MAMMOGRAPHY

by Dr Mahasen Al-Najar

WHAT IS MAMMOGRAPHY?

Mammography is x-ray imaging of the breast designed to detect tumors or other abnormalities. Mammography can be used either for screening or for diagnostic purposes.

WHAT IS A SCREENING MAMMOGRAPHY ?

A screening mammogram is an x-ray of the breast used to detect breast changes in women who have no signs or symptoms of breast cancer. It usually involves two x-rays of each breast.

HOW ARE SCREENING AND DIAGNOSTIC MAMMOGRAMS DIFFERENT?

A diagnostic mammogram is an x-ray of the breast that is used to check for breast cancer after a lump or other sign or symptom of breast cancer has been found.

A diagnostic mammogram also may be used to evaluate changes found during a screening mammogram

AT WHAT AGE SHOULD YOU BEGIN SCREENING MAMMOGRAPHY?

Breast cancer screening guidelines*				
Age	Breast cancer risk	Mammo – grams	Clinical breast exams	Breast self-exams
20 -39	Average	Not needed	Every three years	Consider performing on a regular basis to increase breast health awareness
20-39	High	May be needed. Talk with doctor	Every year	
40 or older	Average to high	Every one to two years	Every year	

*Ref. Mayoclinic.com

WHAT ARE THE FACTORS THAT INCREASE THE RISK OF BREAST CANCER?

- The risk of breast cancer increases gradually as a woman gets older. Most breast cancers occur in women over the age of 50
- Personal hx of breast cancer
- Family hx
- Certain breast changes on biopsy as atypical hyperplasia
- Genetic alterations as BRCA1, BRCA2
- Reproductive and menstrual hx

- Long-term use of menopausal hormone therapy
- Breast density
- Radiation therapy
- Body weight
- Physical activity level
- Alcohol

HOW TO PREPARE FOR MAMMOGRAPHY ?

- It is advised to schedule mammography when the breasts are least likely to be tender, which is usually during the week after menstrual period, to allow better compression

- Advice the patient not to apply deoderants, powders,lotions or perfumes under the arms or on the breasts on the day of the test

Mammography machine

X-Ray Tube

Compression Paddle

Film Holder

Foot Peddles

HOW IS MAMMOGRAPHY DONE?

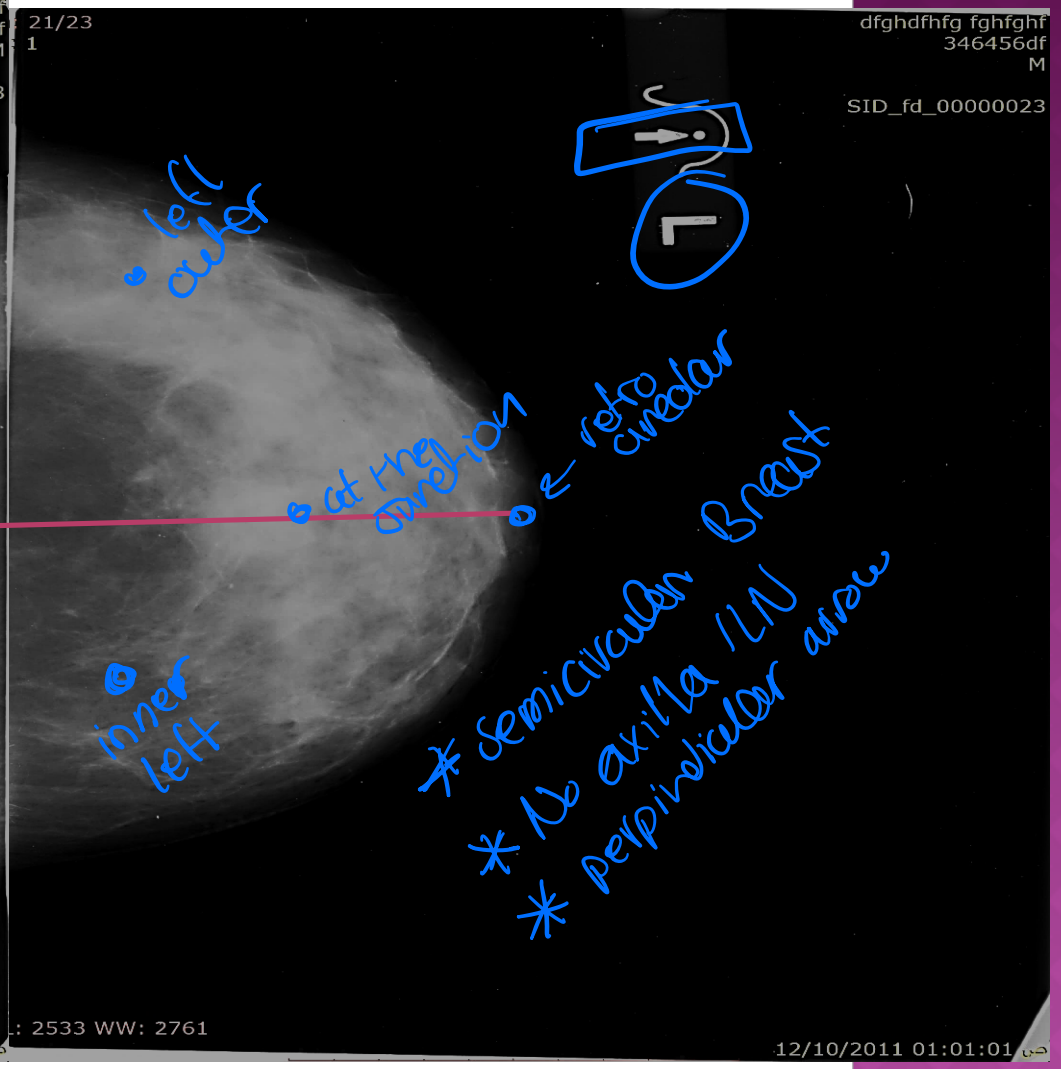
MAMMOGRAM STANDARD VIEWS

L → 2D

- Cranio-caudal View (CC) → inner outer
- Medial-lateral Oblique (MLO) → upper / lower

CC view


Im: 20/23
Se: 1
dfghdfhfg fghfghf
346456df
M
SID_fd_00000023
R
WL: 2533 WW: 2761
12/10/2011 01:01:01


21/23
1
dfghdfhfg fghfghf
346456df
M
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L
left outer
at the axillary
retro areolar
inner left
* semicircular Breast
* No axilla /LN
* perpindicular arrow
WW: 2761
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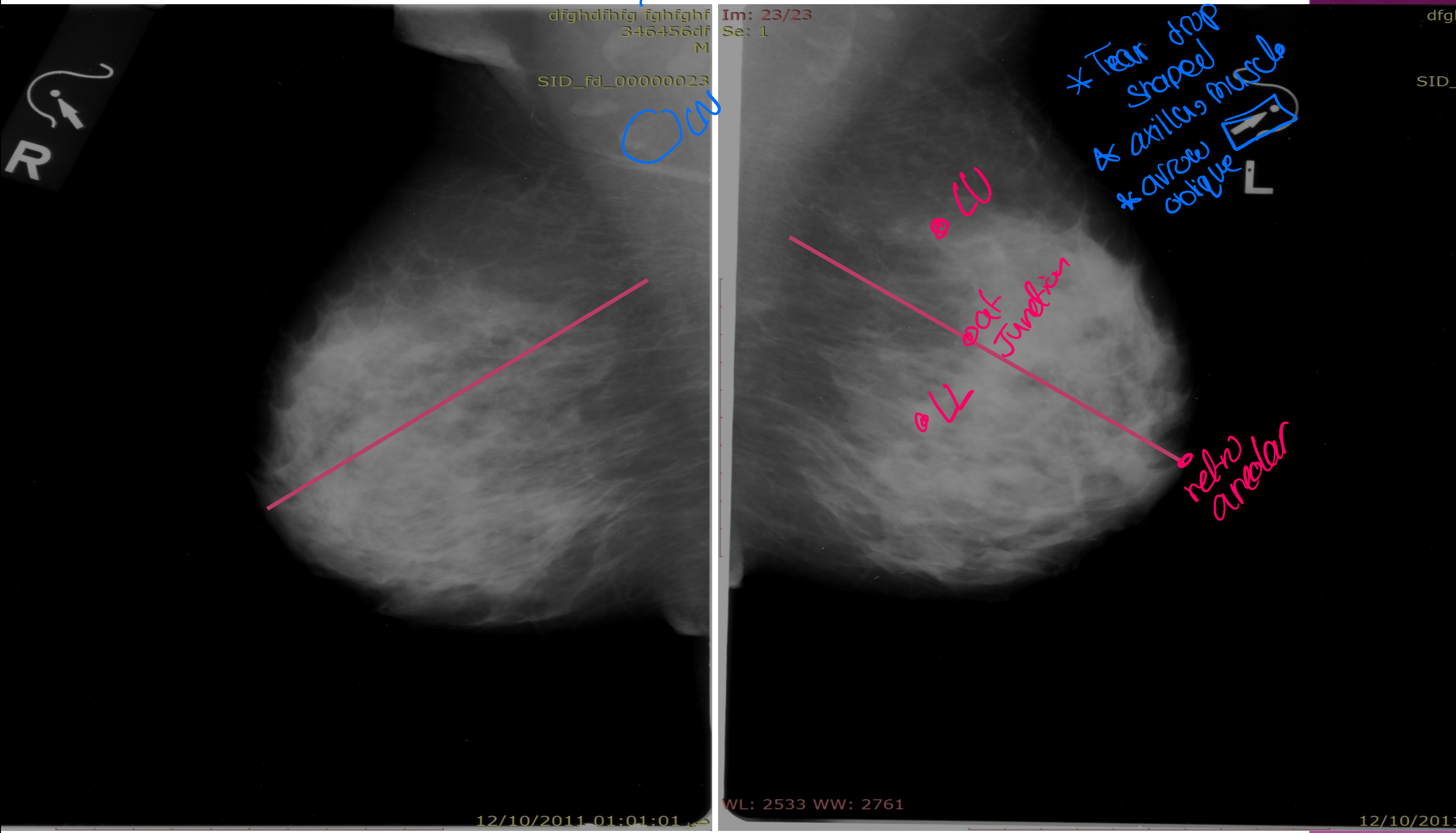
MLO

* upper
lower



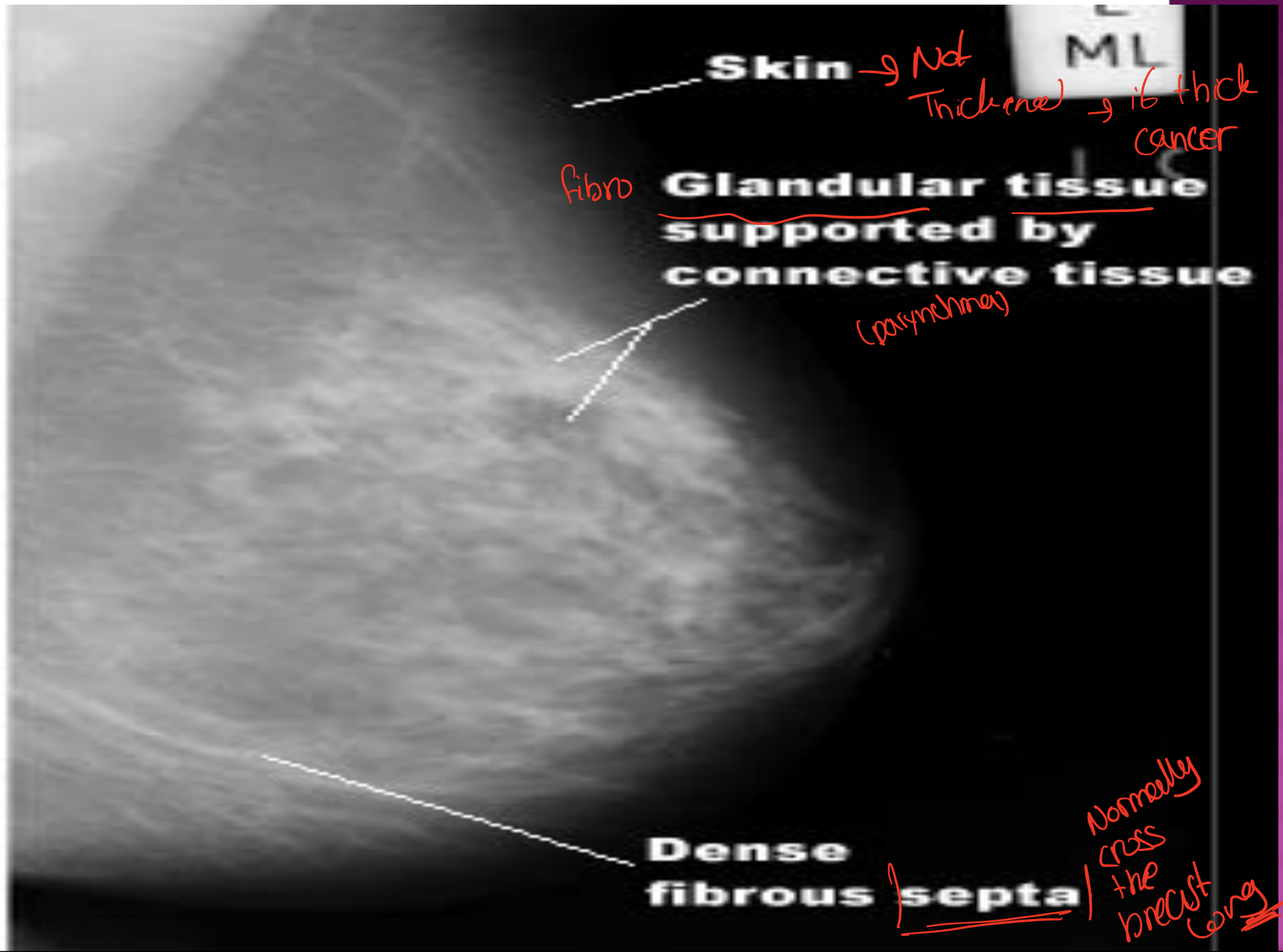
WHAT IS THE RISK OF MAMMOGRAPHY?

- Mammography exposes the breast to low dose radiation. But the dosage is very low, and for women over age 40, the benefits of regular mammography outweigh the risks posed by this amount of radiation
- The allowed dose for each view is 300 mrad

WHAT ARE THE BENEFITS OF SCREENING MAMMOGRAMS?

- Several large studies conducted around the world show that breast cancer screening with mammograms reduces the number of deaths from breast cancer for women ages 40 to 69, especially those over age 50.

APPEARANCES OF MAMMOGRAM

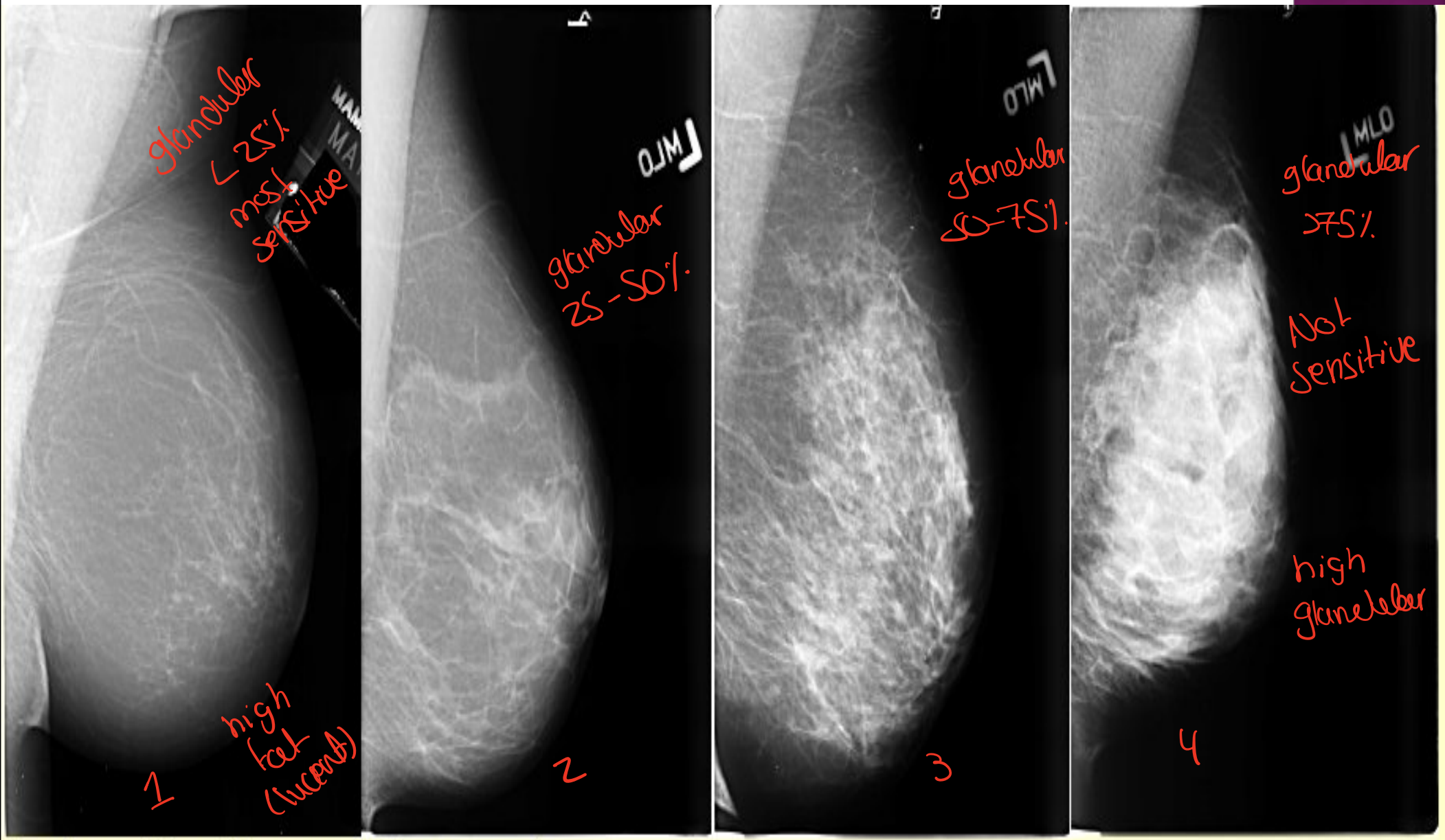


SENSITIVITY OF MAMMOGRAPHY

- 85% - 90% in fatty replaced breasts
- 65% in dense breasts

ACR classification

FATTY & DENSE BREAST



Breast composition and its mammographic appearance.[1]

PRIMARY SIGNS OF CANCER ON MAMMOGRAPHY

- **Mass**:

a Mass is a space occupying lesion seen in two different projections. we describe :

- **Form**: Round, oval ,lobular or irregular

- **Margin**: 1- Circumscribed (well-defined or sharply-defined) margins

2-Indistinct (ill defined) margins

3-Spiculated Margins

4-Microlobulated: margin with small lobulations

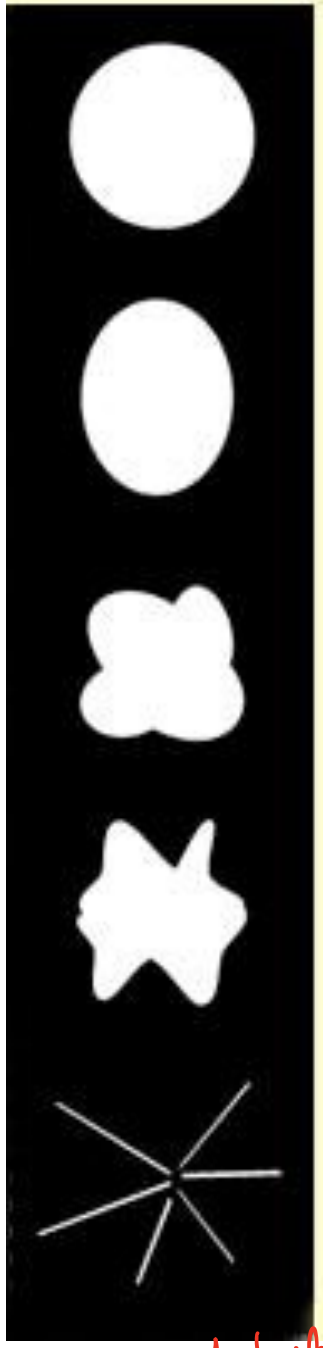
5-parenchymally overlapped: margin is partly or completely hidden under parenchyma

- **Density**: High density (hyperdense) , Isodense, hypodense, fat equivalent as oil cyst, lipoma, galactocele

↗ obscured

compared to dense tissue

Mass Shape[1]



Round

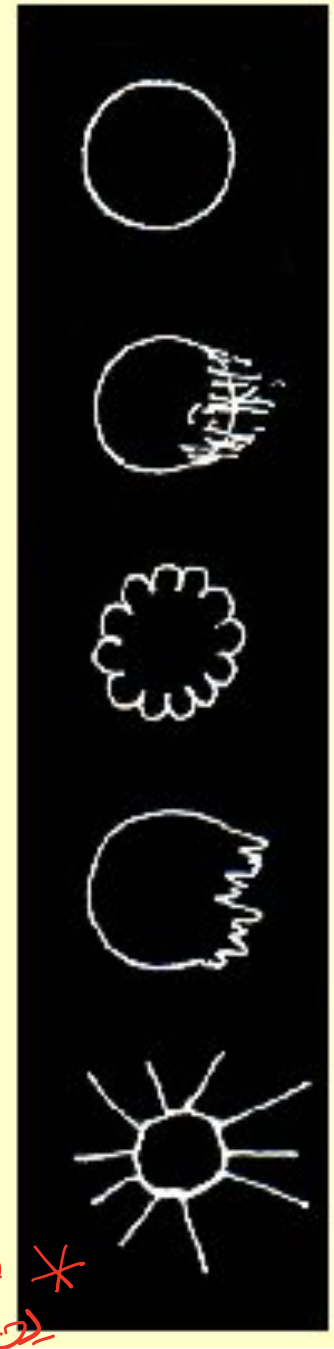
Oval

Lobulated

Irregular

Architectural Distortion

Mass Margins[1]



Circumscribed

Obscured

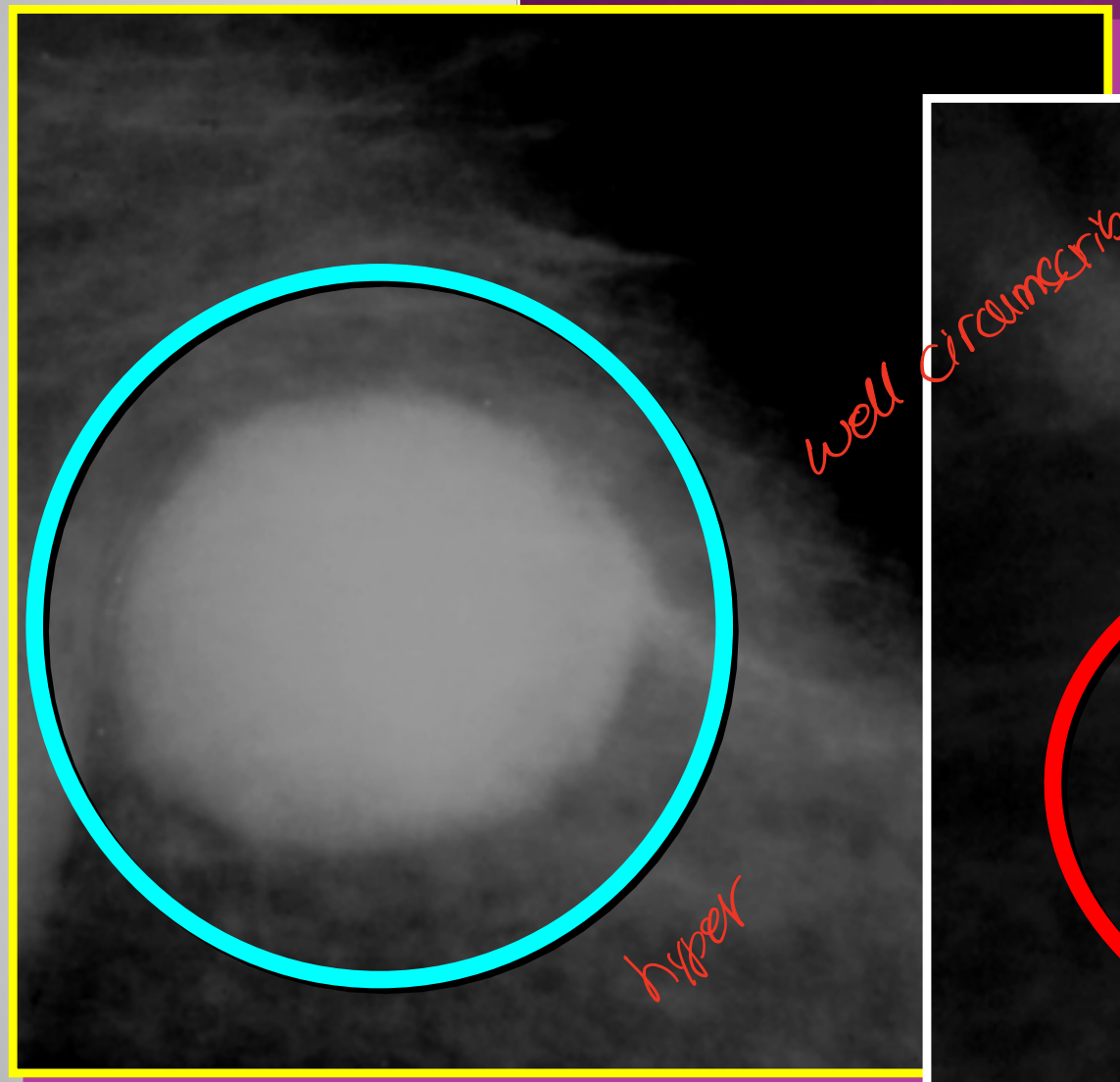
Micro-lobulated

Ill-defined

Spiculated

Short * to differ from Septa
tapper away
dense same mass
BIRADS

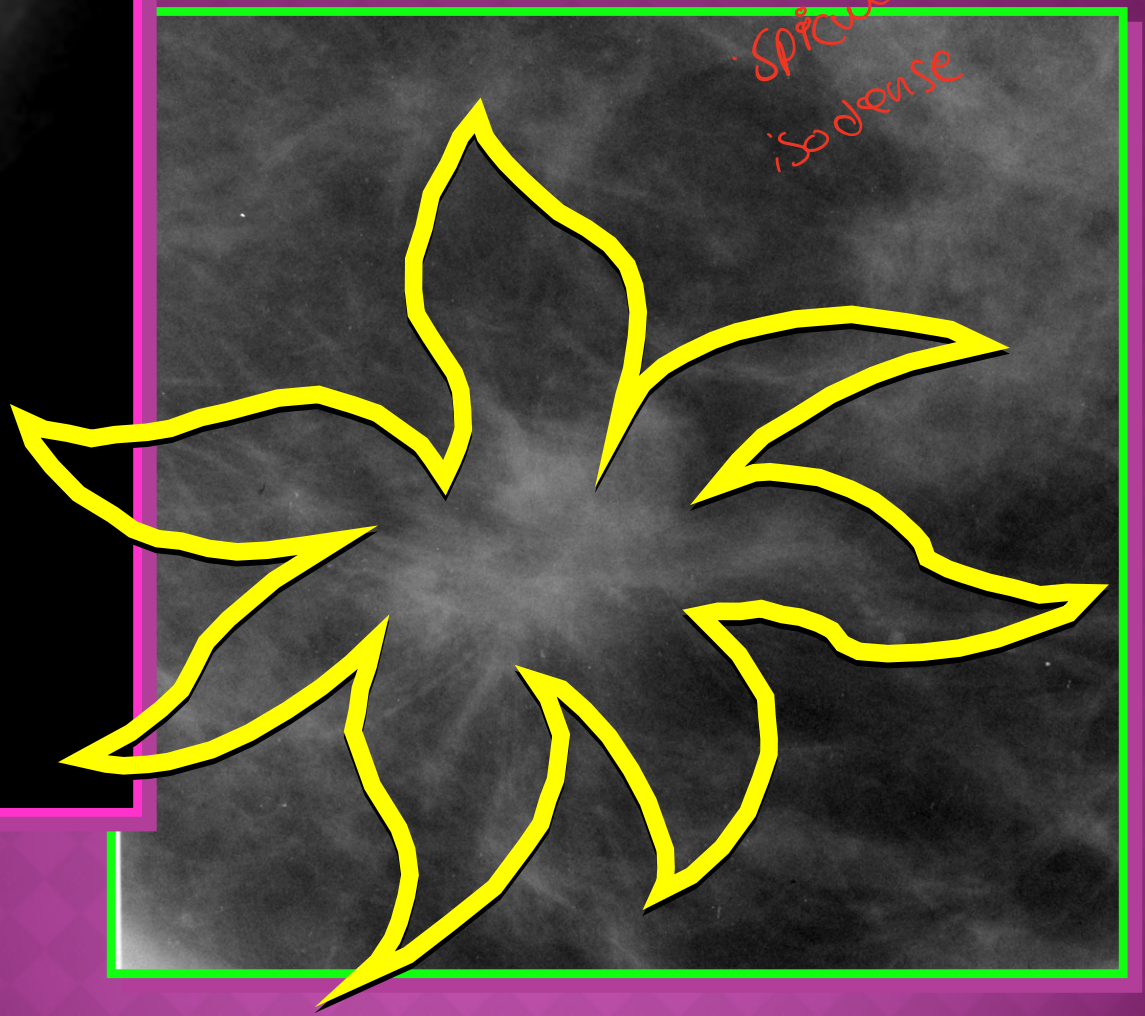
ROUND



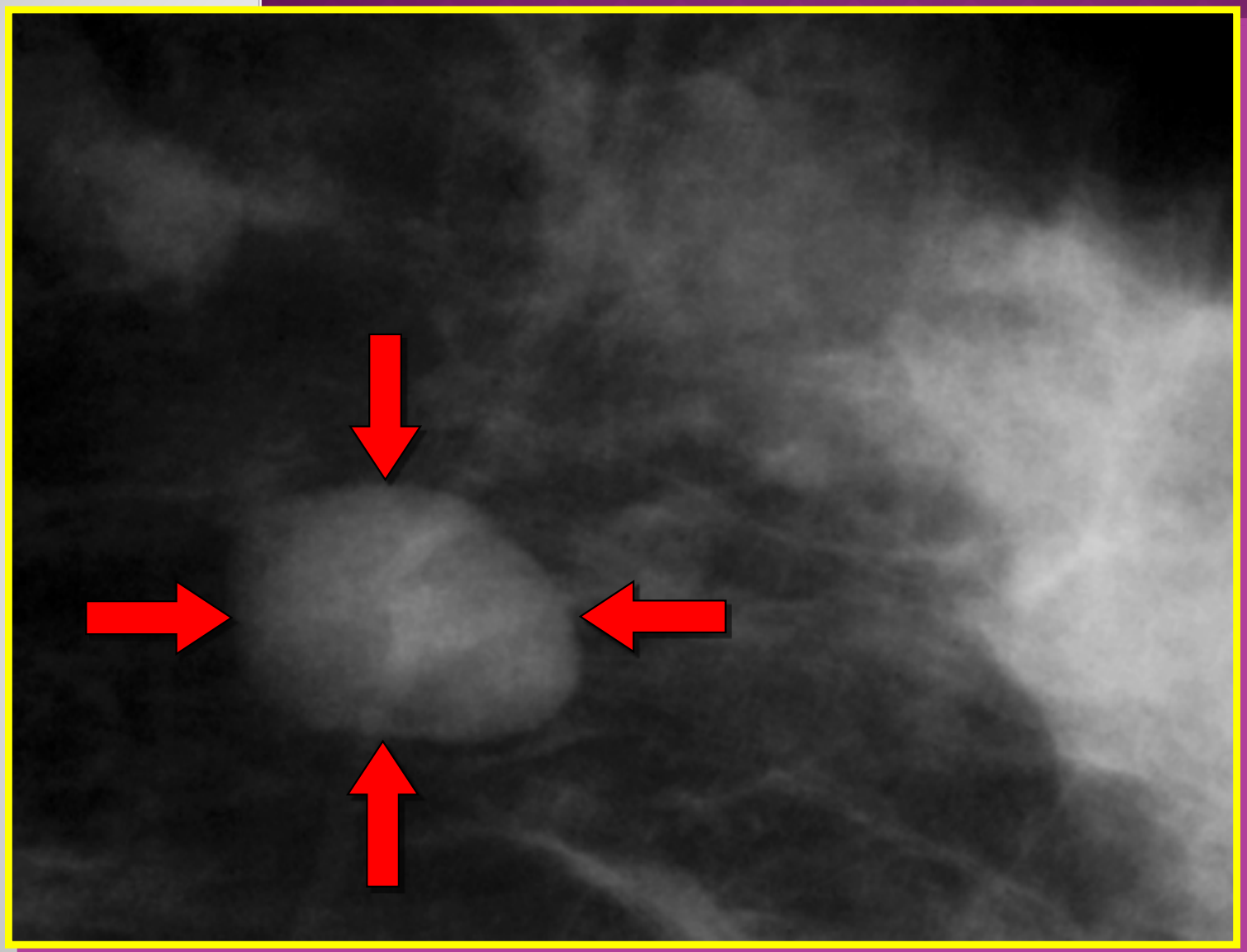
OVAL

LOBULAR

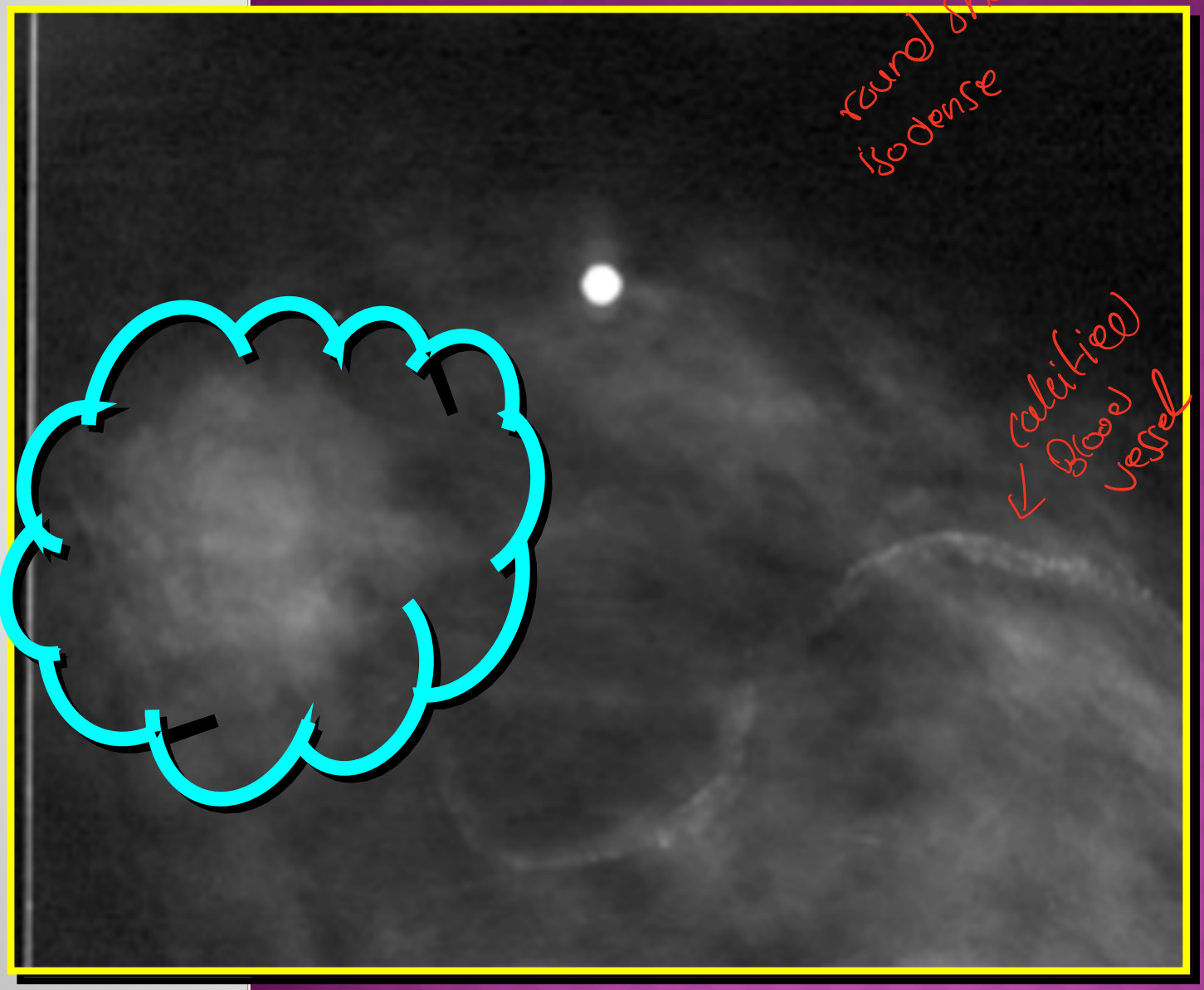
IRREGULAR



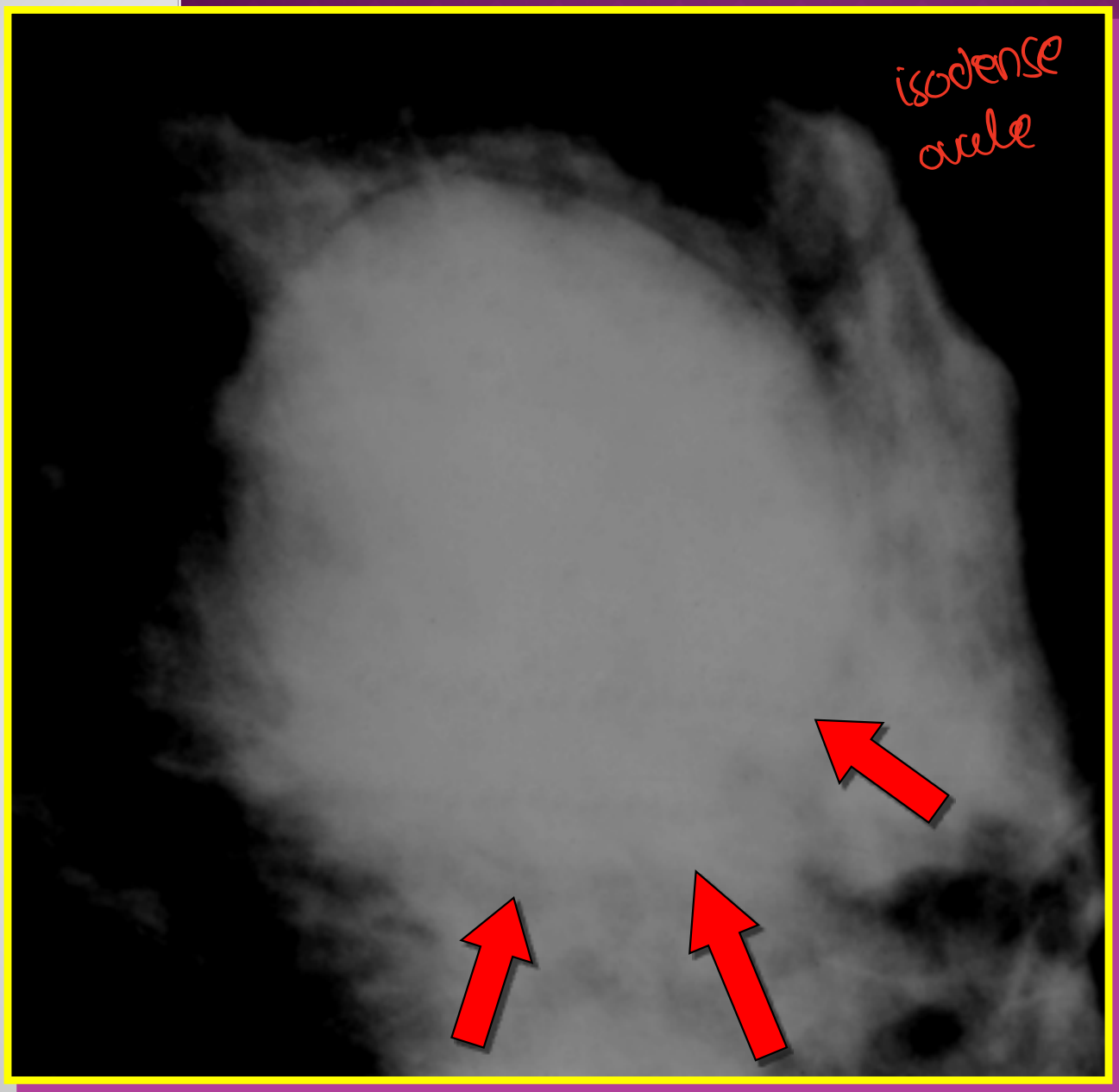
CIRCUMSCRIBED



MICROLOBULATED

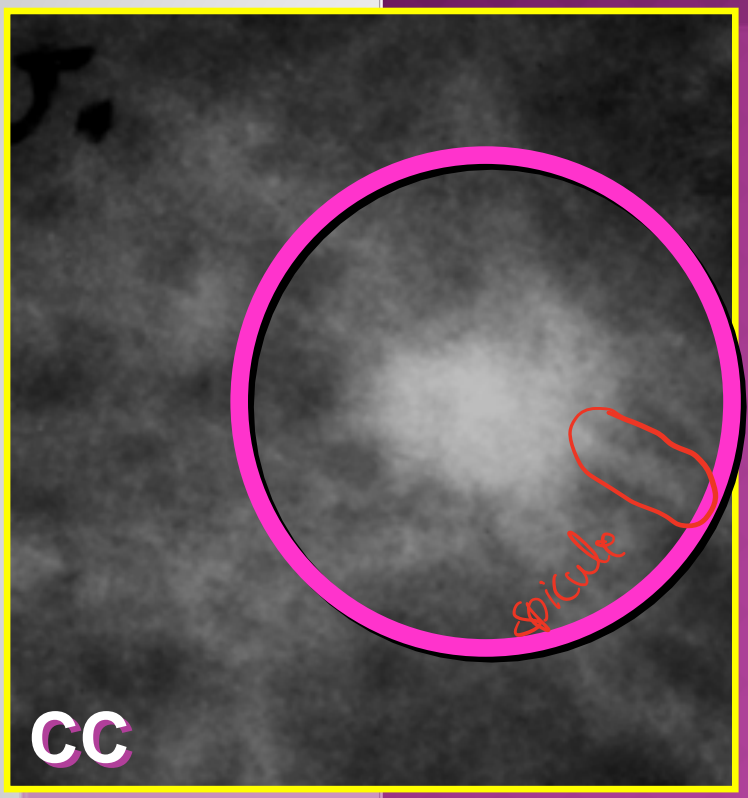


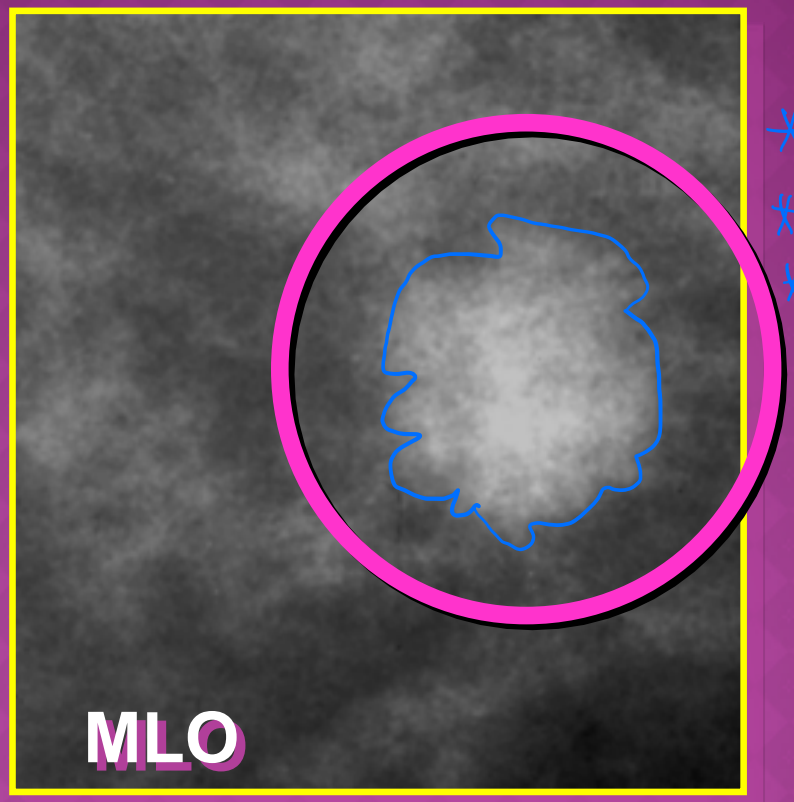
OBSCURED



INDISTINCT

oval
hyperdense
spiculated
malignant

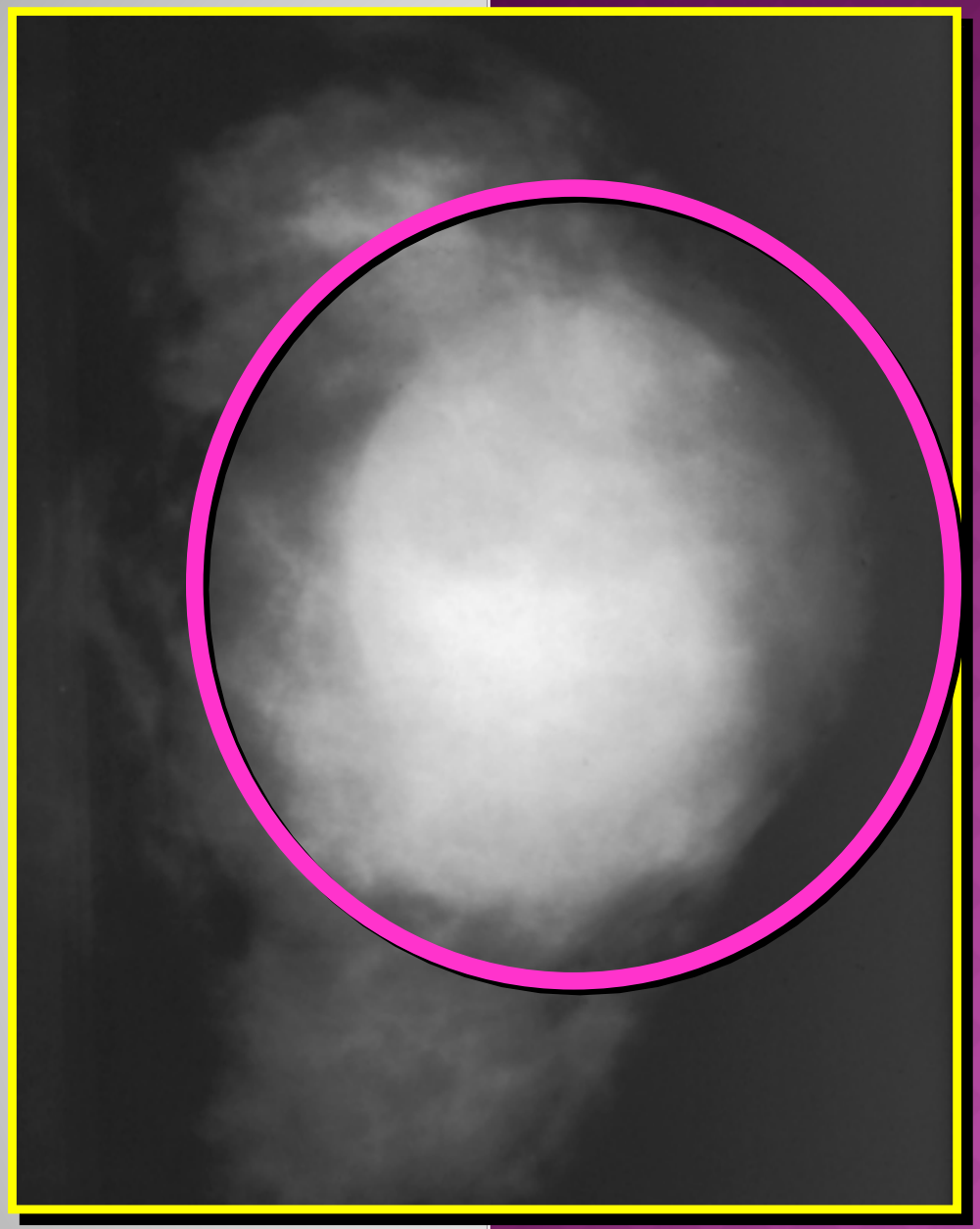




* Round
* hyperdense
* microlobulated

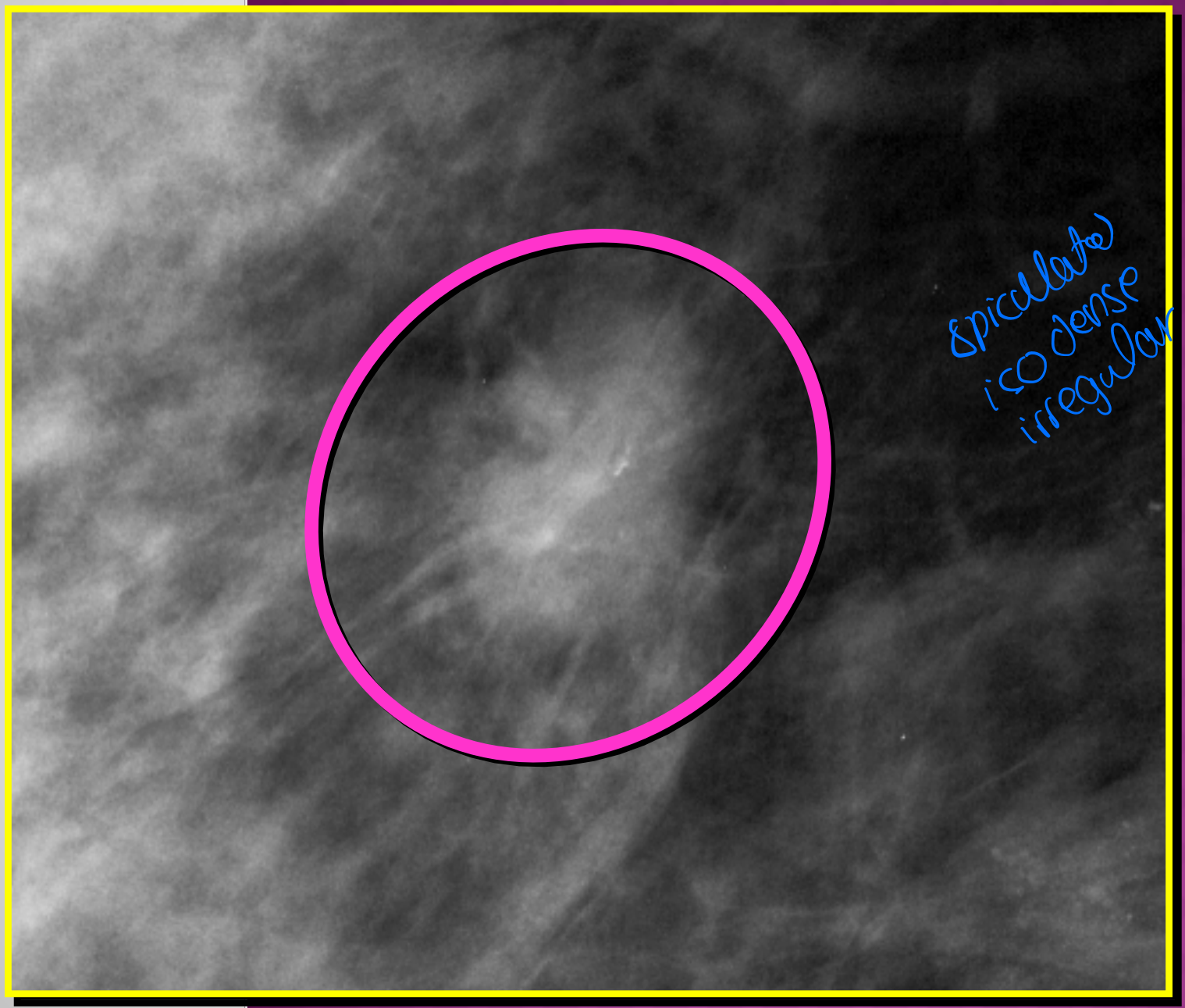
تعتبر spiculated الأسوء والأخبث

SPICULATED

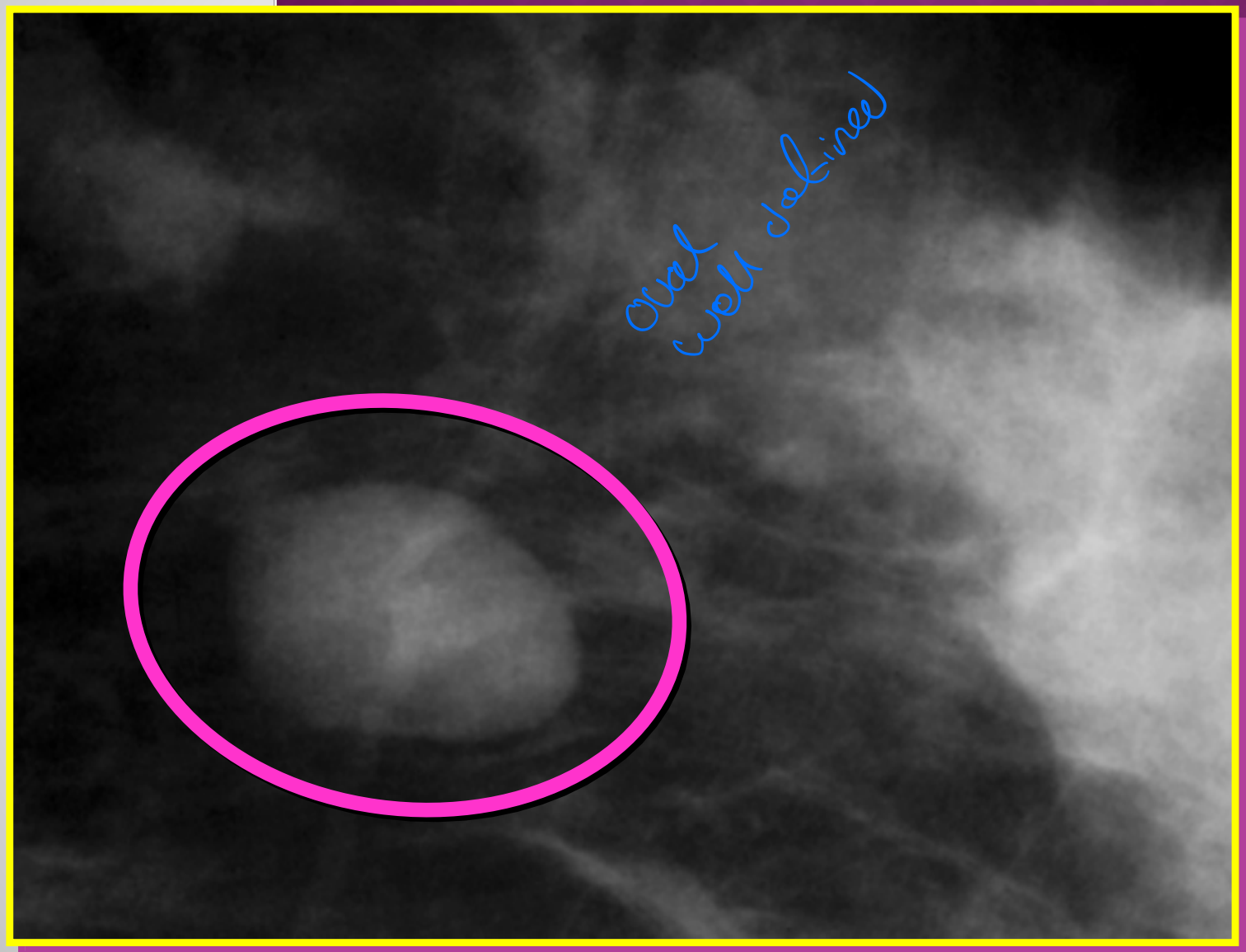


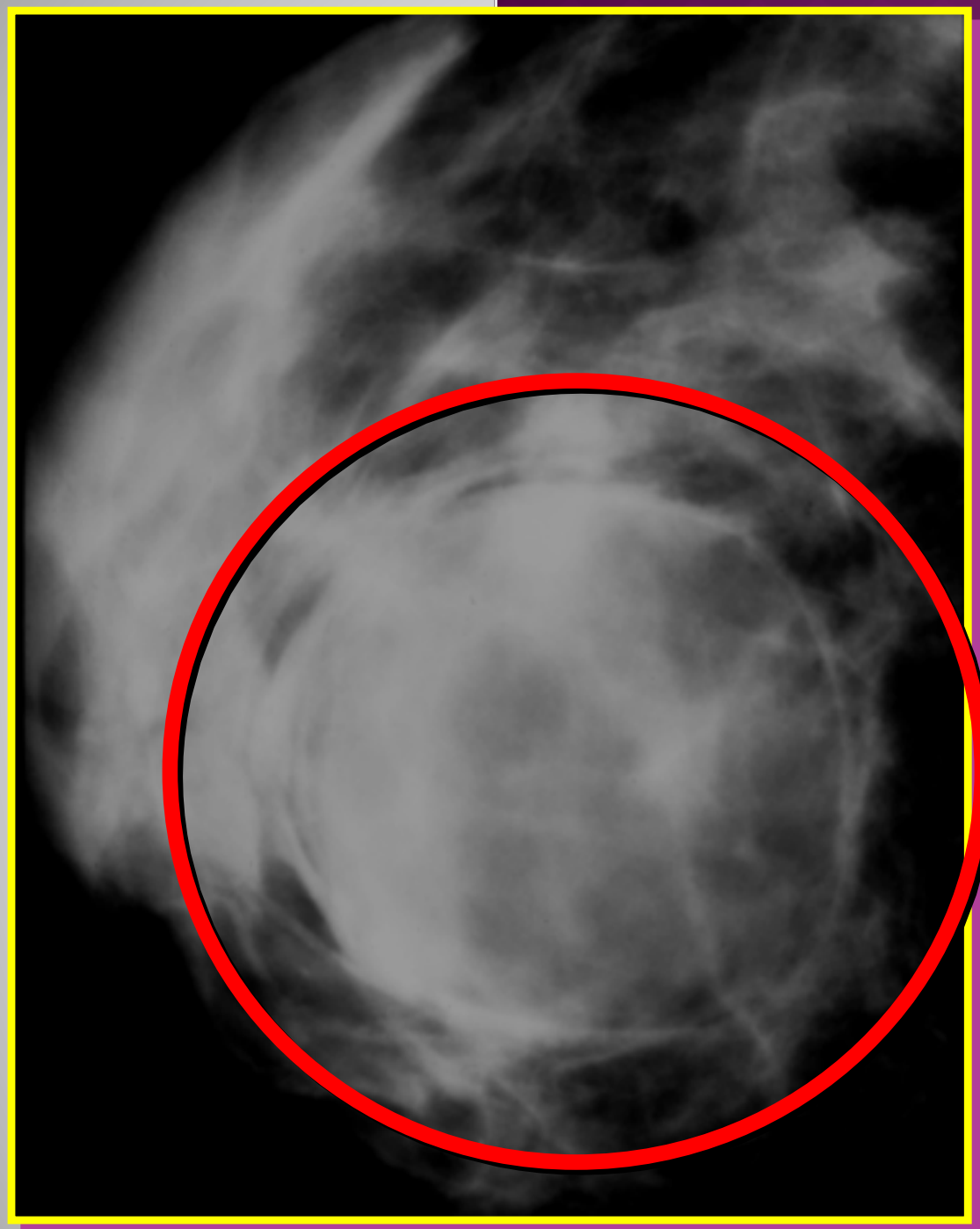
HIGH DENSITY

EQUAL DENSITY



LOW DENSITY





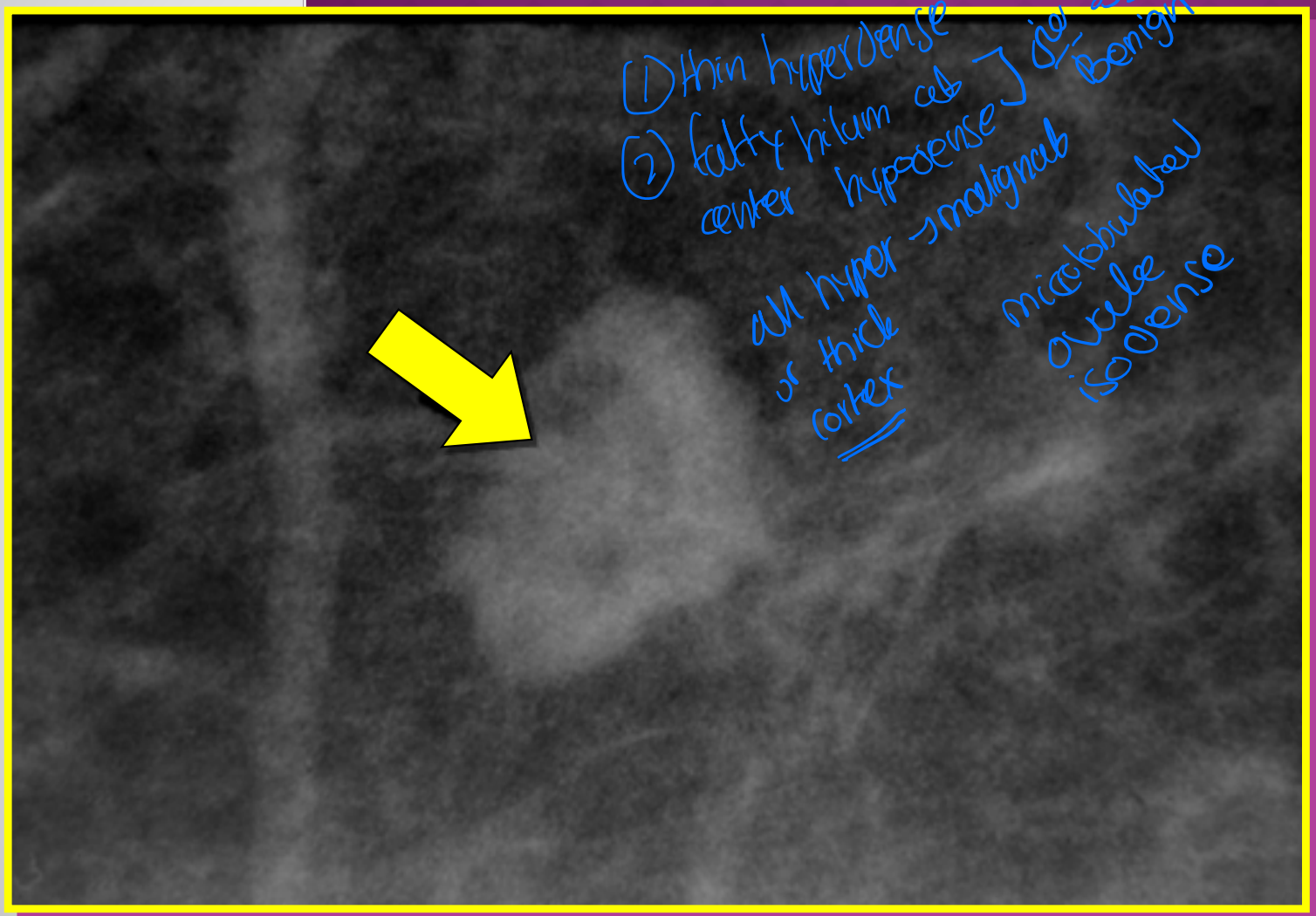
FAT-CONTAINING

Round well defined

fat equivalent ⇒ lipoma

*hyperdense areas is pseudocapsule from compression of Breast

INTRAMAMMARY LYMPH NODE



MASSES: BI-RADS DESCRIPTORS

SHAPE:

- ⇨ Round, oval, lobular, irregular

MALIGNANT

BENIGN

- ⇨ Circumscribed, microlobulated, obscured, indistinct, spiculated

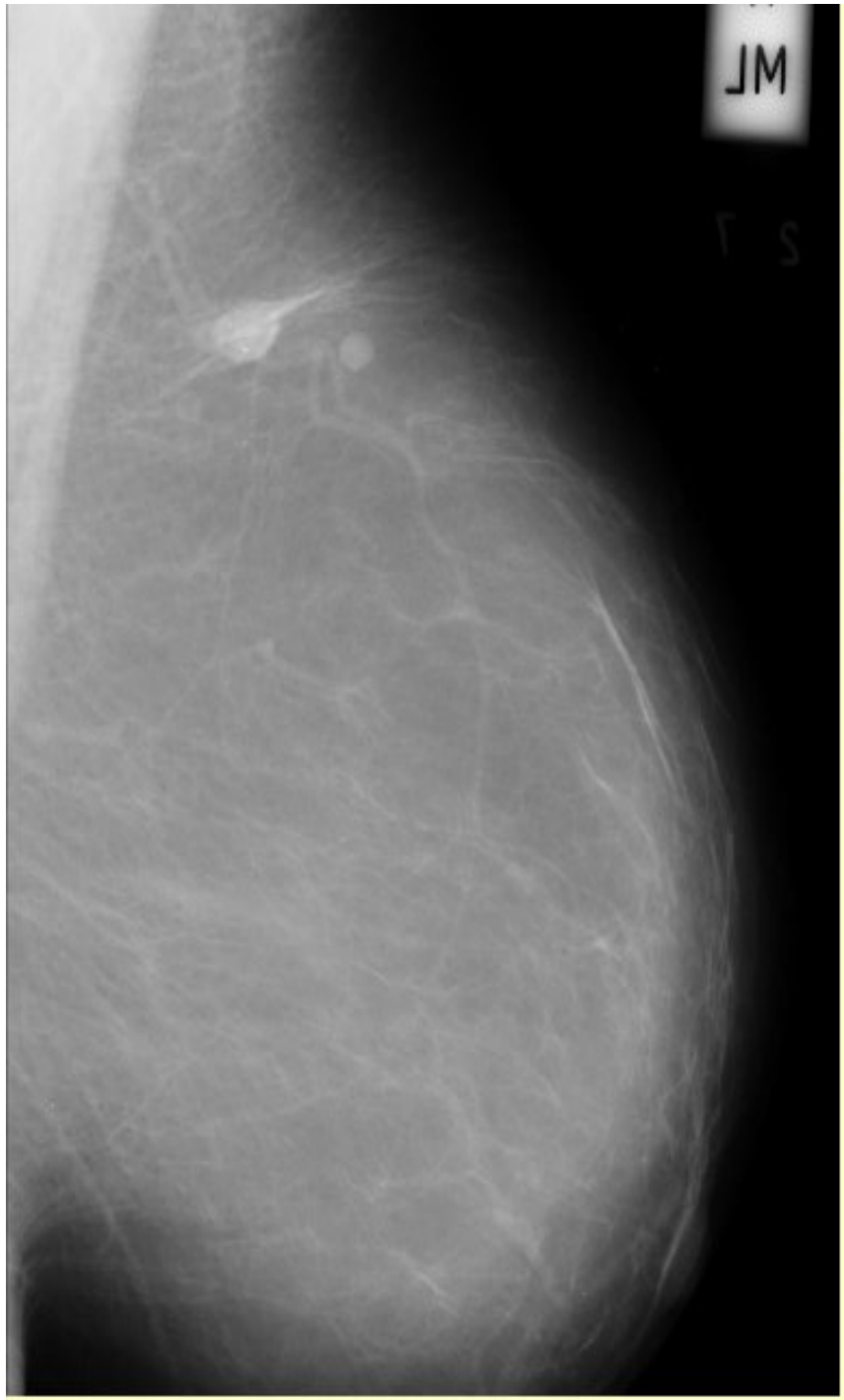
DENSITY:

- ⇨ High, equal, low, fat-containing

BI-RADS LEXICON: MASSES

- For final assessment & further management decisions, use descriptor(s) with MOST WORRISOME FINDINGS

e.g., if mass PARTLY CIRCUMSCRIBED & PARTLY INDISTINCT, take further action based on INDISTINCT MARGINS

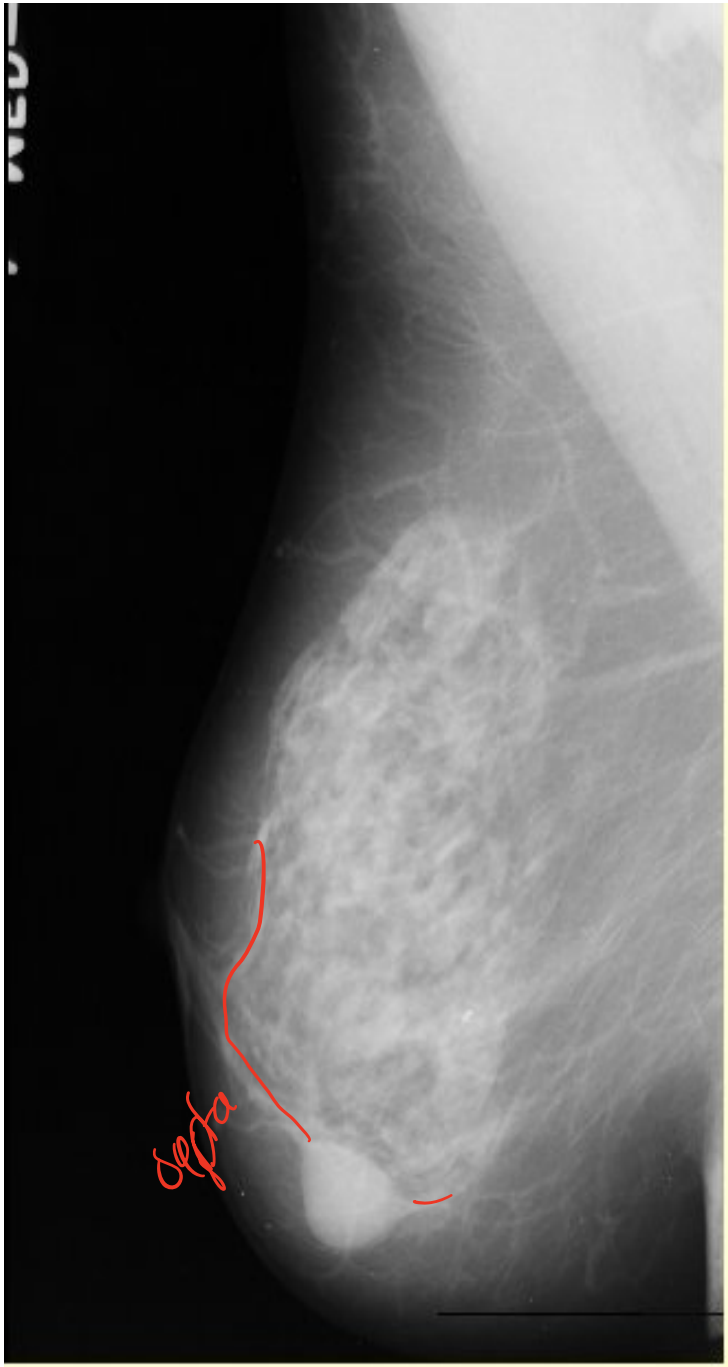


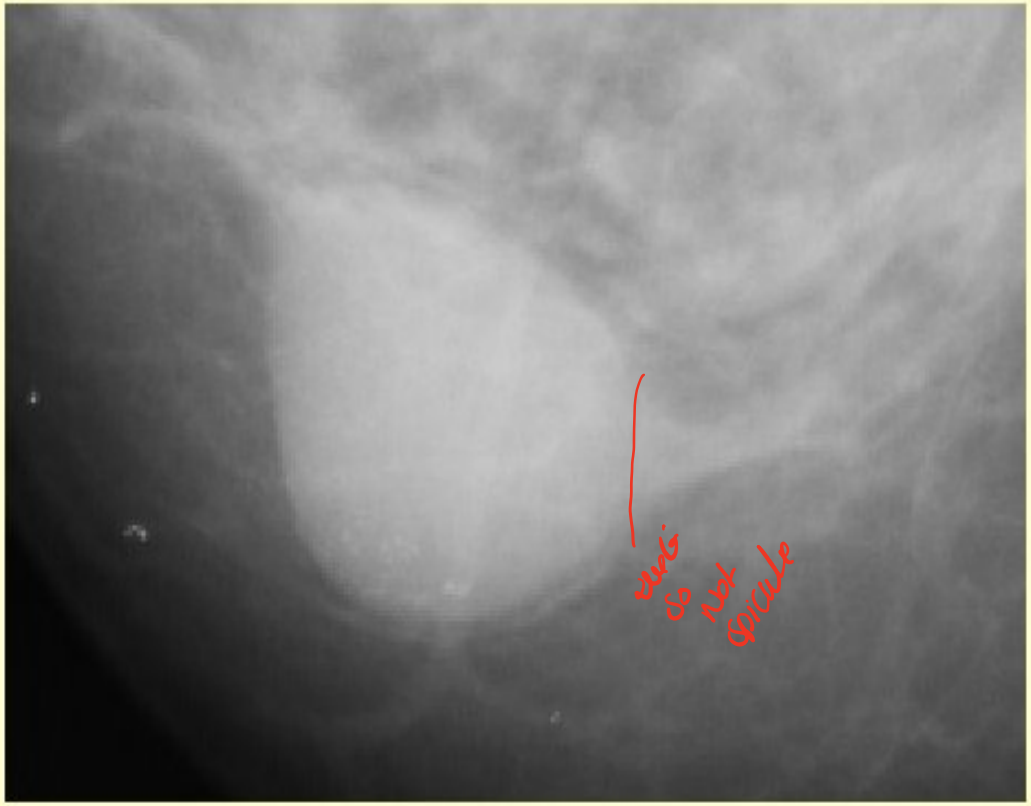
view
site (L/Rt
lesion → upper half
(shape, margin, density)

An oval mass and a round mass with circumscribed margins are evident in the upper quadrant of the breast on this medio-lateral view.[1]

ACR 1
BIRADS 5

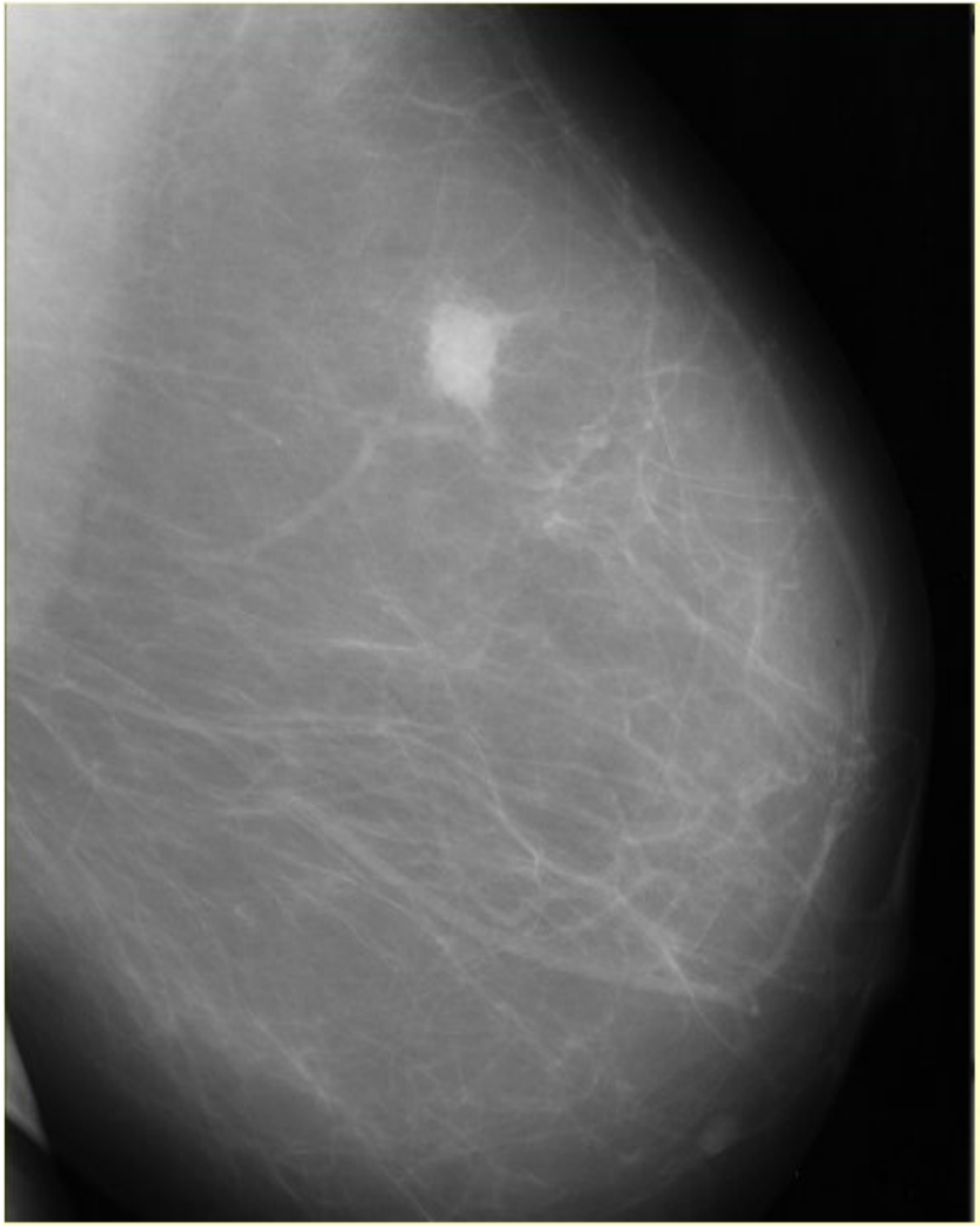
MLO
No site mentioned in pic
lower bdf (oval, well defined) iso dens hyper

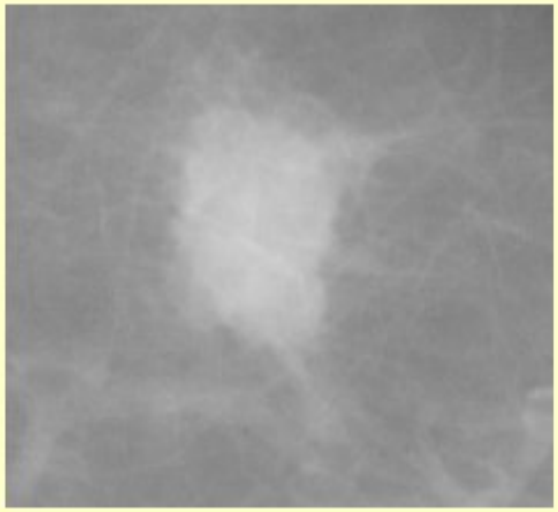




This large round to oval mass has a well-defined circumscribed margin.[1]

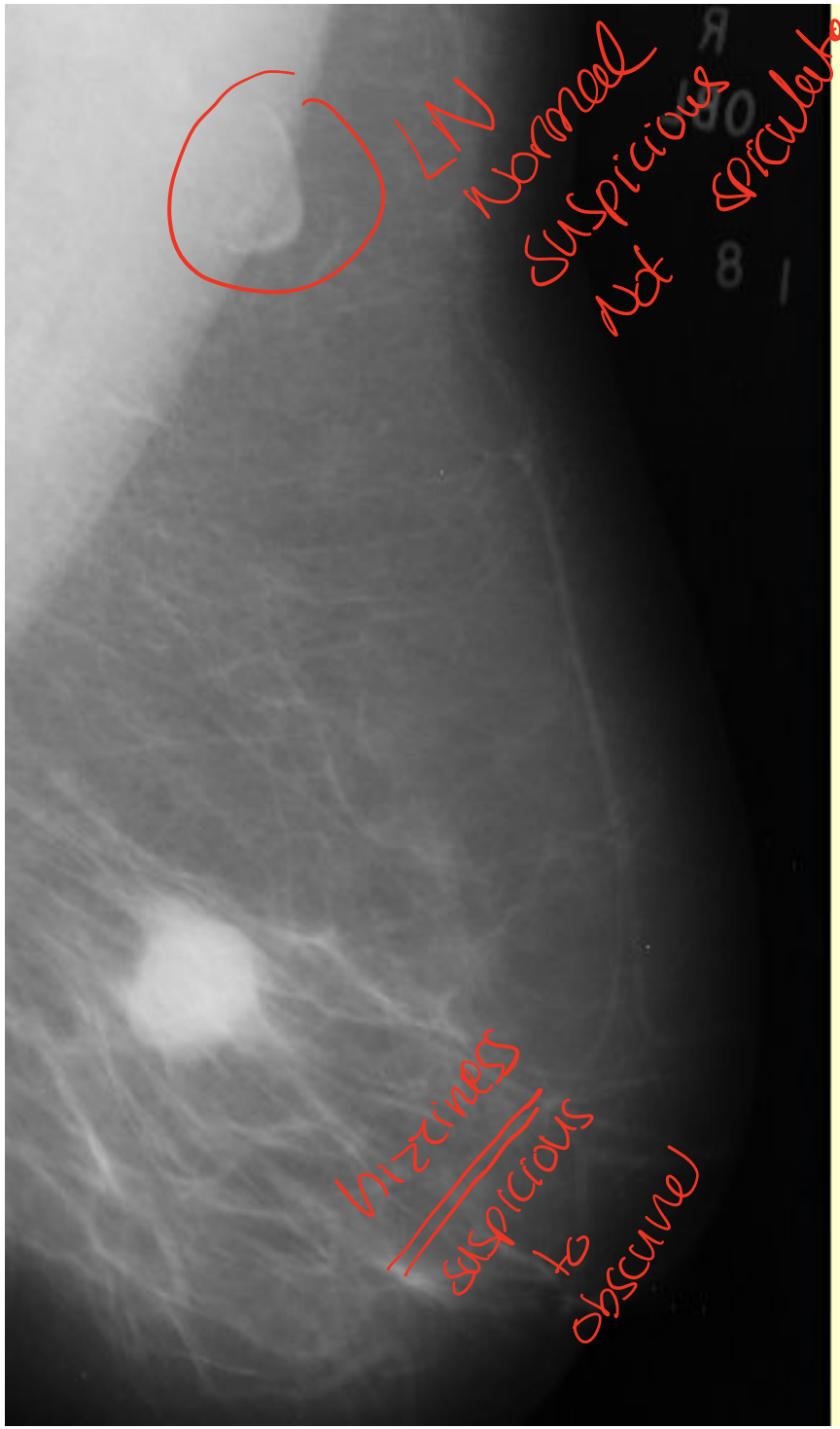
ACR 3c





The margin of this solitary mass is lobulated. The undulations are better appreciated on magnification.[1]

Round
Spiculated
hyper
MLO
No site
BIRADS
RCC 1

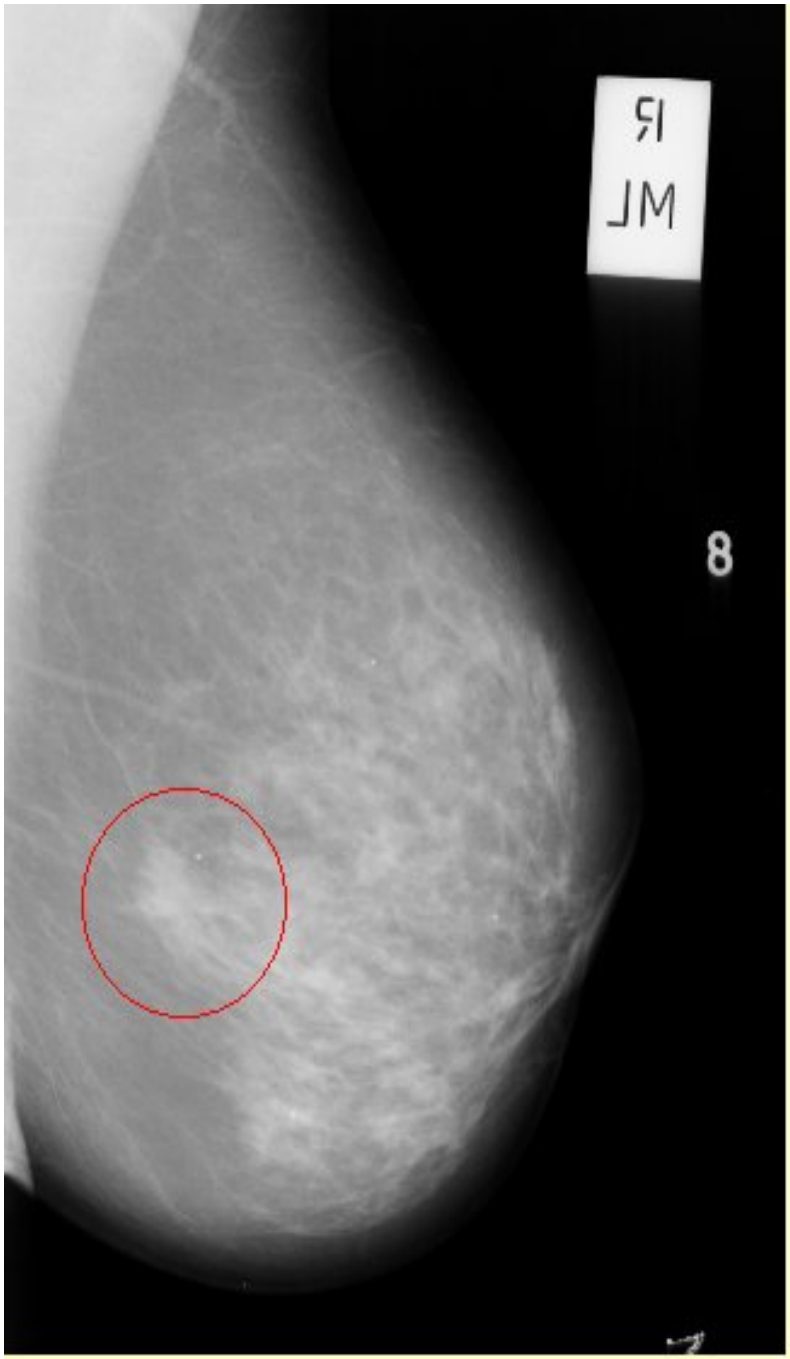


LN normal suspicious not speculated

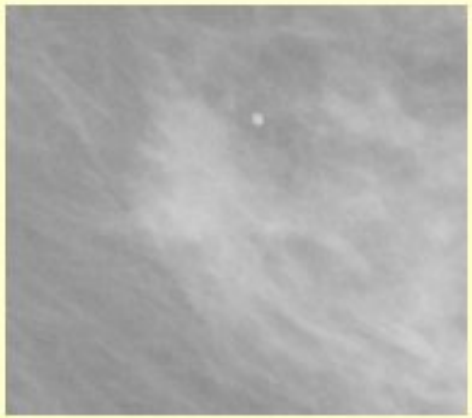
Vizcines suspicious to obscured

This oval mass appears to have its well-circumscribed margin obscured by overlapping tissue. This lesion was diagnosed as being malignant.[1]

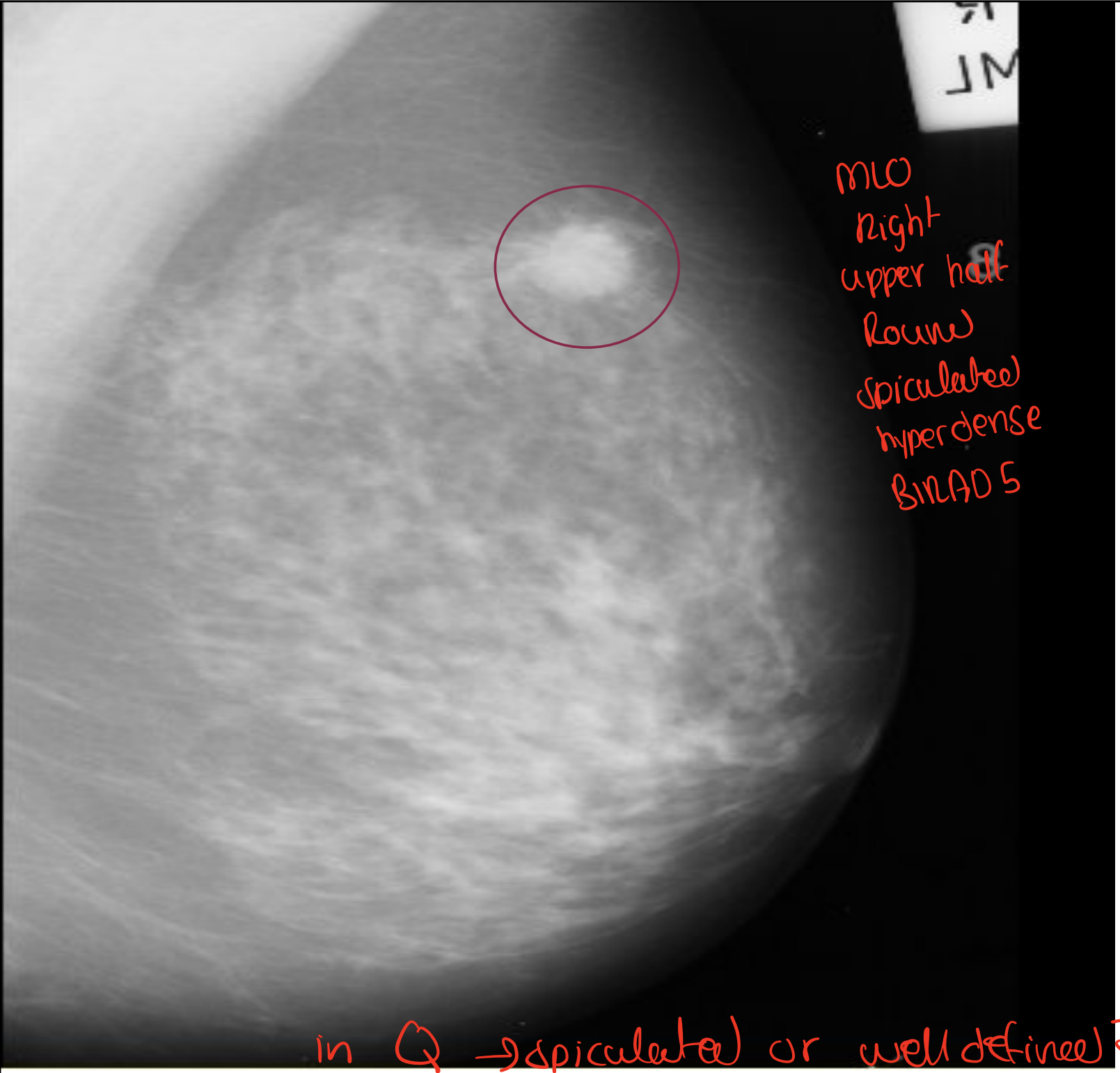
MLO Rt oval obscured iso lower half



This lesion's margin is ill-defined.[1]



MLO
Right
lower half lesion
ill defined border
irregular
iso dense
(follow up just)
ACR 4

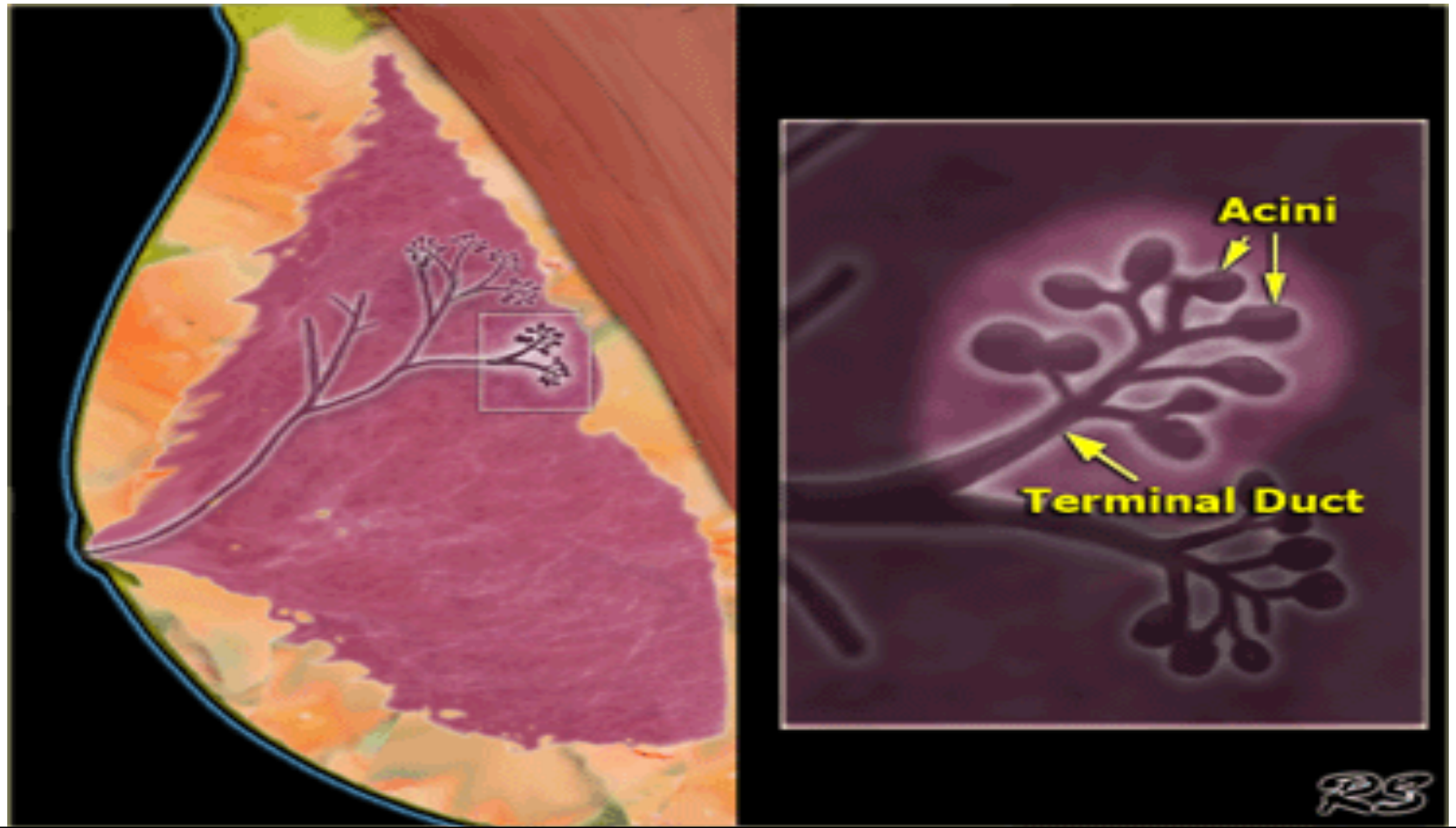


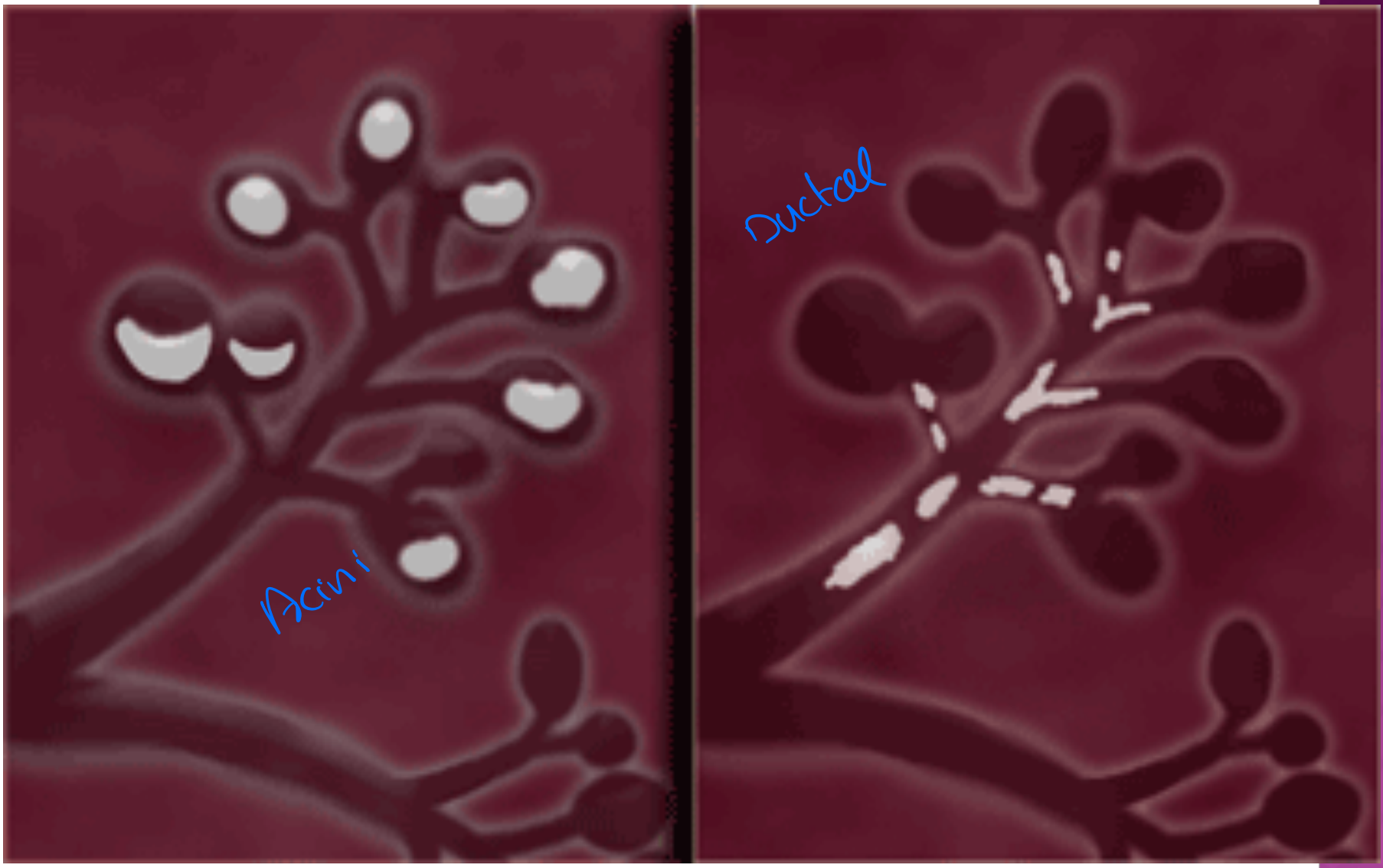
Spiculated mass

CALCIFICATIONS

Terminal ductal lobular unit

The basic functional unit in the breast is the lobule, also called the terminal ductal lobular unit (TDLU





LEFT: Lobular calcifications: punctate, round or 'milk of calcium'
RIGHT: Intraductal calcifications: pleomorph and form casts in a linear or branching distribution

① shape
② Distribution (Not required)

DIAGNOSTIC OF CALCIF. APPROACH

Morphology

The form of calcifications is the most important factor in the differentiation between benign and malignant.

Calcifications Morphology

Benign

Skin
Vascular
popcorn
plasmacell mastitis
fat necrosis
milk of calcium
dystrophic
eggshell
suture

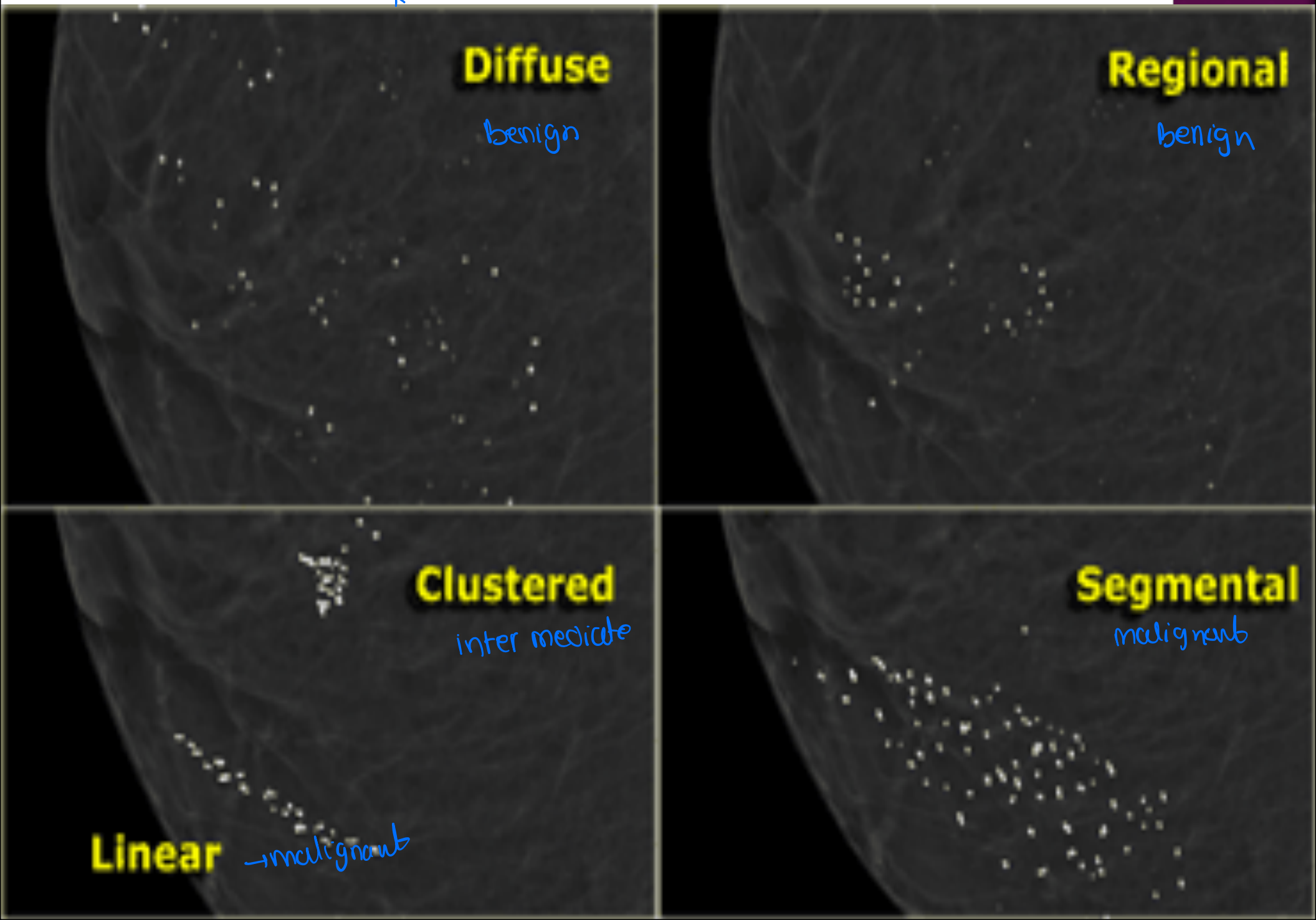
Intermediate Concern

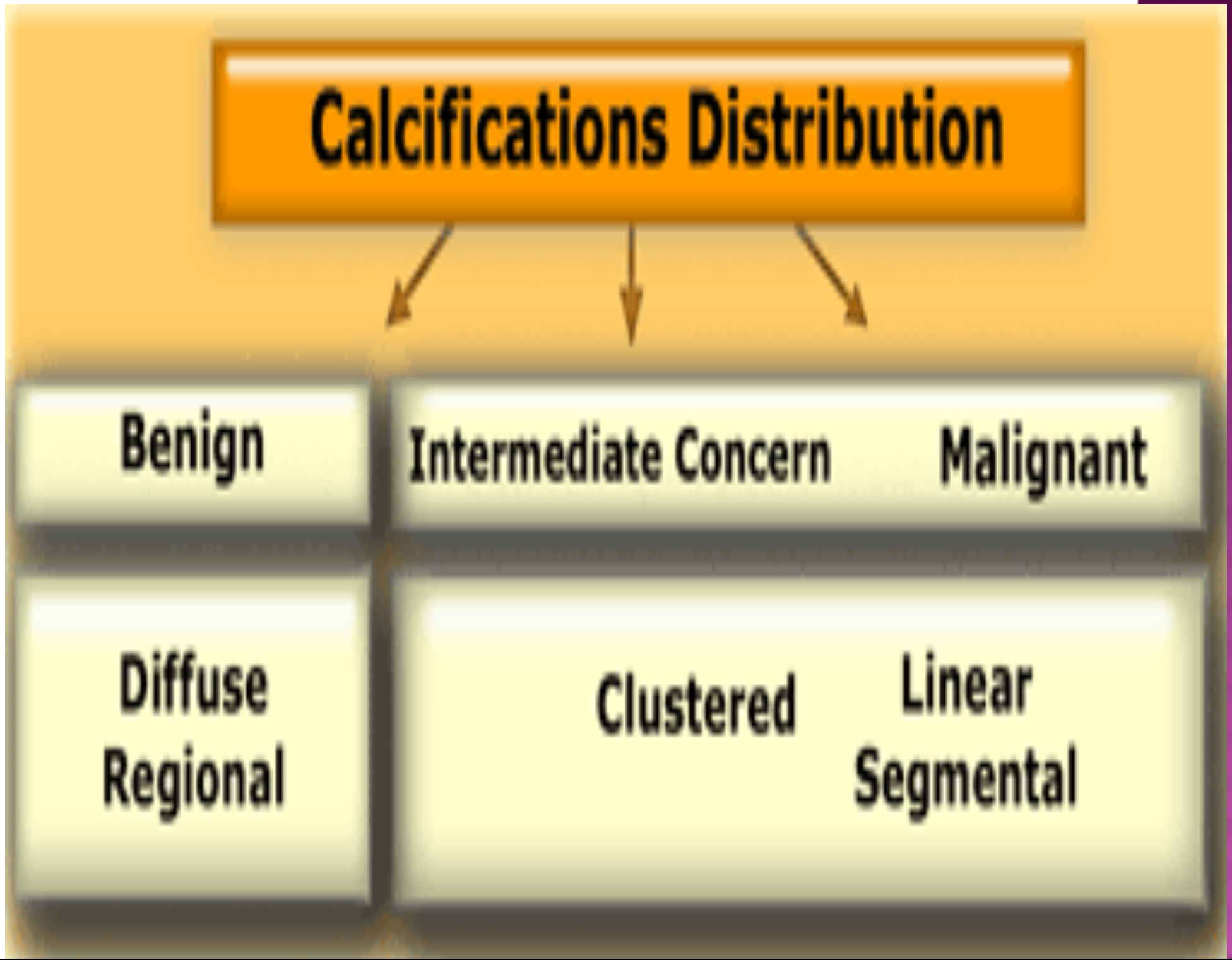
Amorphous
Coarse heterogenous

Malignant

fine linear
branching
pleomorphic

Distribution *Not Required*



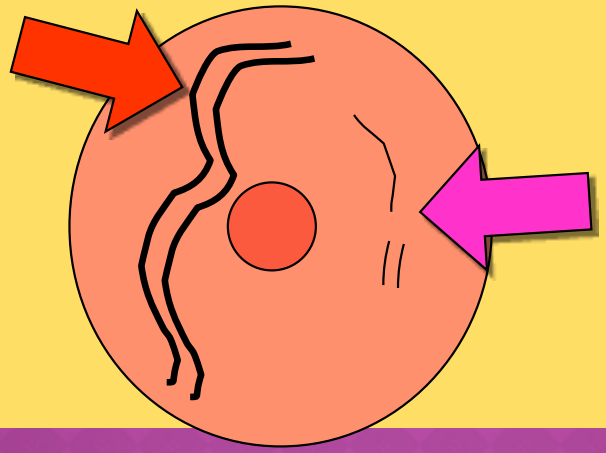

Calcifications Distribution
Benign
Intermediate Concern
Malignant
Diffuse
Regional
Clustered
Linear
Segmental

EVALUATING MICROCALCIFICATIONS: THE BI-RADS LEXICON

TYPICALLY BENIGN:

Skin, vascular, coarse (popcorn-like)

large rod

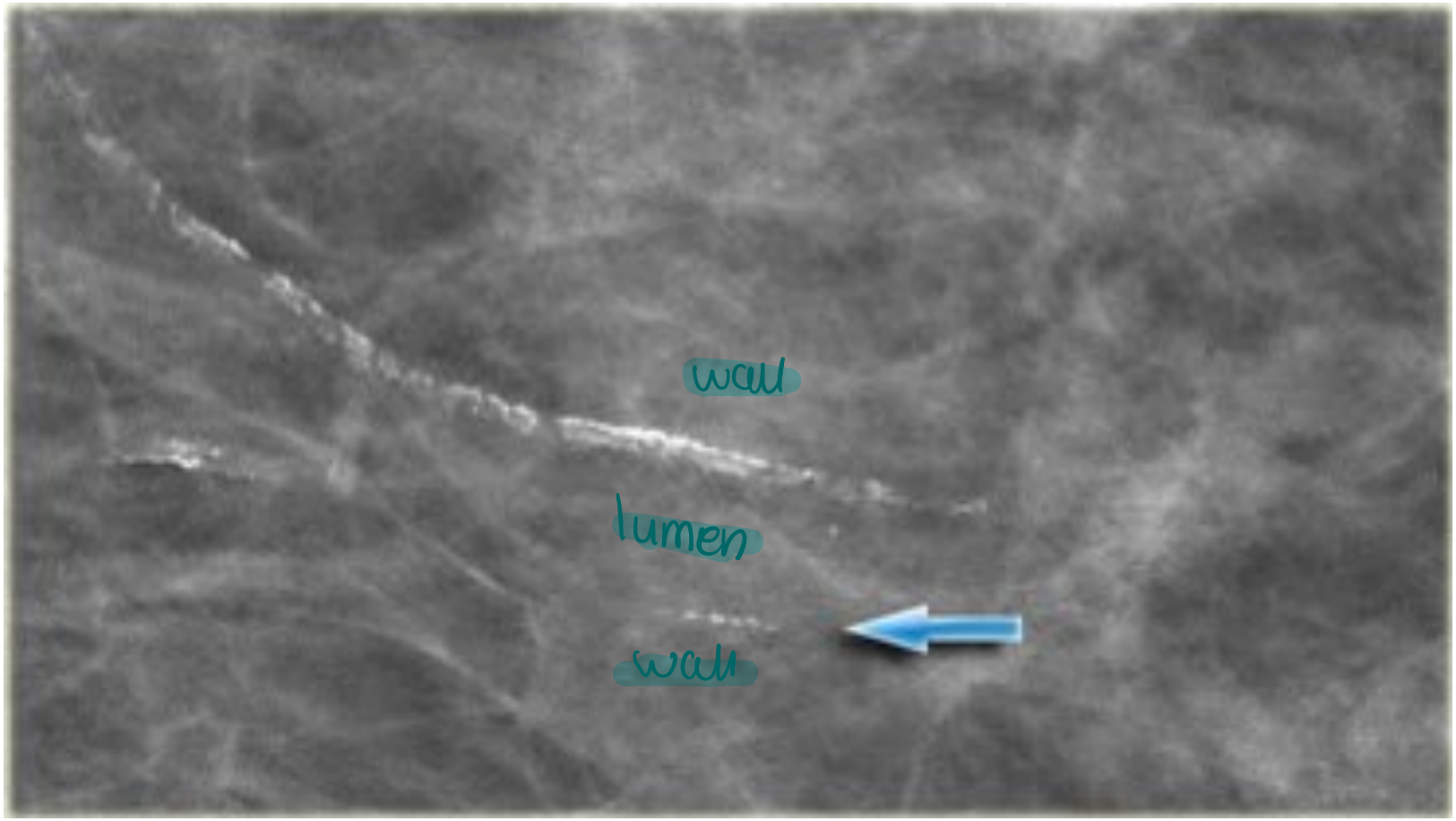


Usually "railroad track" appearance

Can be fragmented

BENIGN CALCIFICATIONS

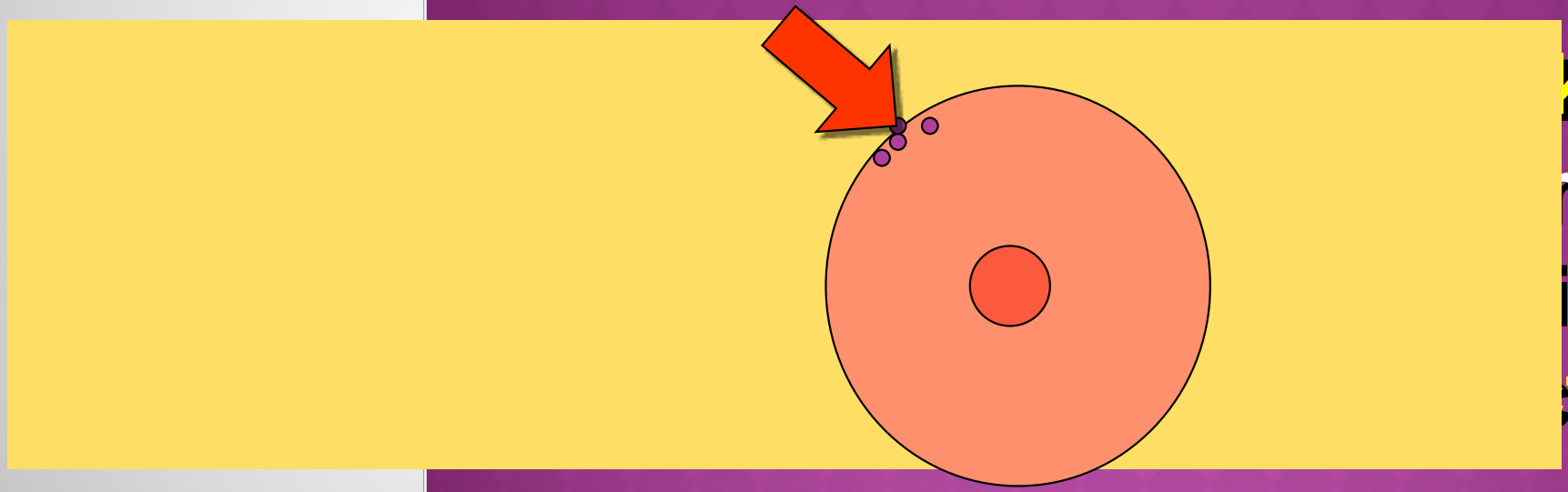
- Vascular Calcifications



EVALUATING MICROCALCIFICATIONS: THE BI-RADS LEXICON

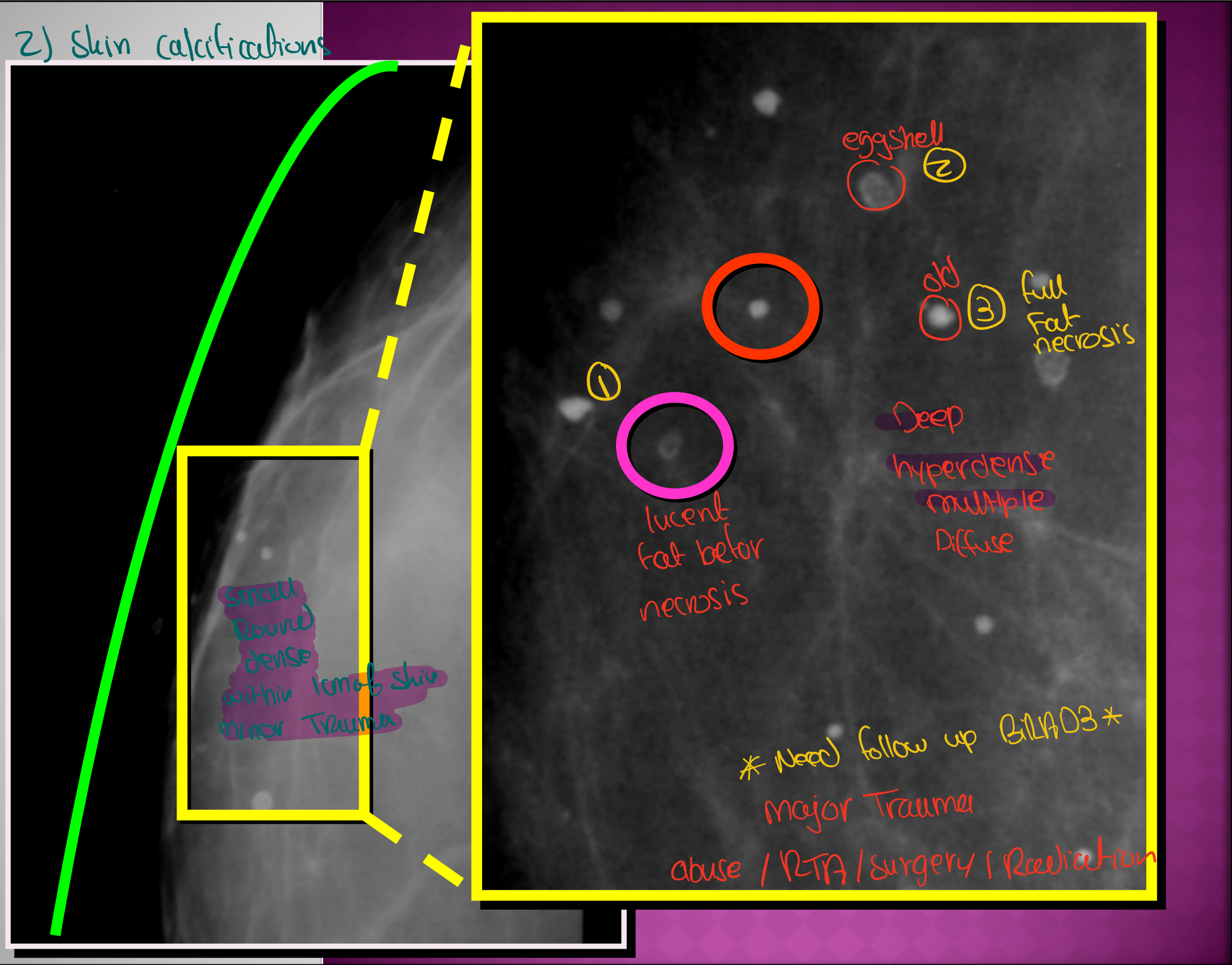
DESCRIPTORS: CALCIFICATIONS

TYPICALLY BENIGN:



ke) ,
nter,
ium,
tate

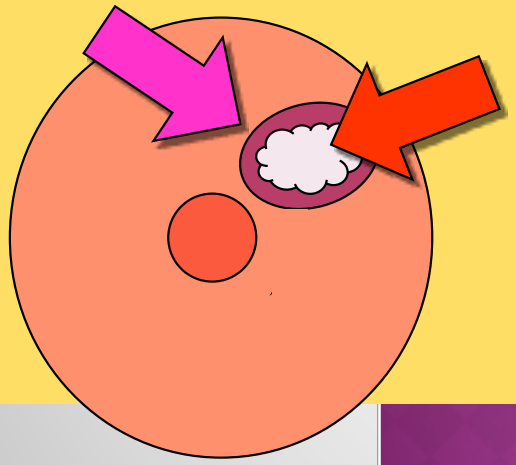
- Round, dense, sometimes egg-shell
- Often within 1 cm of skin in one view


2) Skin calcifications
eggshell
2
old
3
full
Fat
necrosis
1
lucent
fat befor
necrosis
Deep
hyperdense
multiple
Diffuse
small
Round
dense
within Ismob skin
minor Trauma
* Need follow up BILAD3 *
major Trauma
abuse / RTA / surgery / Reelication

EVALUATING MICROCALCIFICATIONS: THE BI-RADS LEXICON

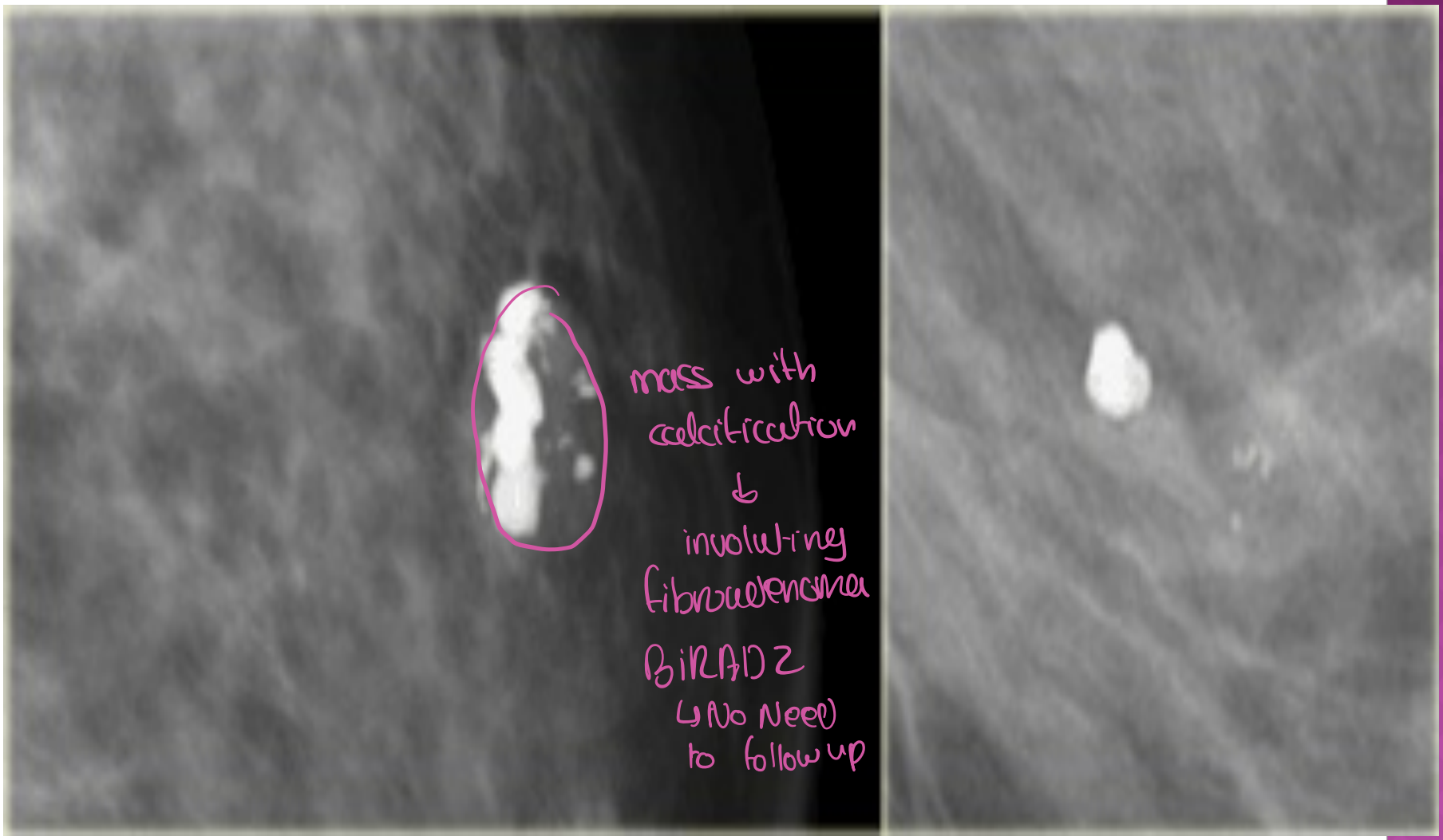
TYPICALLY BENIGN:

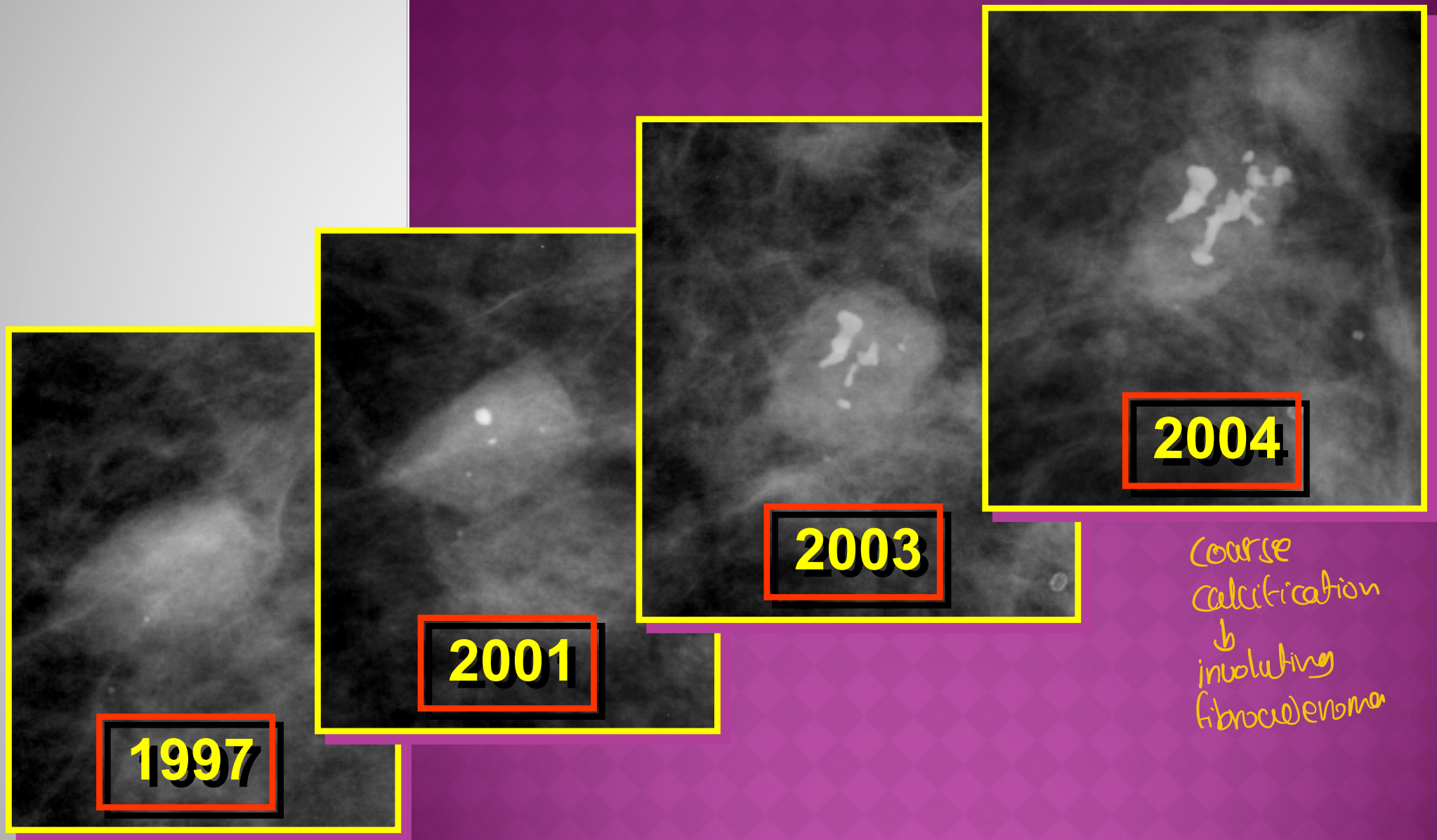
- coarse (popcorn-like)



- Created by involuting fibroadenoma
- May see smooth soft tissue mass

COARSE OR '3) POPCORN-LIKE'



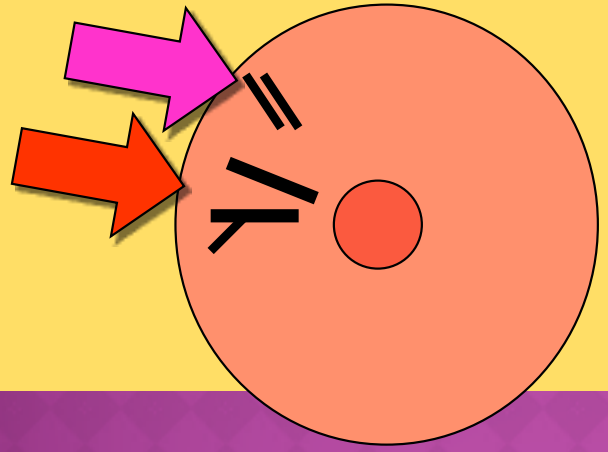


course calcification
↓
involuting fibroadenoma

EVALUATING MICROCALCIFICATIONS: THE BI-RADS LEXICON

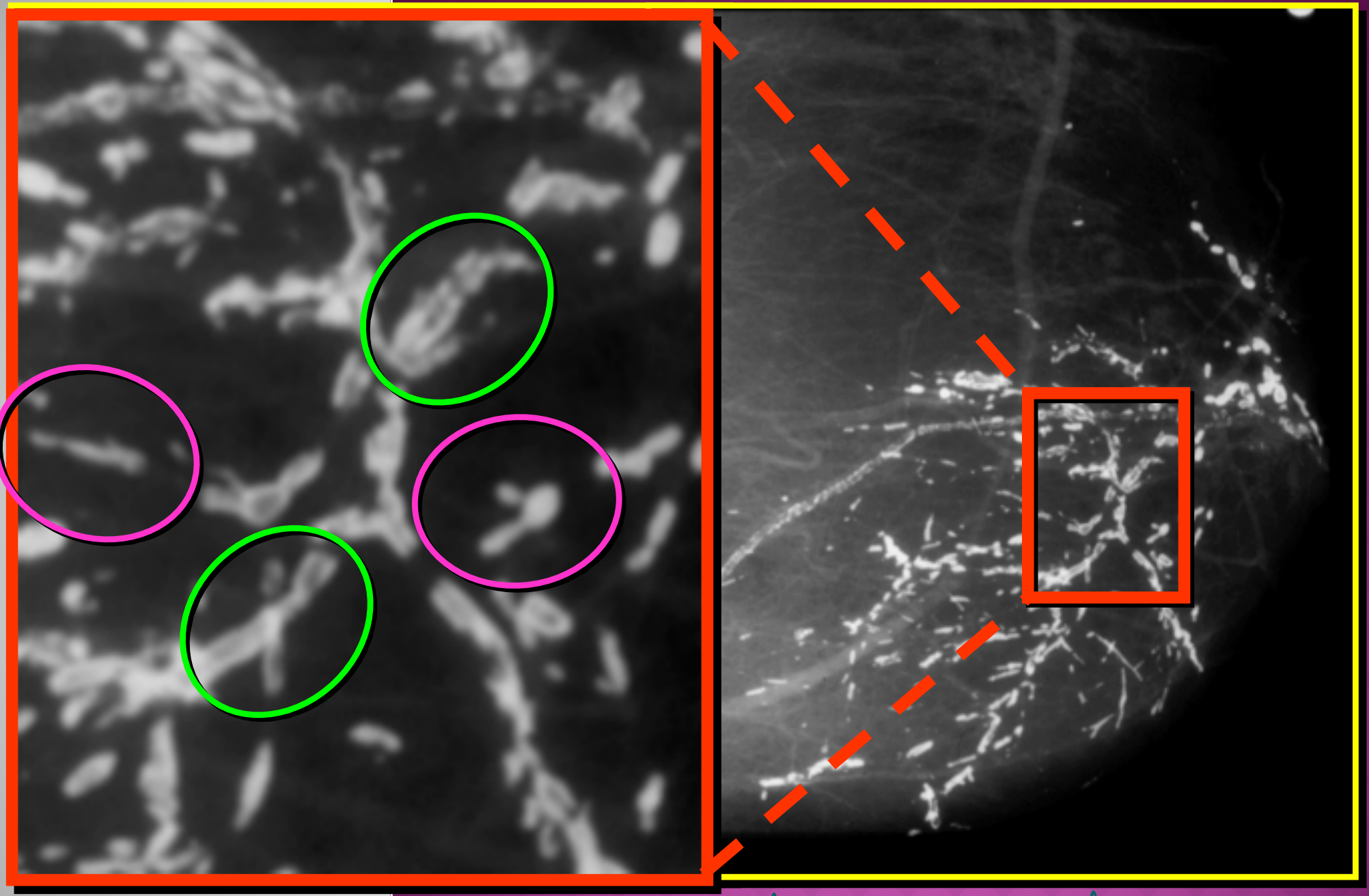
TYPICALLY BENIGN:

large rods,



- Secretory calcs., due to Plasma Cell Mastitis
- Segmental, bilateral, & intraductal or periductal

4) Roos like

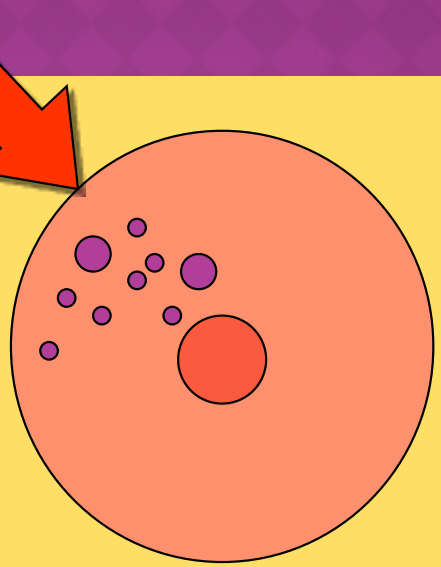


* plasma cell mastitis (Directly without thinking) → Diffuse Bilateral
punctate Bilateral → sclerosis adenosis

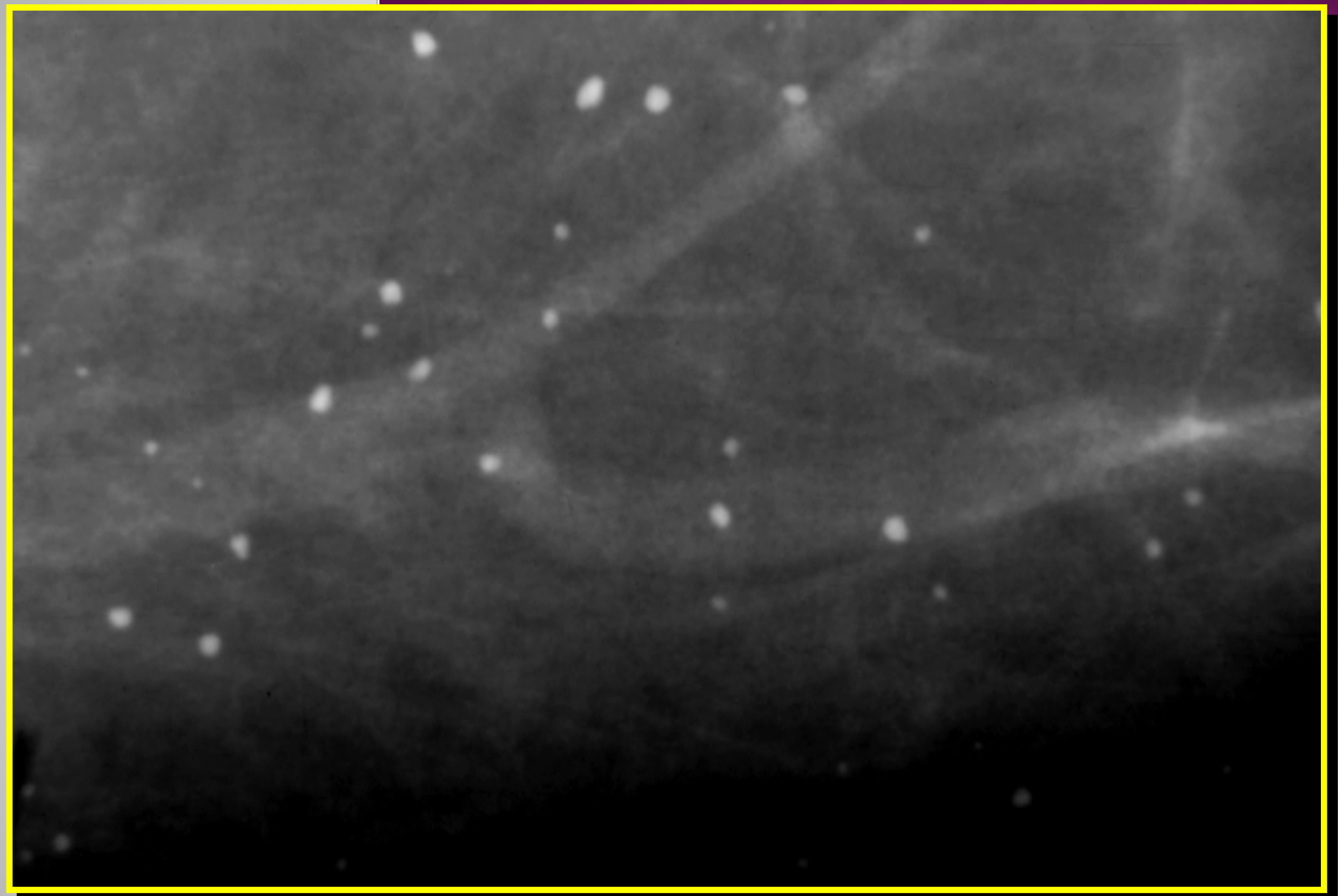
EVALUATING MICROCALCIFICATIONS: THE BI-RADS LEXICON

TYPICALLY BENIGN:

round

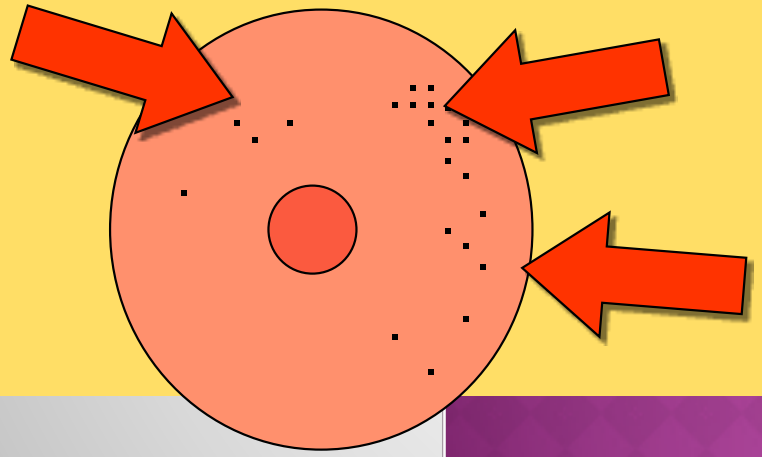


- Dense, scattered or clustered, mixed sizes
- May be difficult if small and clustered



EVALUATING MICROCALCIFICATIONS: THE BI-RADS LEXICON

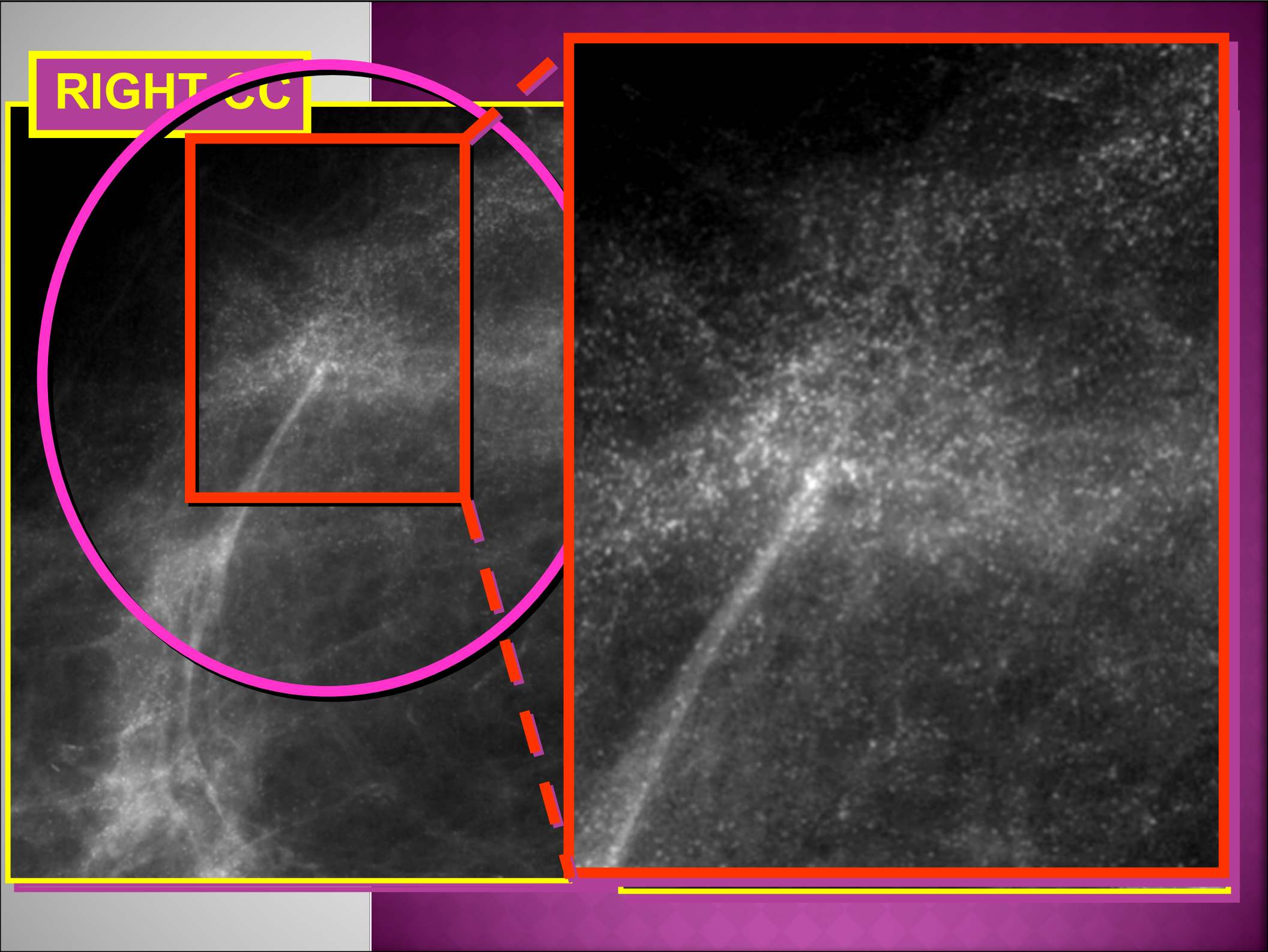
TYPICALLY BENIGN:



punctate

Scleros. Adenosis: “Starry nite”, bilat., scattered

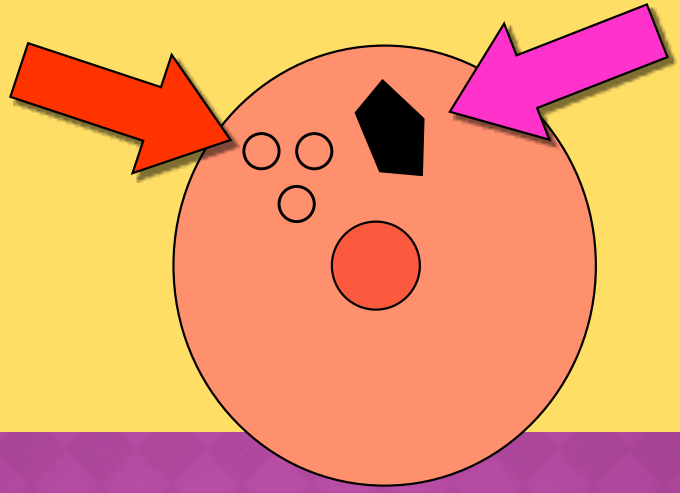
Much harder if unilateral and focally clustered


RIGHT CC

EVALUATING MICROCALCIFICATIONS: THE BI-RADS LEXICON

TYPICALLY BENIGN:

"eggshell" or

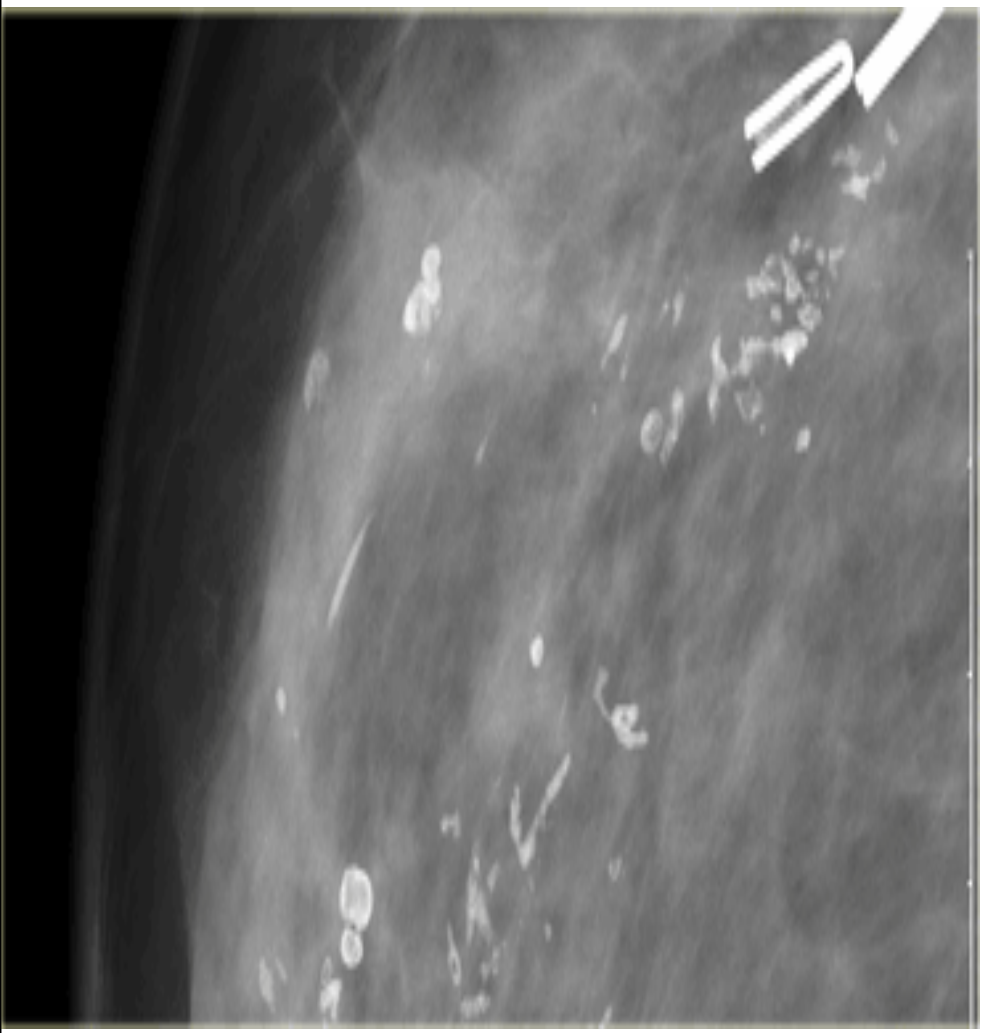


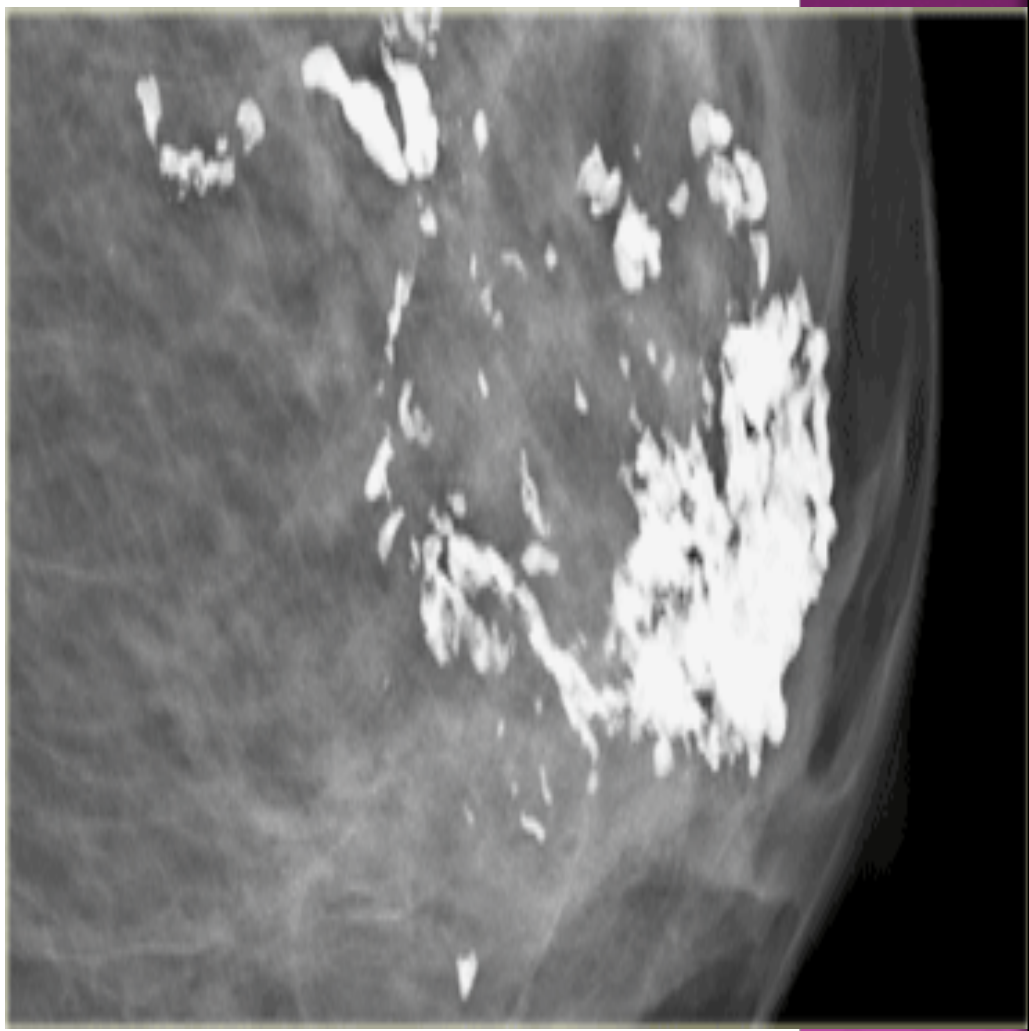
Due to calcified oil cyst or sebaceous gland

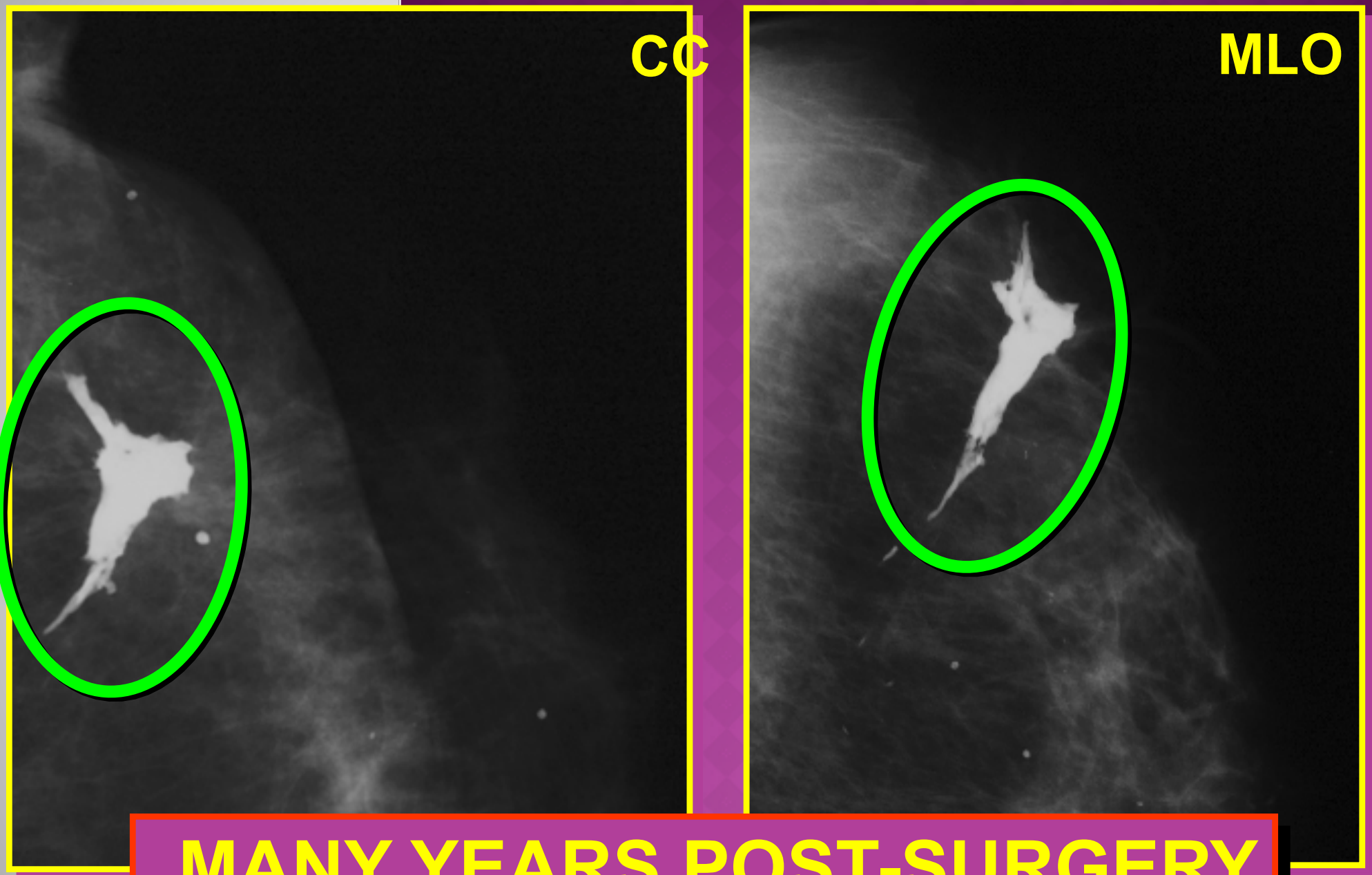
May be associated with dystrophic calcification

Eggshell or Rim Calcifications

Dystrophic calcifications



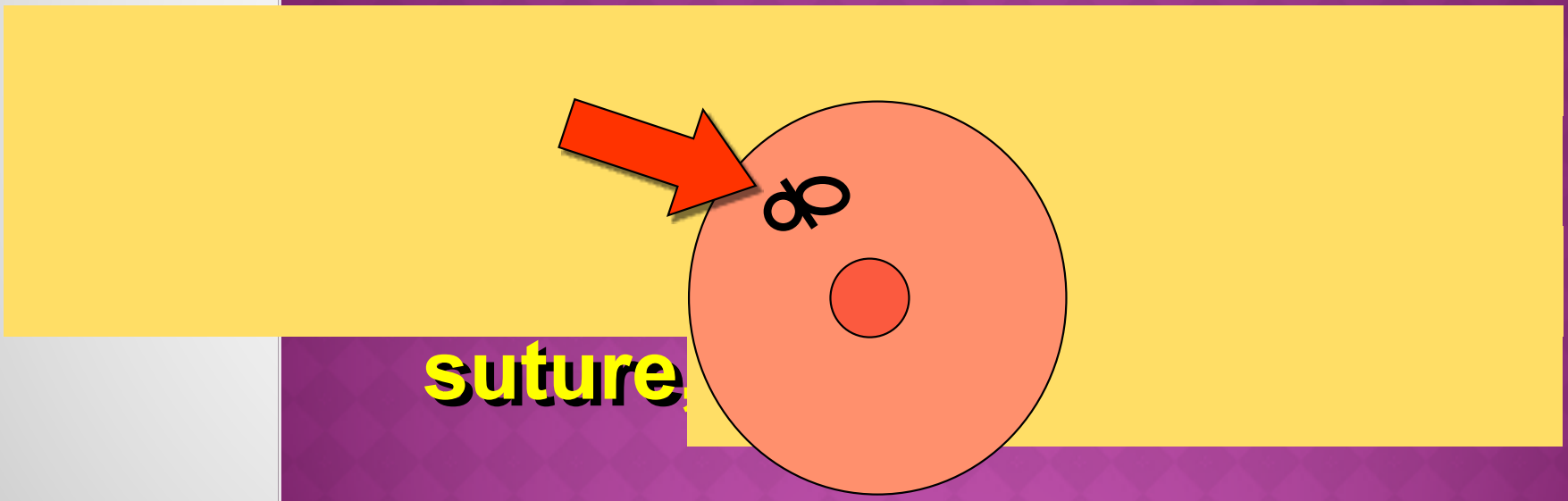




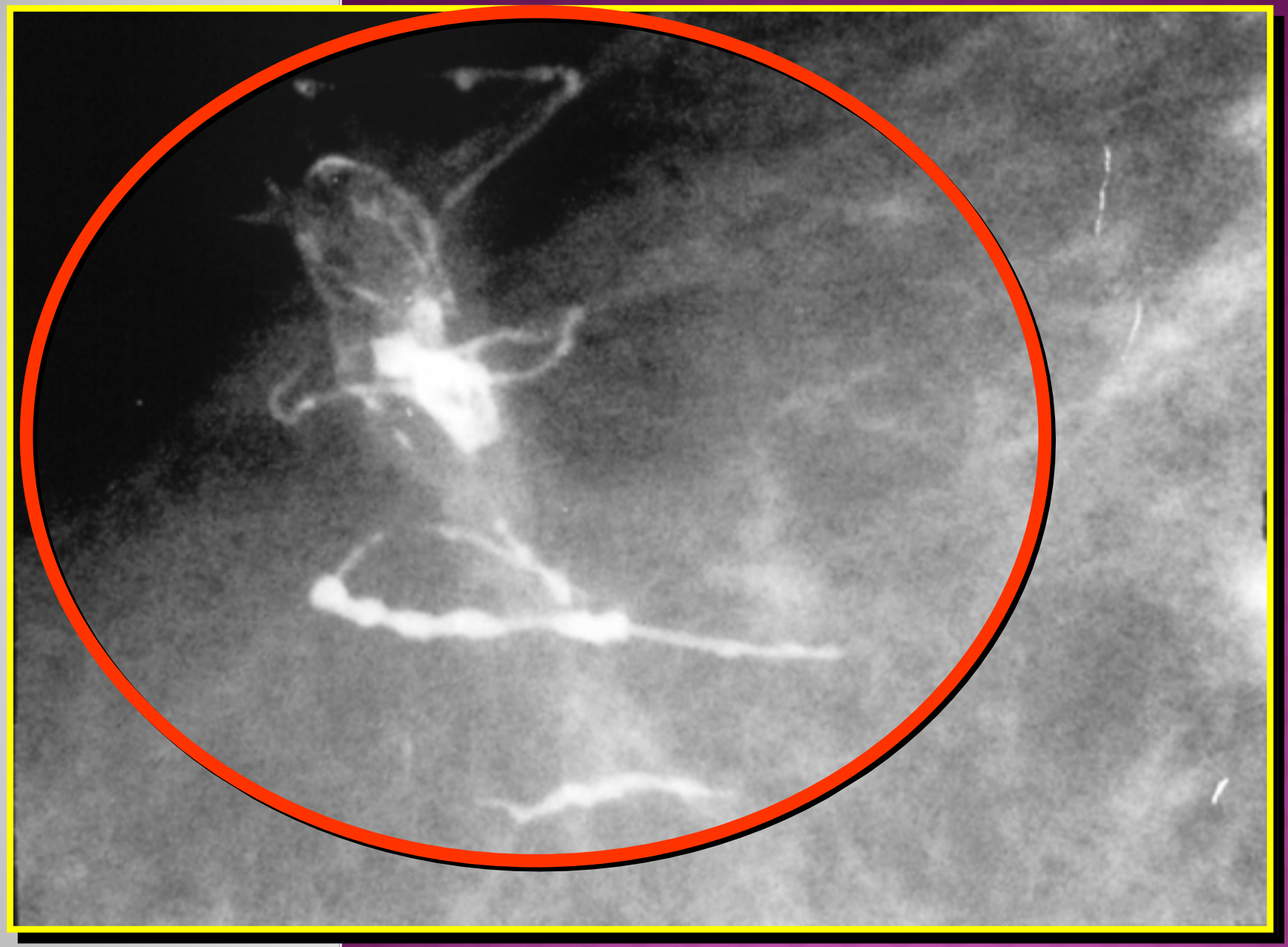
MANY YEARS POST-SURGERY

EVALUATING MICROCALCIFICATIONS: THE BI-RADS LEXICON

TYPICALLY BENIGN:



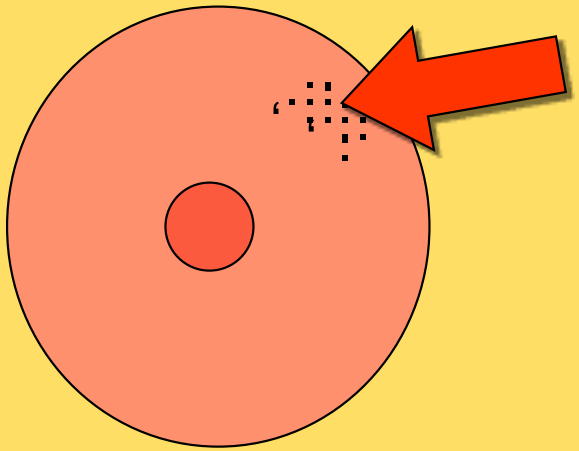
- Calcium forms around surgical suture
- Rare, but can occur post-radiation



EVALUATING MICROCALCIFICATIONS: THE BI-RADS LEXICON

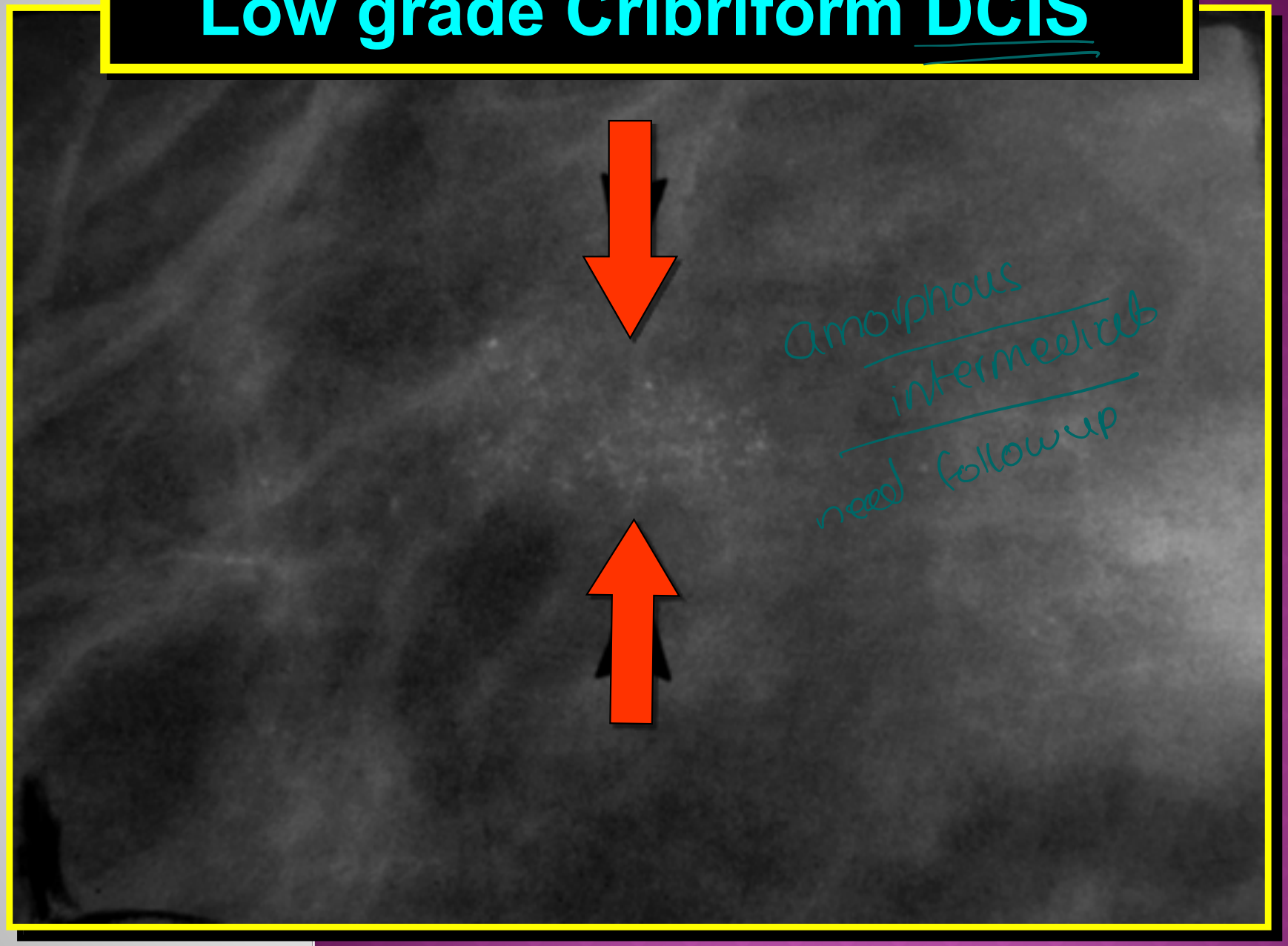
INTERMEDIATE CONCERN:

Amorphous or indistinct



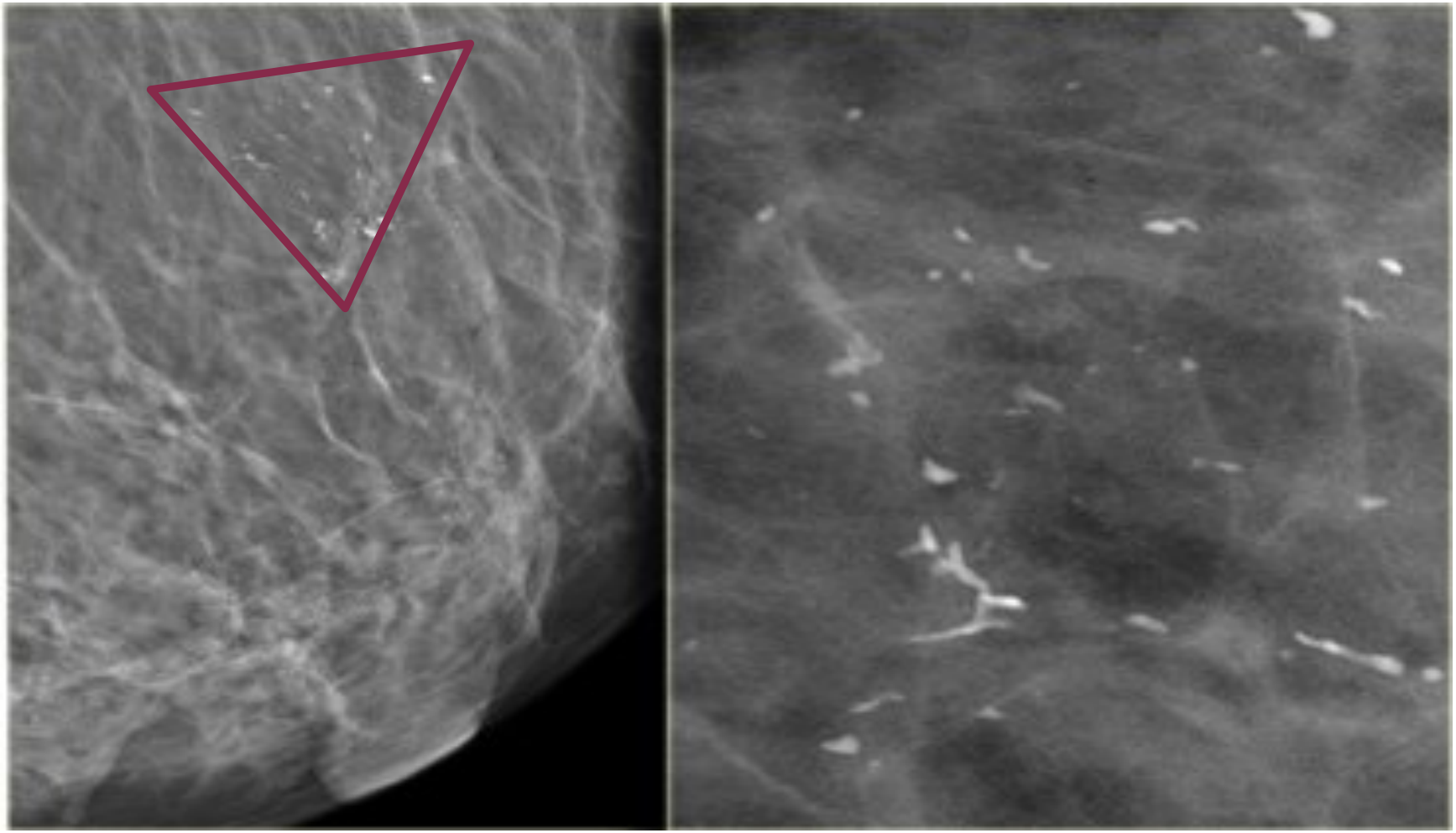
- Powdery, tight clusters
- Low-grade DCIS
- Hard to distinguish from sclerosing adenosis and fibrocystic changes

Low grade Cribriform DCIS



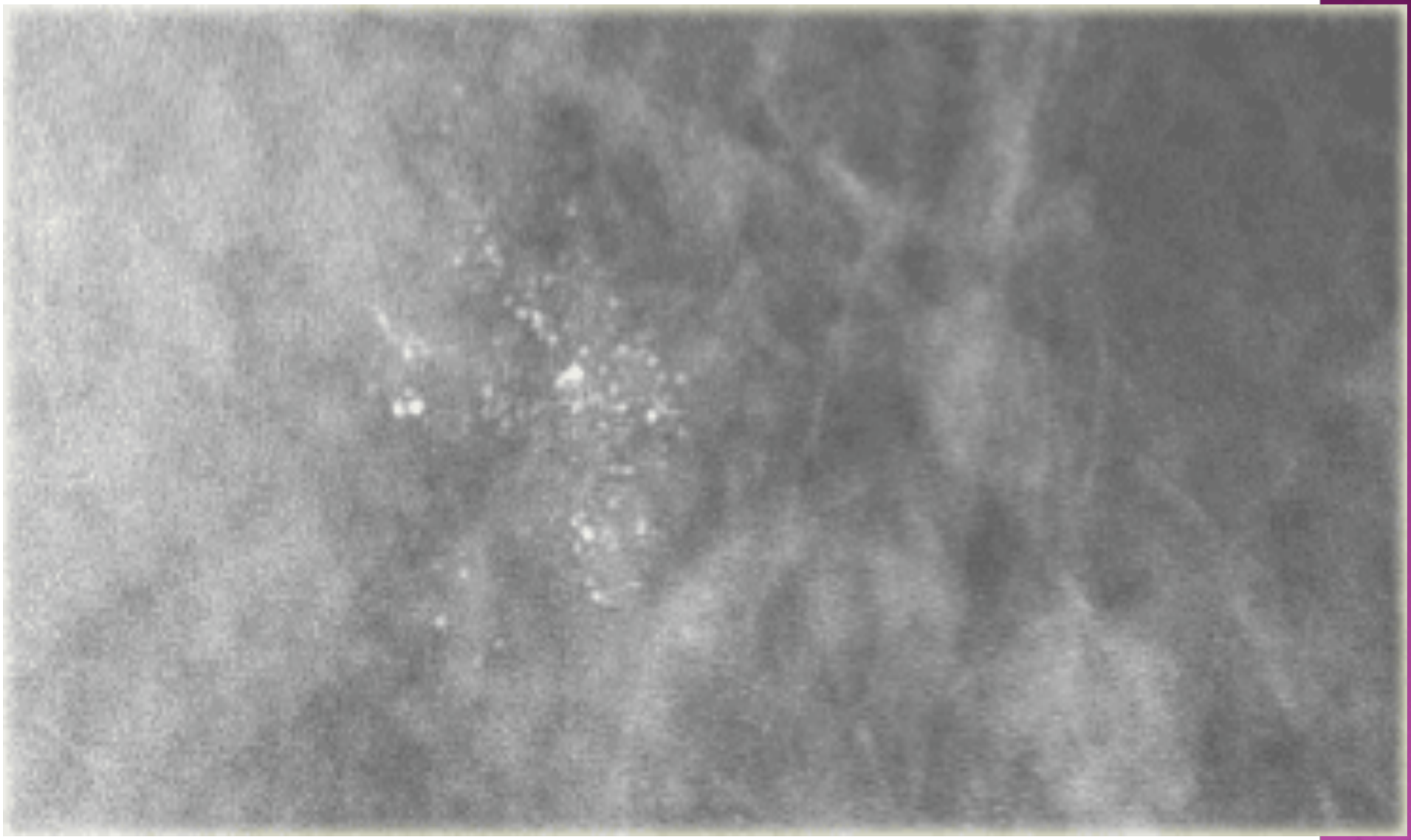
Coarse granular microcalcifications

DDx : Fibroadenoma, fibrosis, fat necrosis (post traumatic) , DCIS



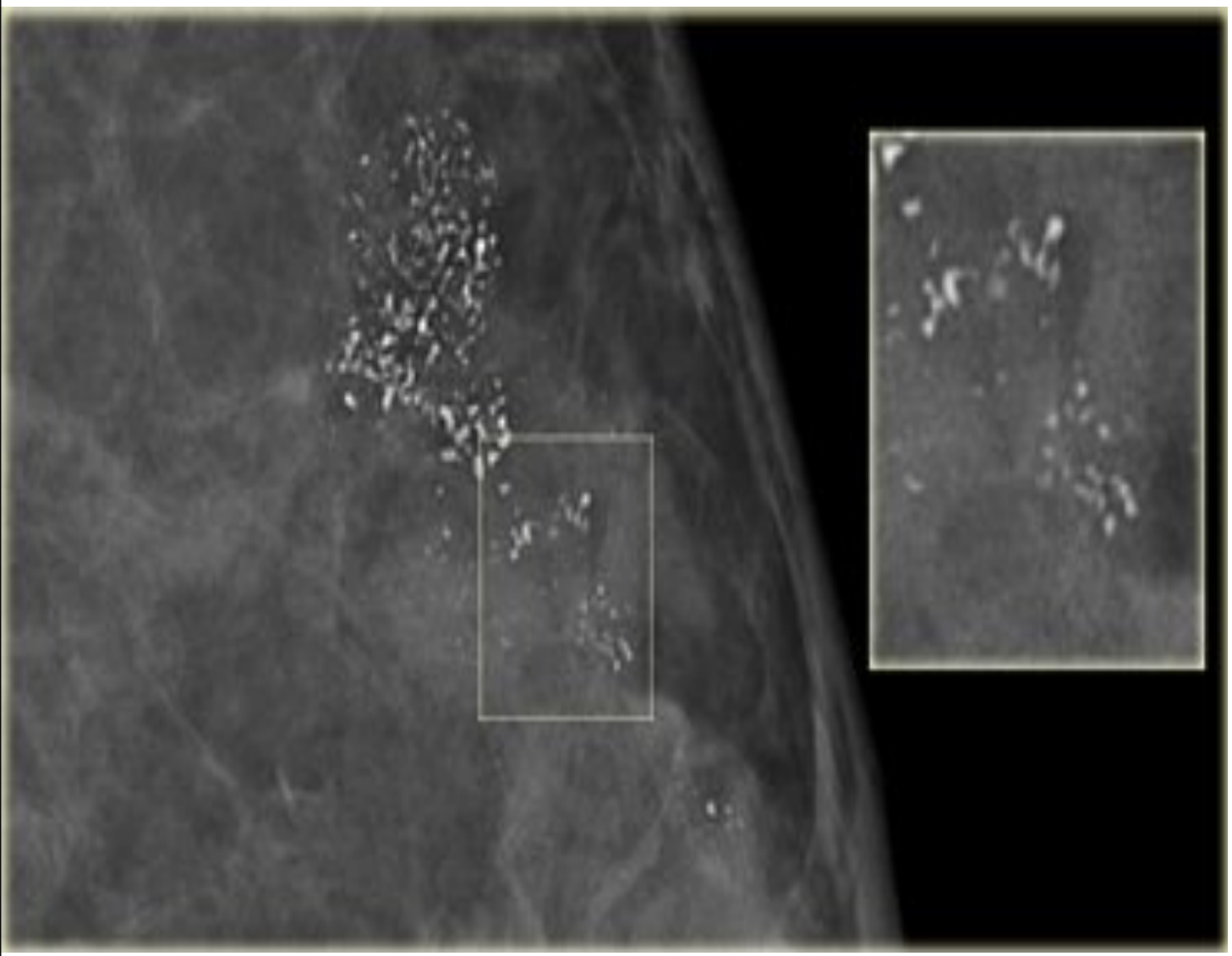
coarse heterogeneous calcifications in a segmented distribution.
These calcifications were classified as BI-RADS 4.
Biopsy showed calcifications within fibrous stroma.

High probability of malignancy



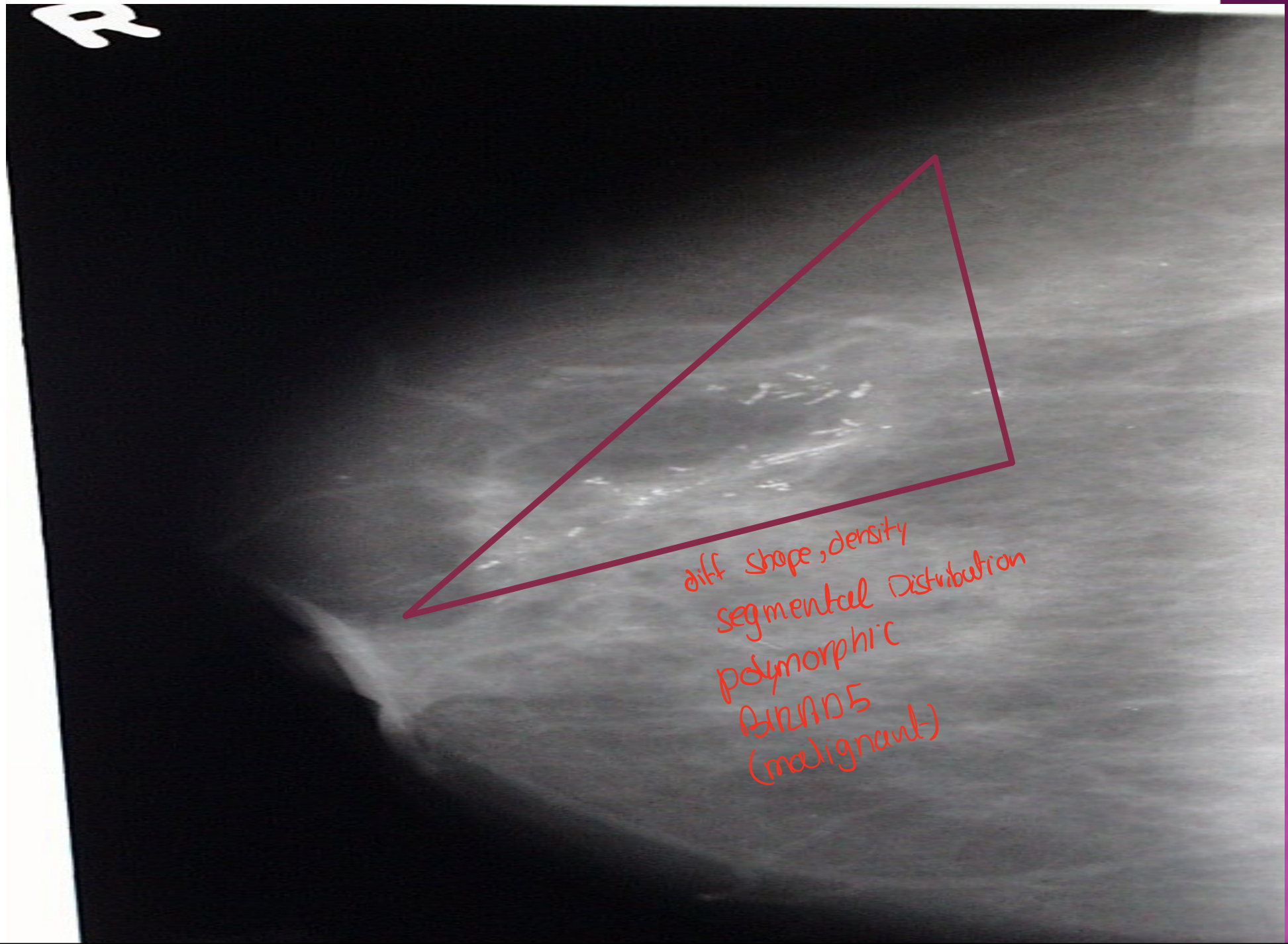
Amorphous and fine pleomorphic calcifications (Bi-RADS 4)
Biopsy: fibrocystic changes

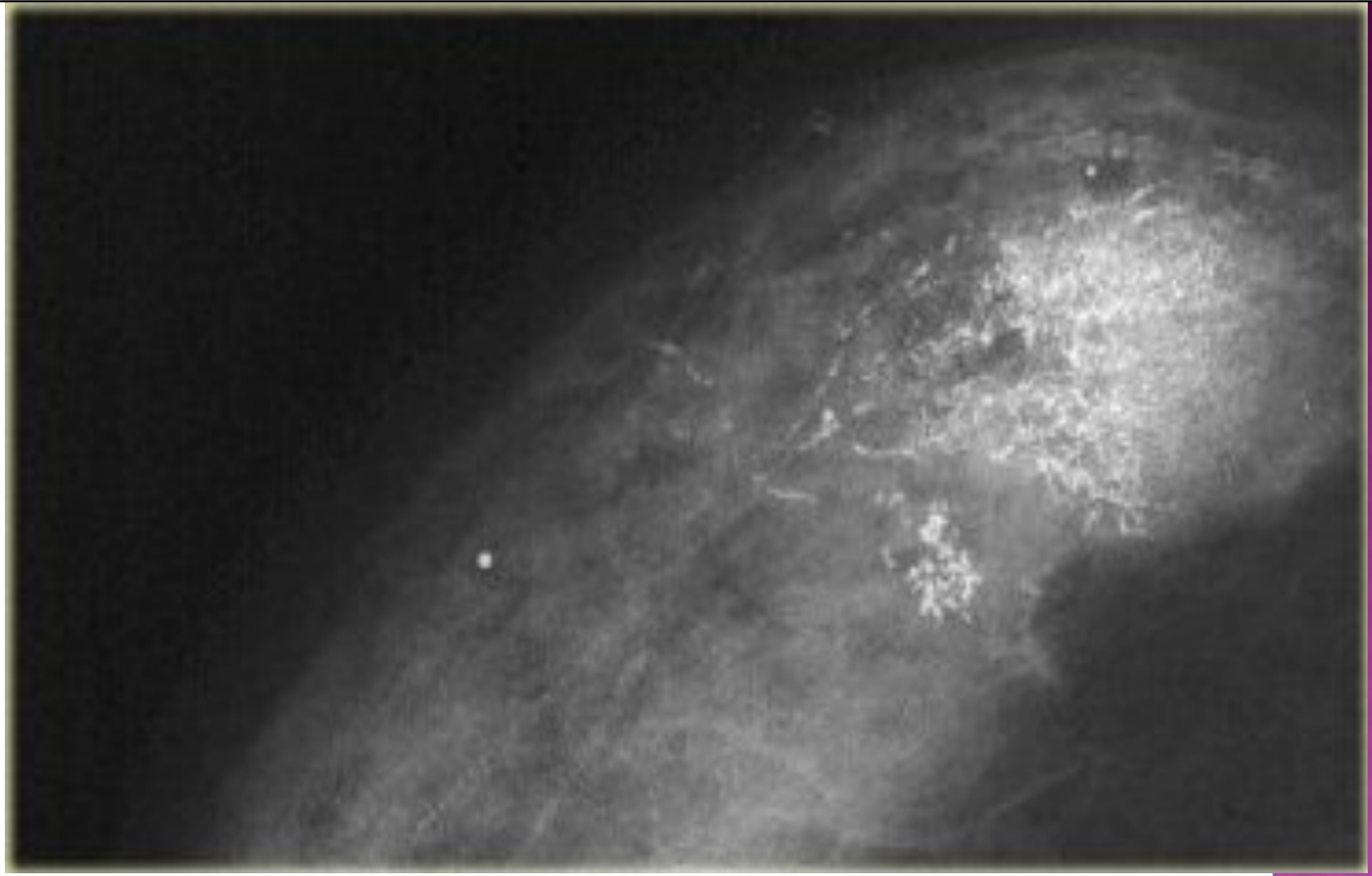
Fine Linear or Fine Linear Branching



calcifications in a segmental distribution. Some have a linear shape and some have a branching morphology. This is highly suggestive of malignancy (BI-RADS 5).

MALIGNANT CALCIFICATIONS





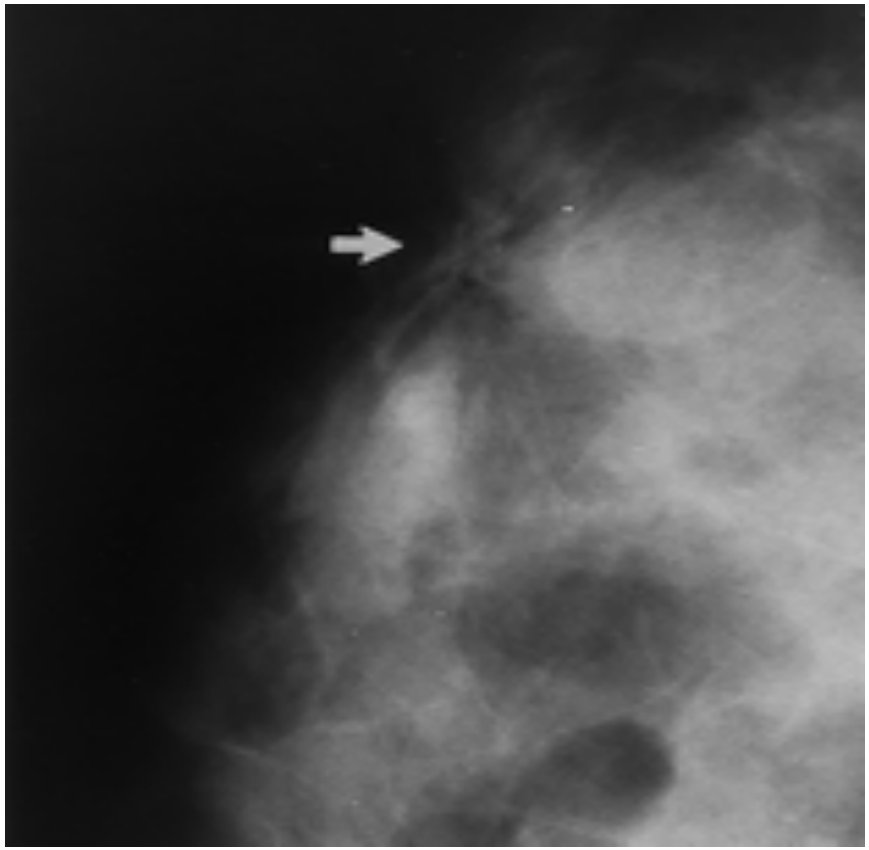
Fine linear and branching calcifications in a segmental distribution highly suggestive of malignancy (BI-RADS 5). Extensive high grade DCIS was found at biopsy.

SECONDARY SIGNS OF CANCER ON MAMMOGRAPHY

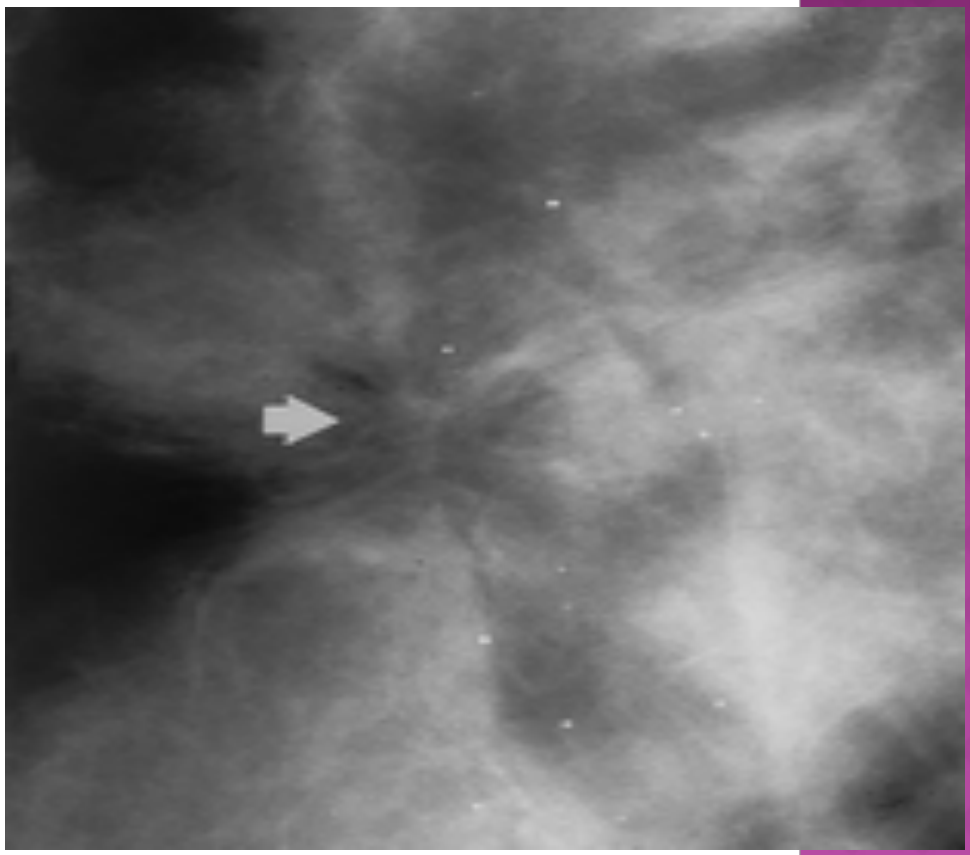
- Nipple Inversion
- Architectural Distortion (inverted area) → primary → no mass
  → secondary → mass
- Skin Thickening
- Axillary Adenopathy
- Skin Retraction
- Tissue Asymmetry
- Developing “Neodensity”

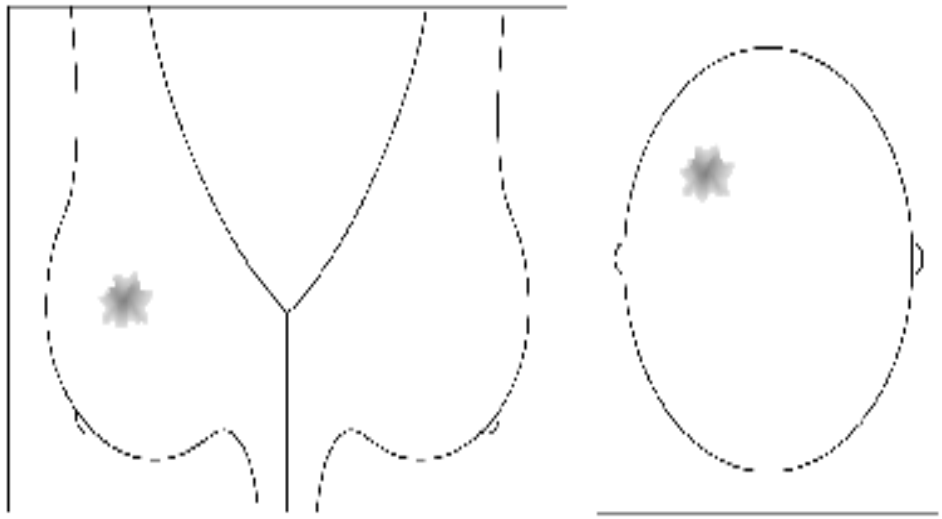
ARCHITECTURAL DISTORSION

ML view

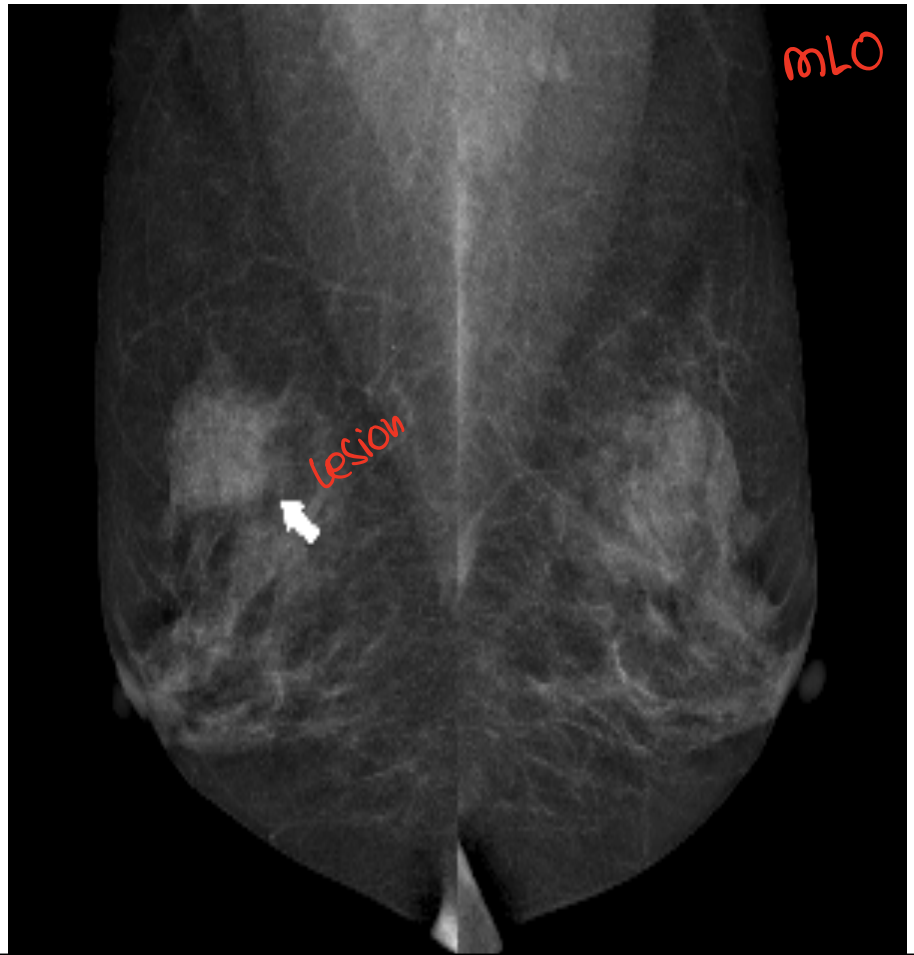


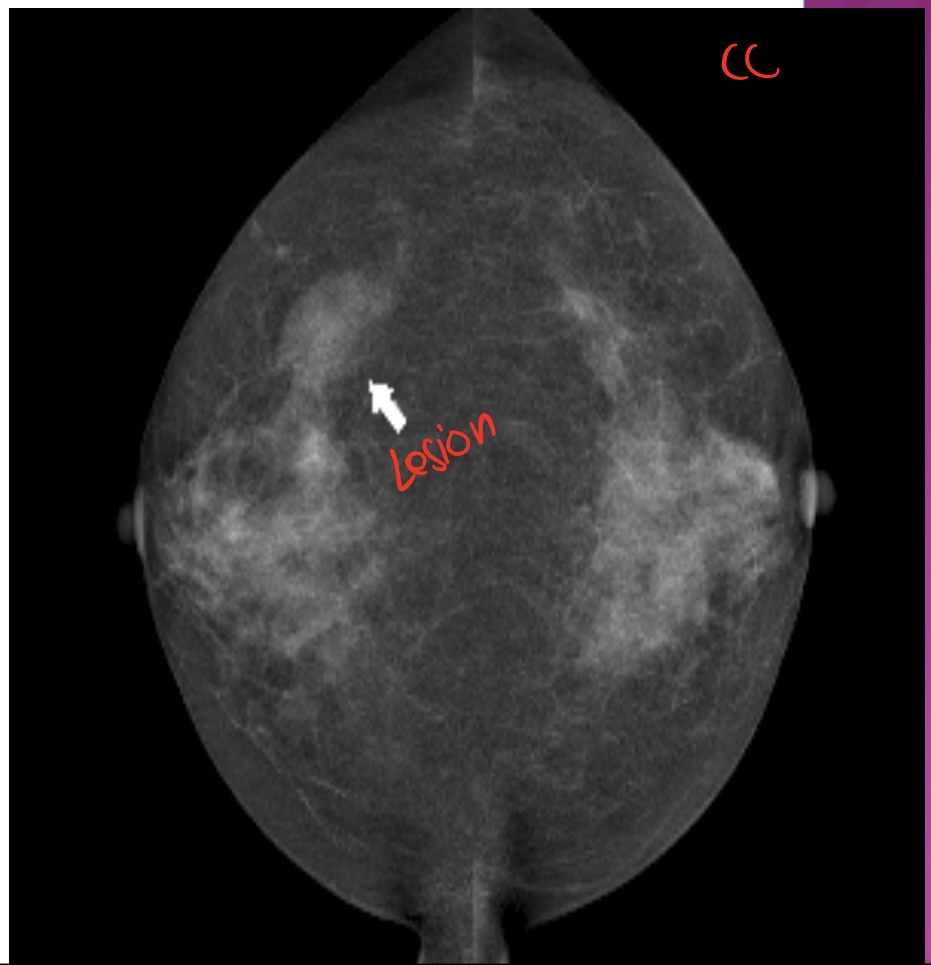
CC view





Focal asymmetry





Final Assessment Categories

0 = Need Additional Imaging Evaluation
or Prior Mammograms For Comparison

1 = Negative
There is nothing to comment on

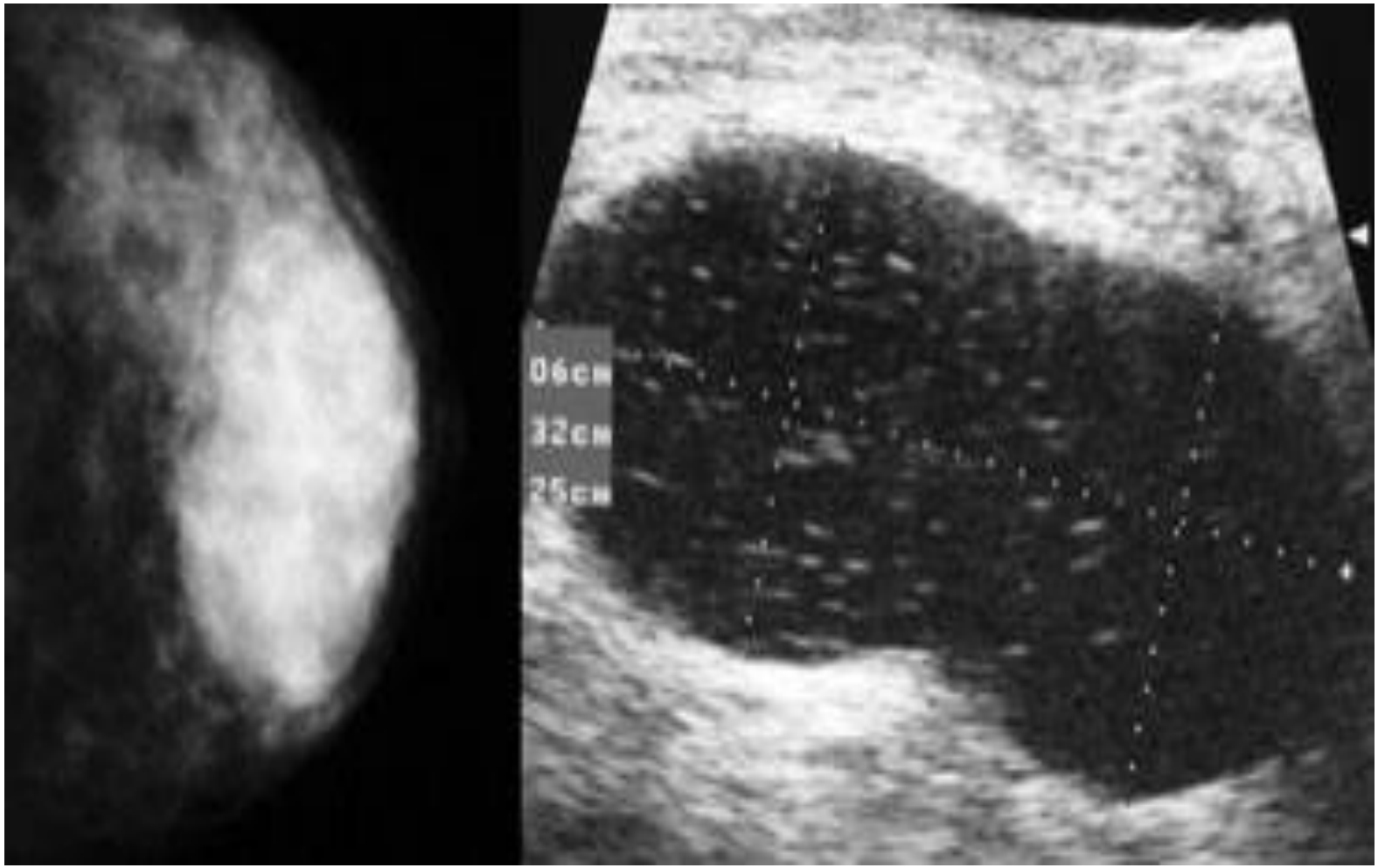
2 = Benign Finding

3 = Probably Benign Finding (<2% malignant)
Initial Short-Interval Follow-Up Suggested

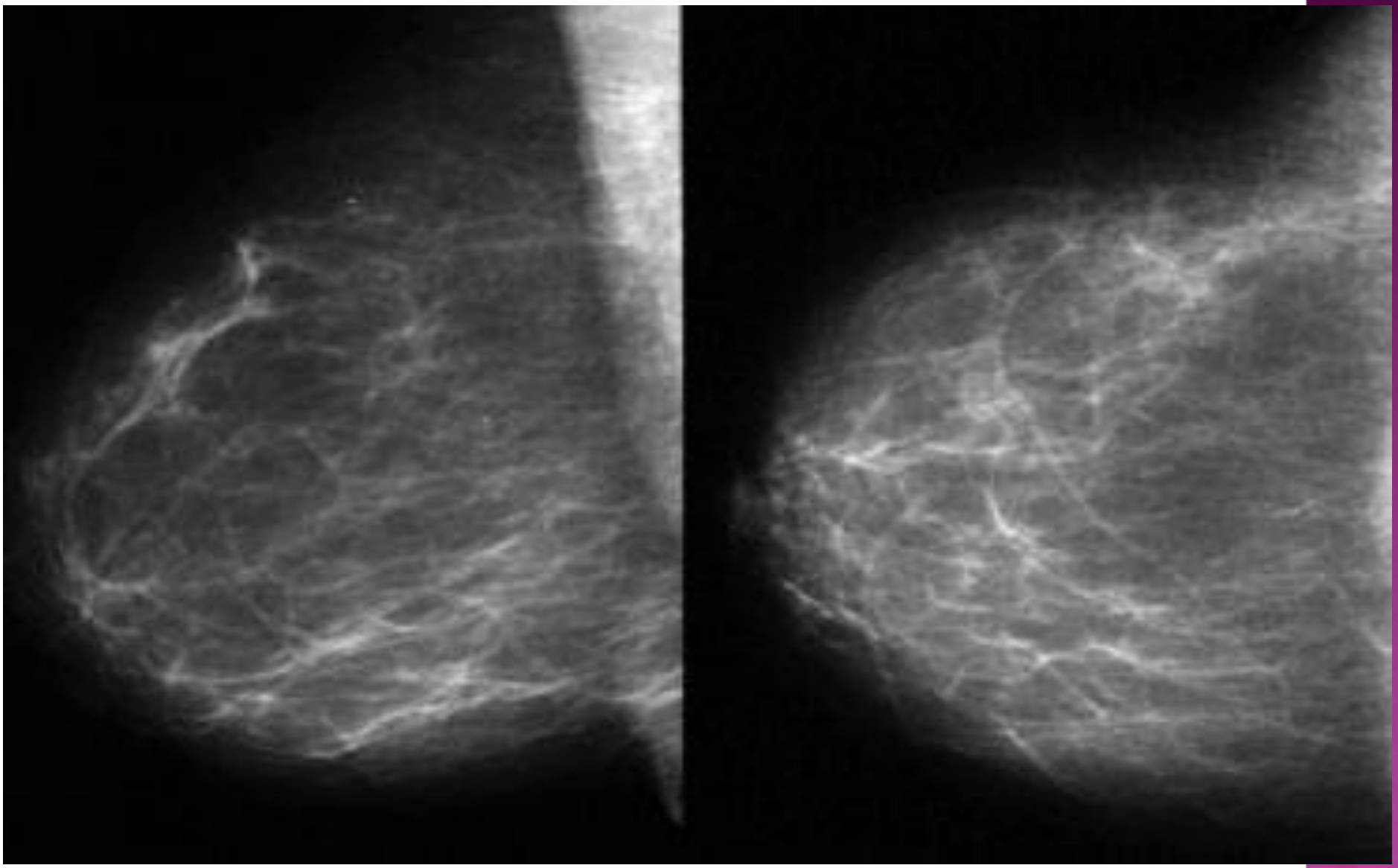
4 = Suspicious Abnormality (2 - 95% malignant)
Biopsy Should Be Considered

5 = Highly Suggestive of Malignancy(>95% malignant)
Appropriate Action Should Be Taken

6 = Known Biopsy – Proven Malignancy

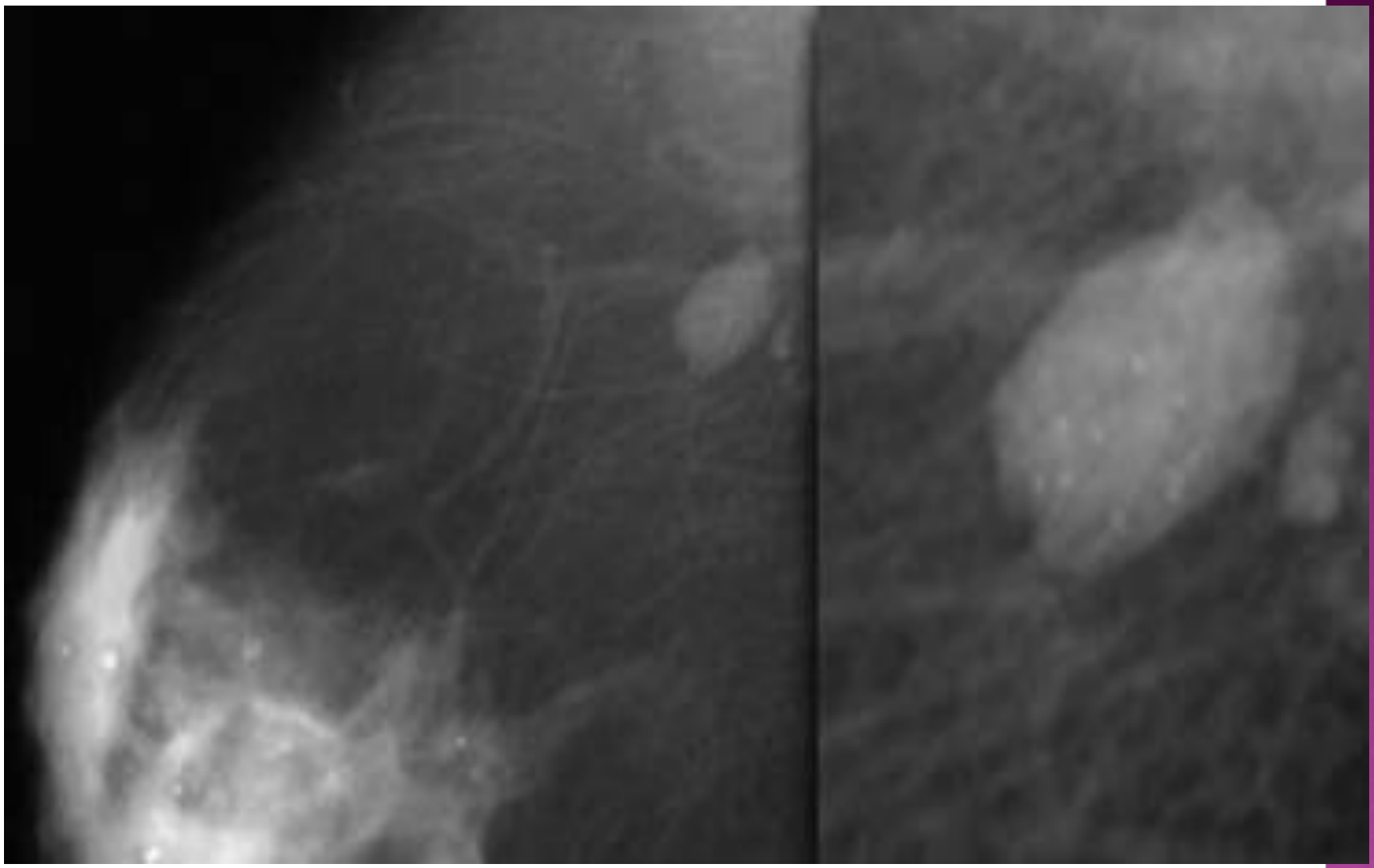


BI-RADS 0 at screening.
Additional ultrasound after referral was performed allowing final assessment. (BI-RADS 2)

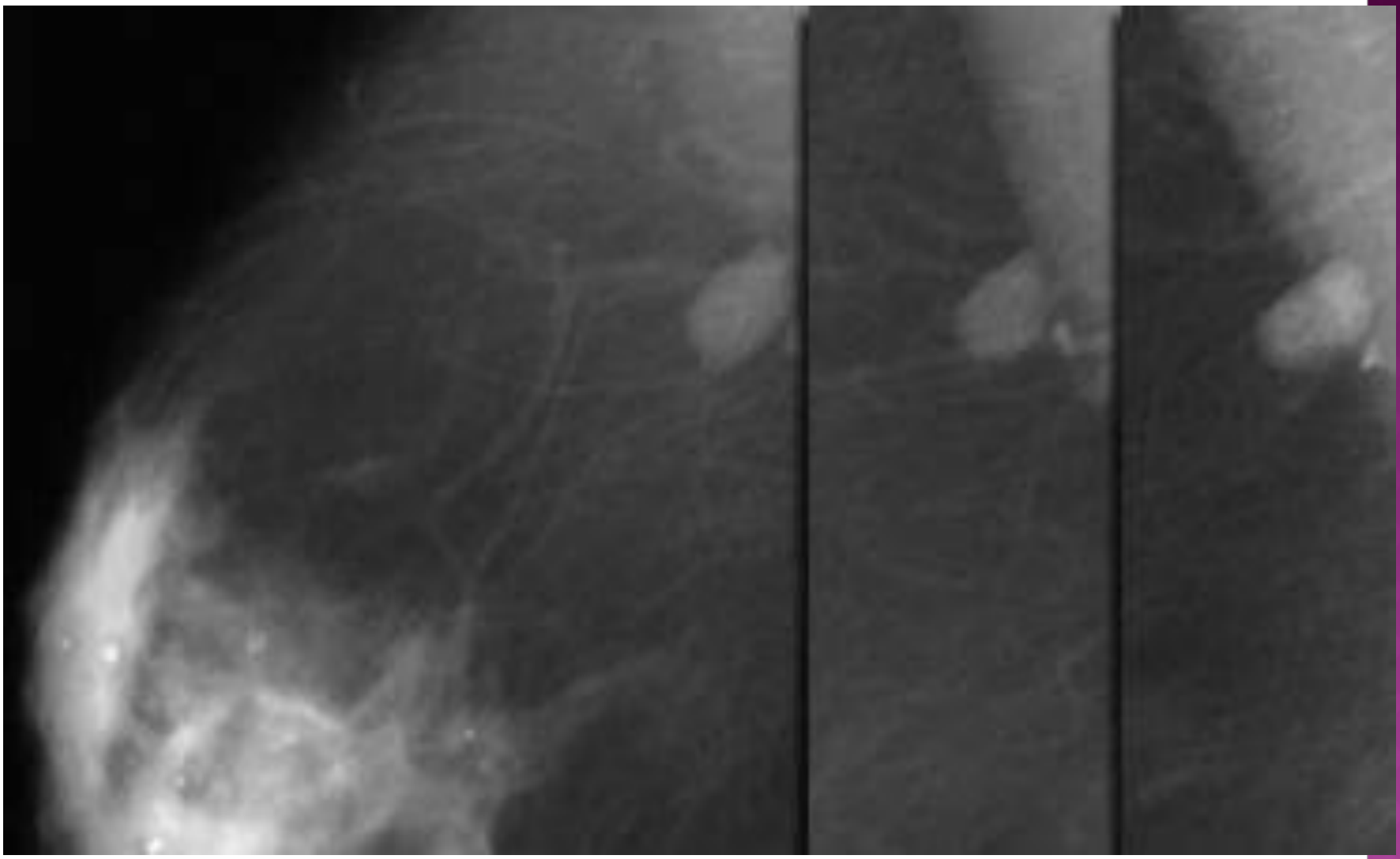


BI-RADS Category 1 Normal

BI-RADS Category 2. A mass seen on mammogram proved to be a cyst.

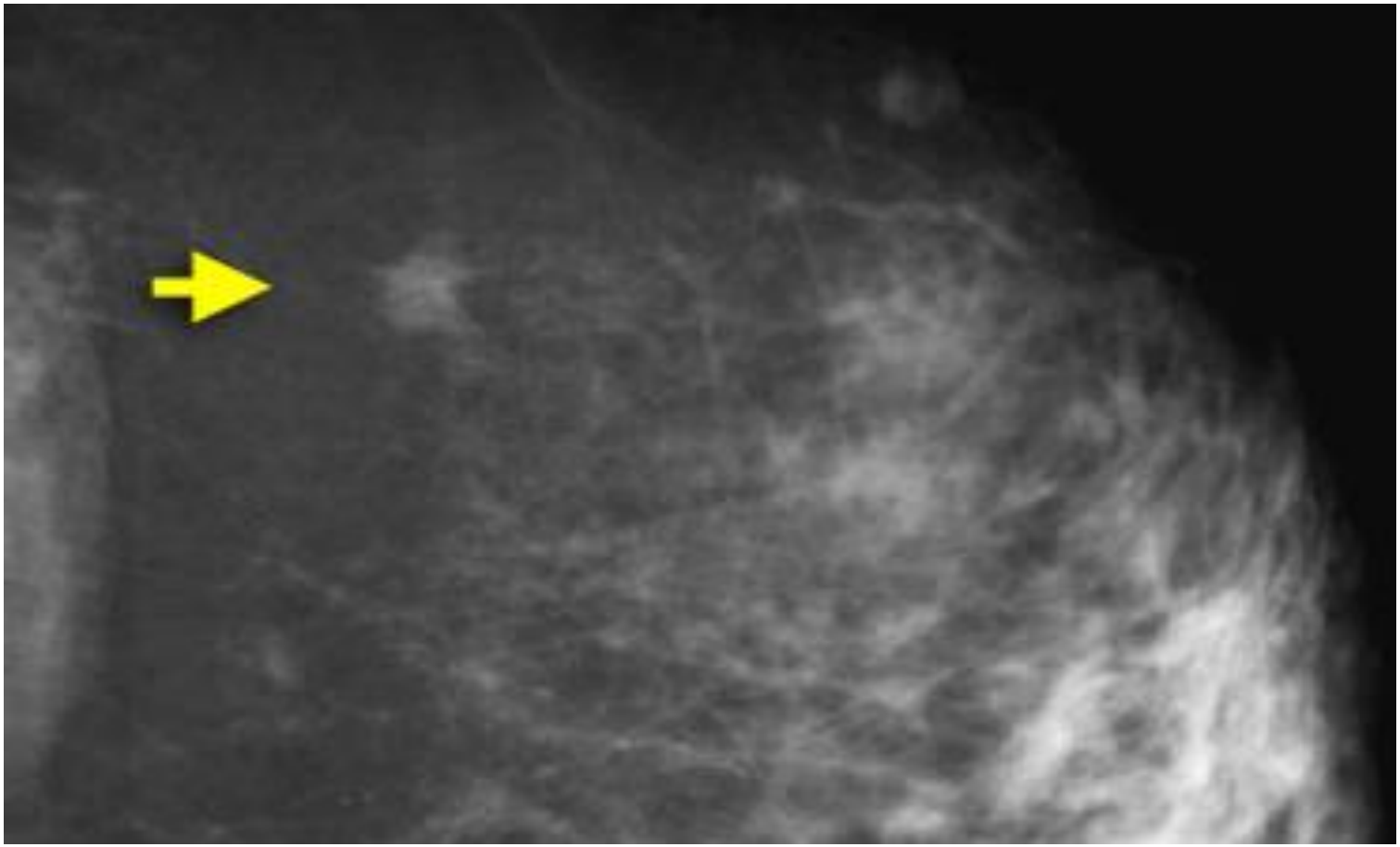


BI-RADS 3. Non-palpable sharply defined lesion with a cluster of punctate calcifications.

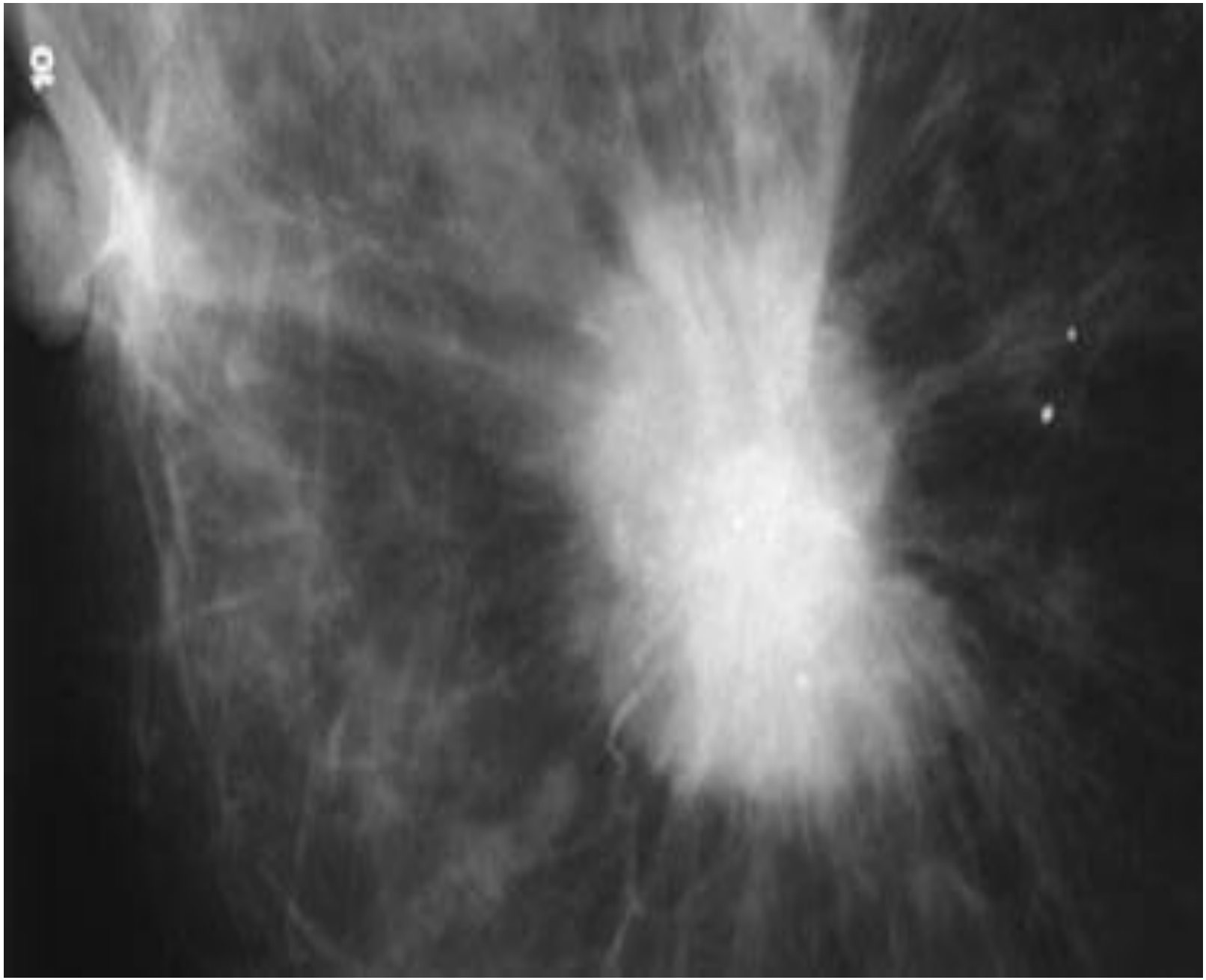


Follow up at 6, 12 and 24 months showed no change. Final assessment was changed to a Category 2.

BI-RADS 4 is reserved for findings that do not have the classic appearance of malignancy but have a wide range of probability of malignancy (2 - 95%).

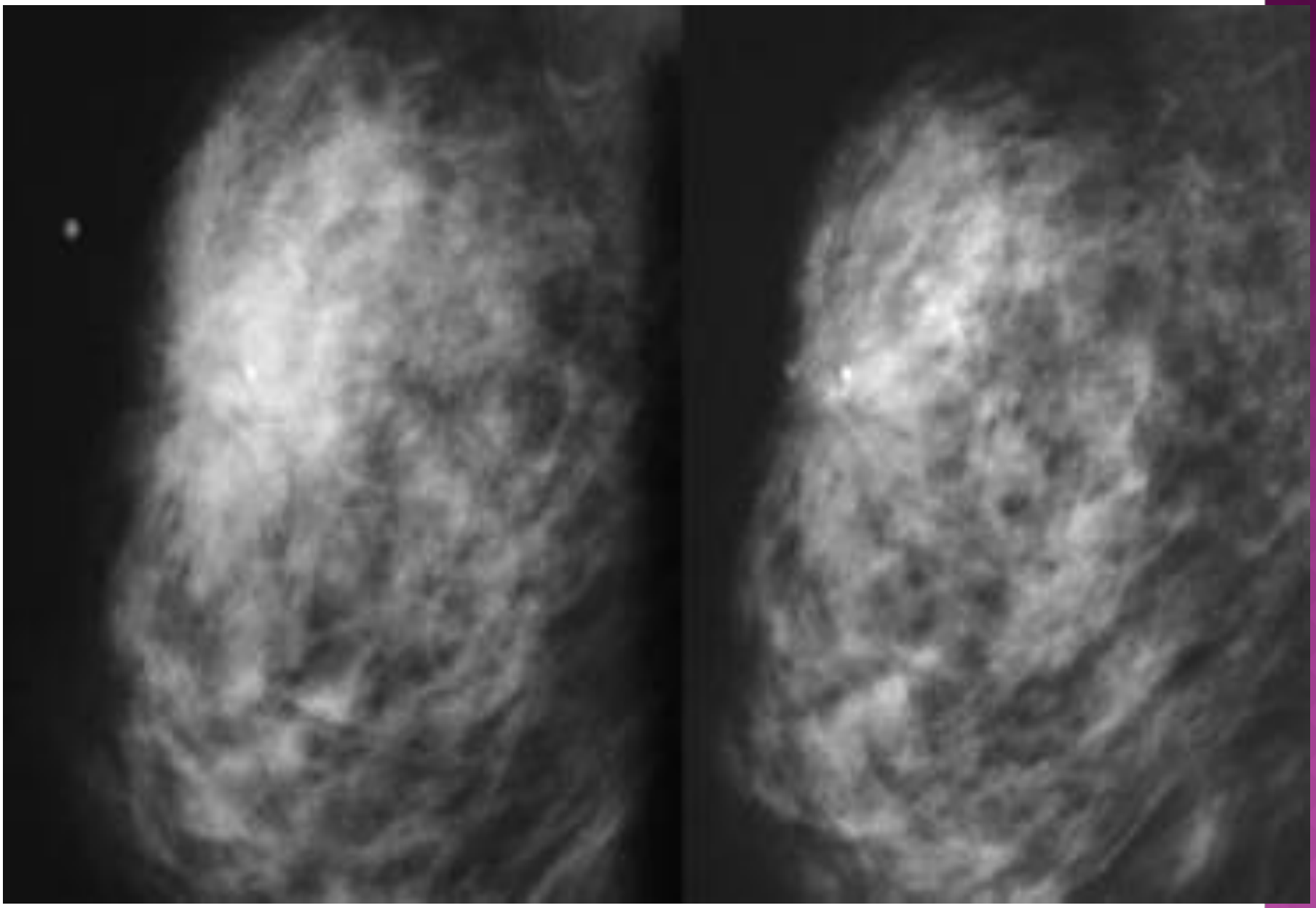


Category 4: There is an abnormality suspicious for malignancy, but a benign lesion, although unlikely, is a possibility (for instance ectopic glandular tissue within a heterogeneous breast).



Classic breast ca, BI-RADS 5

Spiculated



LEFT: initial mammogram with marker on palpable mass. Biopsy proven carcinoma.
RIGHT: Follow up after chemotherapy. Tumor is hardly visible, still BI-RADS 6

Tutorial