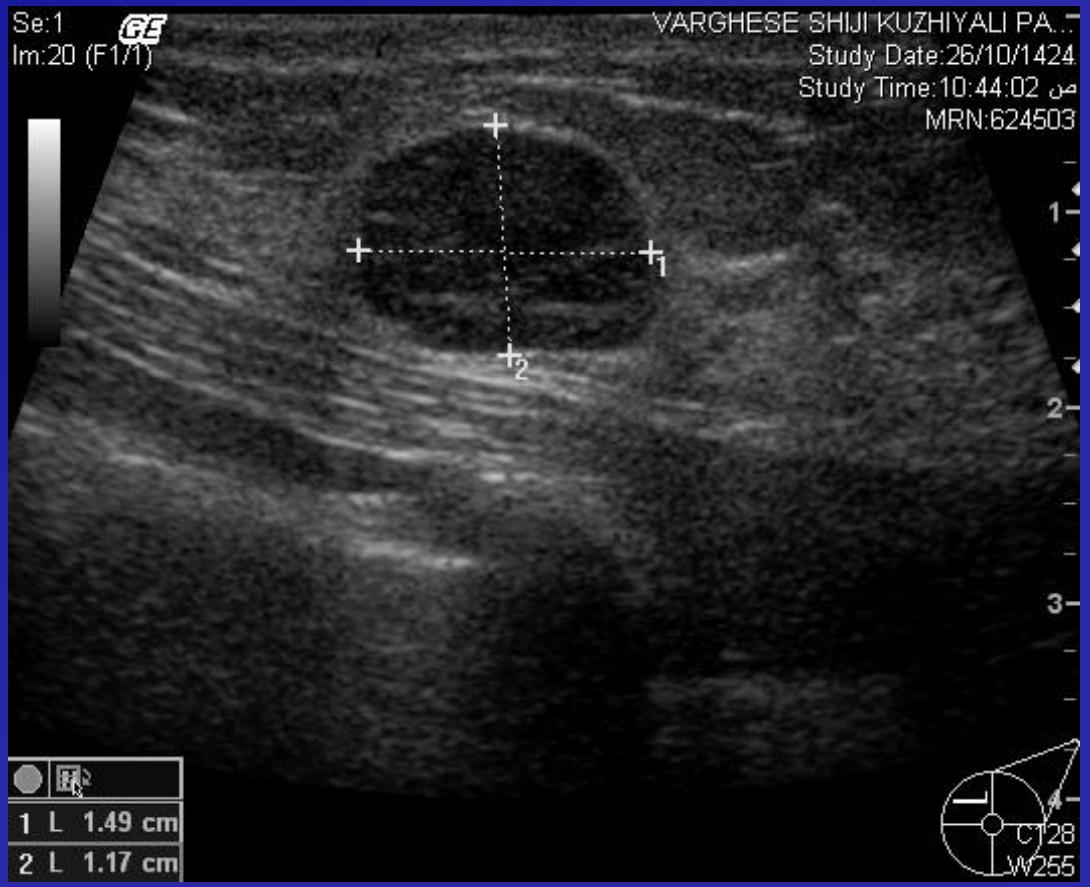
EXAMPLE
OVAL WELL-CIRCUMSCRIBED



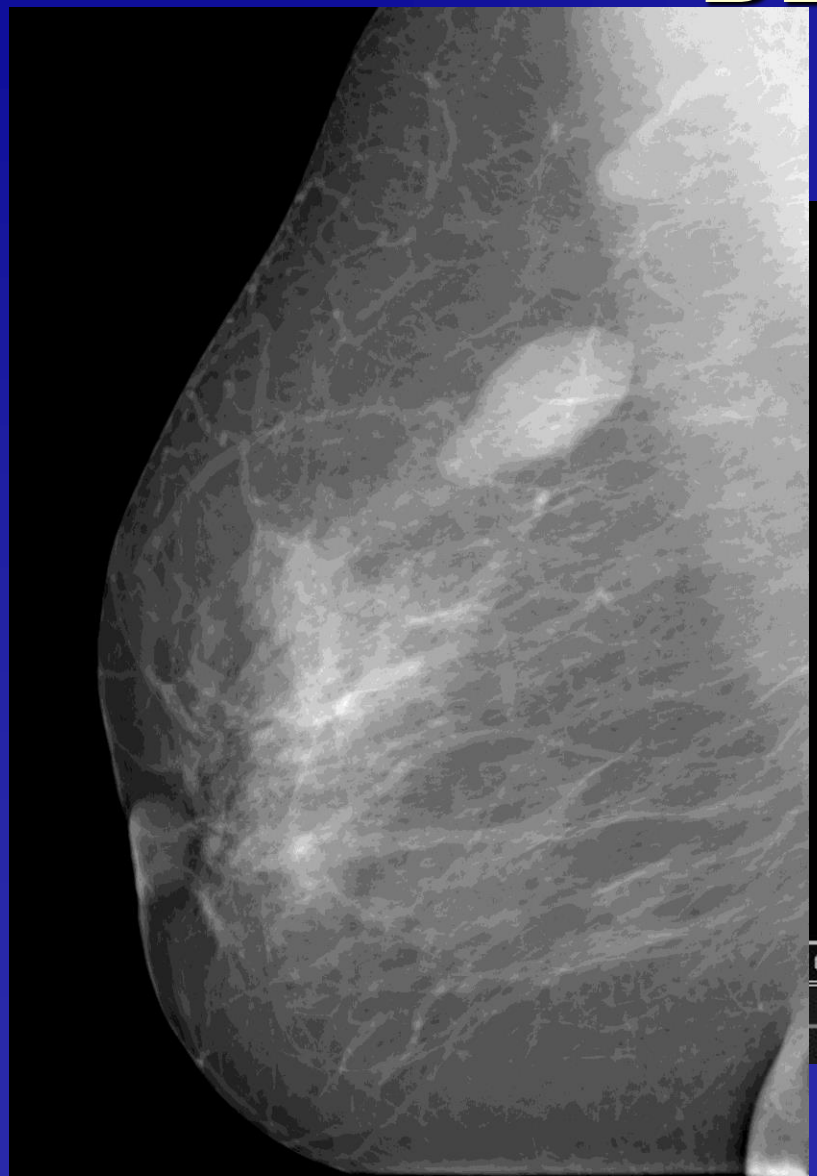


Large Fibroadenoma BENIGN

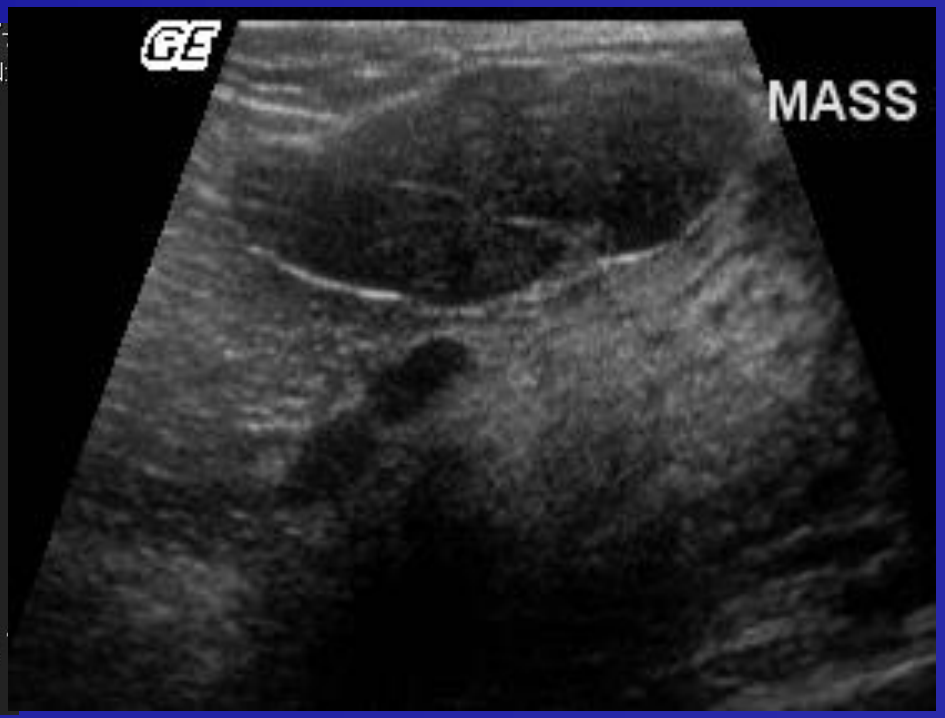




FIBROADENOMA BENIGN

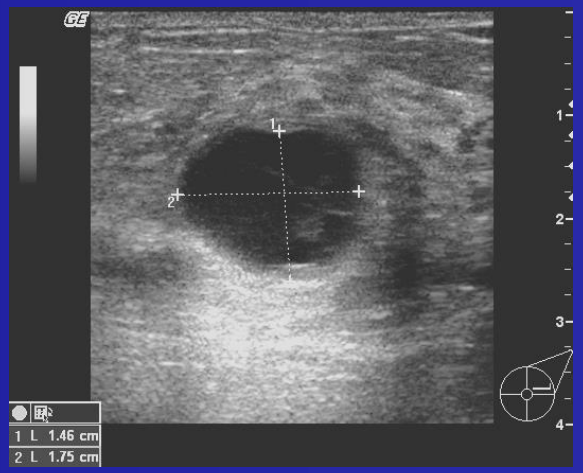


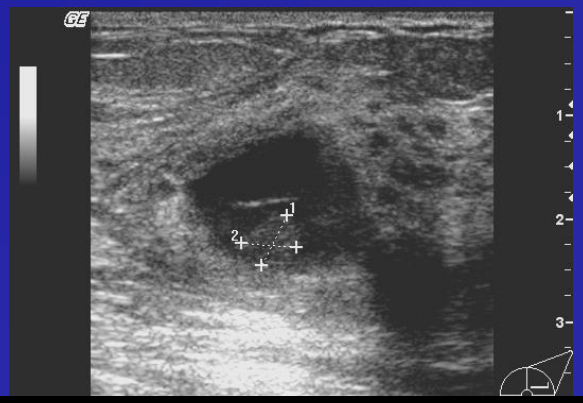
Hamartoma(fibroadenolipoma)



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

- **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.**

NUMBER OF MASSES

- **FACT**

MULTIPLE WELLDEFINED MASSES are probably benign .

- **FACT**

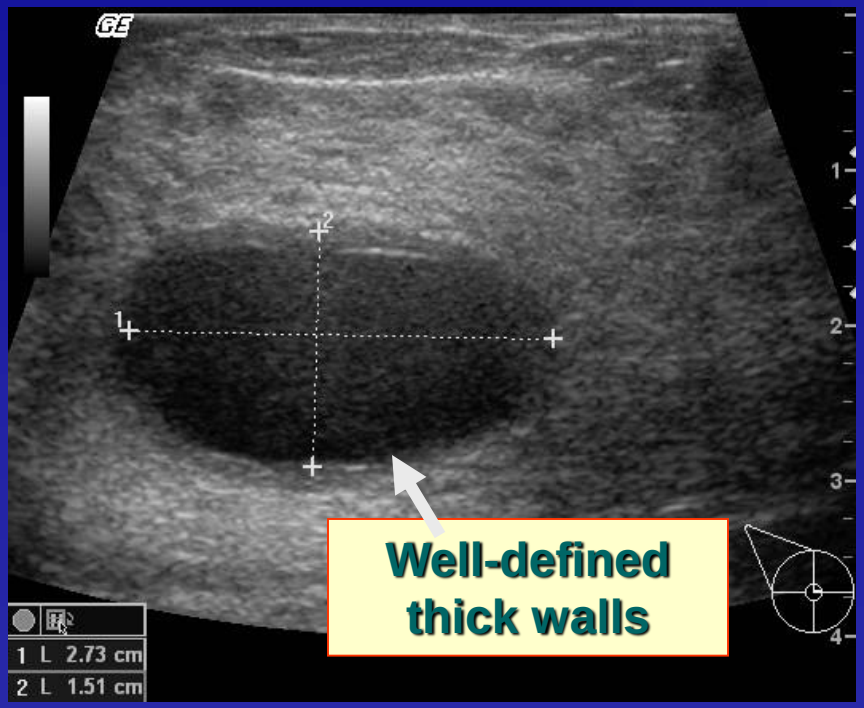
MULTIPLE PRIMARY MALIGNAT LESIONS ARE OBVIUOUSLY ILL-DEFINED OR STELLATE LESIONS.

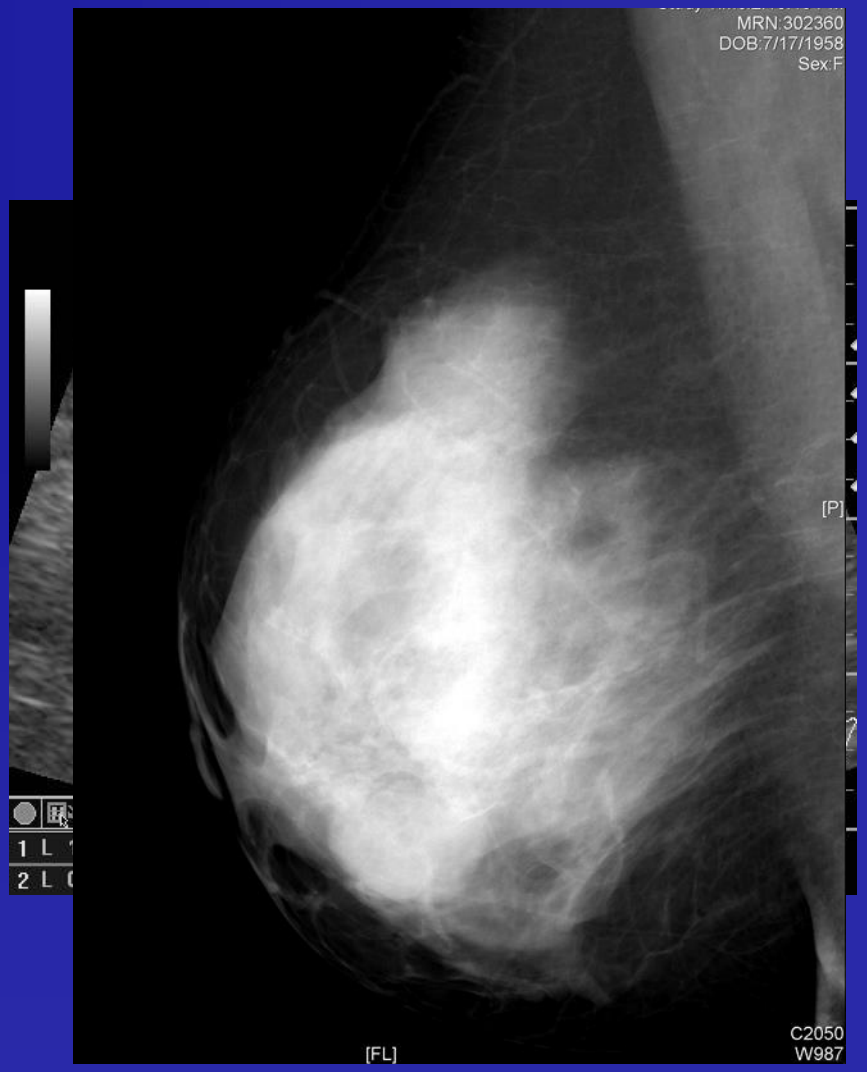
- **FACT**

BENGIN AND MALIGNANT LESIONS CAN COEXIST !!!

Complicated cysts MAMMOGRAPHY !!!

Complicated cysts US





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.

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

- **Most 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.

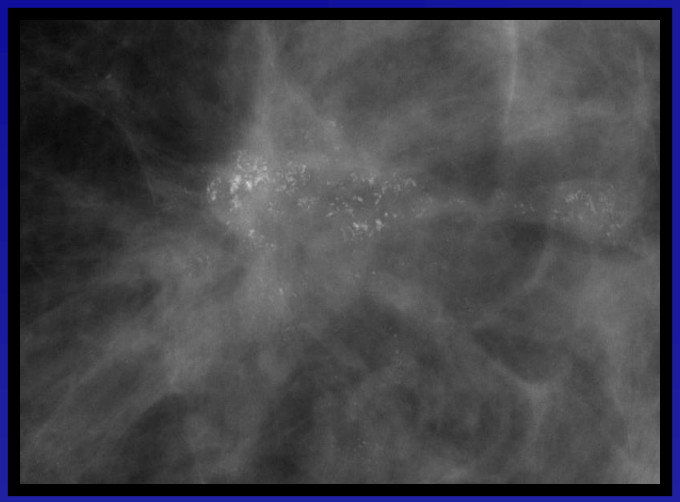
CALCIFICATIONS (CONT.)

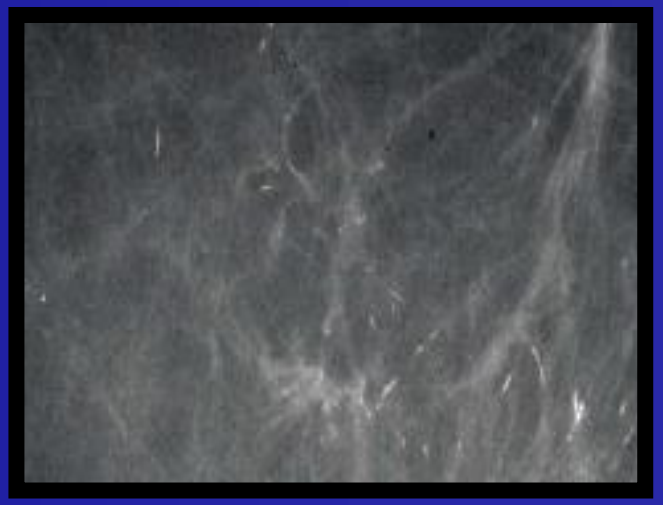
- ACR BIRADS Classification
  The American College of Radiology (ACR) Breast Imaging Reporting and Data System (BIRADS) has classified findings of calcifications into three categories:
- (1) Typically benign;
- (2) Intermediate concern; and
- (3) Higher probability of malignancy.

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.

MALIGNANT MICROCALCIFICATION





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

THANK YOU

DR M SHERIF ELSHARKAWY