

Microcalcifications role in Breast Cancer diagnosis

Ana Sofia Preto
19/06/2013

__ Learning Objectives

__Anatomy

__BI-RADS Descriptors

__Technique for Evaluation

__A bit of Statistics...

__Benign Calcifications

__Malignant Calcifications

__Indeterminate

__Algorithm of management

__Conclusion

__Understanding the underlying pathophysiologic processes leading to the various types of calcifications

__Description and illustration of the several types of calcifications, according to BIRADS classification

__Technique for their evaluation

__Some statistics of our Breast Pathology Center

__Tips on how to differentiate malignant from benign types.



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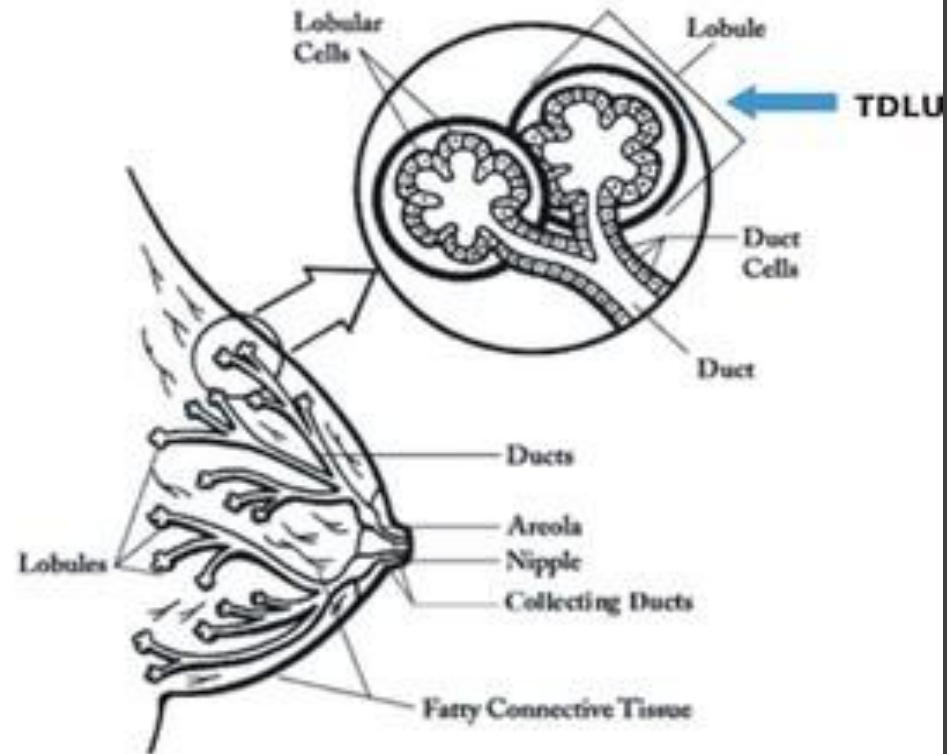
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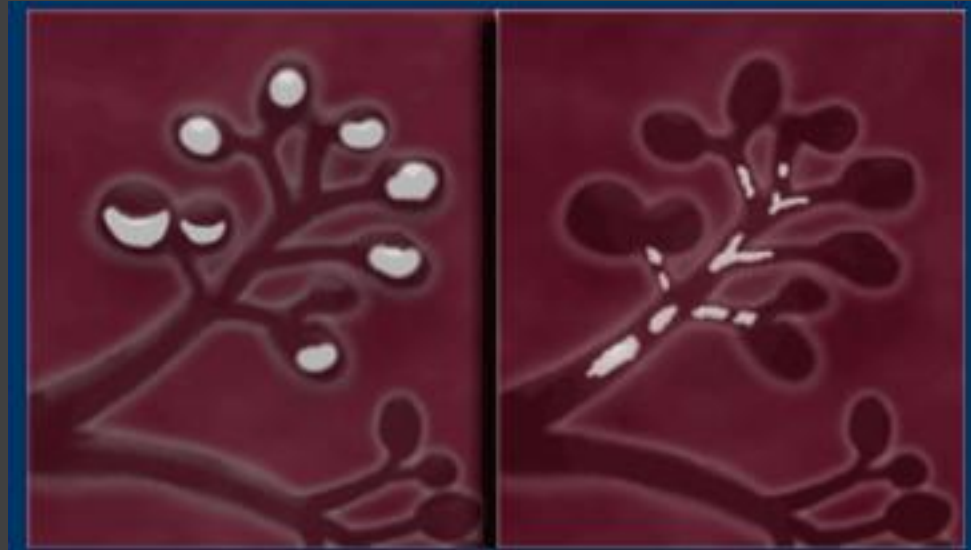
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__ Lobular

__ Fill the acini, which are often dilated.

__ Uniform, homogeneous and sharply outlined calcifications, that are often punctate or round.

__ When the acini become very large - 'milk of calcium'

__ Ductal

__ The uneven calcification of the cellular debris explains the fragmentation and irregular contours of the calcifications.

__ These calcifications are extremely variable in size, density and form (i.e. pleomorphic)

__ May form a complete cast of the ductal lumen

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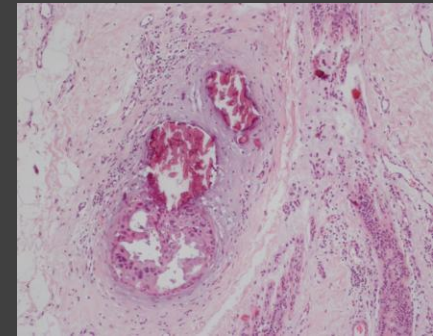
__ 2 Pathophysiologic processes

1__ Active cellular secretion of calcium salts (Phosphate and Oxalate) by the ductal epithelium

Calcium Phosphate - are easily visible on H & E

Calcium Oxalate – only visible under polarized light microscopy; the ones produced by benign breast disease are colorless birefringent crystals (rarely found in malignant disease –DCIS)

2__ Calcification of necrotic debris – form casts in the center of the malignant ducts





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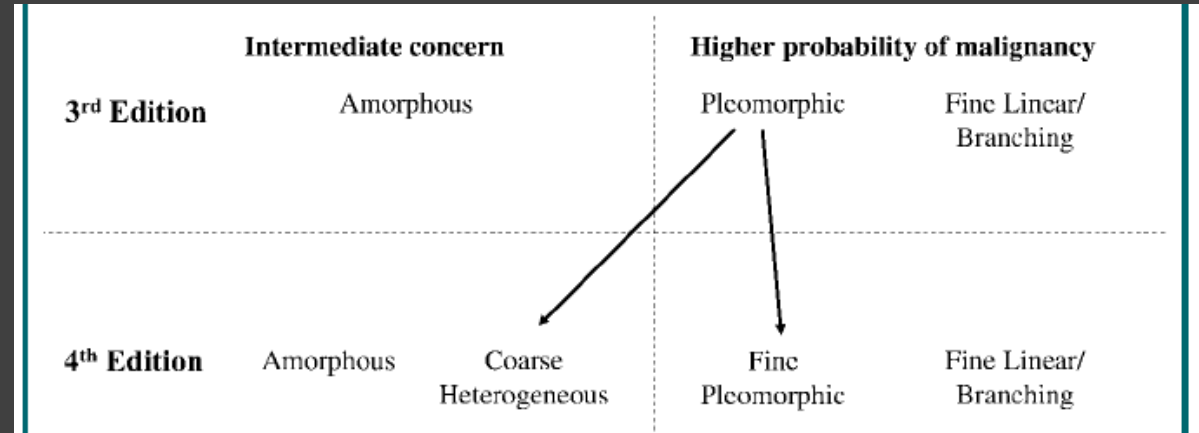
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BI-RADS Fourth Edition Terminology

Mammographic Evaluation	Characteristic
Calcifications	
Description	
Typically benign	Vascular
	Coarse or popcornlike
	Rodlike
	Round
	Punctate
	Lucent center
	Rim or eggshell
	Milk of calcium
	Suture
	Dystrophic
Intermediate	Amorphous or indistinct
	Coarse heterogeneous
Higher probability of malignancy	Pleomorphic
	Fine branching or casting
Distribution	Grouped or clustered
	Linear
	Segmental
	Regional
	Diffuse or scattered
Number	<5
	5–10
	>10

Morphology



___Coarse heterogeneous - “irregular, conspicuous calcifications that are generally larger than 0.5 mm” - considered to be of intermediate concern, along with amorphous microcalcifications

___Fine pleomorphic - “vary in sizes and shapes, usually less than 0.5 mm in diameter” and are considered to be of higher probability of malignancy, along with fine linear microcalcifications

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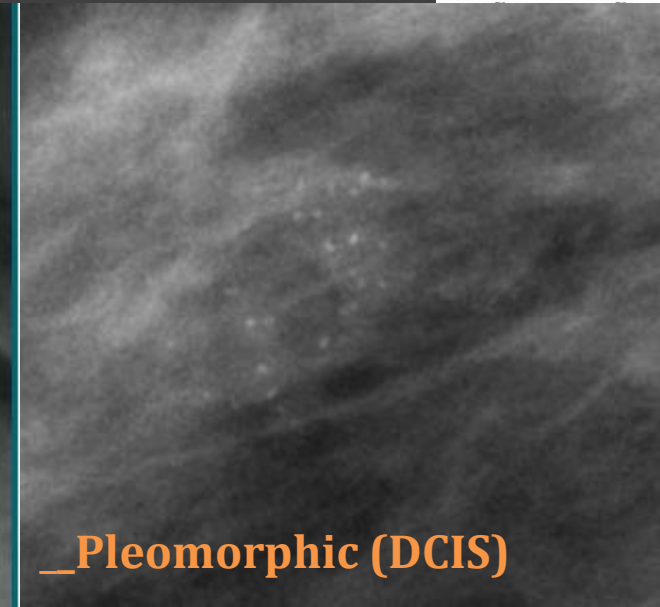
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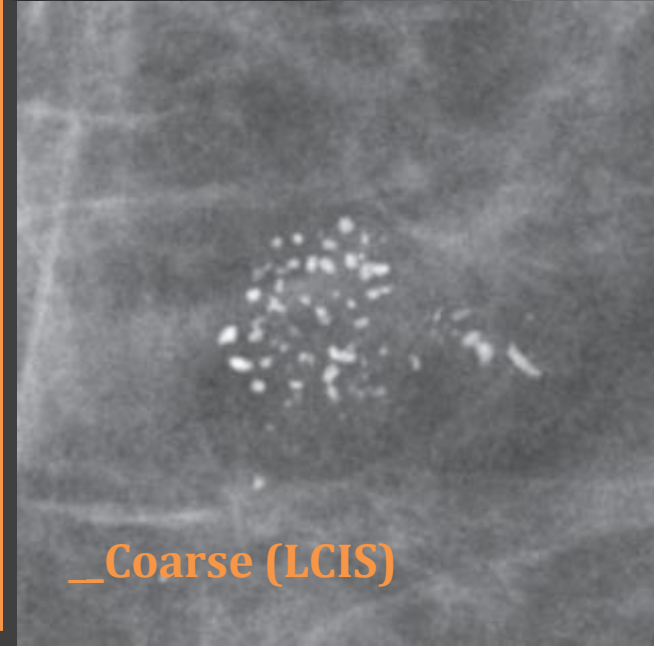
__ Morphology



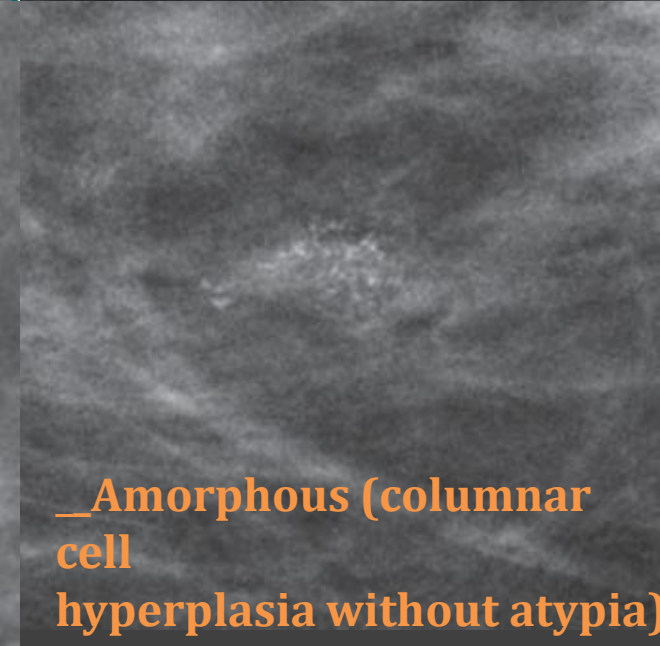
__ **Coarse (Benign)**



__ **Pleomorphic (DCIS)**



__ **Coarse (LCIS)**



__ **Amorphous (columnar
cell
hyperplasia without atypia)**

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__ Distribution

__ The risk of breast cancer increases progressively from diffuse (scattered or regional - > 2cm and not ductal in distribution) to focal (clustered) to ductal (segmental or linear ductal) in distribution

__ Number (less important)

__ **Stability** (malignant processes almost always change in 3 y)



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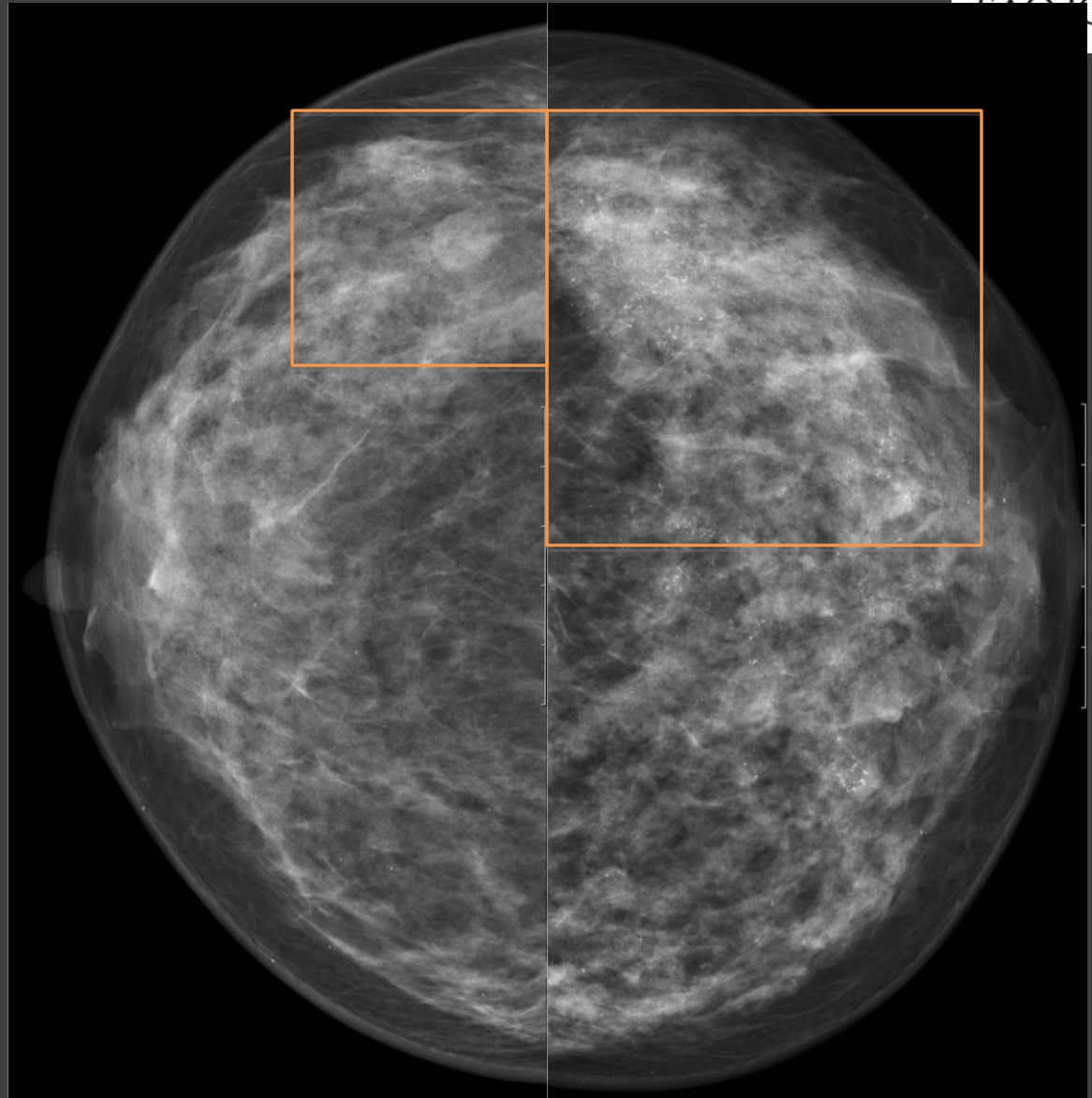
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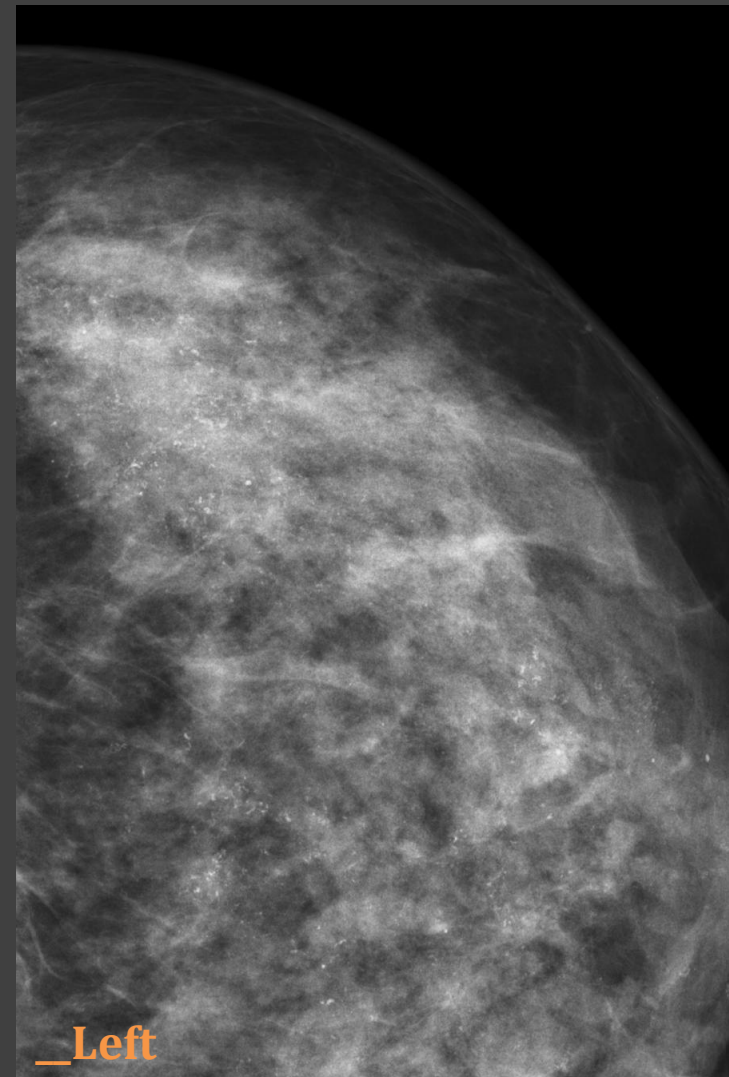
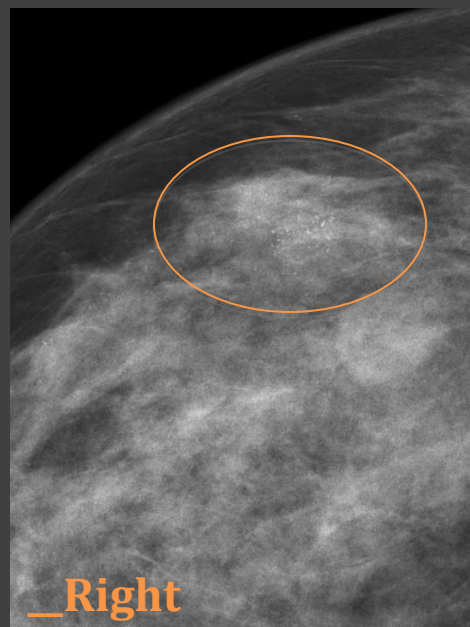
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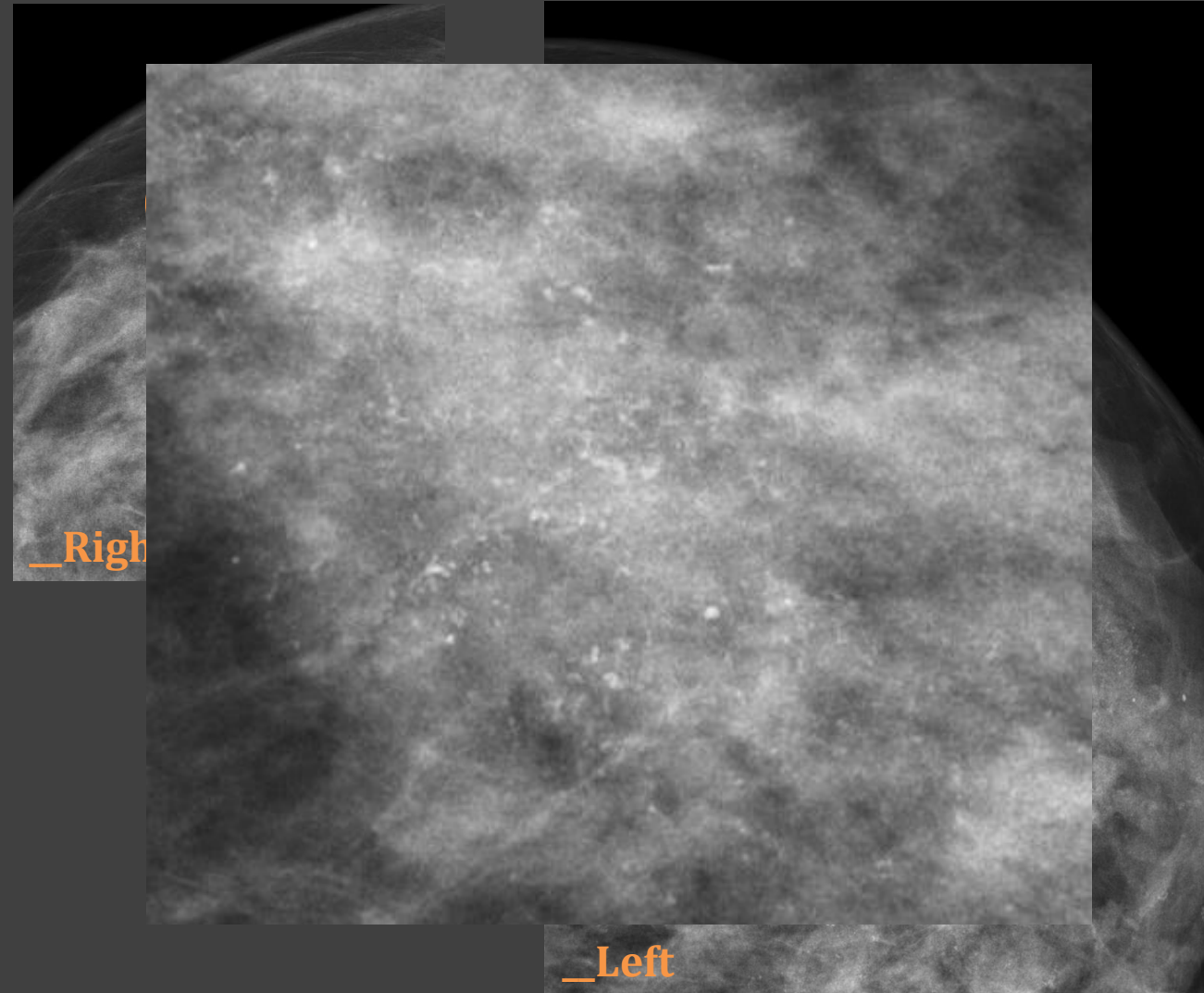
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__ Routine Evaluation

__ High-quality mammography is the best diagnostic tool for the identification of breast calcifications.

Mammography technologists importance!!

__ At our department we use digital (direct and indirect) mammography

__ Routine mammograms should include craniocaudal (CC) and mediolateral oblique (MLO) views

__ Magnification images of calcifications

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__ Routine Evaluation

__ Tangential views

__ Comparing current mammograms with prior mammograms is essential to determine the stability of any calcifications detected

__ In the mammography report, radiologists describe the distribution and size of the calcification cluster or group, their location, the forms of the individual calcifications in the cluster or group, associated findings and whether any change has occurred since the previous study, and the final BI-RADS assesment and recomendation for patient management

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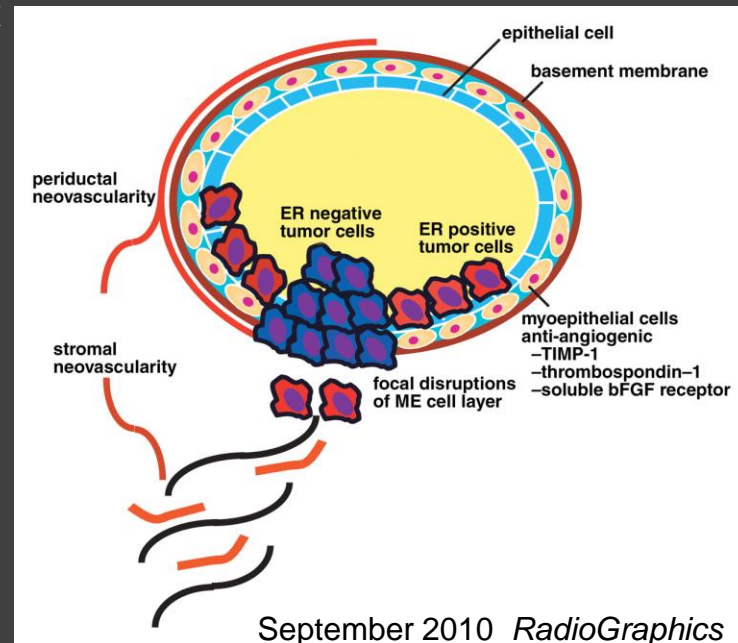
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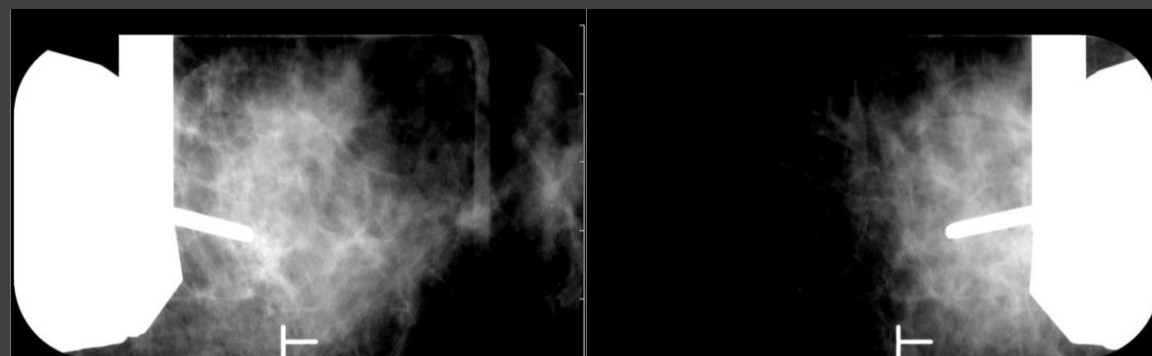
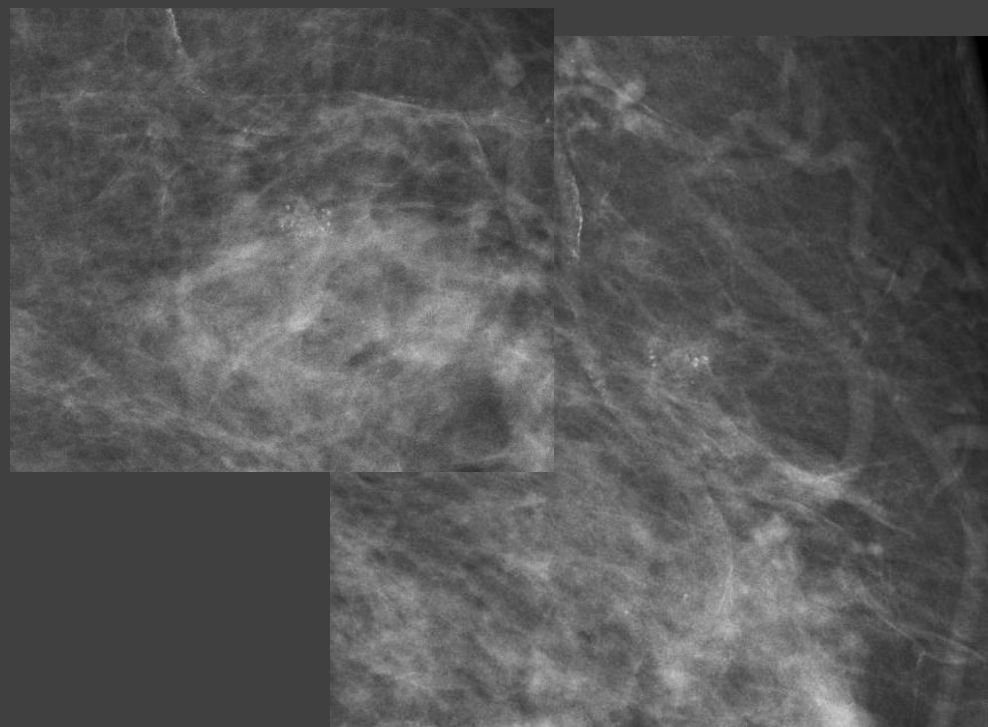
__Routine Evaluation

__Ultrasound in Evaluation of Calcifications - limited role, lymph nodes and sometimes serves to guide the biopsy...

__MRI- the extent of DCIS involvement is frequently underestimated at mammography, which can reliably help detect only calcified DCIS; consequently, magnetic resonance (MR) imaging evaluation can alter the course of treatment



_Biopsy and Posterior Evaluation



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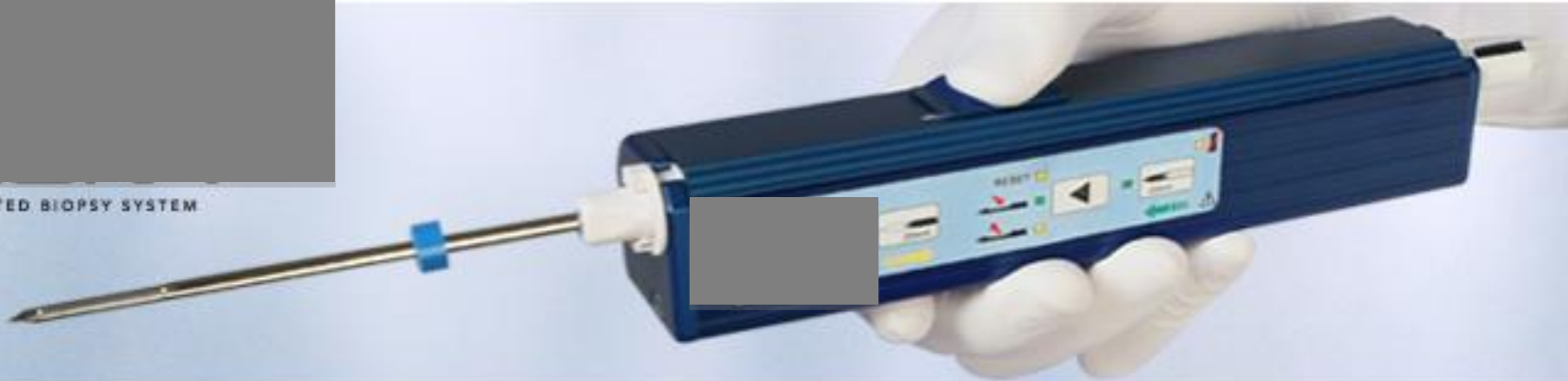
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_Biopsy and Posterior Evaluation

REUSABLE CORE BIOPSY SYSTEM



VACUUM ASSISTED BIOPSY SYSTEM



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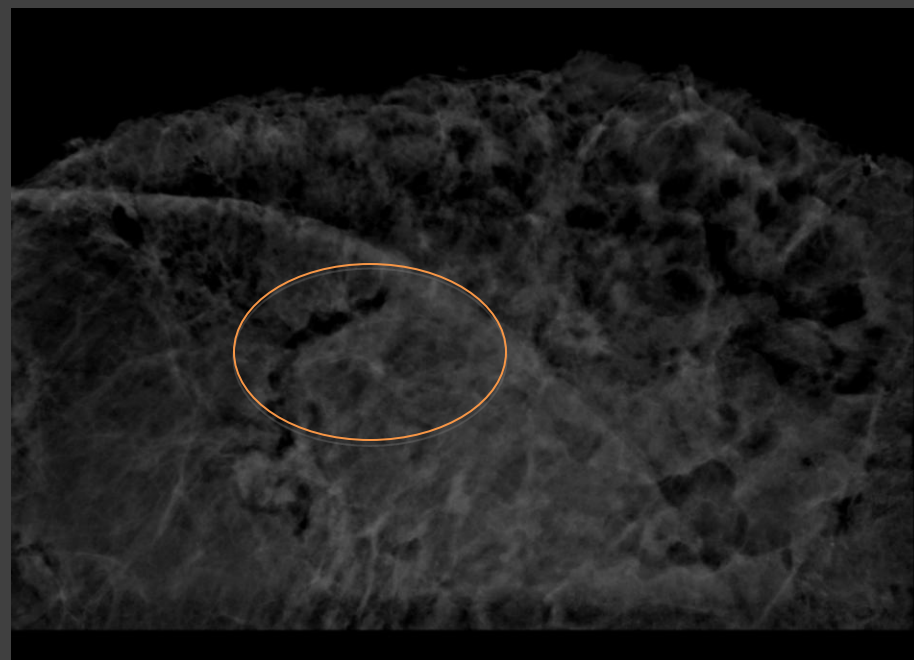
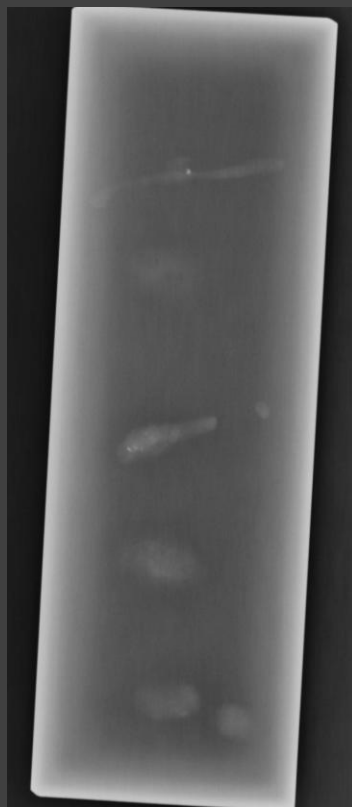
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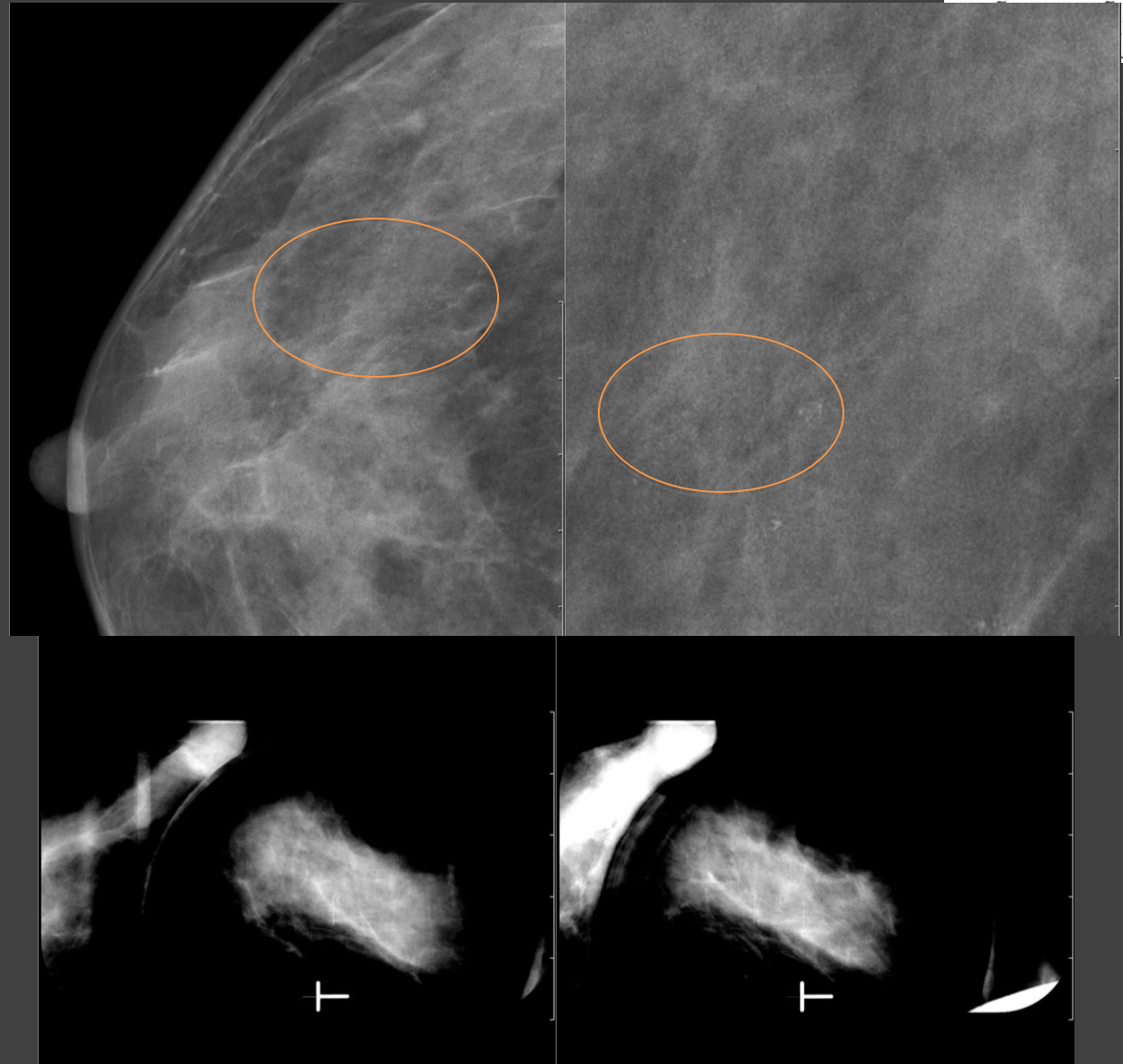
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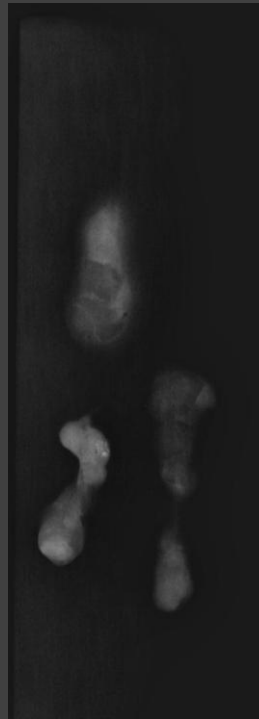
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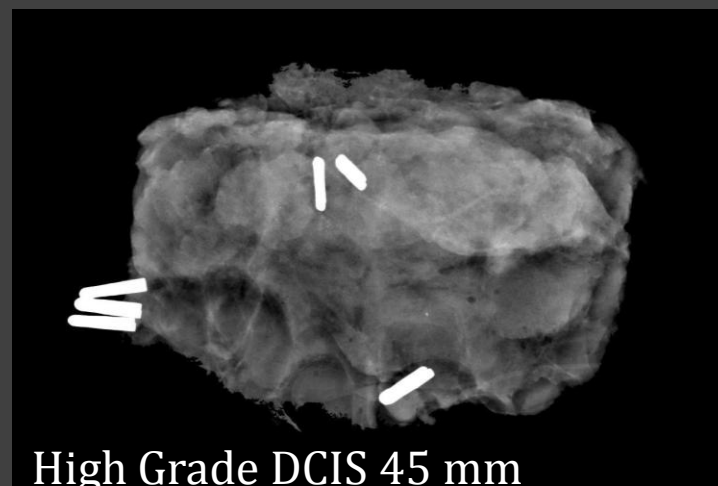
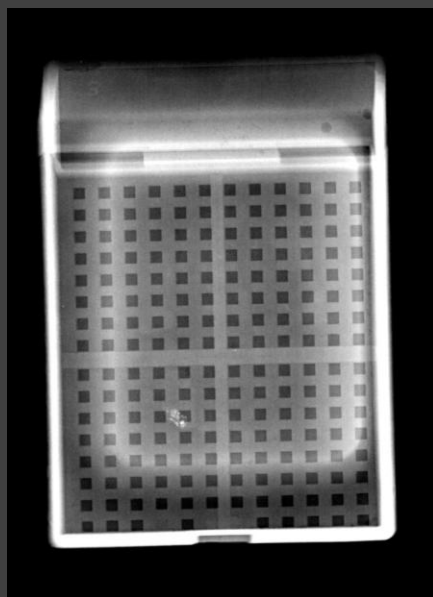
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__ PARAFFIN BLOCK Radiography

__ Help Pathology to see the micros

__ Technique – usually 56 mAs and 25 to 30 Kv (↑ mAs and ↓ Kv to reduce noise)



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__ 45% of all breast cancers present as calcification on mammography

__ Both invasive carcinoma and DCIS can present as calcification

__ When there is only calcification we can't differentiate them on mammograms

__ Calcification + mass – Us. invasive disease

__ 87% and 95% - Mammography sensibility for detection of DCIS calcifications

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__ At our Center

__ May 2010 and June 2012 – 73 patients went stereotatic biopsy with suspicious microcalcifications on mammograms, not visible on US

__ 90 stereotatic biopsies (42 Vacuum-assisted core B and 48 Core B)

__ Median diameter – 16 mm (4 -120 mm)

__ 4,5 fragments were taken in average

__ 36 cases proposed to Surgery, 13 for re-biopsy and 39 follow-up in the Breast Center

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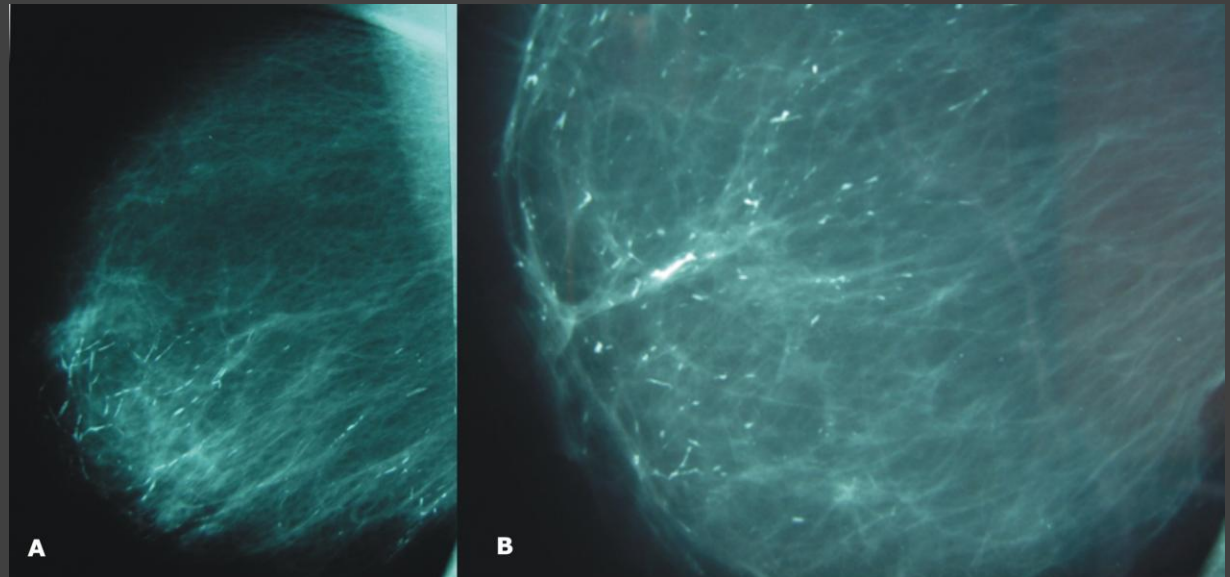
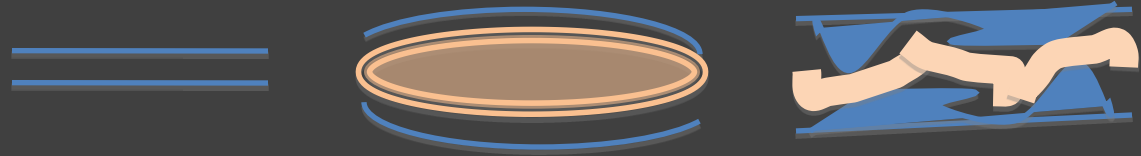
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_ Require no further action if they are perceived as so.

A) Within the ducts

Large rodlike, or secretory calcifications -inflammation is periductal or intraductal



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Plasma Cell Mastitis versus DCIS

Plasma Cell Mastitis

Lined up along ducts
Point at the nipple
Linear, sometimes branching
Branches over a wide area
No tiny additional calcifications
Big calcifications – can be seen without a magnifier
Coarse, rod-like calcifications
Sharply marginated

DCIS

Lined up along ducts
Point at the nipple
Linear, sometimes branching, pleomorphic
Branches many times over 1 cm (ducts are smaller)
Magnification shows many more small calcifications
Big and small calcifications
Fine, linear calcifications
Indefinite margins

B) Within the TDLUs

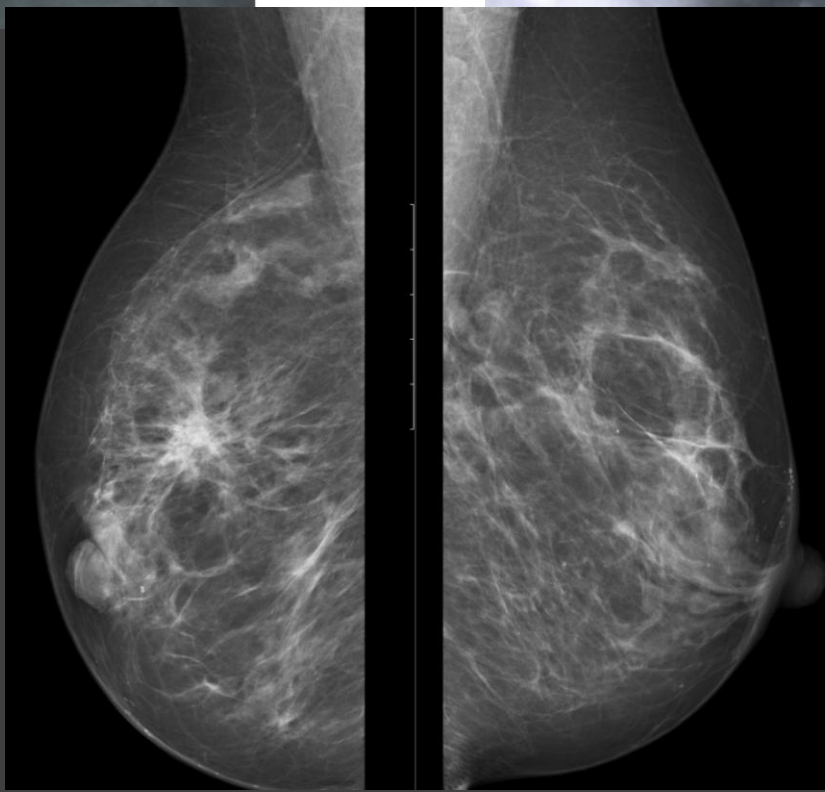
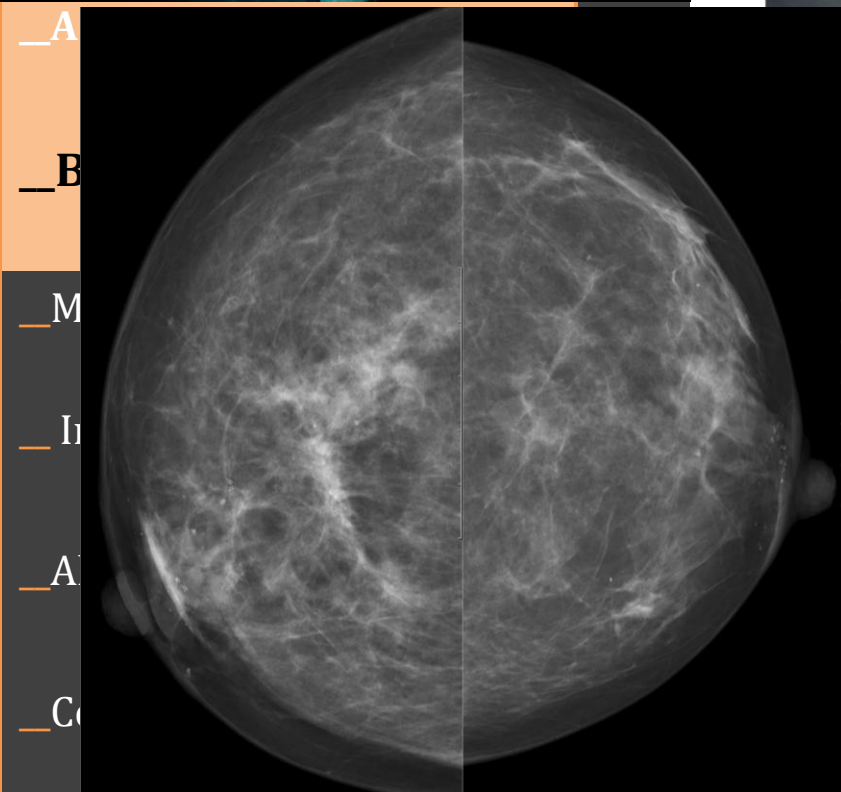
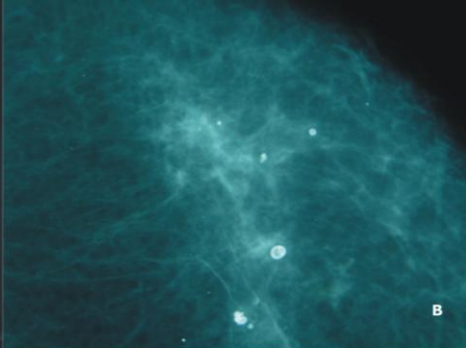
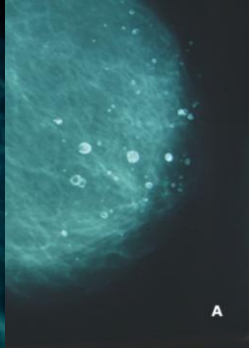
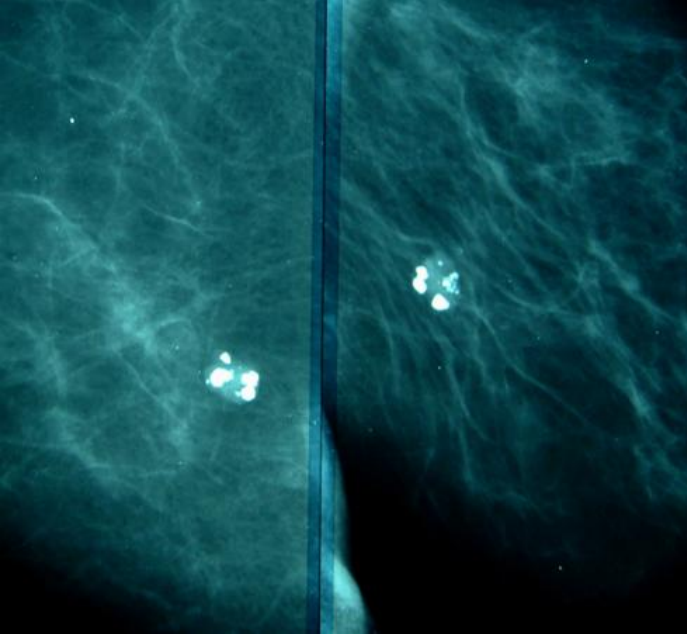
__Coarse or “popcorn-like” calcifications (Fibroadenomas)

__Round and punctate calcifications (less than 0.5 mm - fibrocystic change and sclerosing adenosis)

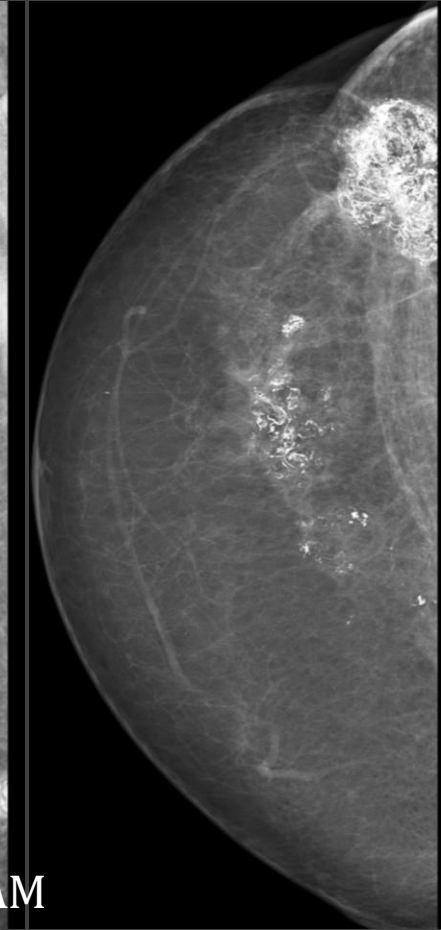
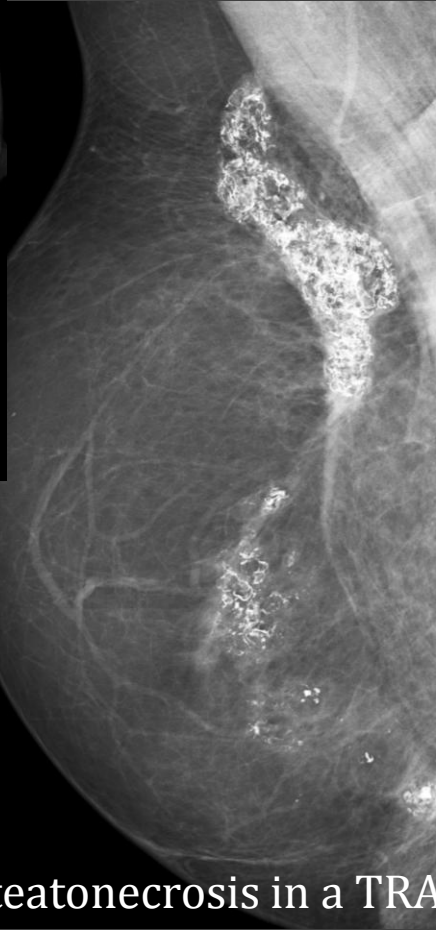
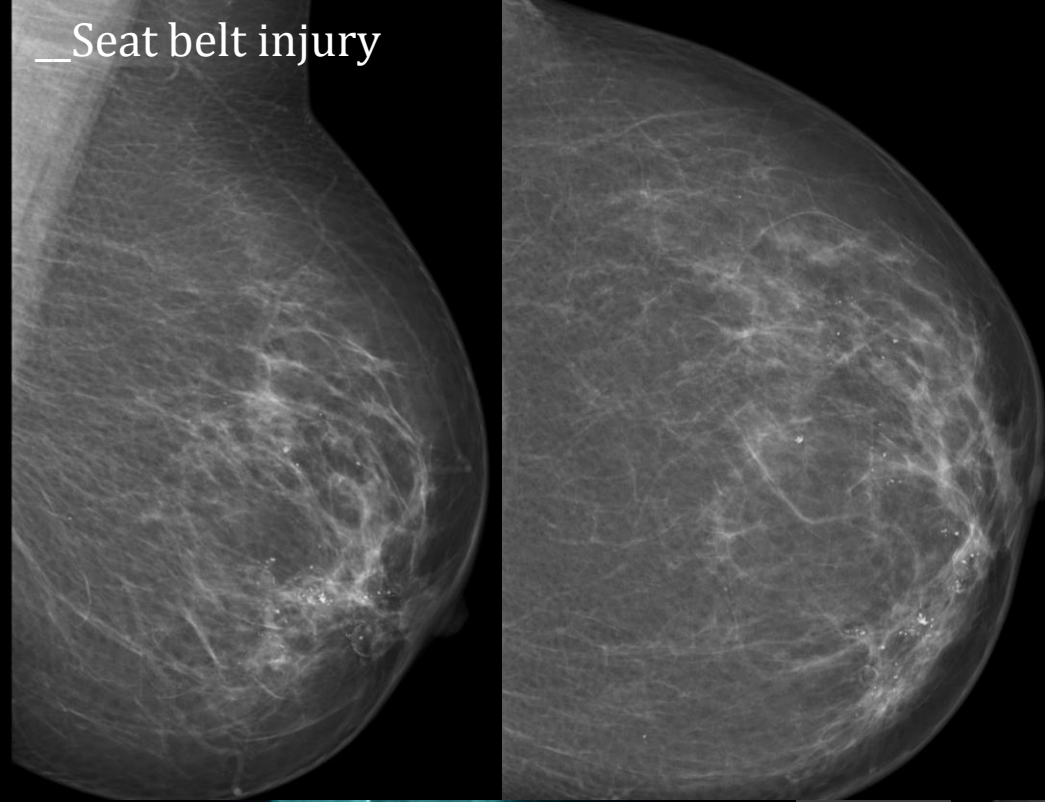
__Milk of Calcium - sedimented calcifications within tiny benign cysts

__Lucent-centered calcifications

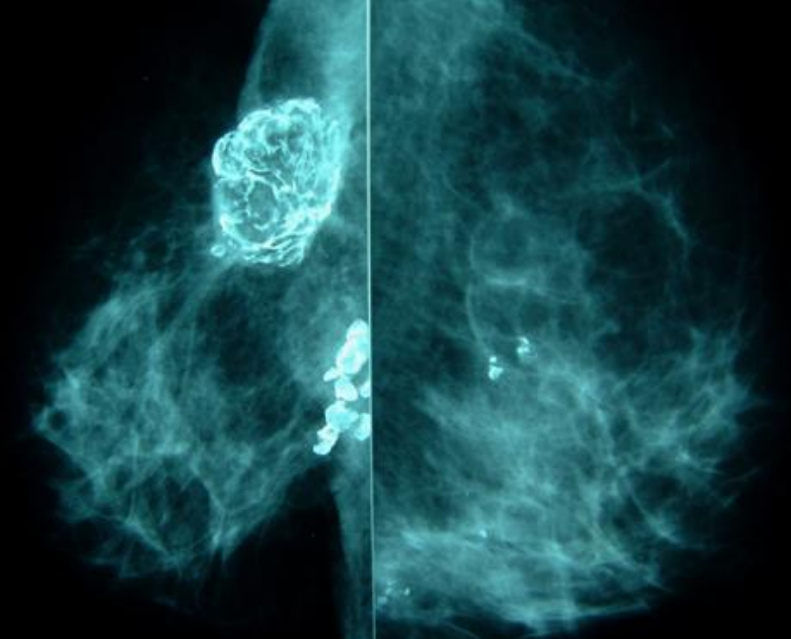
__Dystrophic calcifications/ steatonecrosis - secondary to trauma, surgery, or irradiation



__Seat belt injury



__Steatonecrosis in a TRAM



__Steatonecrosis after Sx

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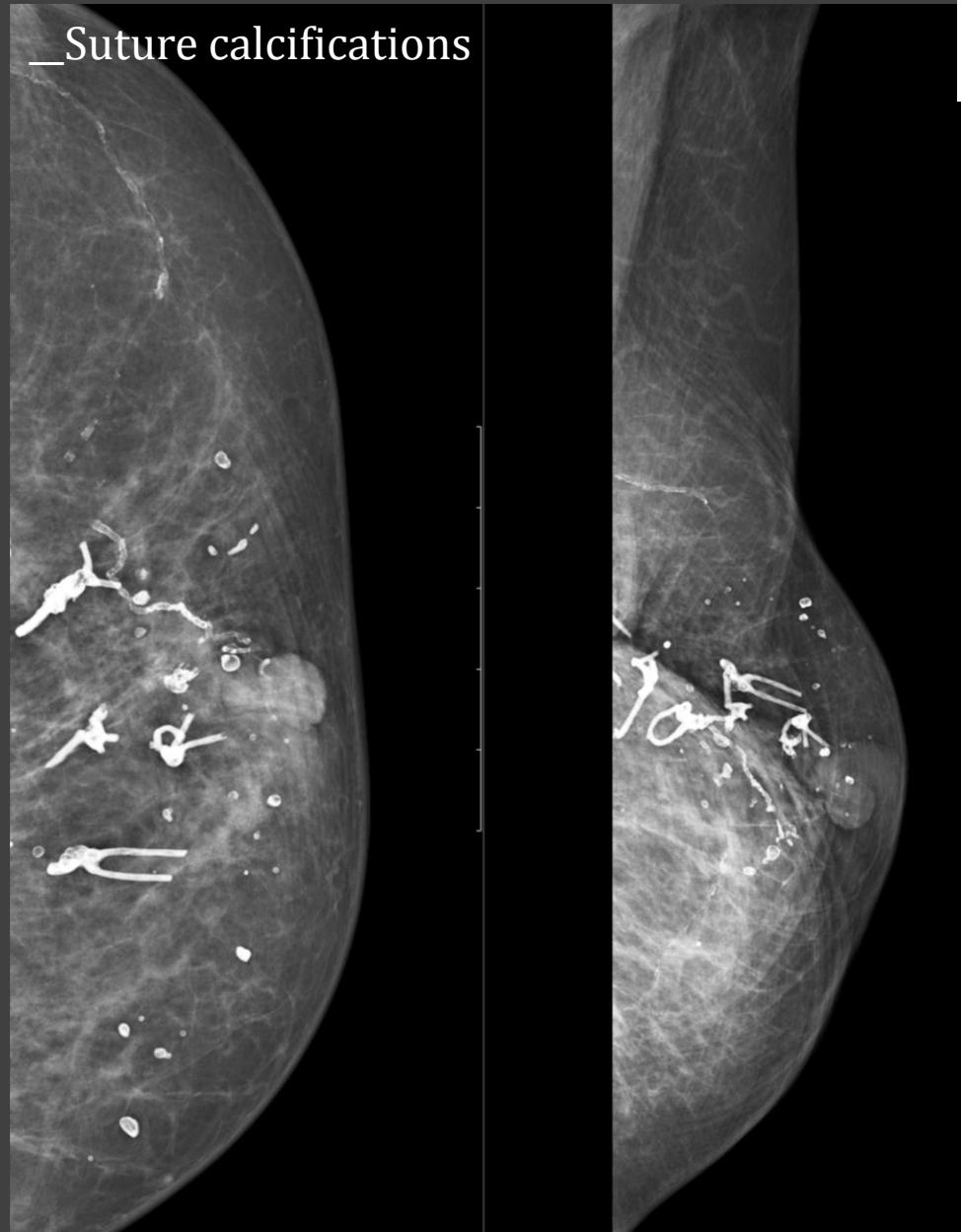
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_ Suture calcifications



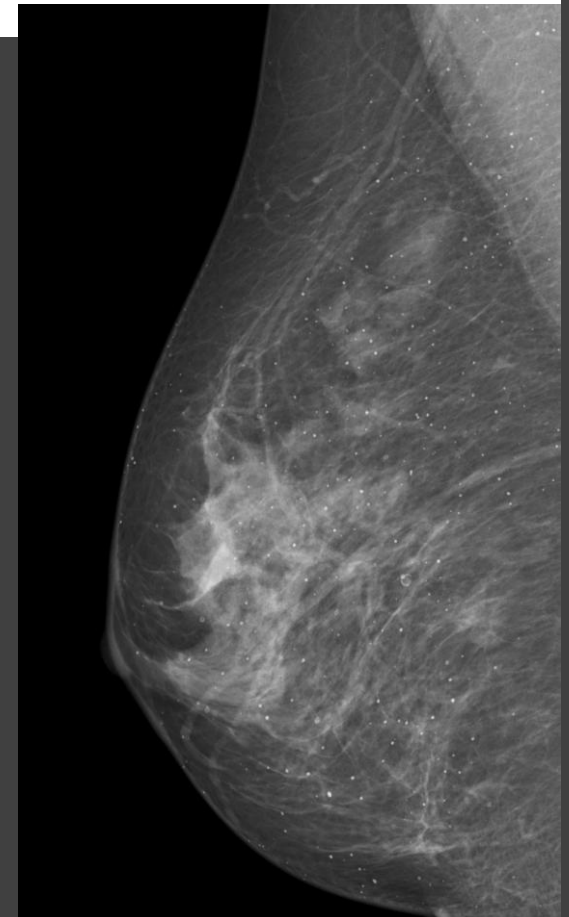
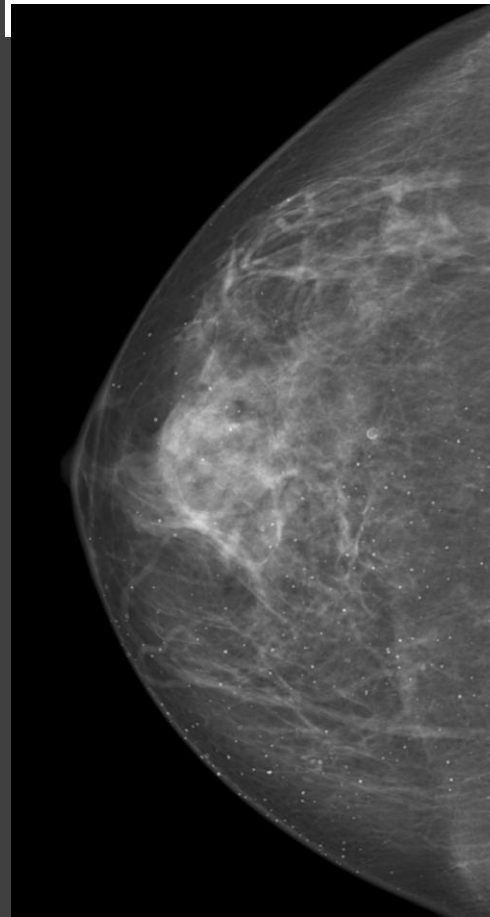
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C) Outside the glandular tissue

Skin or dermal calcifications and artifacts simulating calcifications

Reasons to suspect skin calcifications

- Peripheral location in the breast
- Location close to the skin surface on one view
- Location in the axilla, inframammary fold, or medial part of the breast
- Size similar to skin pores
- Other skin calcifications present



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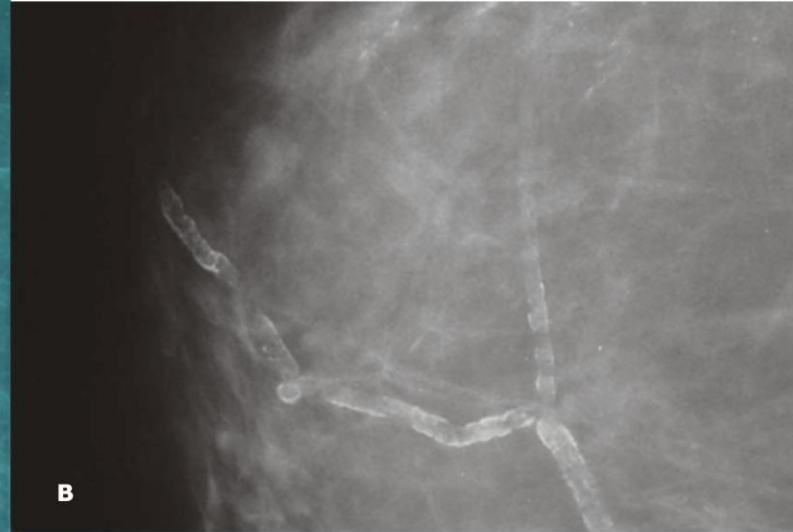
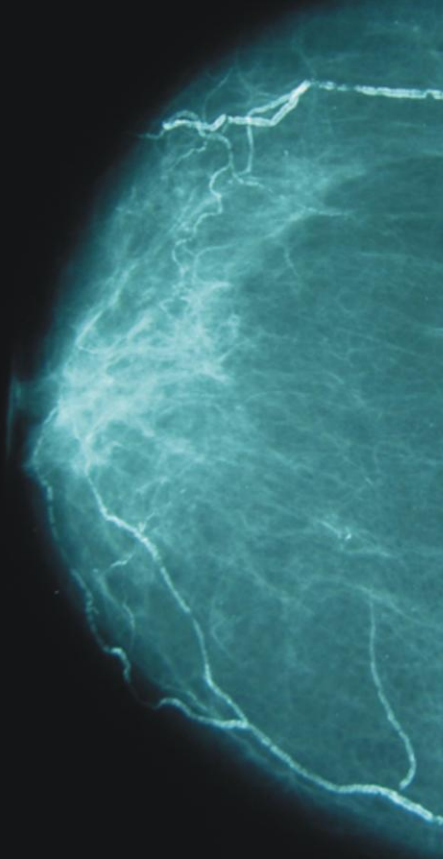
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C) Outside the glandular tissue

Vascular



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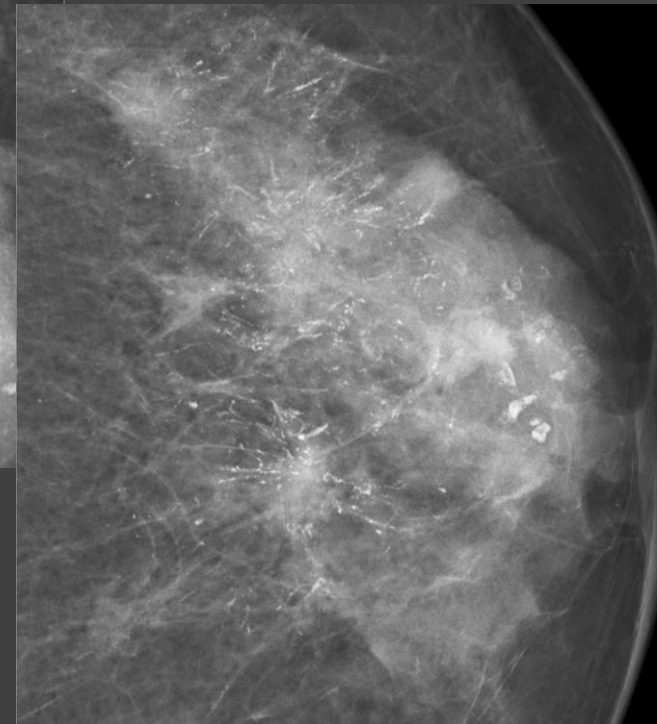
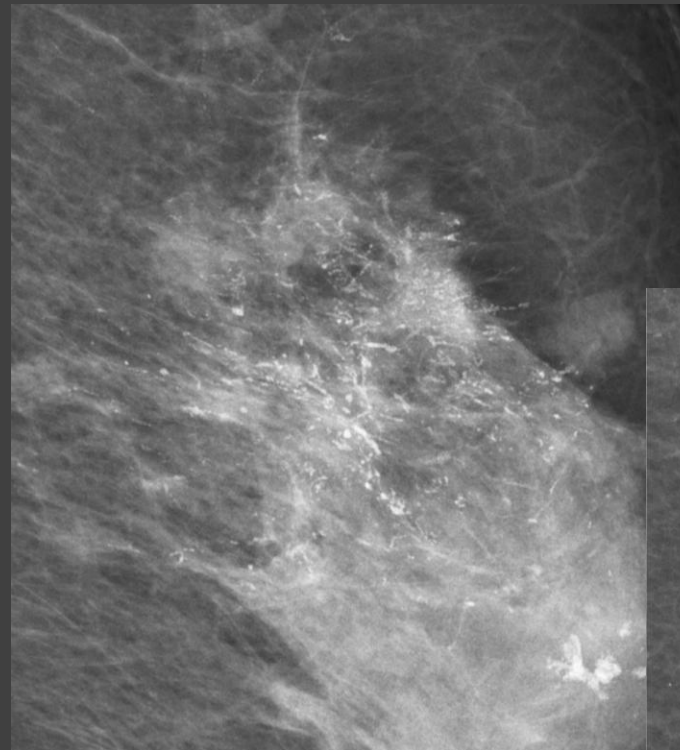
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__ Calcifications in malignancy are tightly clustered, vary in size and shape, and have bizarre branching irregular or linear forms consisting of at least five discrete particles smaller than 0,5 mm distributed over a 1 cm³ region.

A) Within the ducts – Casting type (sometimes seen in comedocarcinoma)





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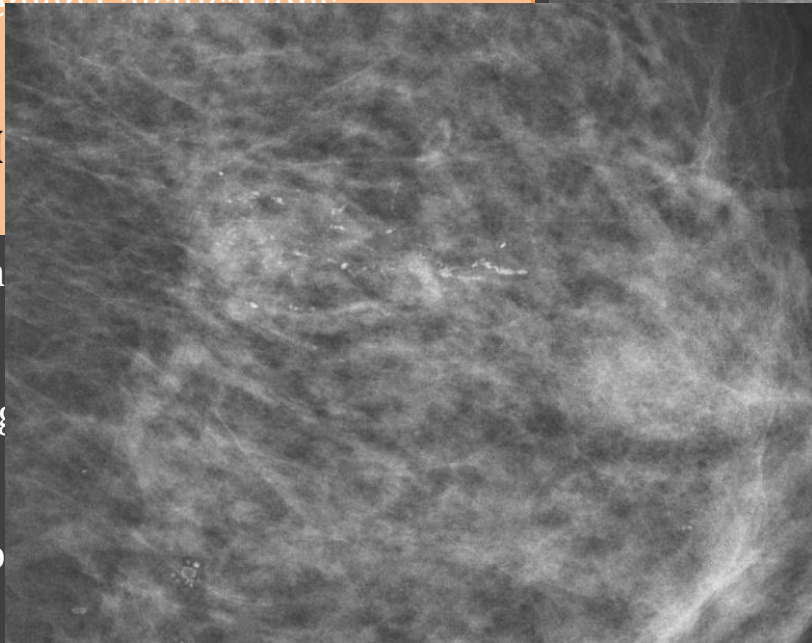
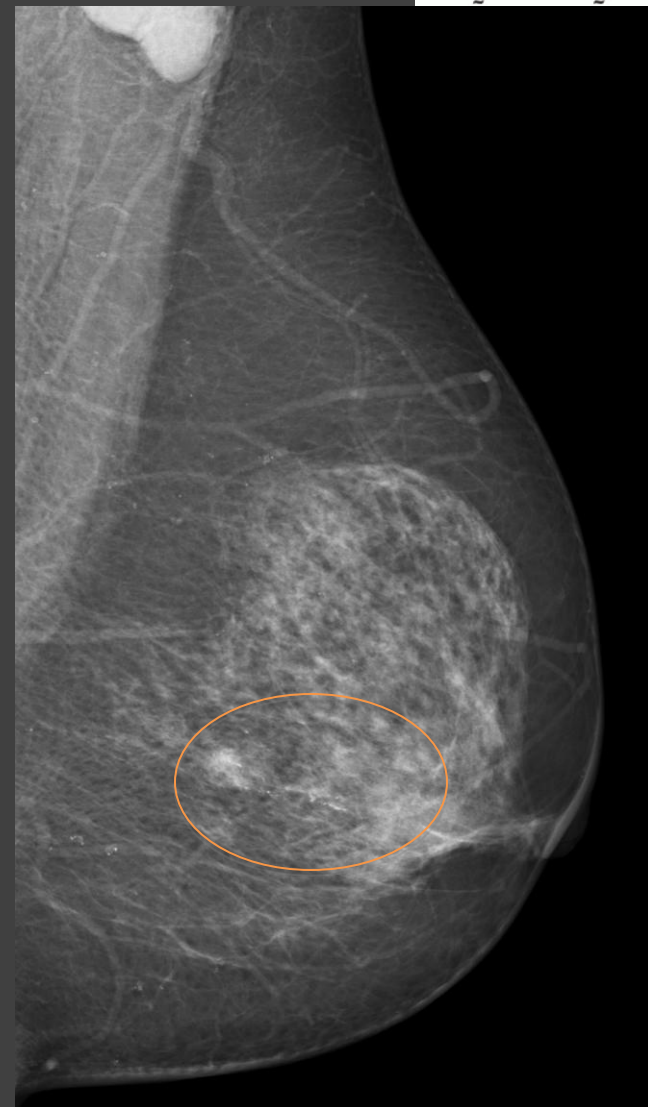
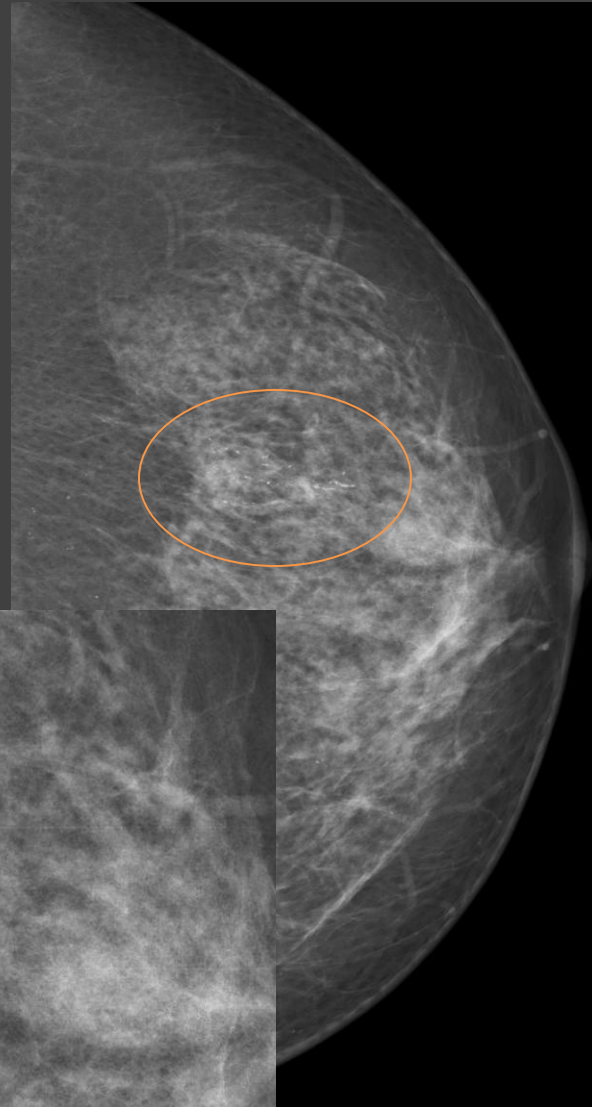
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A) Within the ducts – Casting type (sometimes seen in comedocarcinoma)



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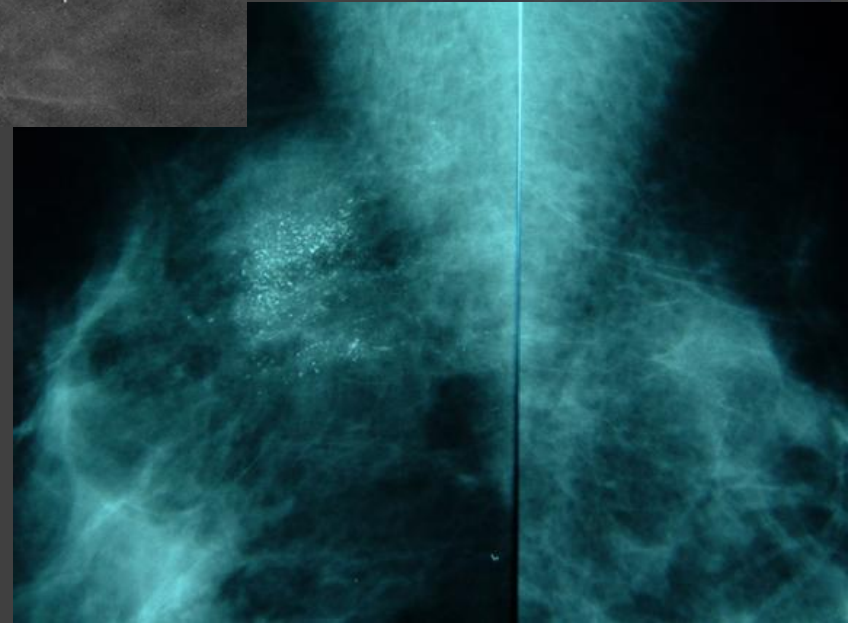
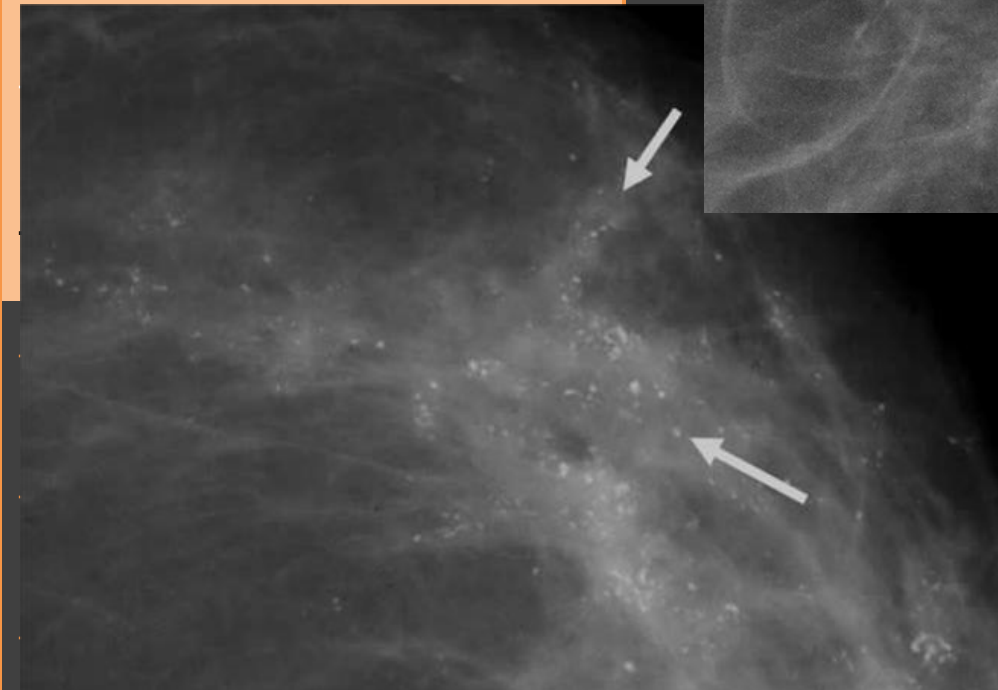
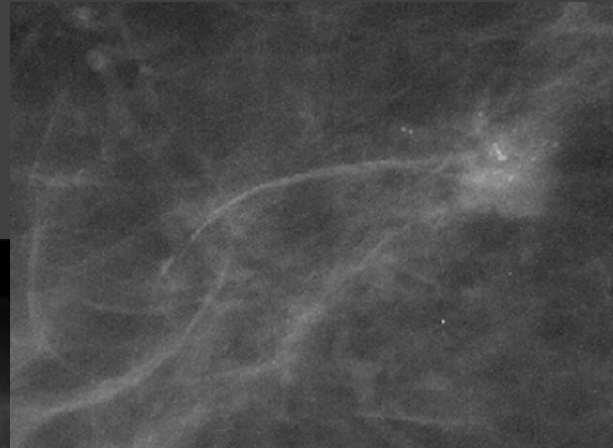
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B) Within the TDLUs – crushed stone-like (“broken-needle tip”, “arrowhead/spearhead”)

_ The differential diagnosis is a challenge between Grade 2 in situ carcinoma on the one hand and 1) Fibrocystic change 2) Fibroadenoma and 3) Papilloma on the other hand



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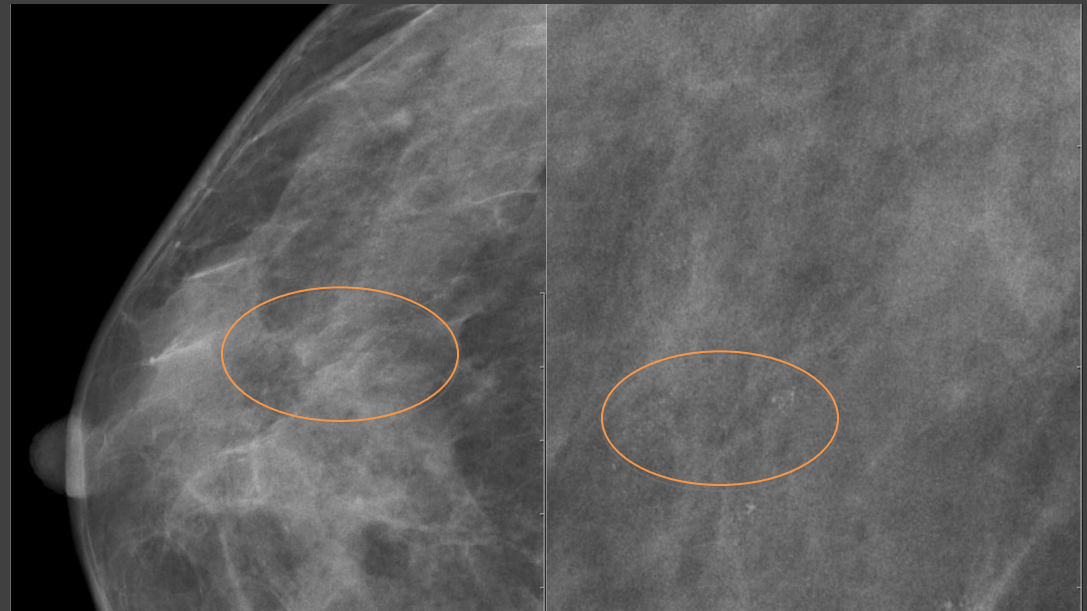
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B) Within the TDLUs – powdery calcifications

__ Because the same type of calcification, the so-called psammoma body-type, may occur both in benign processes (such as sclerosing adenosis, blunt duct adenosis, etc.) and in Grade 1 in situ carcinoma, mammographic analysis cannot distinguish them

__ In single or multiple clusters, since they are confined to the distended lobules. The individual calcium particles are usually not discernable, giving a "cotton ball" like appearance



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__ Even after careful analysis, some calcifications are **indeterminate** for malignancy. At this point, either **surgical biopsy, percutaneous biopsy, or periodic short-term mammographic follow-up** may be recommended, depending on the clinical history and desires of the patient and referring physician

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__ On the other hand, **periodic mammographic follow-up** to confirm stability is an accepted method of follow-up for probably benign lesions if the calcifications have less than a 2% chance of malignancy

__ **Period follow-up at 6 months and then yearly for 2 to 3 years** can be undertaken if the calcifications are round or punctate, have no malignant features, and are stable

__ Learning Objectives
__ Anatomy
__ BI-RADS Descriptors
__ Technique for Evaluation
__ A bit of Statistics...
__ Benign Calcifications
__ Malignant Calcifications
__ Indeterminate
__ Algorithm of management
__ Conclusion

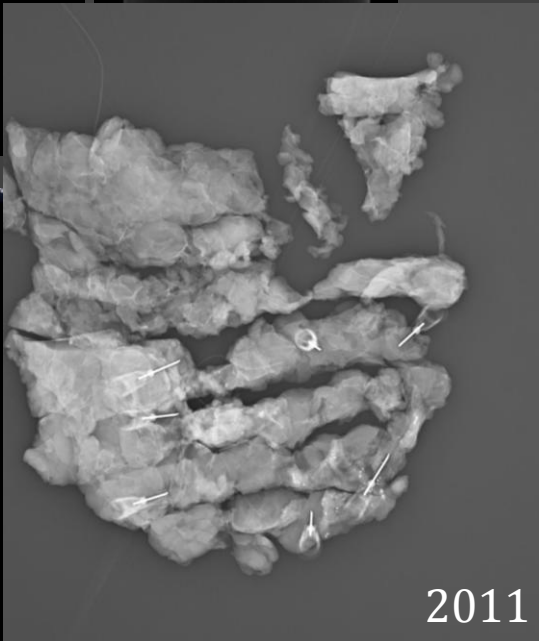
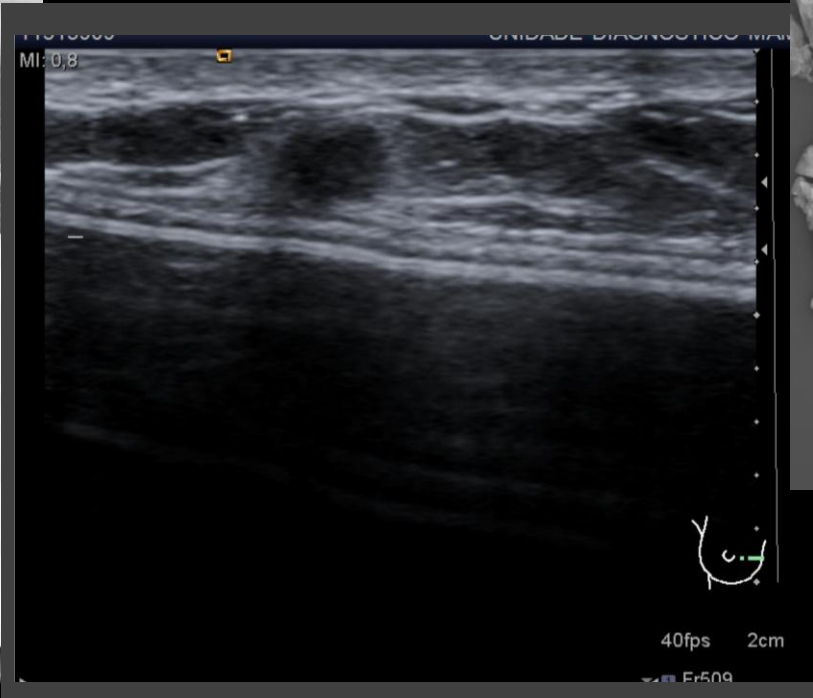
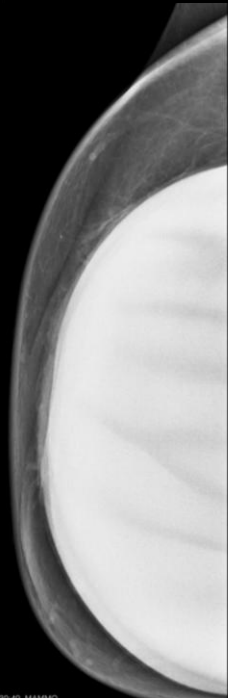
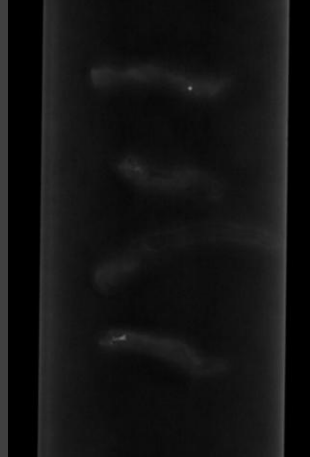
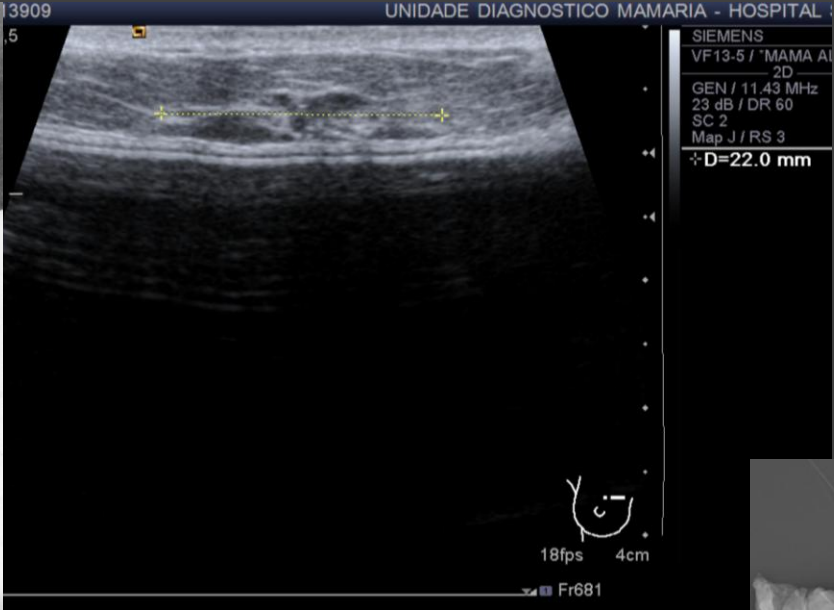
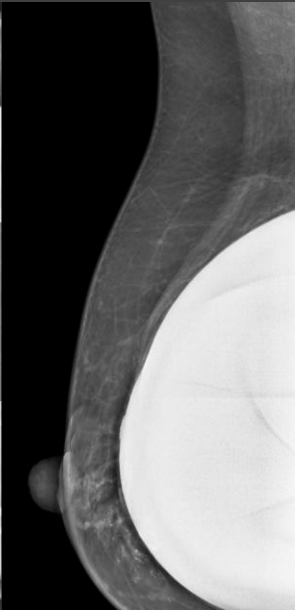
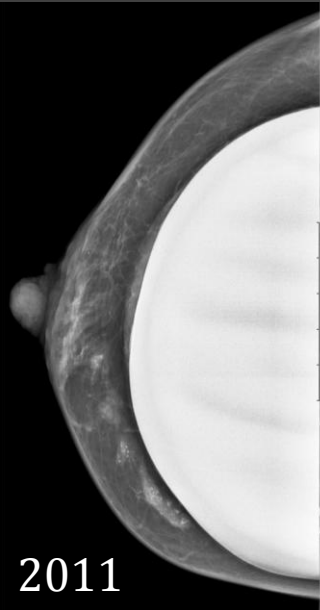
__ New, increasing, or pleomorphic calcifications **should be biopsied.**

__ Biopsy is an alternative method, knowing that many benign biopsies will be obtained in the search for small carcinomas

__ However, biopsy of isolated clusters of tiny calcifications have a 20-30% true-positive biopsy rate for cancer, according to literature

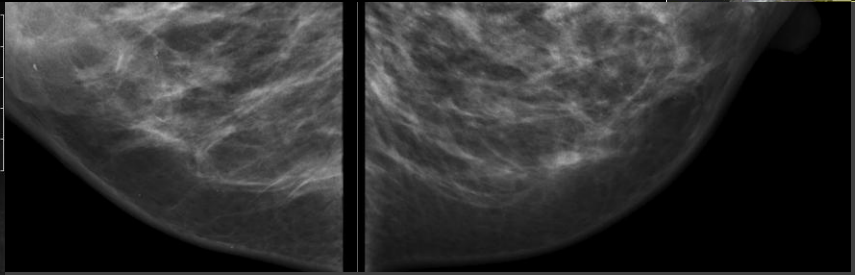
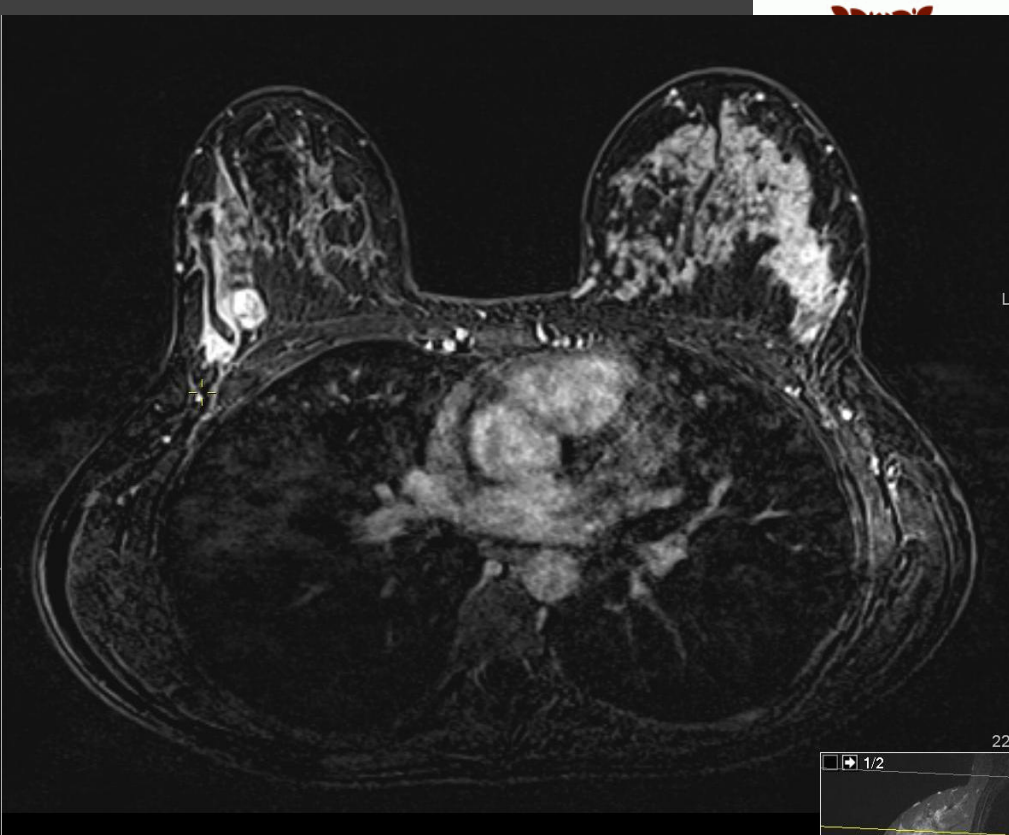
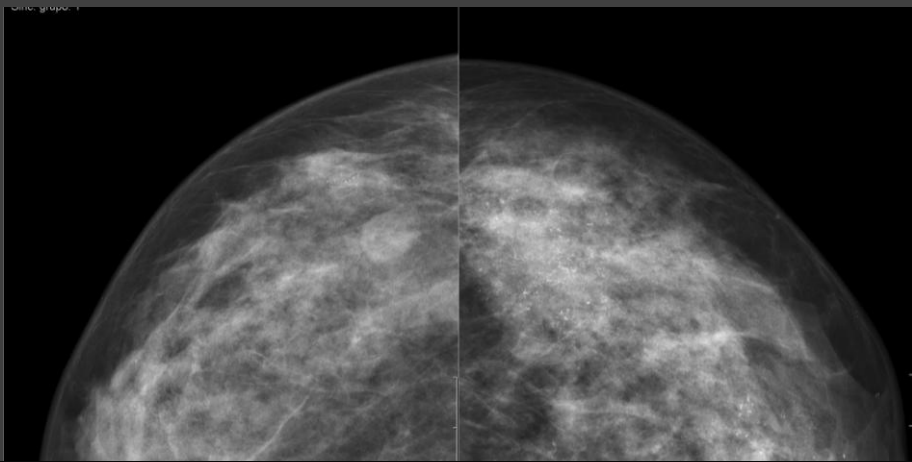
__ CASES __

1__45 y.o. Previous right mastectomy and silicone prosthesis (2009)



2011

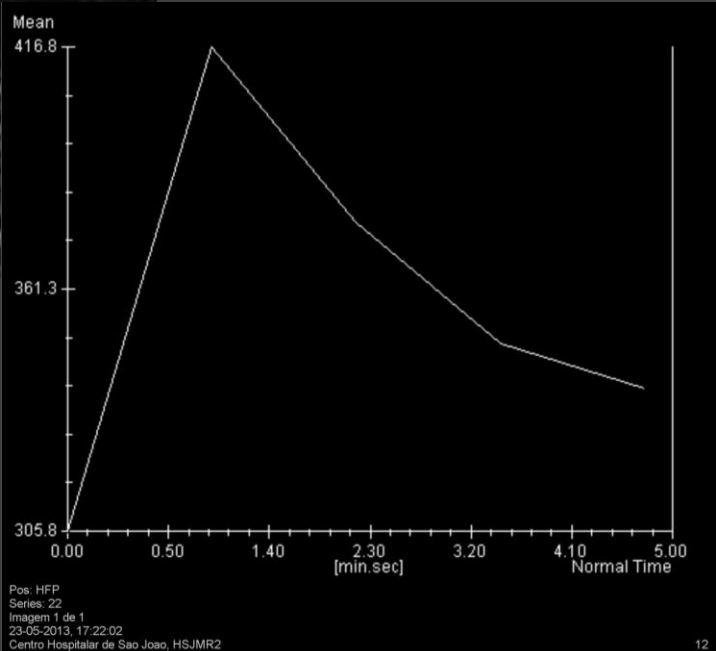
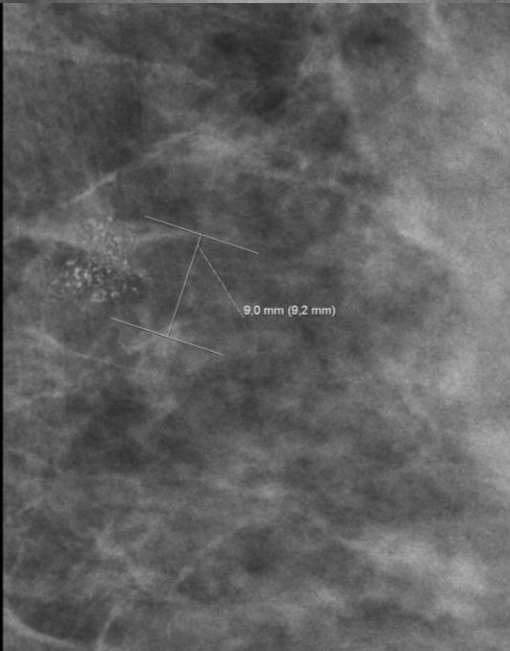
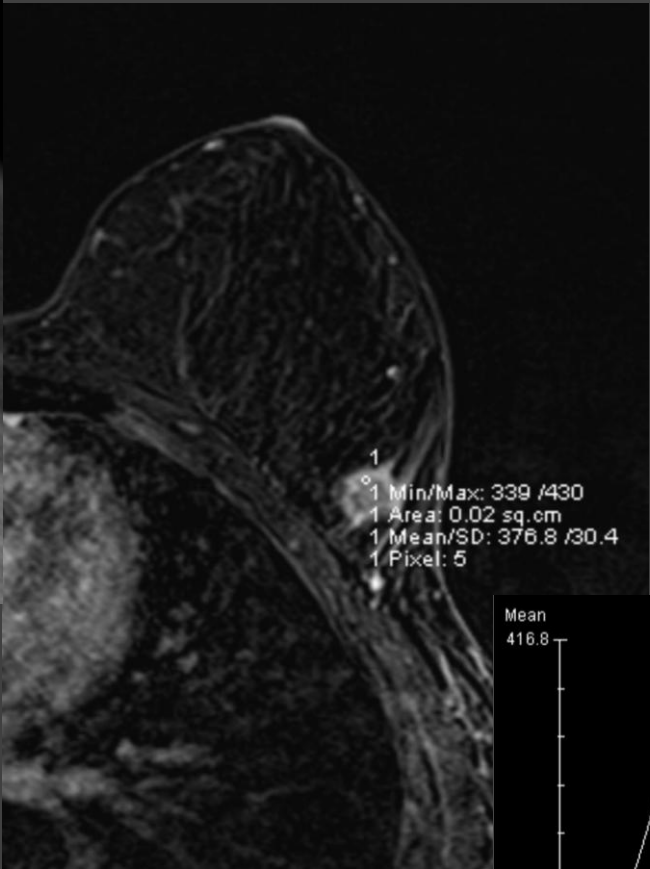
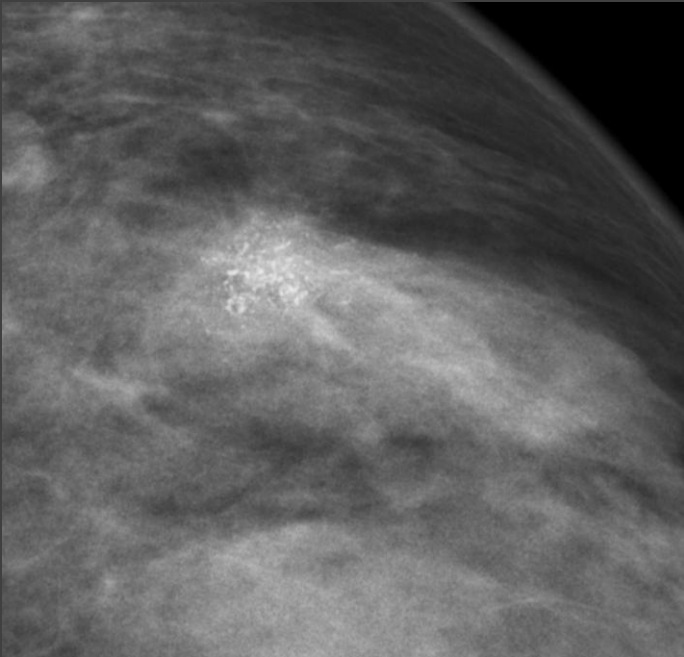
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__CASES__

3__21 y.o. medical student



__ Learning Objectives

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__ Conclusion

__ Our eyes are prone to bright focus of light.

__ Many studies indicate that the differences observed in the imaging intensity of malignant and benign calcifications can be attributed to density differences in the underlying soft tissue and not to differences in the calcifications themselves

__ Difference in the type of tissue in which malignant processes arise or changes in the normal tissue adjacent to malignant calcifications which do not occur near benign calcifications

__ To be successful - MULTIDISCIPLINARY TEAM!!

