



Radiology

Subject: _____

Group no: *C7* _____

Done by: *قاع الهامور الهادي* _____



هَذَا خَلْفَ اللَّهِ فَأَرْهَبِي مَاذَا خَلْفَ الَّذِينَ مِنْ دُونِهِ بَلِ الظَّالِمُونَ فِي ضَلَالٍ مُبِينٍ



MAMMOGRAPHY

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Consultant radiologist

BREAST CANCER ⇒

- More than 3% will die from the disease.
- Breast cancer incidence in women in the United States is 1 in 8 (about 13%).



BREAST CANCER IN JORDAN



Ten most common cancers among Jordanian Males, 2011

	Site	Frequency	Percent
1	Lung	279	12.7
2	Colorectal	278	12.7
3	U. bladder	171	7.8
4	Prostate	169	7.7
5	Leukemia	128	5.8
6	NHL	120	5.5
7	Brain & CNS	108	4.9
8	Stomach	81	3.7
9	larynx	79	3.6
10	Hodgkin lymphoma	71	3.2



Ten most common cancers among Jordanian Females, 2011

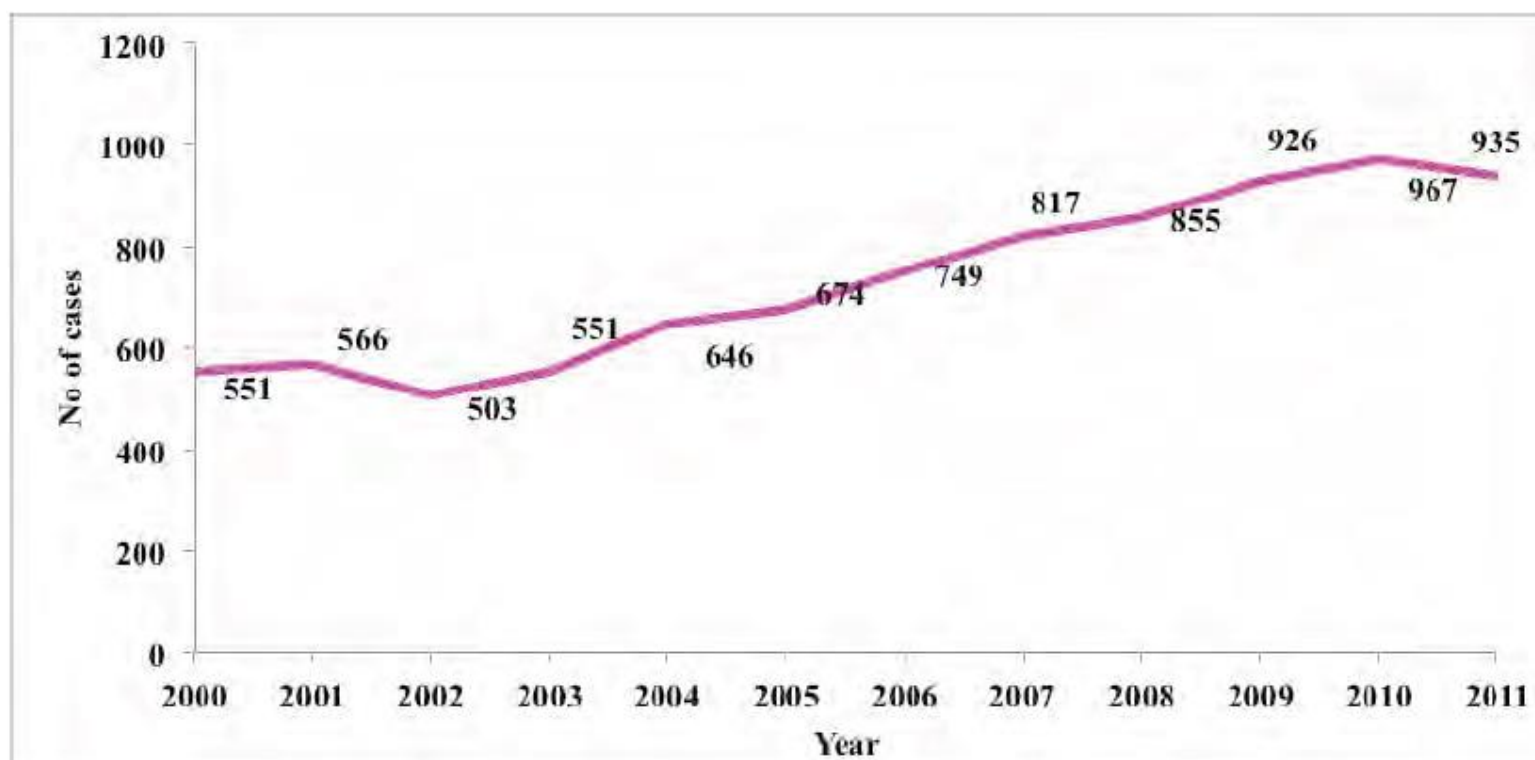
Rank	Cancer	Frequency	Percent
1	Breast	935	37.7
2	Colorectal	233	9.4
3	Thyroid	145	5.8
4	Corpus Uterous	138	5.6
5	Non-Hodgkin lymphoma	100	4.0
6	Leukemia	98	4.0
7	Ovary	70	2.8
8	Brain, Nervous system	67	2.7
9	Hodgkin disease	53	2.1
10	Cervix Uteri	51	2.1

Less than 1% of all new breast cancer cases occur in men.



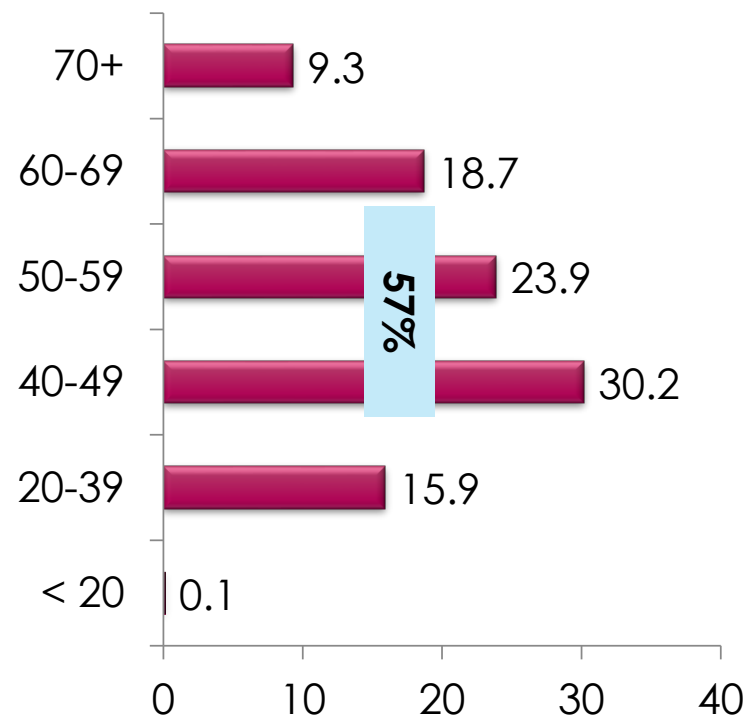
شبكة الإنترنت
وزارة الصحة
مديرية الشؤون الطبية
السجل الوطني للسرطان
وزارة الصحة - عمان
الطبيب
د. محمد العبدالله
د. محمد العبدالله
د. محمد العبدالله

BREAST CANCER IN JORDAN



Trend number of female breast cancer 2000- 2011, Jordan

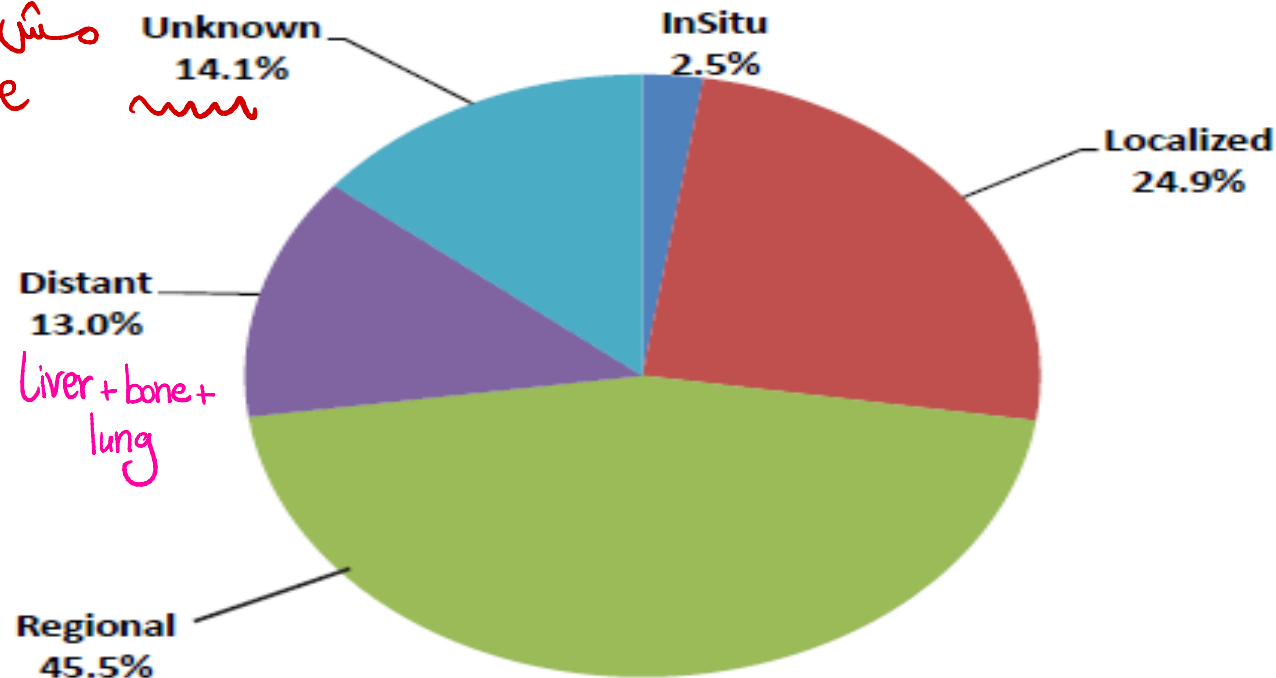
% of Female Breast Cancer cases By Age-group



BREAST CANCER IN JORDAN ➔

مش معروف
origine

Liver D.
كلى عىنه
بالقواىله
breast

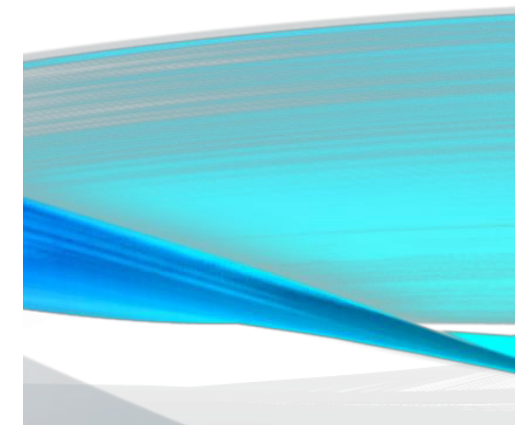
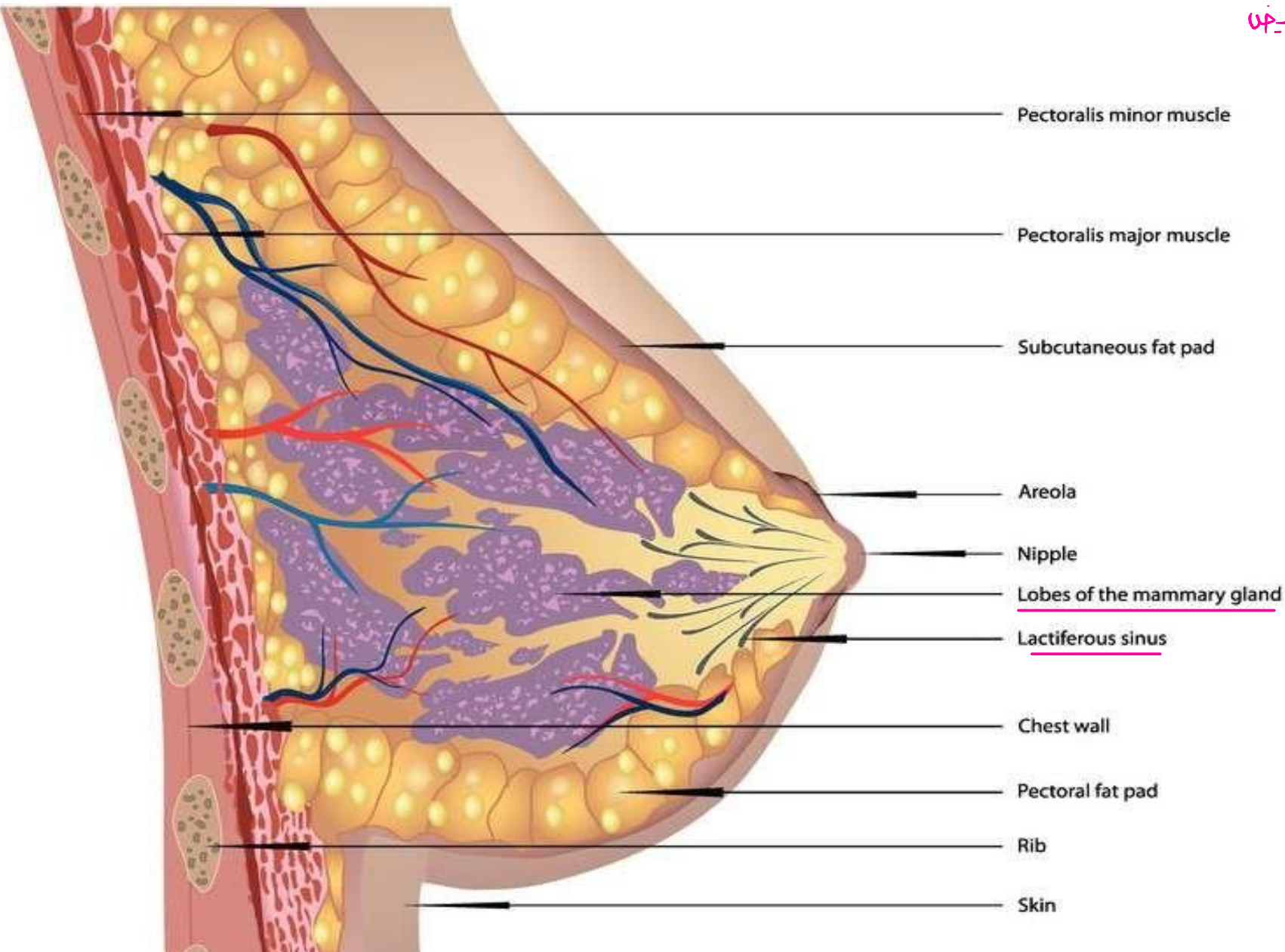


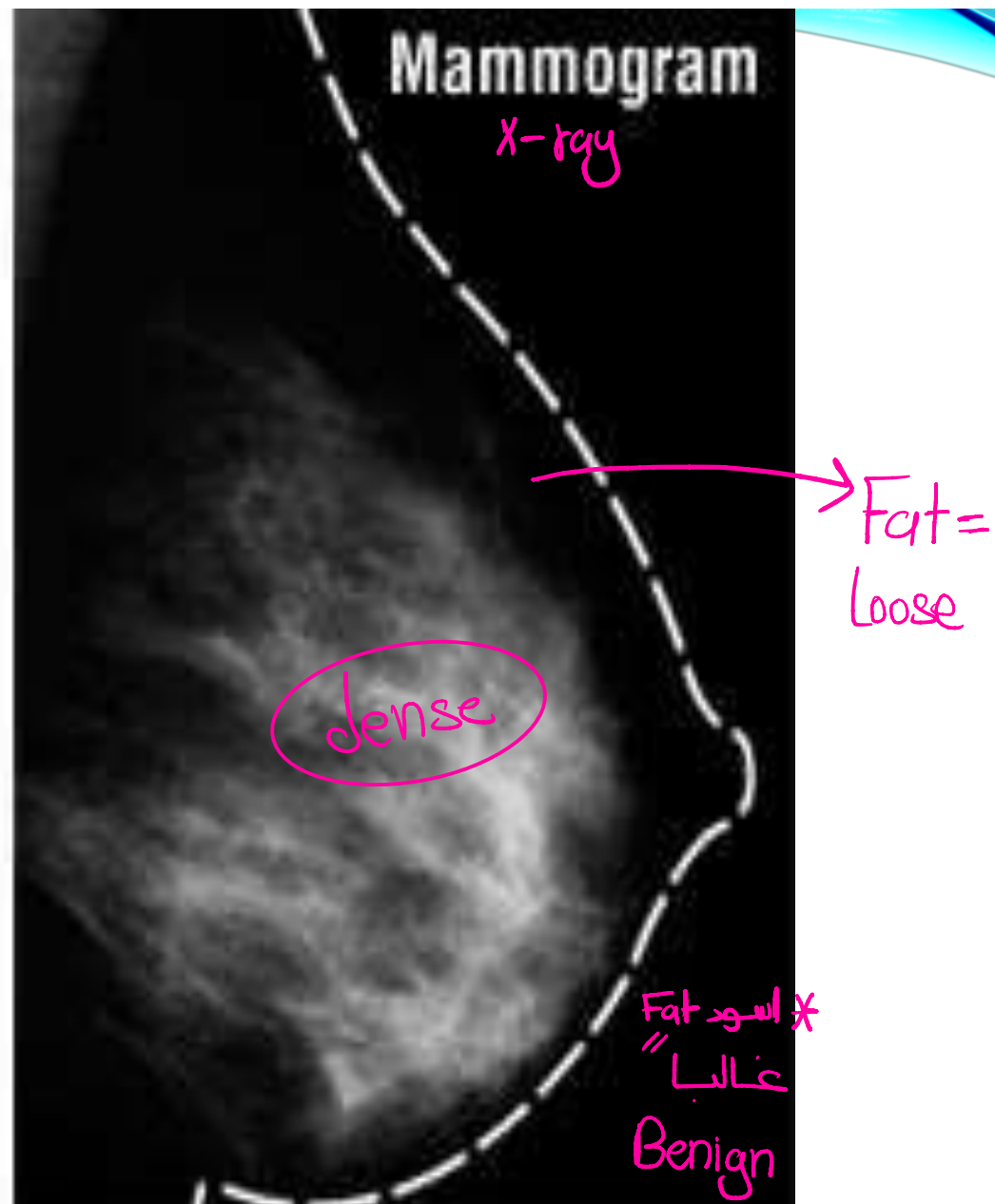
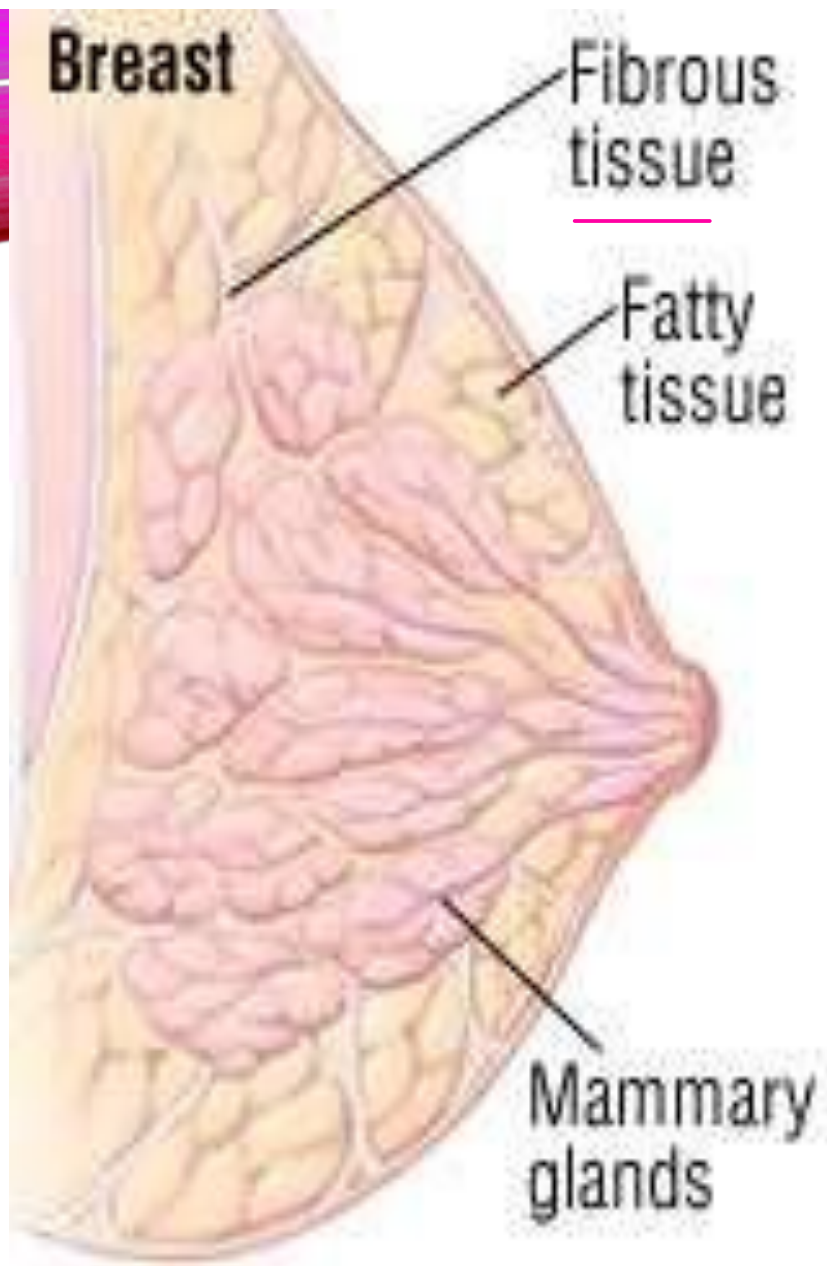
- Distribution of female breast cancer by Summary Stage , 2011

btw "2+6" ribs

up=10g in Fibroglandular breast Tis.
+
> 90% in Fat

anatomy







Our ultimate goal..

- is to **decrease mortality** from **breast cancer**

How?

- **Finding small breast cancer before** they are **clinically evident** .treatable if **early detected**

By:

- **Screening Mammography**

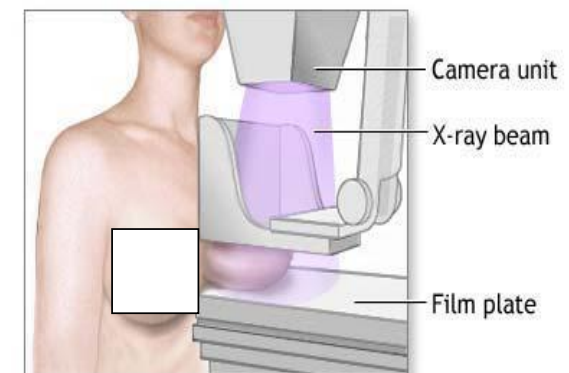
MAMMOGRAPHY

- Has become the standard tool for screening and initial evaluation of breast cancer.
- The major role of mammography is early detection of breast cancer in an asymptomatic women i.e. SCREENING mammography.

✦ White parts on mammography like fibromyalgia-glandular tissue are called dense

✦ Black parts on mammography like fatty tissue are called lucent

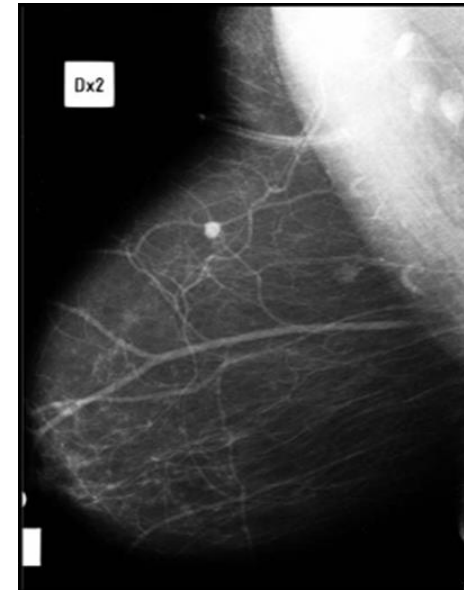
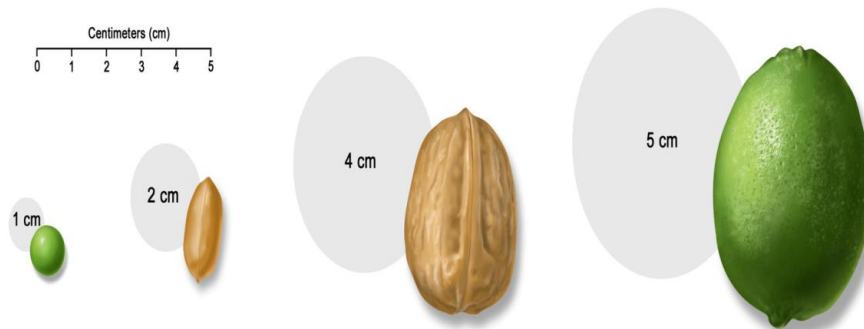
✦ اي اشئي lucent بال breast فهو benign



In mammography, each breast is compressed horizontally, then obliquely and an x-ray is taken of each position

MAMMOGRAPHY

Reduction in mortality has been achieved by the ability of mammography to find cancer at an early stage and smaller size even before its clinically palpable .



* very low $\frac{1}{3}$ X ray

- Mammography is the **cornerstone of breast imaging** .
- Is the process of **using low-energy X-rays** (usually around 30 kVp)
 ← مقارنة بصورة X-ray عادية بتكون 100 KVP
 ← بنعطي المريضة IV contrast هيك ال fibro-glandular tissue
 ← يكون مابين ابيض اكثر و ال mass بتكون بيضة اكثر
- **Tomosynthesis (3D multi slices) and contrast enhanced mammogram** play a major role in early detection of breast cancer.
- There are several breast imaging modalities available such as Ultrasound, ,Digital Mammography ,MRI and PEM .

Positron emission mammography (PEM) is a nuclear medicine imaging modality used to detect or characterise breast cancer. Mammography typically refers to x-ray imaging of the breast, while PEM uses injected positron emitting isotope and a dedicated scanner to detect breast tumors.

حبر مسمومة

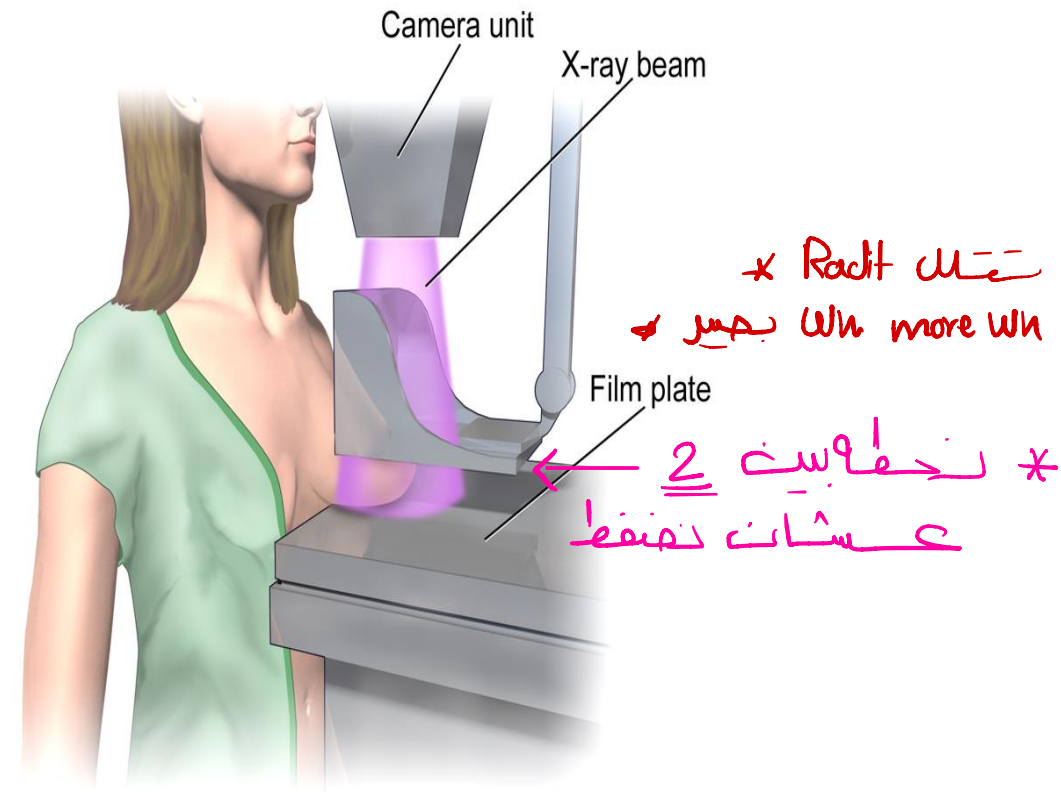
*very low Risk

RISK OF MAMMOGRAPHY

- Extremely low dose .
- Comparable risk are:
 - Travelling 4000 miles by air
 - Travelling 600 miles by car
 - 15 min of mountain climbing
 - smoking 8 cigarettes.

PROCEDURE

- The breast is compressed using a dedicated mammography unit.
- Parallel-plate compression evens out the thickness of breast tissue to increase image quality by reducing the thickness of tissue that x-rays must penetrate, decreasing the amount of scattered radiation (as scatter degrades image quality), reducing the required radiation dose, and holding the breast still (preventing motion blur).



Mammogram

COMPRESSION PADDLE

لماذا نضغط؟

- (i) Decreases the thickness of the breast , thus reduces the scattered radiation –improves the contrast .
- (ii) Decreases the kinetic blur .
- (iii) Reduces geometric unsharpness by homogenously bringing the object close to the film .
- (iv) Makes breast thickness uniform in film density.
- (v) Differentiates the easily compressible cysts and fibro- glandular tissue from the more rigid carcinomas
- (vi) Separates the super imposed breast lesions
- (vii) Reduces radiation dose to the breast tissue .



INDICATIONS

- Screening of asymptomatic women
- Screening of high risk women (eg:BRCA gene)
- Follow up of patients after mastectomy of same and opposite breast / same breast with implant .
- Investigations of benign breast diseases with eczematous skin,nipple discharge , skin thickening .
- Investigation of a breast lump
- Investigation of occult primary with secondary mets.
- Male breast evaluation .

✱
✚ اي ست فوق ال ٤٠ بنصورها mammogram .. بين ٣٠-٤٠ بنصورها MRI .. اي ست عندها first degree relative

مصابة ب breast cancer بنبشها screening قبل ب عشر سنوات من العمر الي تشخصت فيه القرية

✚ اي palpable mass بتصورها mammogram .. اي lactating or pregnant woman بنصورها

✚ ultrasound .. الي عندهم BRCA 1,2 بنبش ال screening على ال ٢٥ سنة ب MRI ✱



male patient عنده mass عمره فوق ال ٢٥ بصورة mammogram

Risk Assessment

Gravida

Breast feeding

Age of menarche

Hormonal Therapy

Medical History

Previous Breast Surgery

Current Medical Problems

Family History

Family History of breast cancer and age of diagnosis.

Family History of other cancer and age of diagnosis.

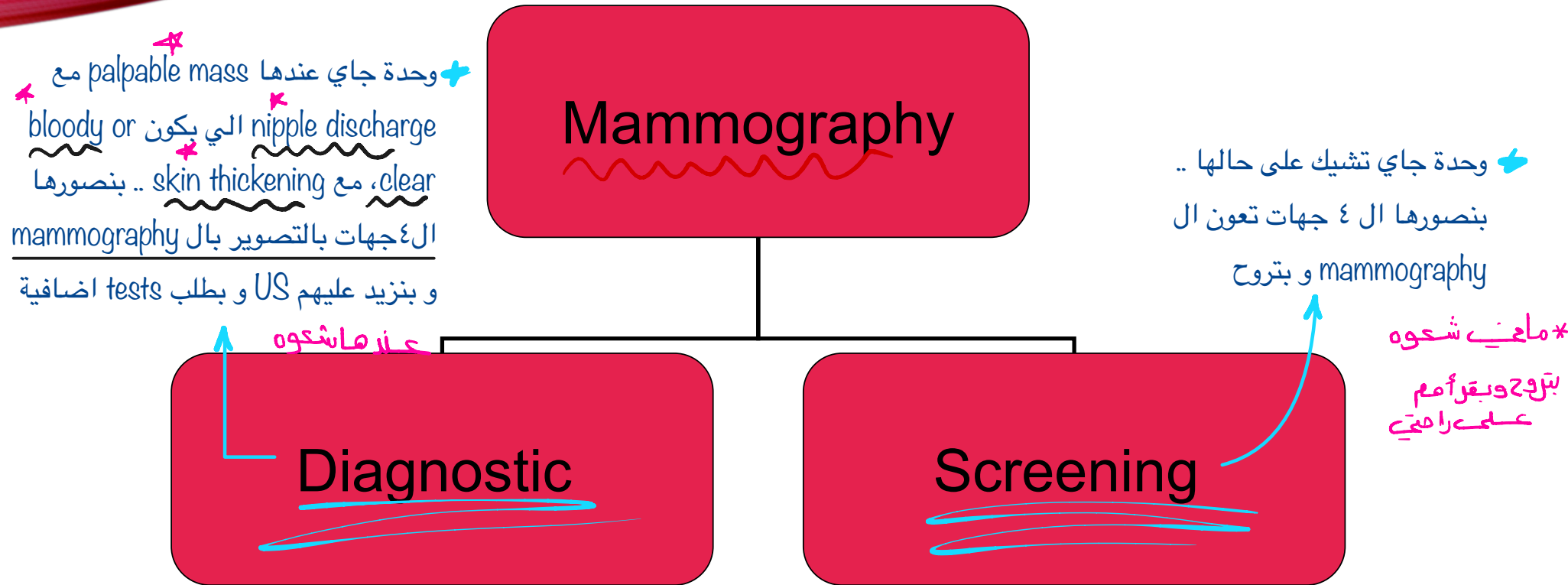
Physical Examination

لاي ست عندها breast implant بنصورها mammogram يرتفع ال implant بطريقة معينة بحيث

يبين ال tissue الي تحته بس بضل جزء منه مو مبين تقريبا ٢٠٪ ف ممكن نلجأ لصورة MRI



INDICATIONS FOR MAMMOGRAPHY



The rate of breast cancer detection has increased due to the use Screening mammography



WHY SCREENING

- High prevalence .
- Improved outcome during asymptomatic period.
- Significant impact on public health.
- Curable early stage.
- It can be detected 3-5 years before it is clinically palpable



SCREENING MAMMOGRAPHY

- Mammography in asymptomatic patients.
 - Guidelines or screening protocols in each country.
 - Baseline: >40 years annual .
 - Till life time expectancy is > 10 years
 - In ladies less than 40 years and above 30 years with high risk:
 - strong family history
 - genetic predispositions (early onset of breast cancer, male breast cancer). BRCA 1 and BRCA 2 gene mutation.
 - 10 year prior to age of diagnosis of first degree relative .
 - History of prior radiotherapy
- *MRI for high risk patient .



DIAGNOSTIC MAMMOGRAPHY

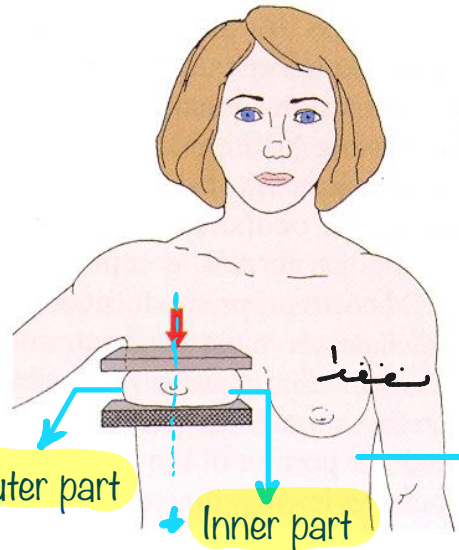
1. Evaluation of breast symptoms and signs
 - pain, mass, nipple discharge, skin or nipple retraction or changes.
2. Before breast surgery (multifocal, multicentric, bilateral).
3. Follow up breast cancer patients: the treated breast.
4. Work up of patients with metastasis from an unknown primary.
5. Additional views in screening patients (recalled patient)
6. Under supervision of radiologist

مهم جدا جدا تتنبهوا على الجهات و تحددها

BASIC VIEWS:

1. CRANIOCAUDAL VIEW (CC VIEW).

Outer and inner



Craniocaudal (CC)*

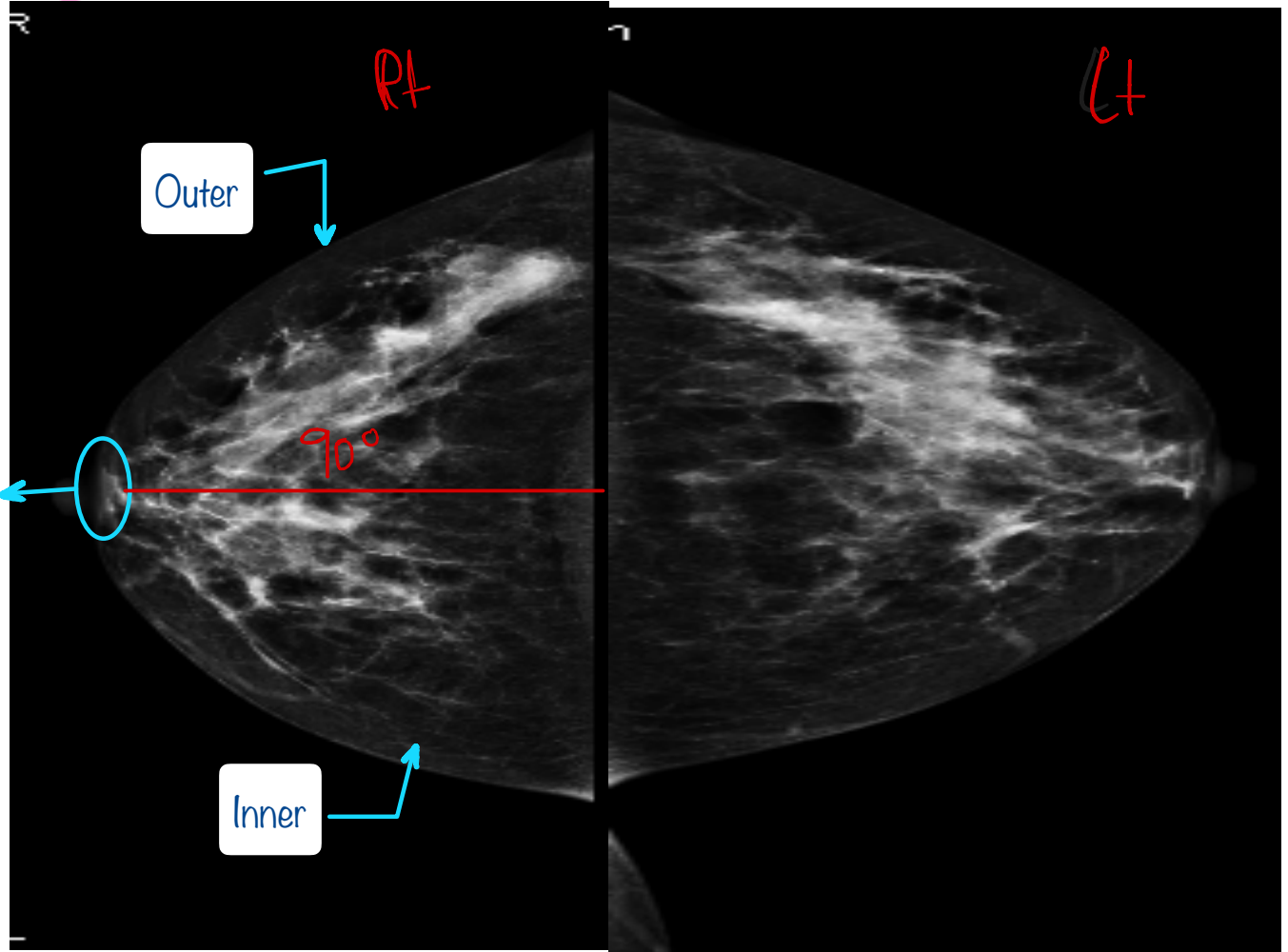
نفس ال breast بس بدل ما يكون بالطول

عملناه هون بالعرض بحيث صار ال outer

part فوق و ال inner part تحت

10°

Nipple



لازم نشوف لحد ال posterior fat line الي هو السواد الي اخر اشي

CRANIO-CAUDAL VIEW

- The cassette is placed under the breast at the level of the inframammary fold .
- The breast is then pulled until the inframammary fold is taut .
- ~~☆~~ Compression is applied and Xray beam is directed vertically from above .
- Postero medial aspect should also be included .



Rt

Lt CC

Lateral
Outer

Calcification at
lower left breast
outer

نقطة بيضاء

Medial
Inner

normal right breast

لونه على سواد

لانه في fat اكثر

Rt

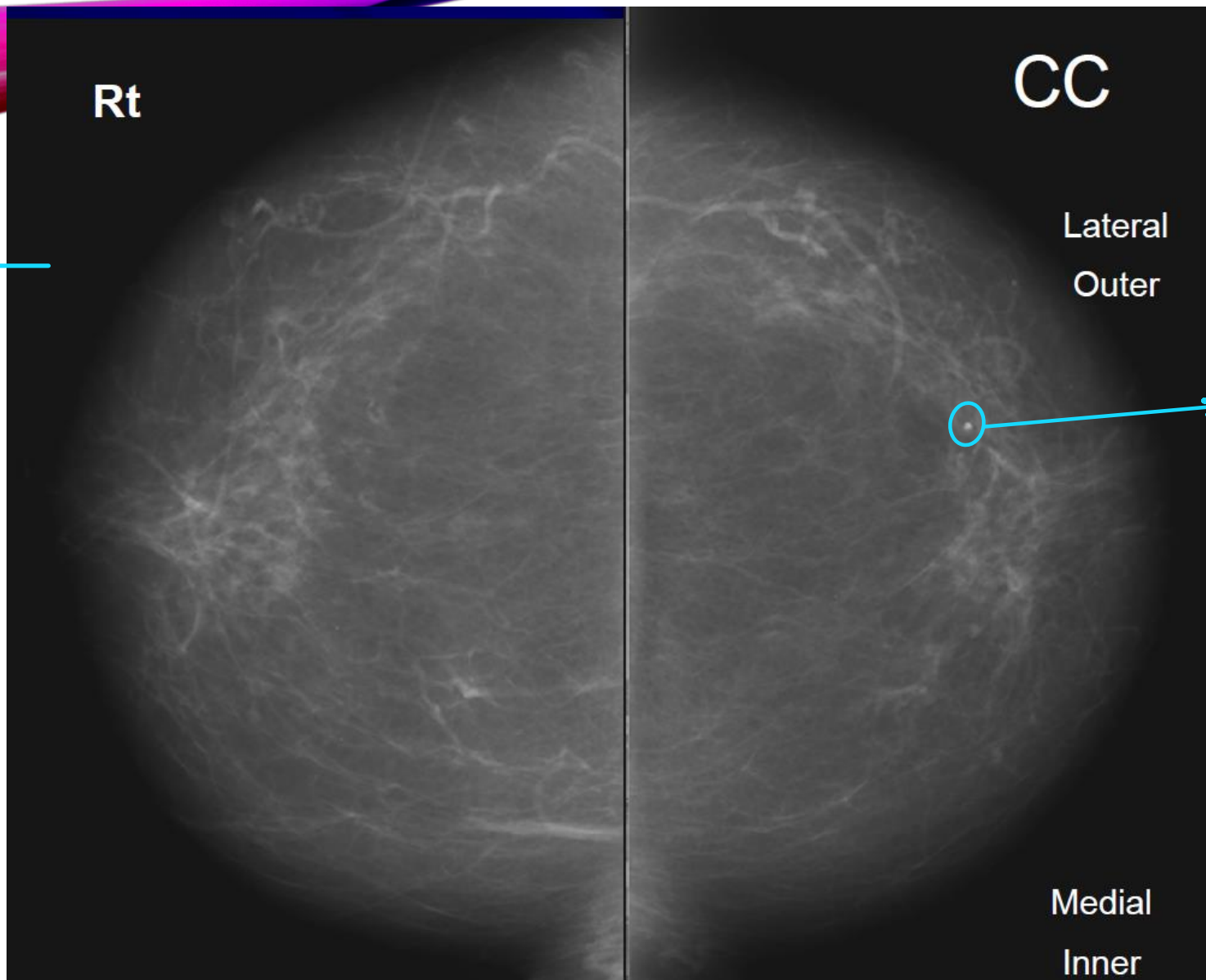
CC

Lateral
Outer

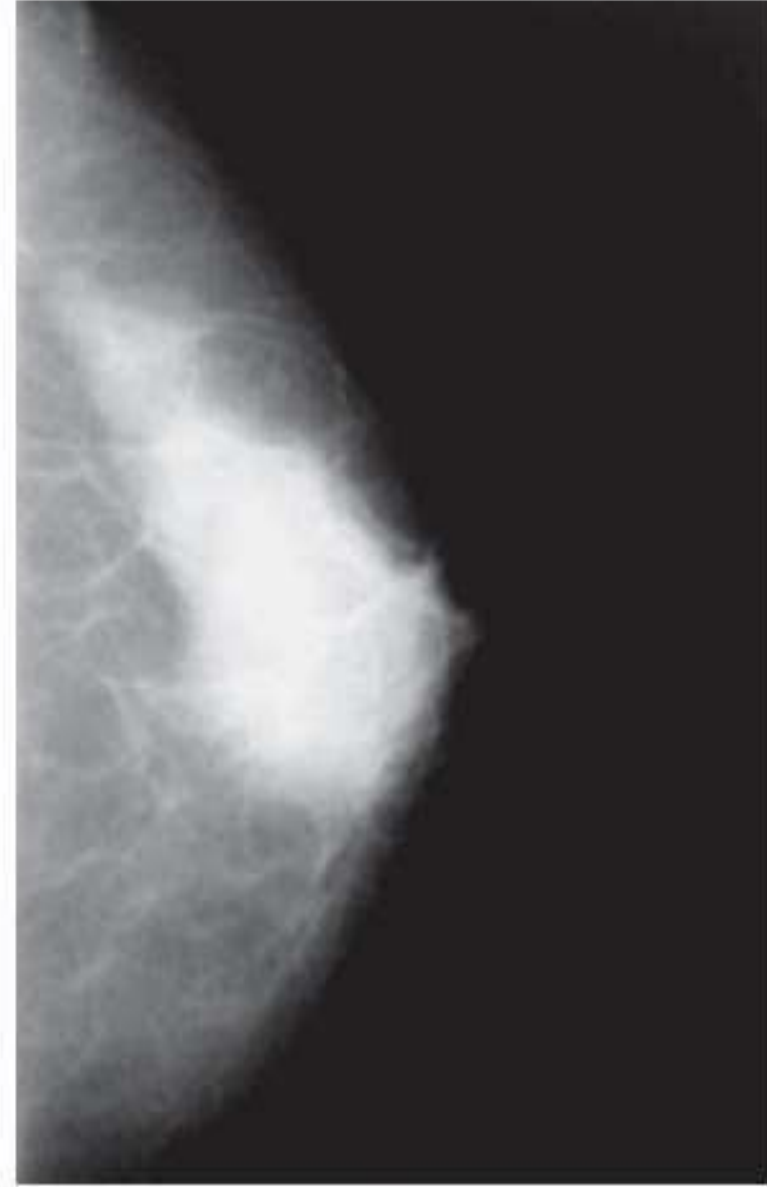
Medial
Inner

normal right breast
لونه على سواد
لانه في fat اكثر

Calcification at
lower left breast



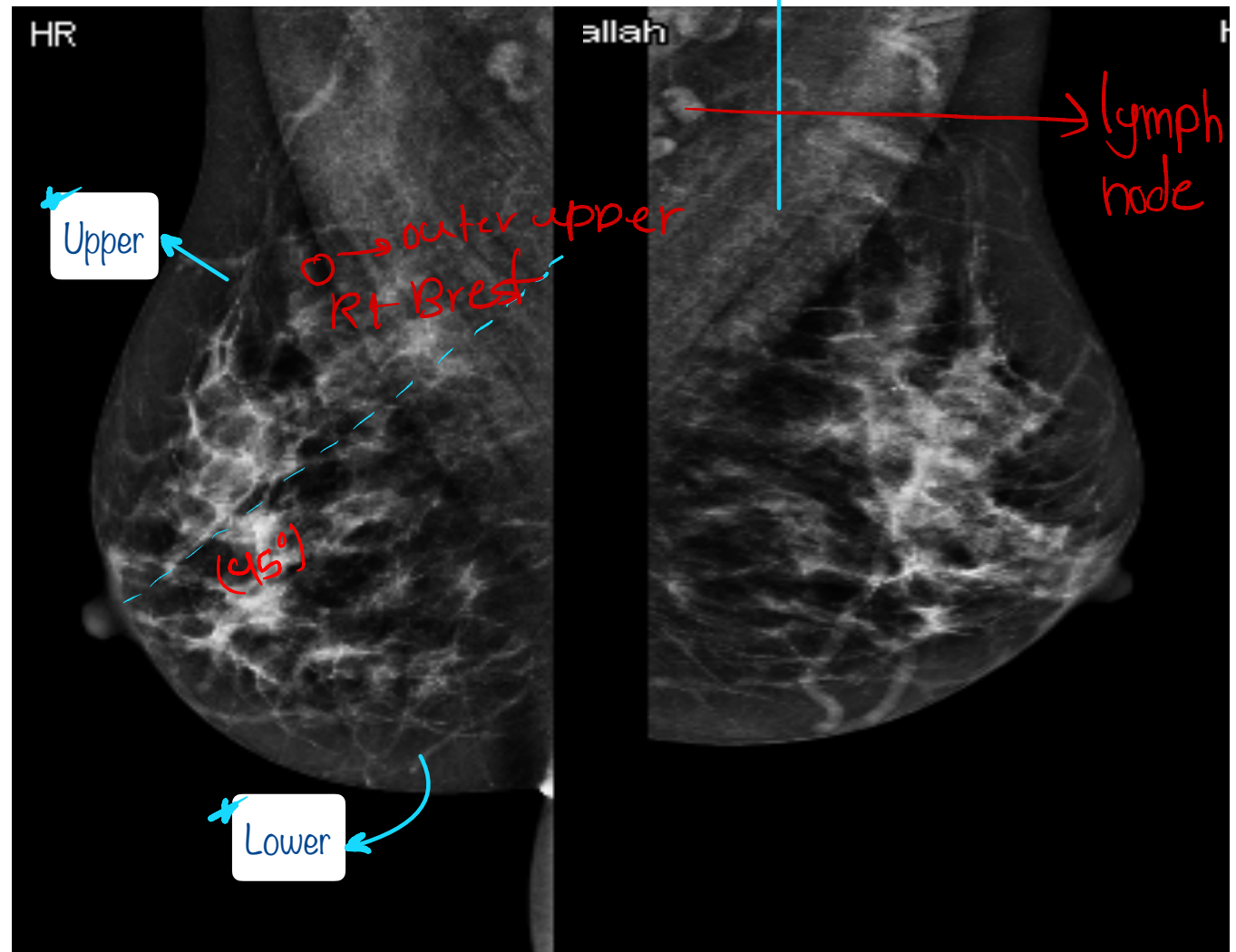
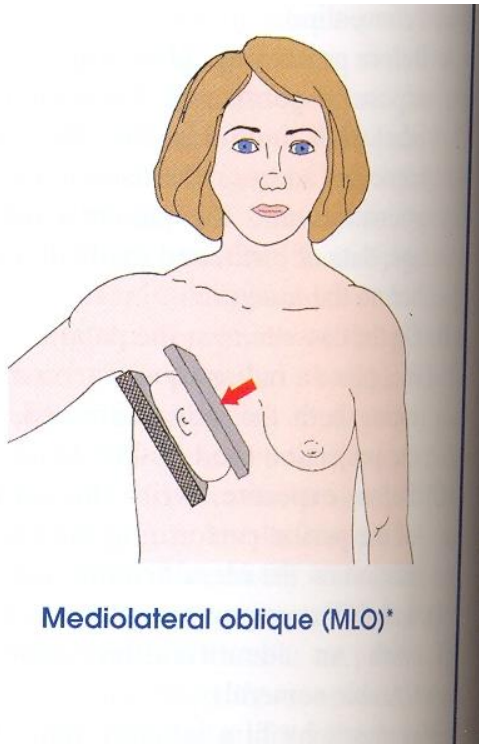
✂
+ هاد normal breast لونه ابيض لانه في كثير fibrosis-glandular tissue



✦ Pectoralis major

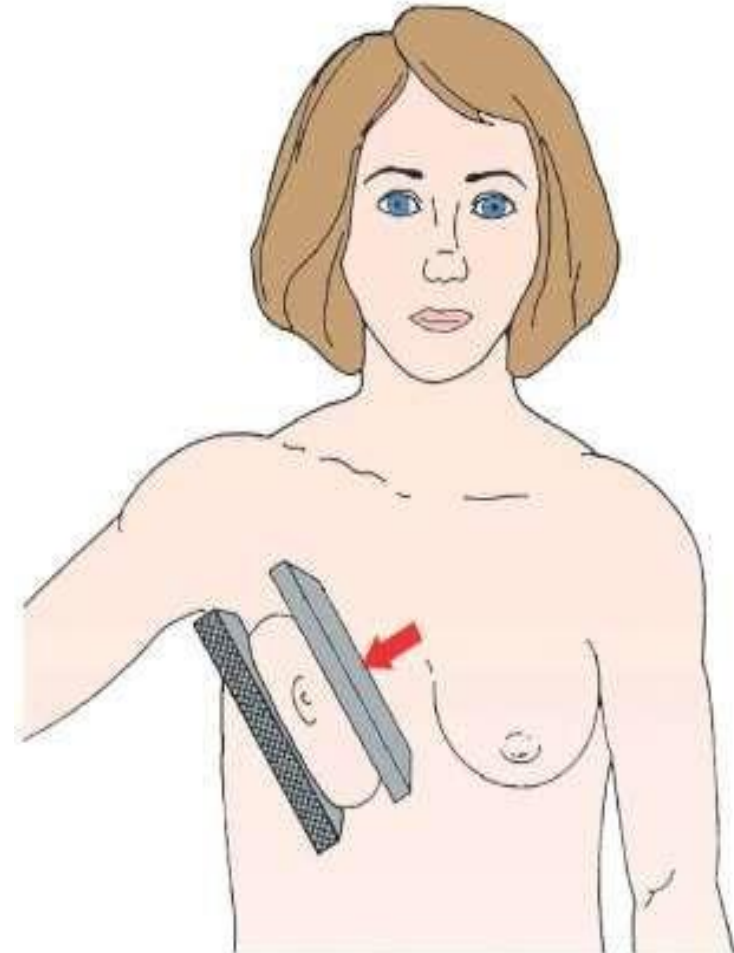
2. MEDIOLATERAL OBLIQUE VIEW (MLO VIEW).

Upper and lower



MEDIOLATERAL OBLIQUE VIEW

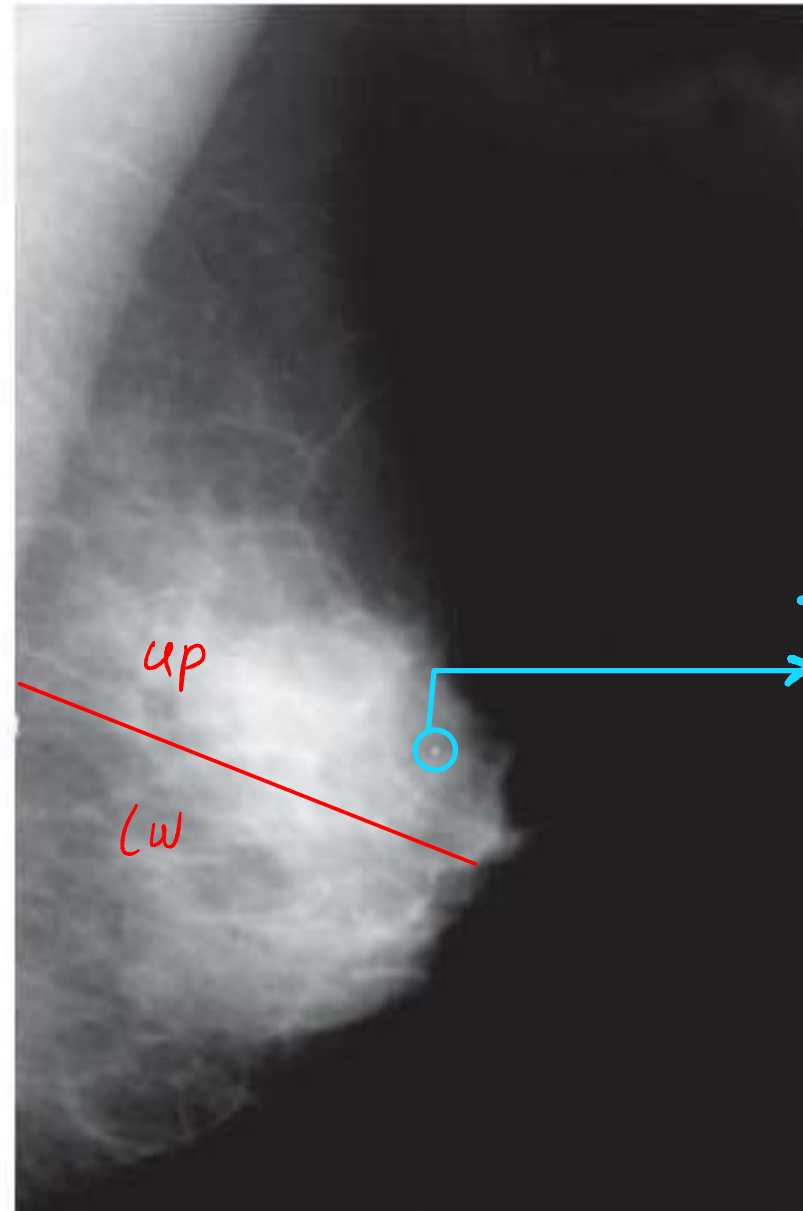
- Best view to image all of the breast tissue and the pectoral muscle .
- The C-arm of the mammographic unit is rotated to 45 degree so that the cassette is parallel to the pectoral muscle .
- The film holder is kept high up in the axillary fossa and the patient's arm is abducted at the elbow by 80degrees.
- The xray beam enters the breast from the medial side –compression is applied to the pectoralis major muscle .



Mosley, Anne and Colwell Jones, B. 2007, 2007, 2007 by Mosley, Inc. ; an affiliate of Thomson.



A

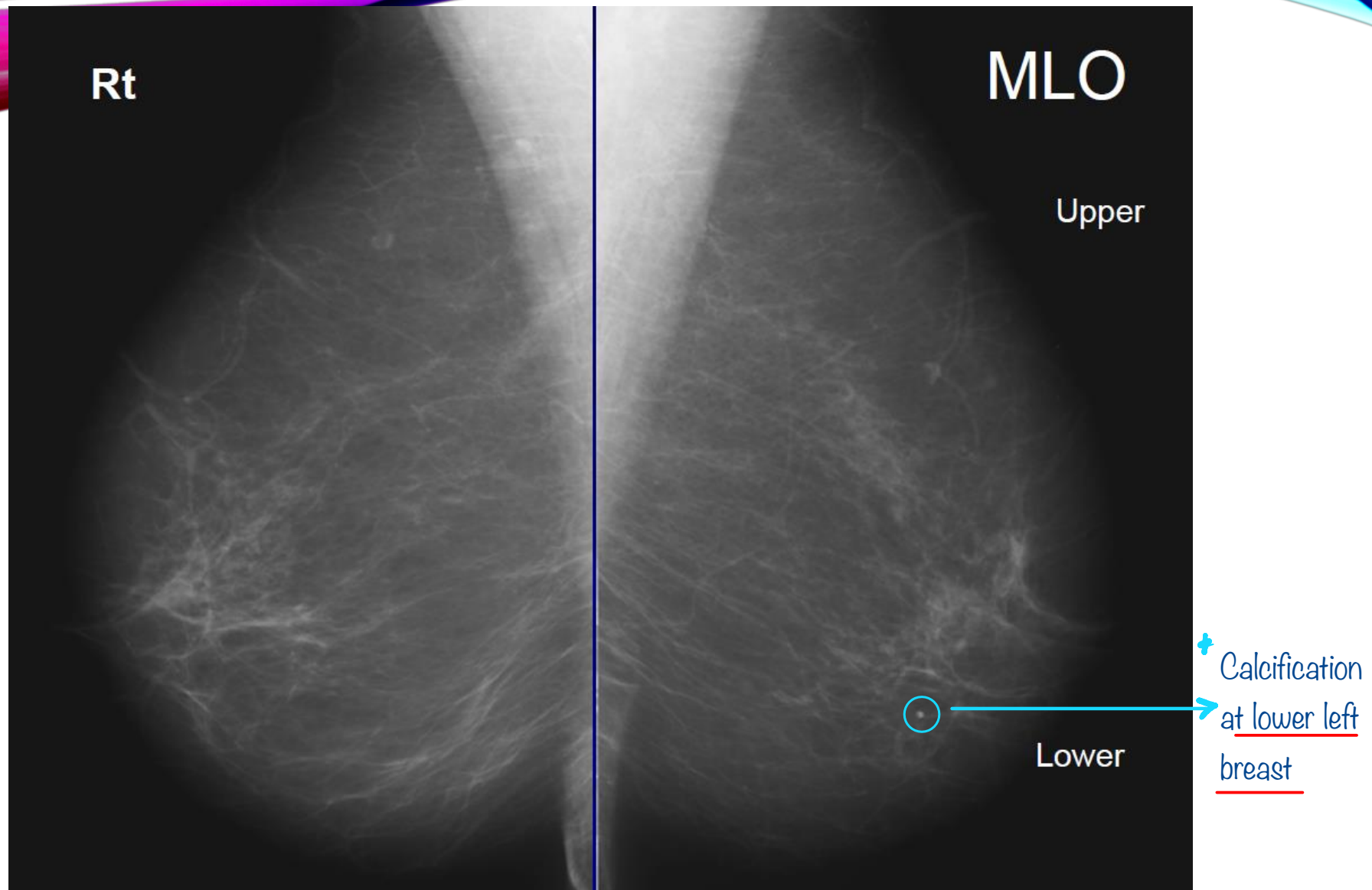


up

lw

+ Calcification in
upper left breast
Outer

B



عن حال diagnosis لازم عمل معهم و بحتاج VIEWS ثانيين

SUPPLEMENTARY VIEWS

90° درجة ←

✚ هاد exaggerated CC view بنصورها

لما ما يكون مابين ال fat الي ورا ال

1. Lateral projections (mediolateral/lateromedial) CC view العادي breast بال

2. Extended craniocaudal projection , XCCL .

لما يكون outer مش مابين منيح

3. Tangential views in palpable masses and in skin calcification .

4. Spot compression (asymmetrical breast tissue or suspicious mass).

* مابين

5. Magnification views for calcification.

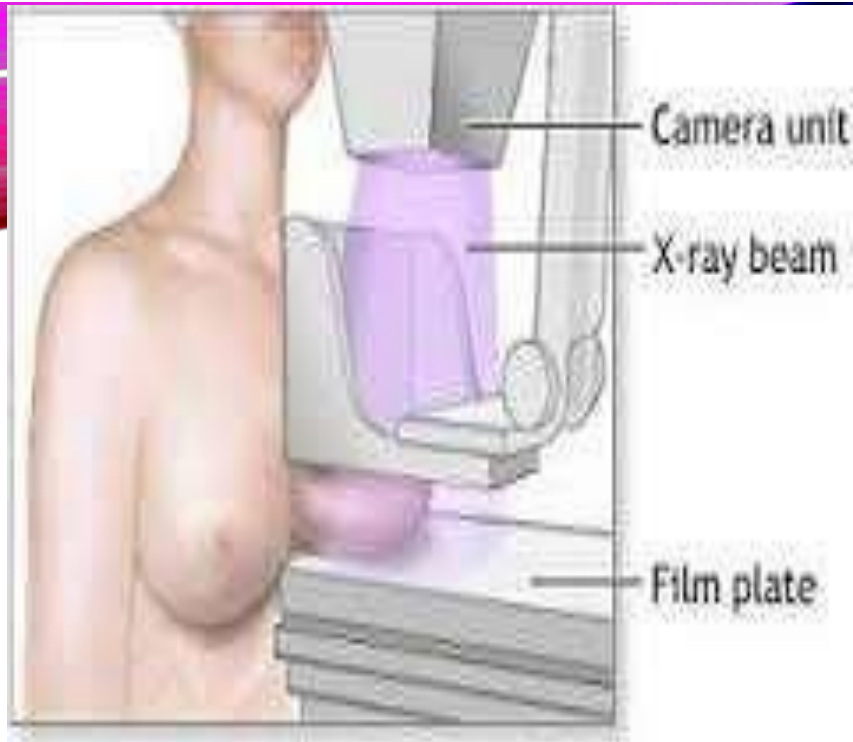
6. Cleavage view for inner masses.

→ Inner view

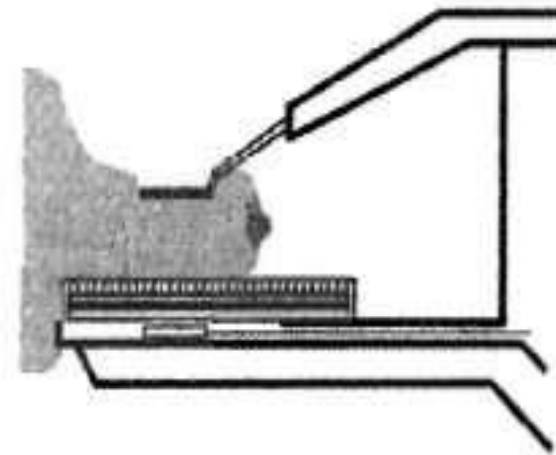
عكس XCCL

ادمجوه مع بعض
يكونوا view واحد
بالجواب

✚ اي مريضة بتتصور mammogram لازم ناخذها ال 2 views الي هم ال CC and MLO بعدين بشوف ال views الثانية لو احتجتها



Spot compression



Spot compression paddle:
Better compression over small area

- The compression device is parallel to the receptor surface .
- Radiolucent plate that is flat and parallel to the support table .
- Should match the cassette size

COMPRESSION VIEW



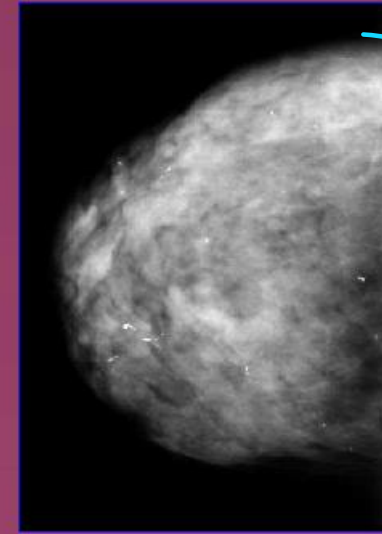
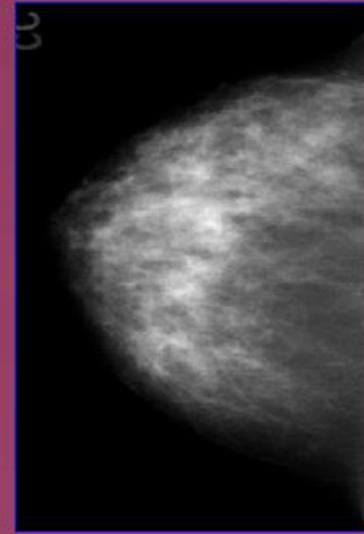
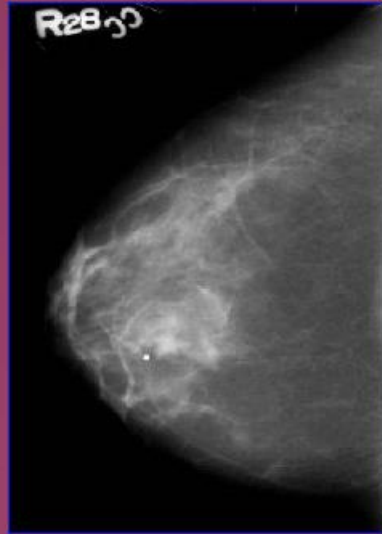
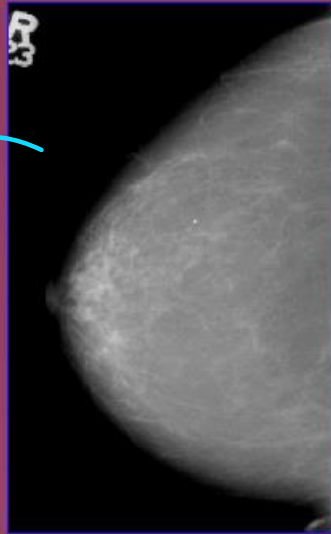
عشان نوضح ال mass و
ال calcification ➡

MAGNIFICATION VIEW



لیست بهتم یاد آید؟
! لیست معنی = خون benign
و تمیس Malign.
! معنی علامات مبعده لد malign

Breast Density



87%

63%

↓ Sensitivity

97%

89%

↑ Specificity

Carney PA. Ann Int Med 2003

ON

Very dense
بسیار کثیف
Type 4

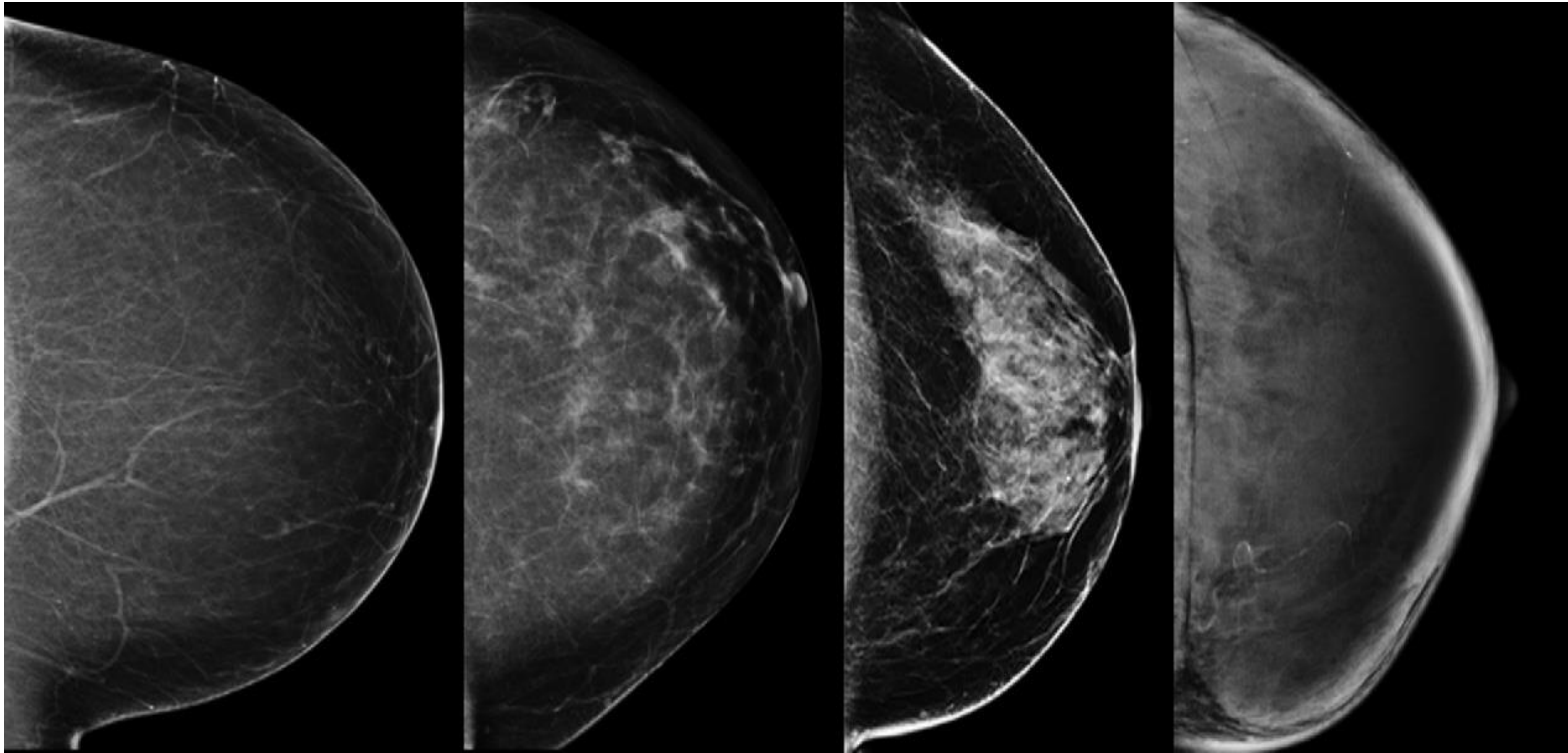
* کثیف لوہے
ماہی شوقیہ
خدا انما بنمور
* Ultrasound

لیش مانیش
ultrason...
Calc...

ca → kutr
mass → ultra

* بتقسیم ل ۴ درجات

MAMMOGRAMM - DENSITY



Subjective assessment of breast density. entirely fatty (far left), scattered areas of fibroglandular density (second from left), heterogeneously dense (second from right), and extremely dense (far right).

MAMMOGRAPHIC ALARMING SIGN

Red flags

- Irregular spiculated mass
- Asymmetrical breast density واحد اكبر من الثاني
- Architectural distortion
- Clustered micro calcification and linear branching microcalcification
- ✦ Skin and nipple retraction
- ✦ Skin thickening
- ✦ Pathological lymphadenopathy

الفرق بين ال distortion and mass : ال distortion

بتكون بس speculations زي اشعة الشمس بس

بالنص ما في mass اما ال speculated mass في

mass بالنص لونها ابيض و طالع منها speculations

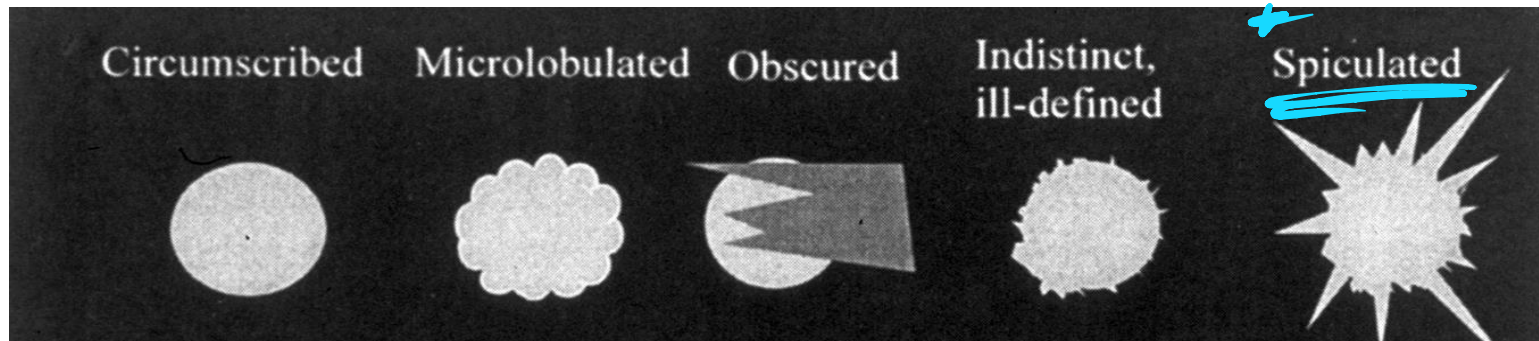
colorless / bloody
unilateral

MASS

Shape



MARGIN



0 cc
irr spicu..

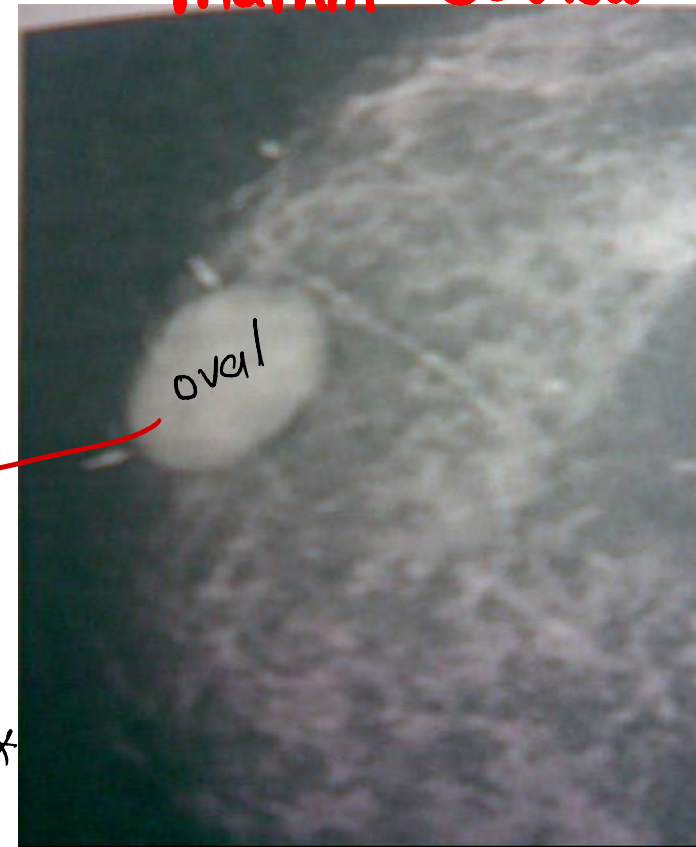
BENIGN MASS

~~*~~ & dense mass

- ~~*~~ Circumscribed oval or round mass and may contain coarse, pop corn or benign calcification

* Coarse calcification ← MLO or CC view

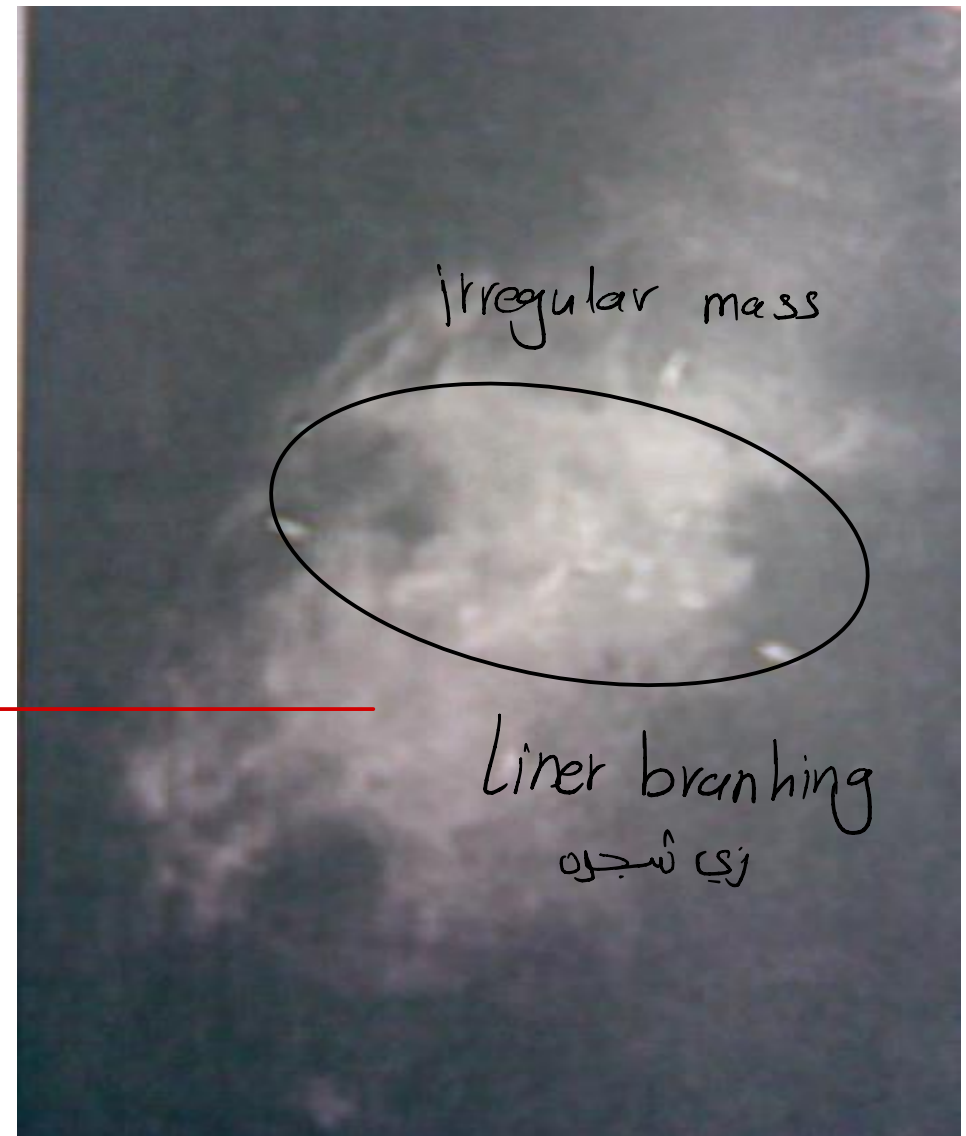
Mamm - CC view



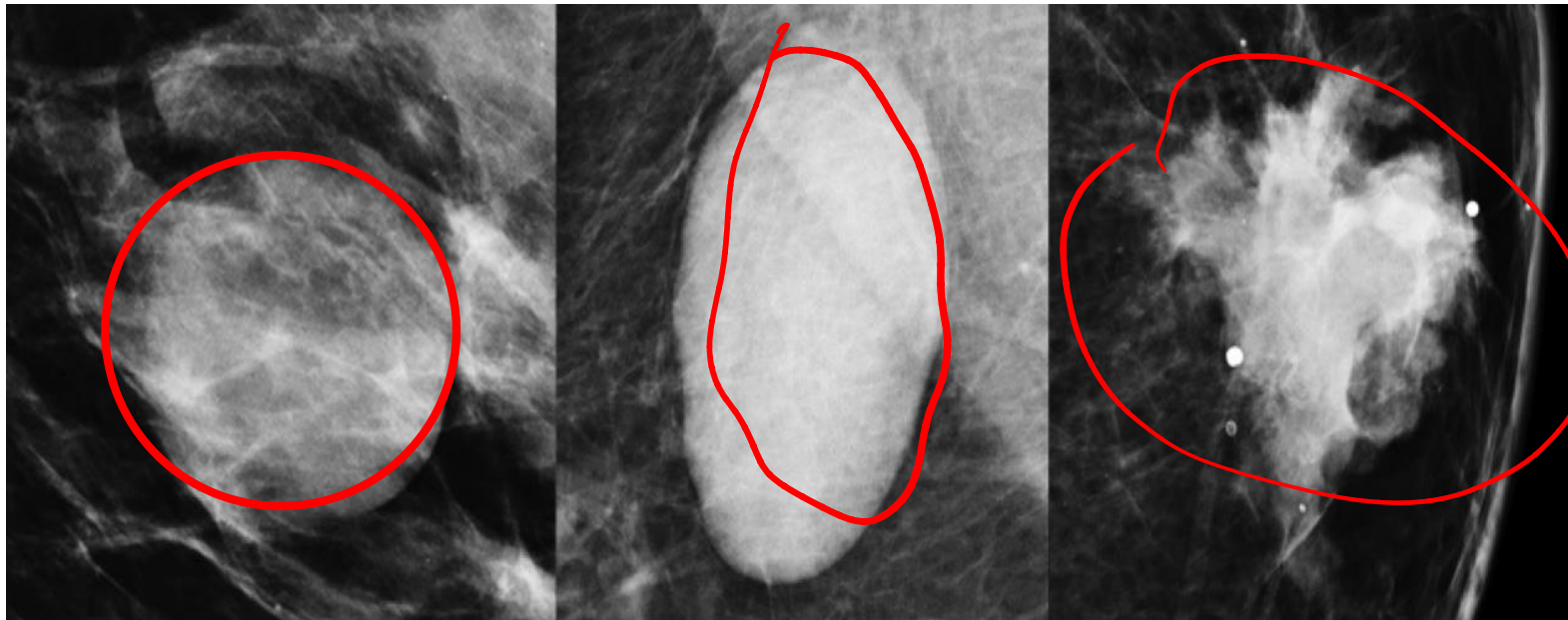
MALIGNANT MASS

Variable shape , irregular
outline , spiculated and
may contain malignant
pleomorphic or linear
branching calcifications

Dense mass



MAMMOGRAMM - **MASSSES**



Rounded

oval dense

~~irregular~~
spiculated dense

کریستوف

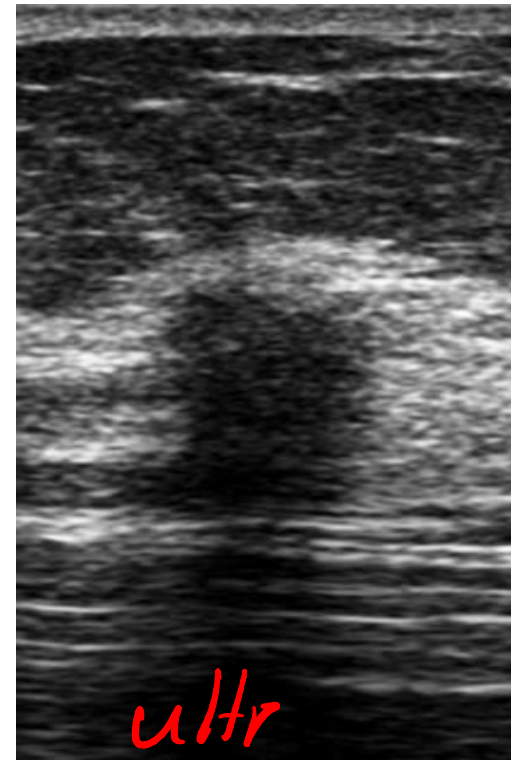
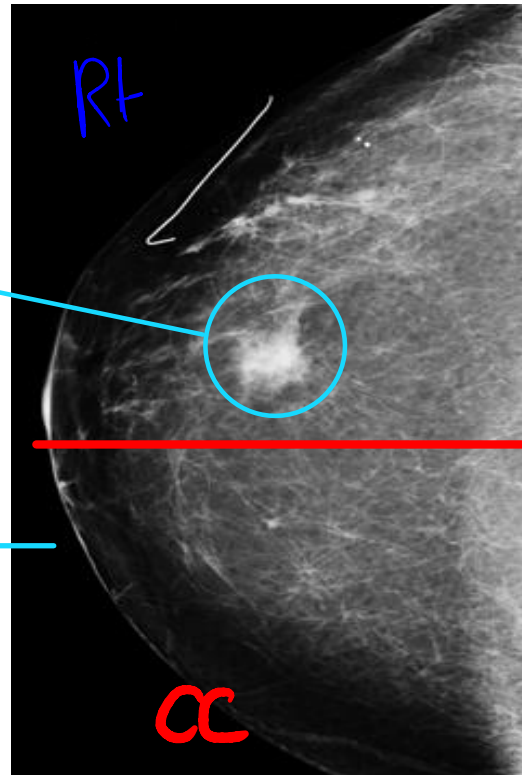
INVASIVE LOBULAR CA.

+ Irregular speculated dense
mass in (outer) right breast

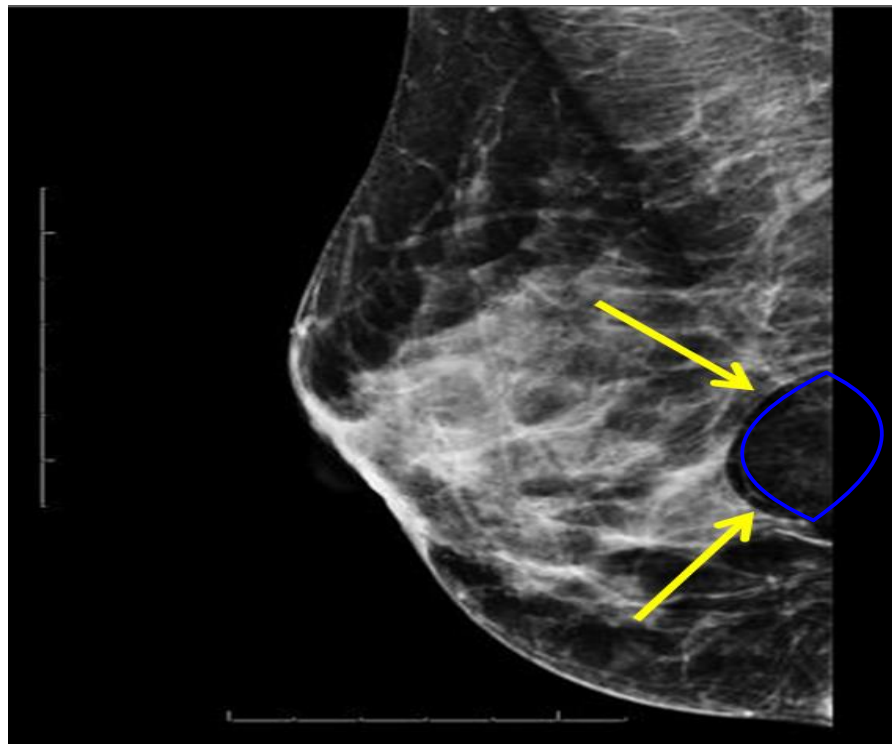
+ عرفنا انه ال view تاع

الصورة CC لانه ما في

pectoralis major



RADIOLUCENT MASS



Regular circumscribed oval lucent mass

✓ lucent → fat



FALSE NEGATIVE MAMMOGRAM

- Extremely dense breast .
- Occult on mammogram (lobular cancer)
- Technical
- Error in interpretation

٣ أنواع

CALCIFICATION = Risk of cancer

بكونوا بقنوات الحليب و بصير لهم sedimentation و بيبينوا

على 2 lateral view الي بنصوره على ٩٠ درجة

- ① Most calcification are benign . (Milk of calcium , egg shell , popcorn , lucent center , vascular , suture , large rod like (secretory) and skin calcification .

صح هم benign و على الاغلب بنعتبرهم DCIS

بس كمان سنة سنتين ممكن يتحول cancer

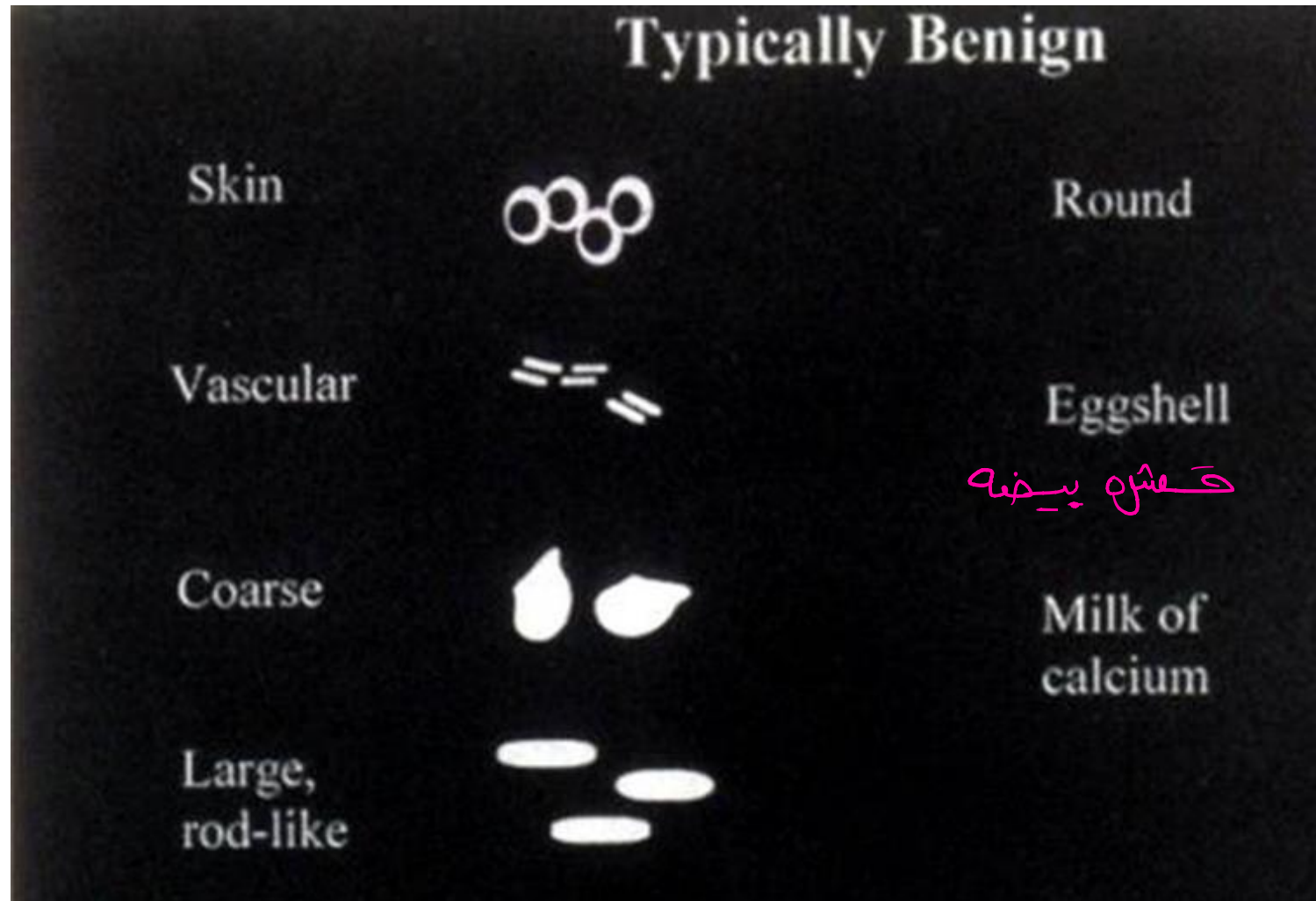
- Microcalcification are important as early sign of breast cancer.
- 90% of DCIS appear as microcalcification .

- ✱ • Malignant calcification (1. pleomorphic , 2. cluster , 3. linear branching)

كلا وحدة شكل

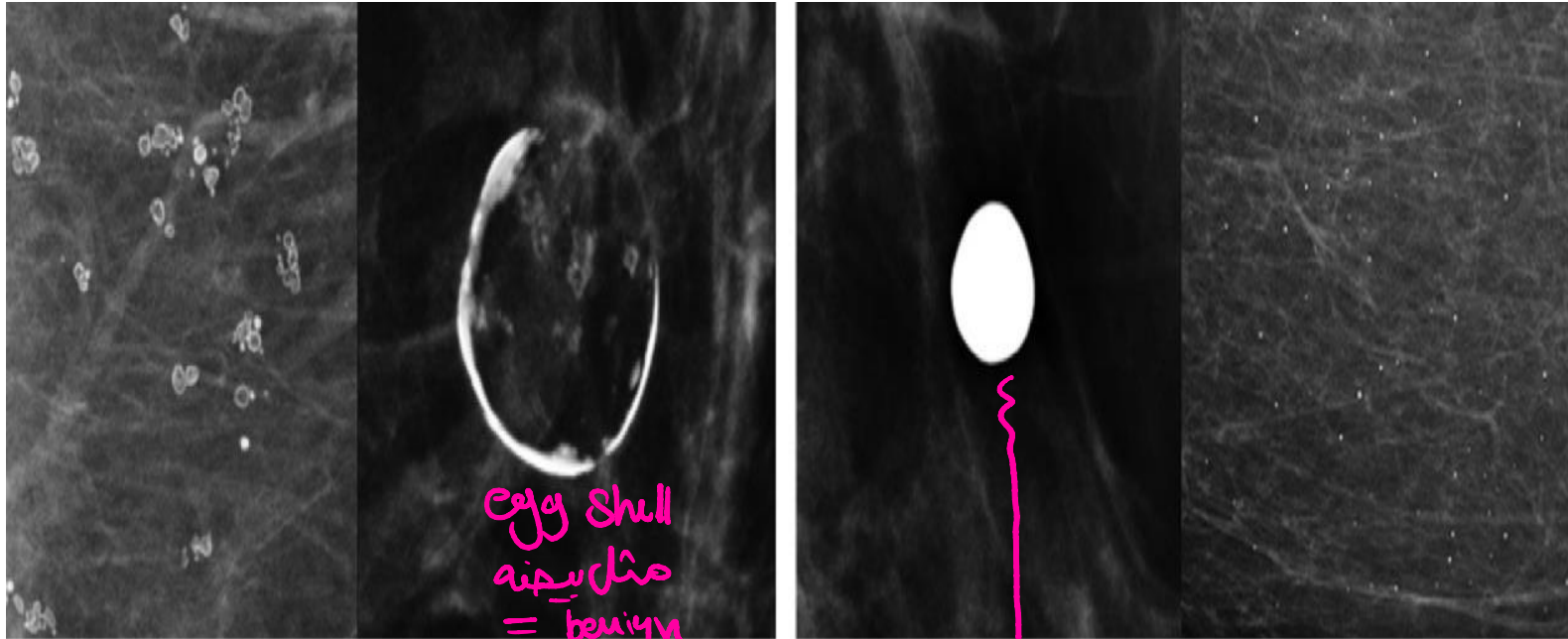
بمساحة
1cm

BENIGN CALCIFICATIONS



معمولاً معینہ زئی
عکسہ → Spot Magnification پس اسٹوف کالک باخودما

MAMMOGRAM – BENIGN CALCIFICATIONS



a.

☆ Rim calcifications: Lucent-centered and eggshell calcifications have been combined into one category

egg shell
calcification
= benign

b.

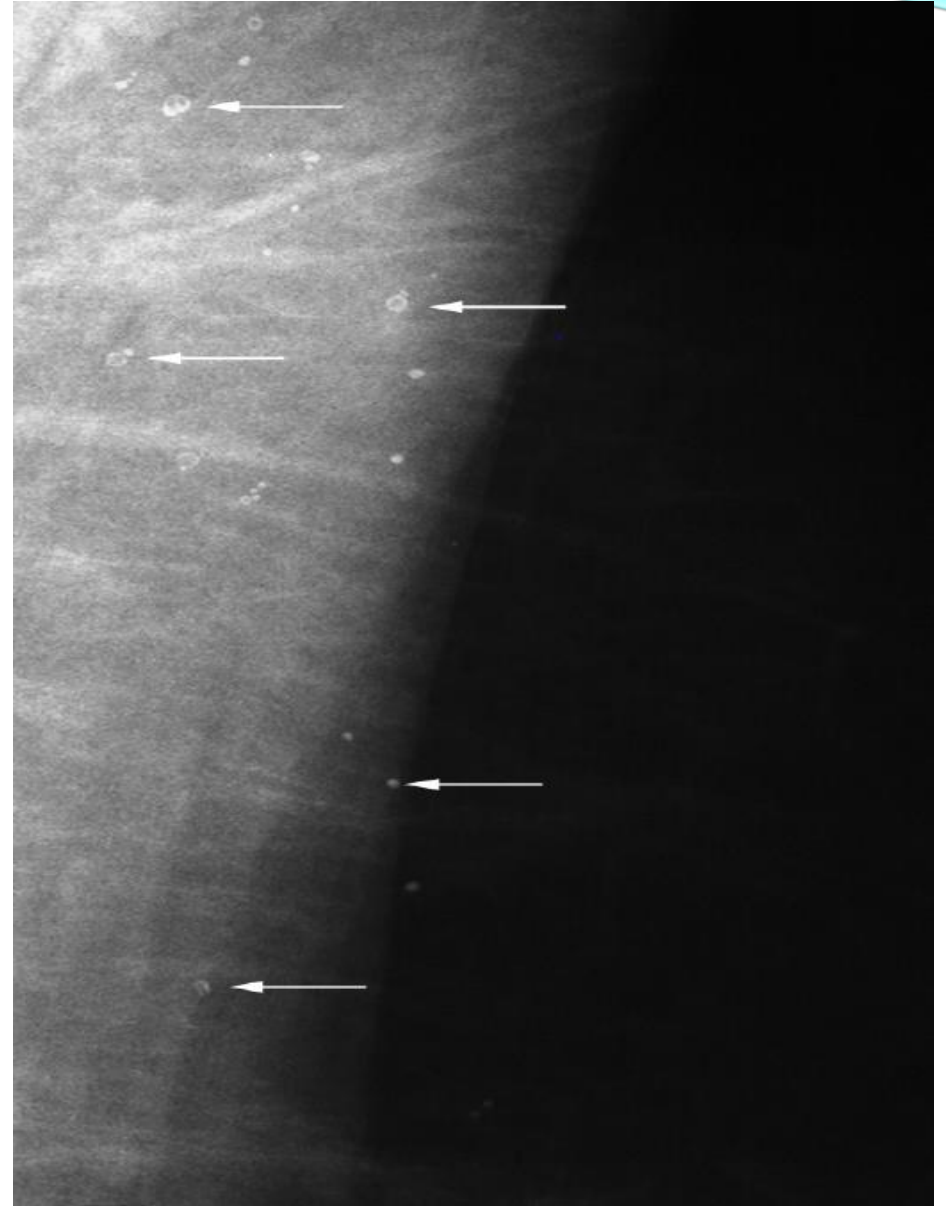
☆ Round calcifications: Round and punctate calcifications have been combined into one category.

* Benign

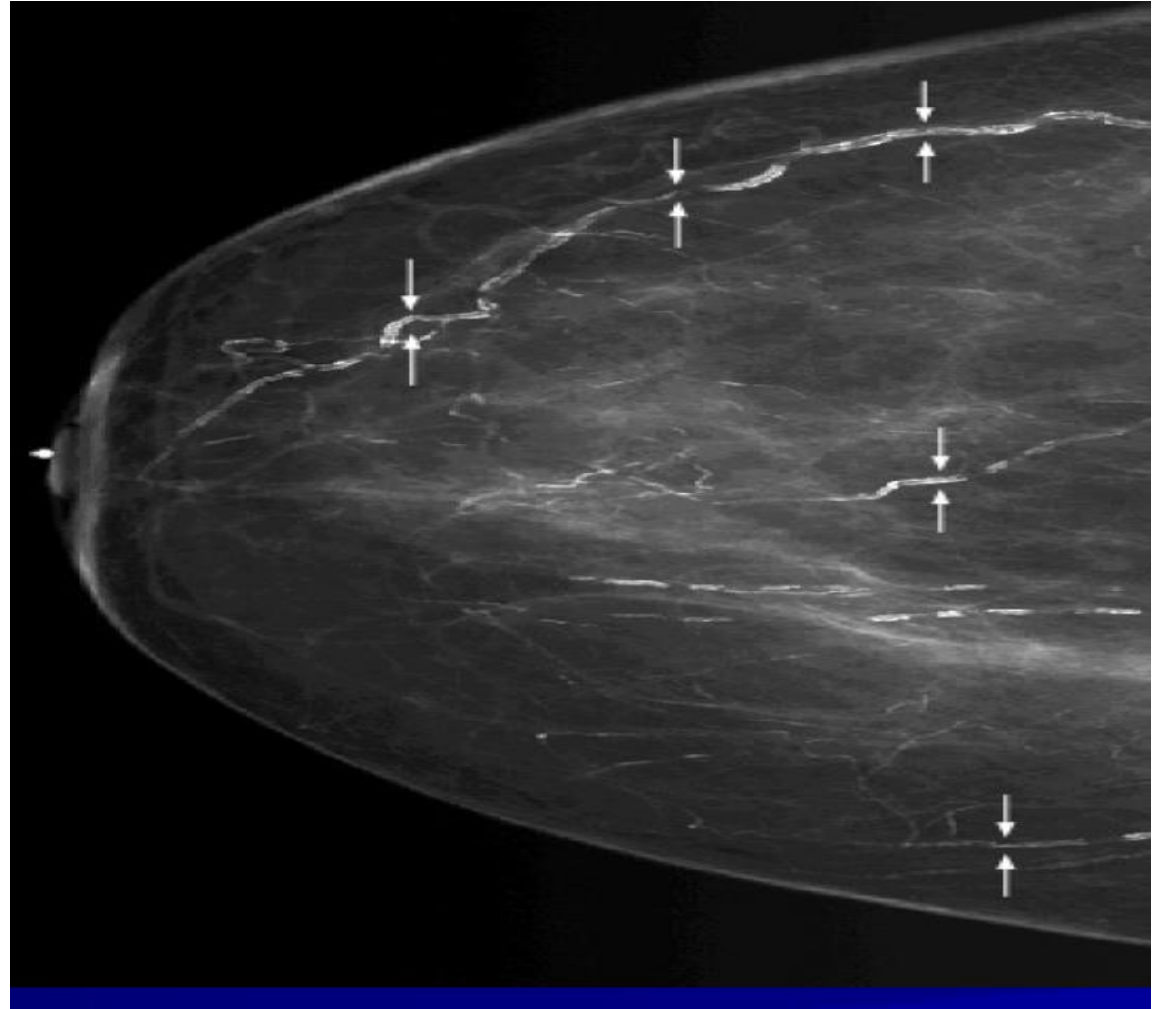
DERMAL CALCIFICATION

✚ اذا شفت هاد المنظر حوالين ال axilla بس بشك انهم بال

✚ skin و عشان اتاكد بصور tangential view



VASCULAR CALCIFICATION



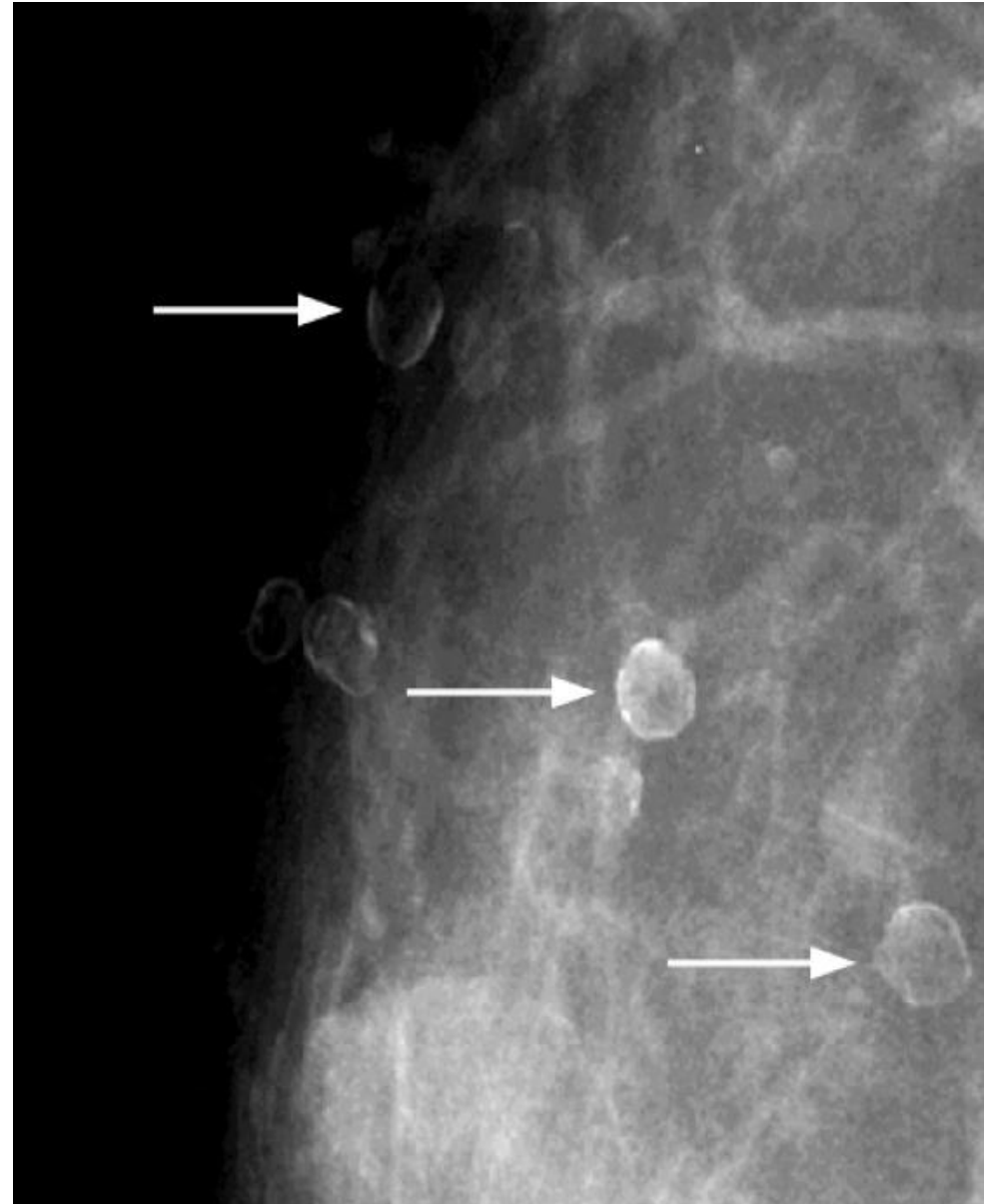
LUCENT CENTER CALCIFICATION

→ Egg shell calcification

→ Popcorn calcification



Egg shell , rim calcification

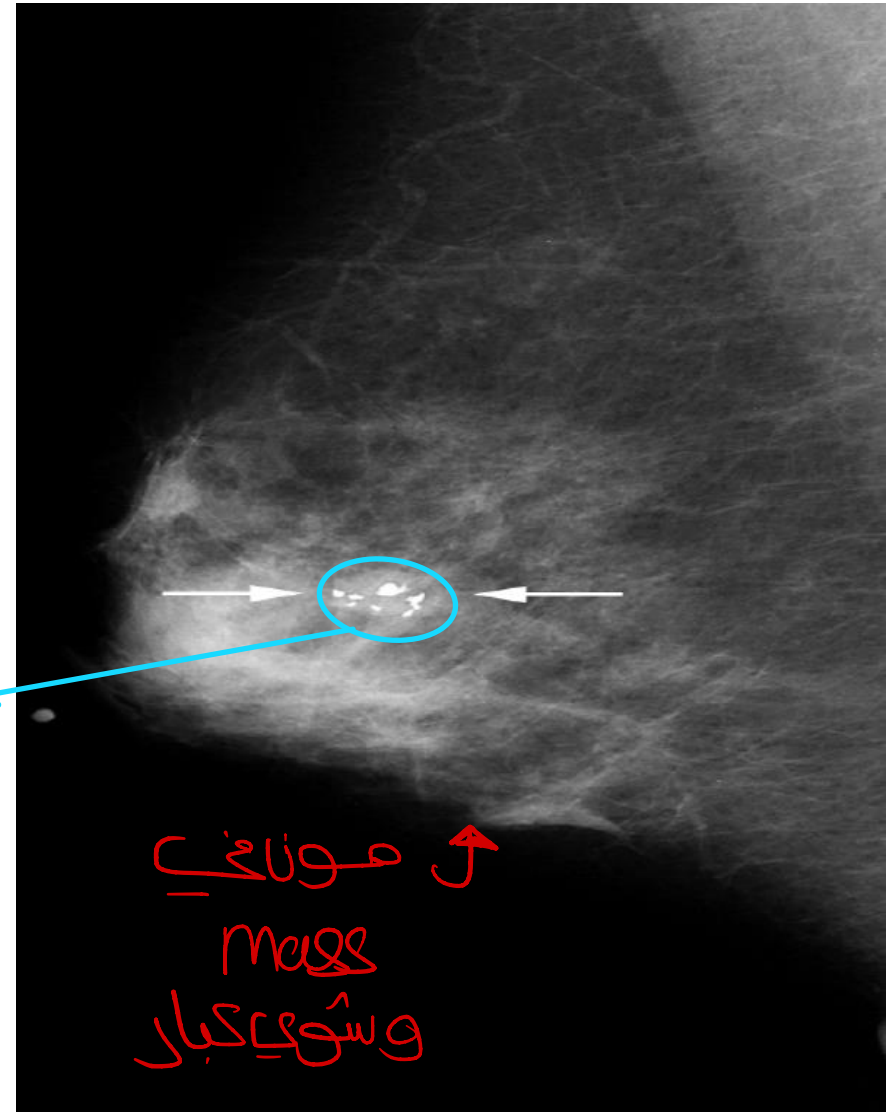


Pop corn calcification

✦ Oval circumscribed mass with popcorn calcification

Not pleomorphic
منهاله منار

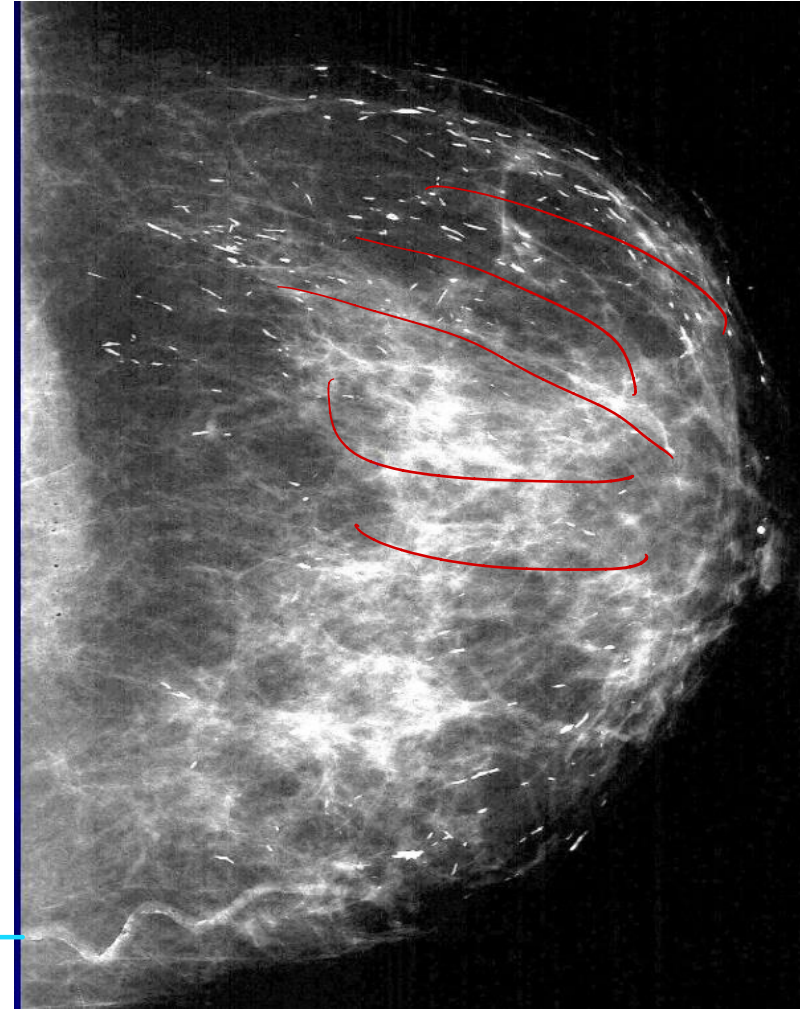
degeneration FibroAdenoma



→ Rod-like calcification
Secretory calcification

+ يكونوا زي خط فراغ خط فراغ بتمشي ناحية الحلمة هيك
بنعرف انه هدول ال calcifications بقنوات الحليب

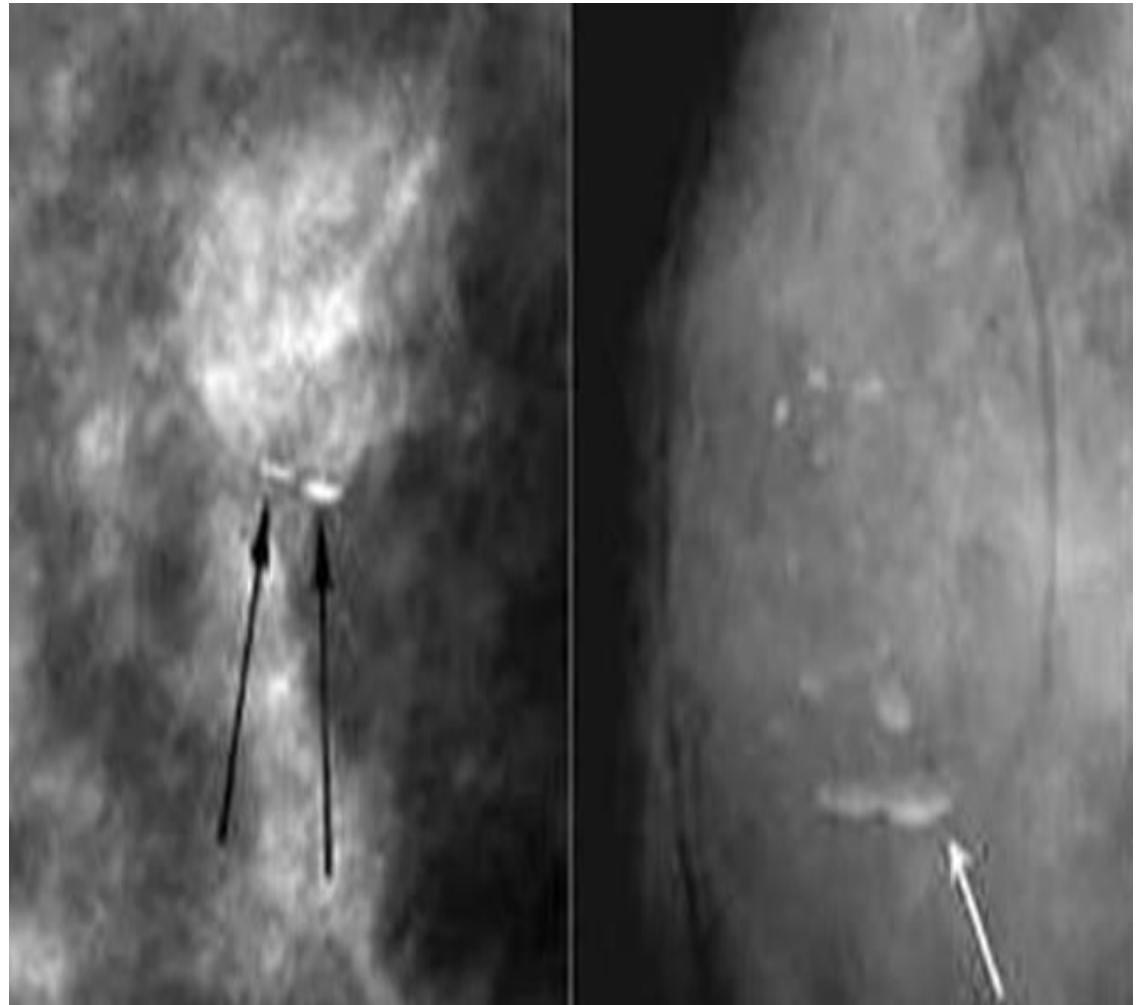
+ Vascular calcification ←



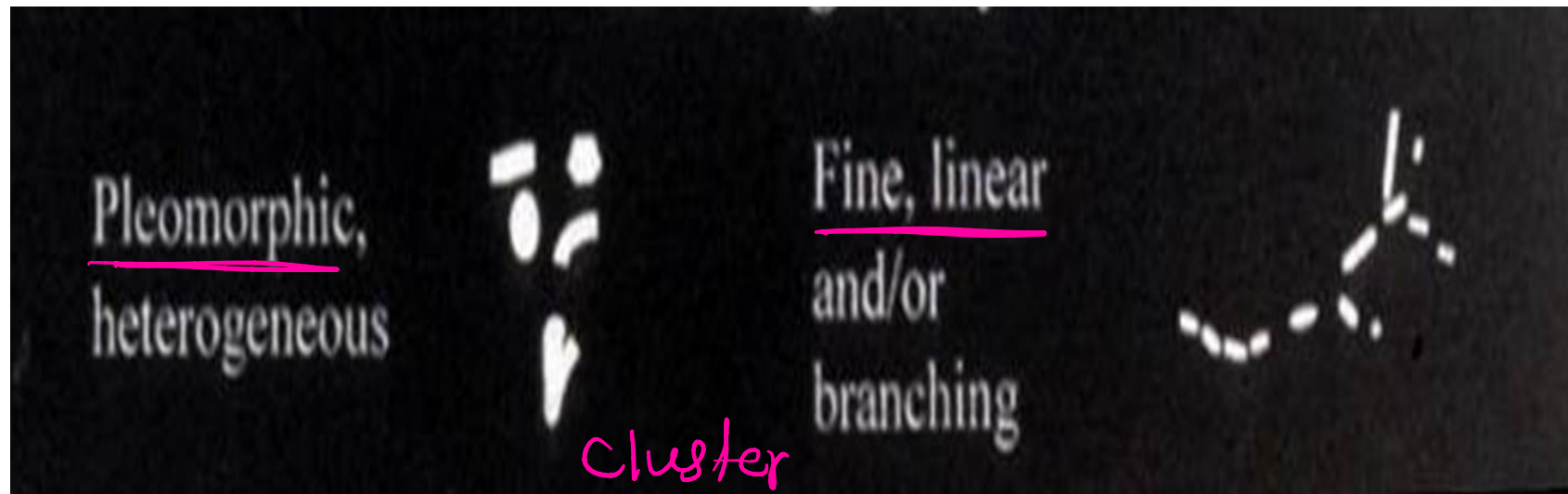
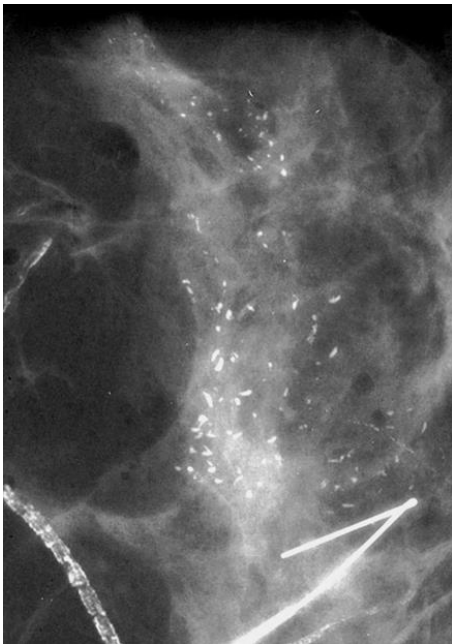
✖
Milk of calcium layering
on true lateral view

➤ بنحکی عنهم tea cup و بکونوا بقنوات الحليب

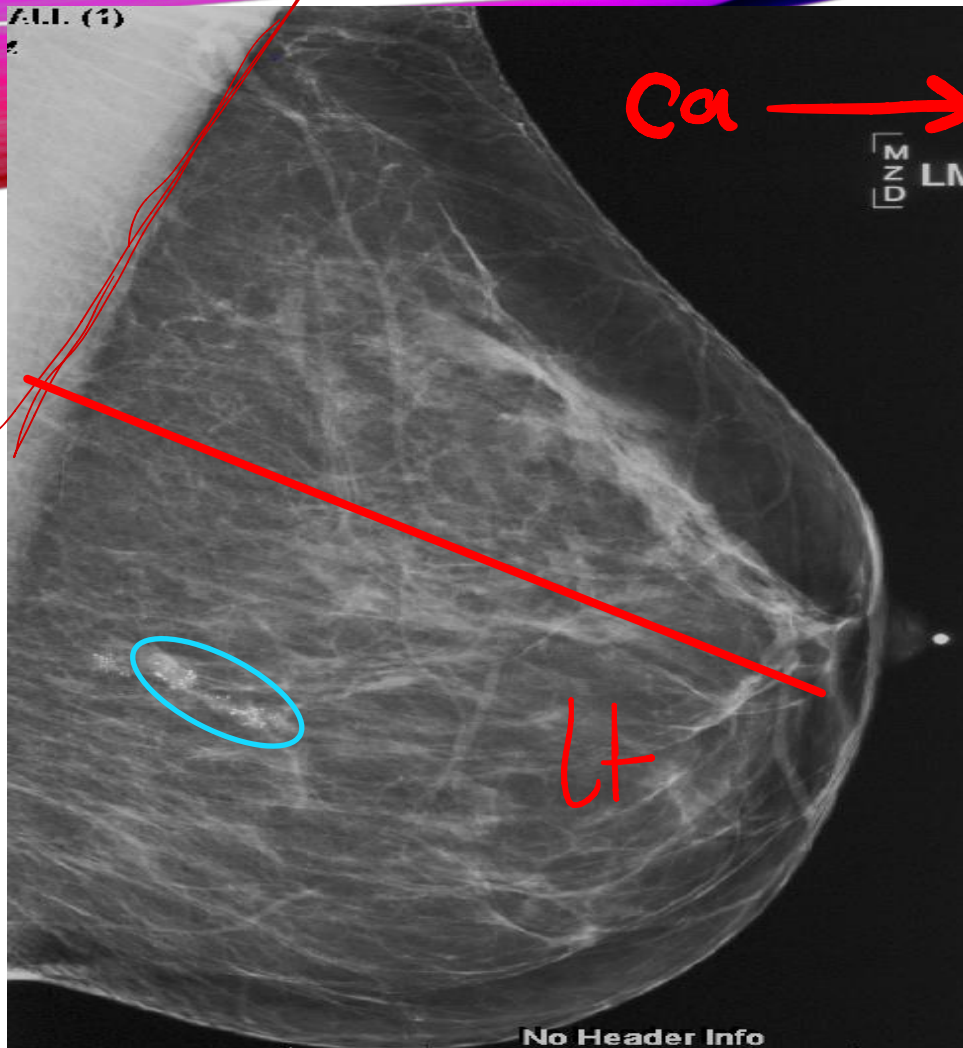
رئی سٹای بیخدا علیہ زب



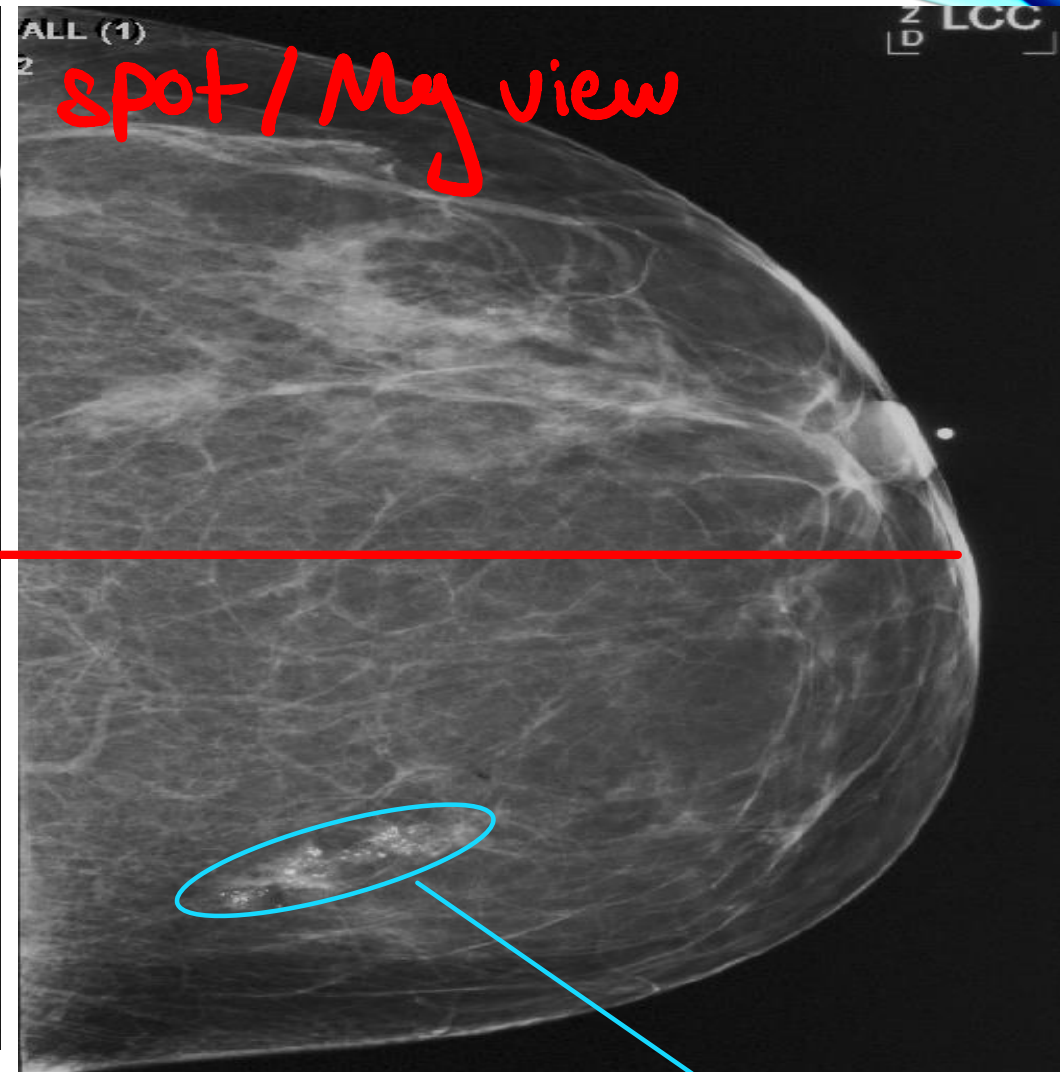
HIGHER PROBABILITY OF MALIGNANCY



③



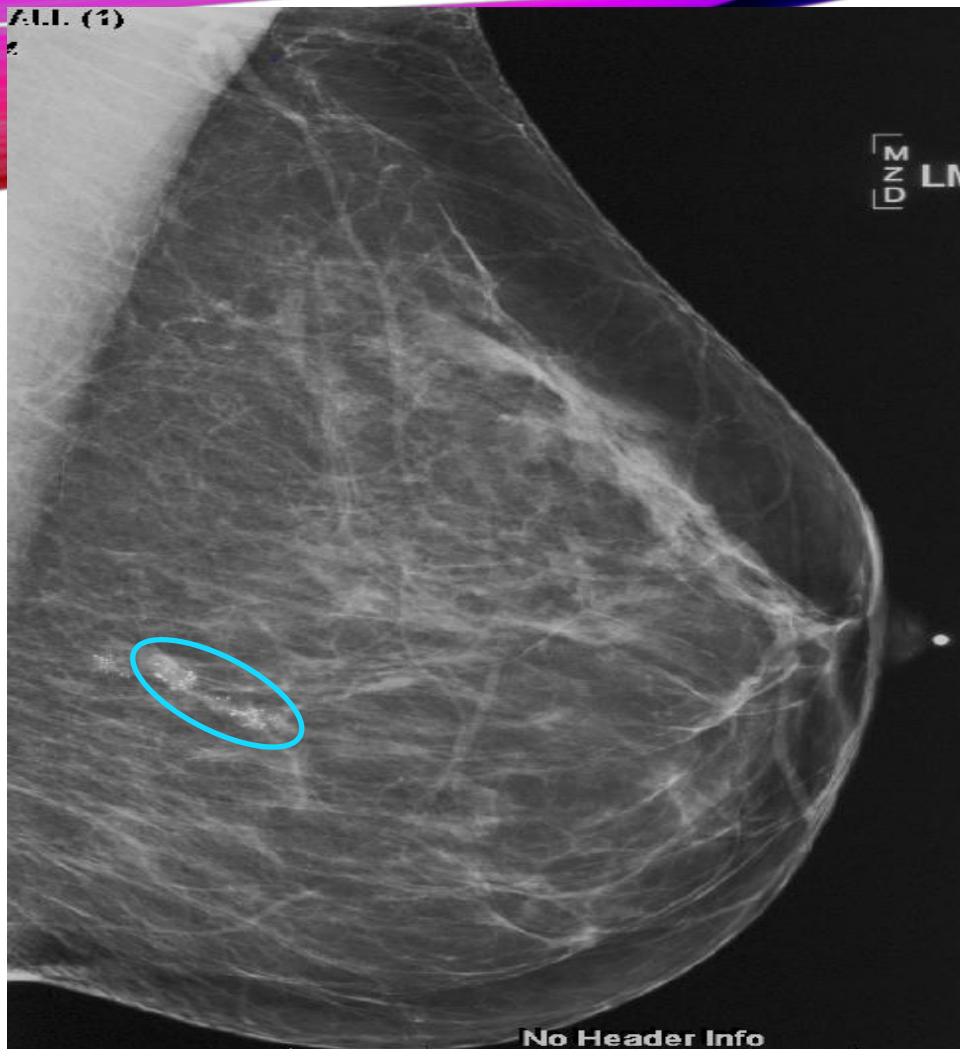
+ Lower inner left breast



مصوره + Spot compression
magnification view

calcification
plcomorphic

هاي هي الخطوة الي دايما بنعملها بعد اي calcification بنشوفها



+ Lower inner left breast



+ Spot compression
magnification view

~~Cluster calcification~~
Pleom

هاي هي الخطوة الي دايما بنعملها بعد اي calcification بنشوفها

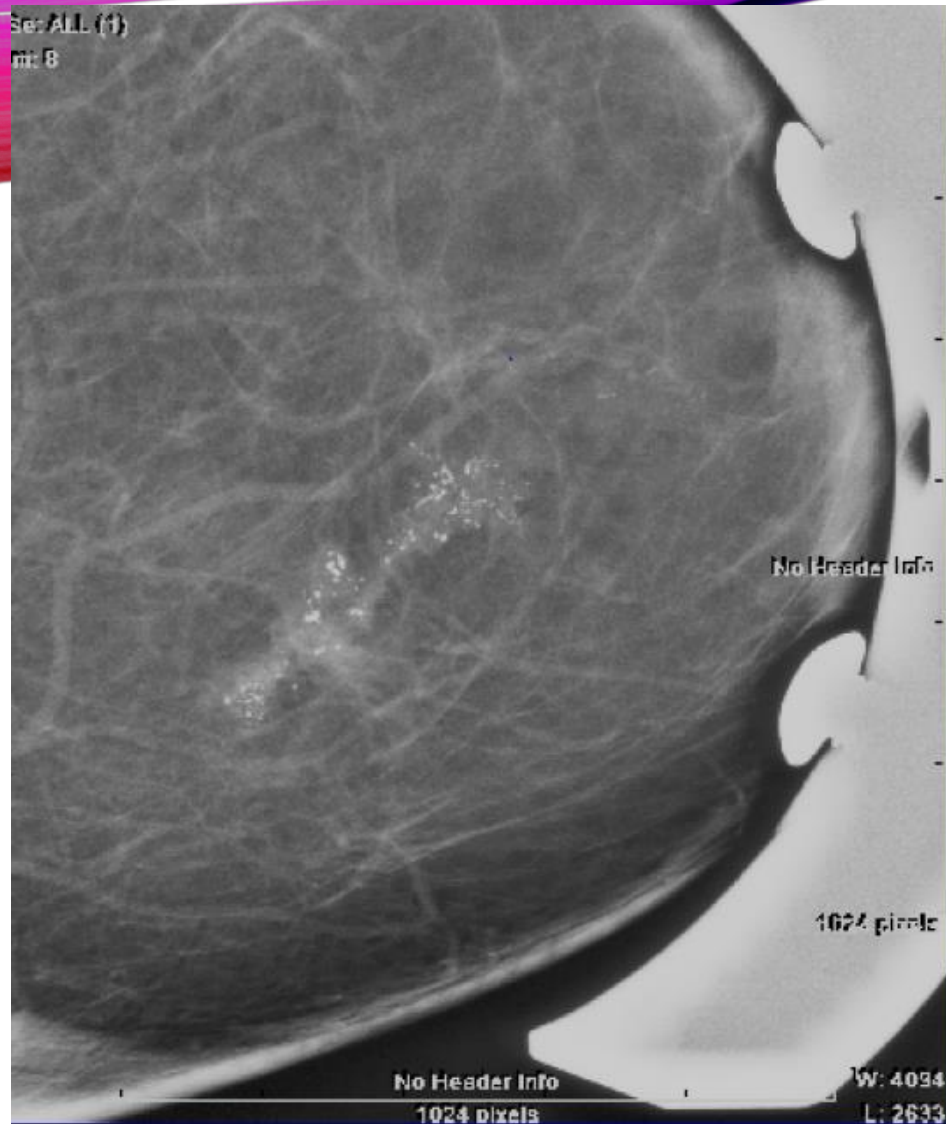
Set: ALL (1)
Im: 8



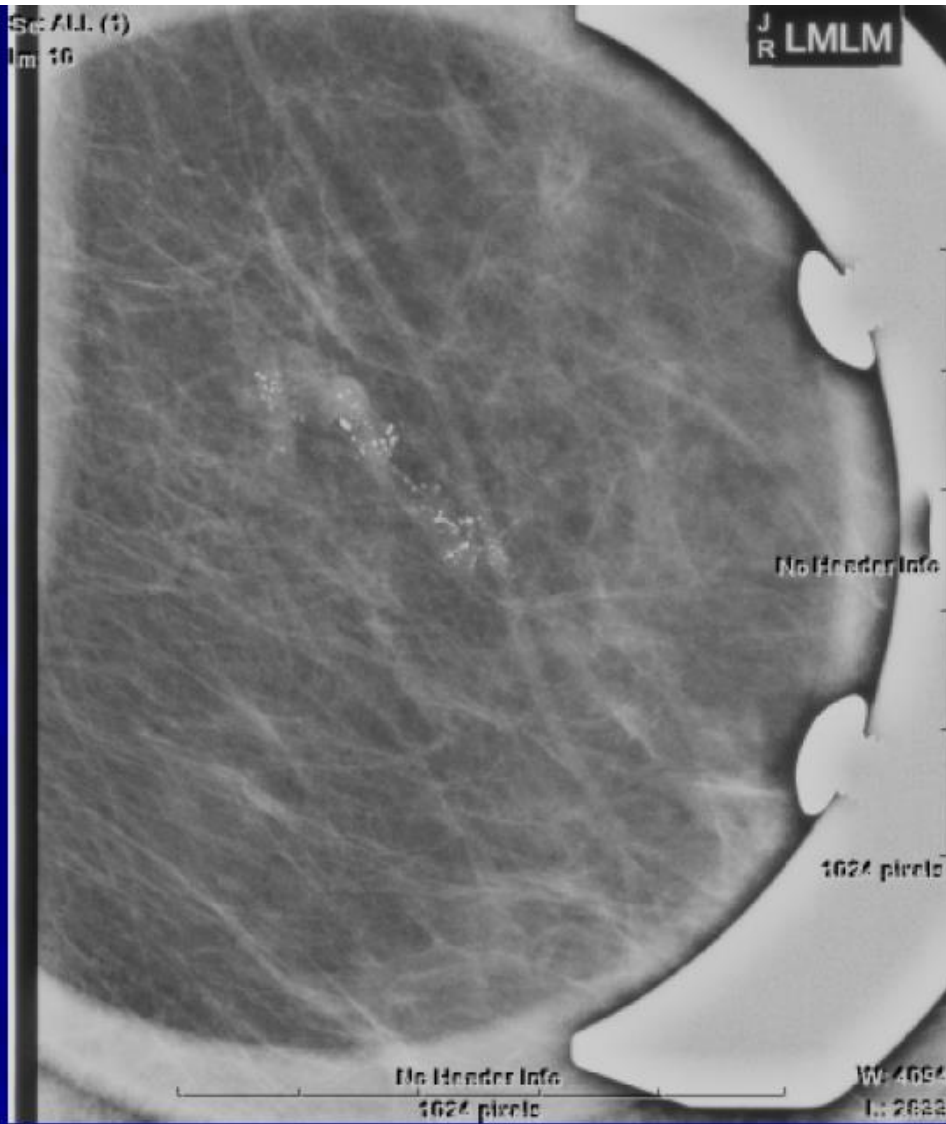
Set: ALL (1)
Im: 10



Set: ALL (1)
Im: 8



Set: ALL (1)
Im: 10

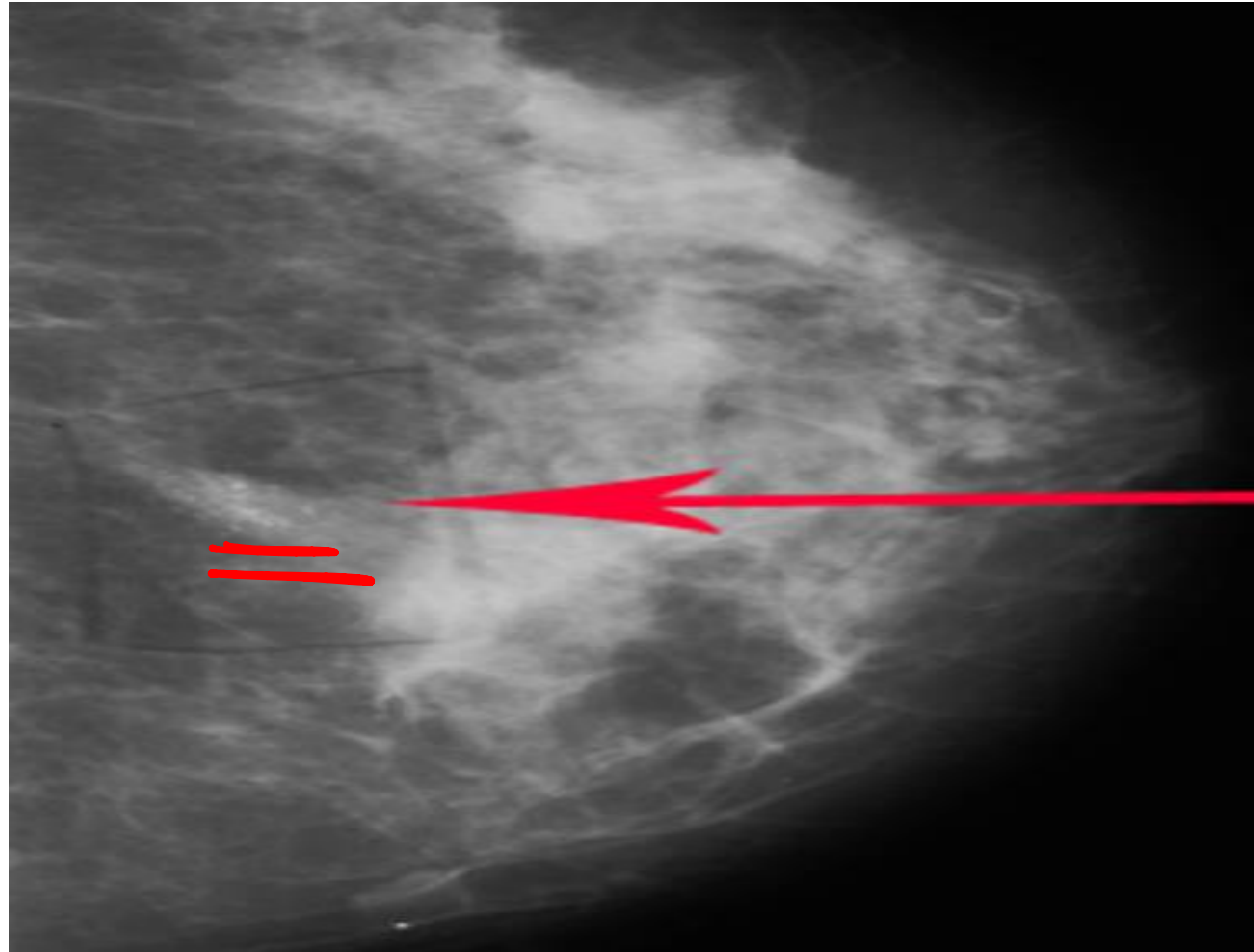


- 
- ✧ • Pleomorphic calcification at lower inner left breast
...suspicious

Linear branching
calcification



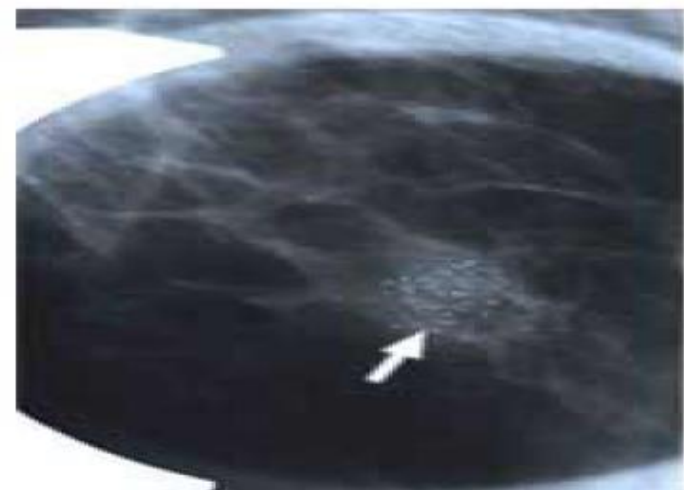
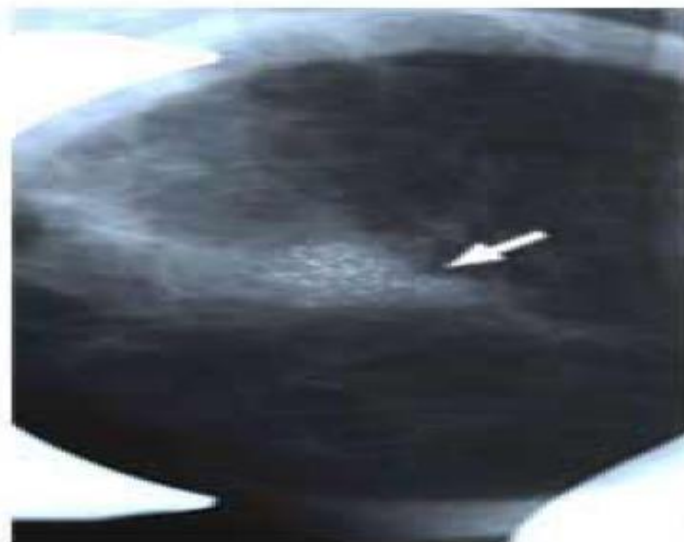
Cluster of calcification (at
least 5 in less than 1cm)

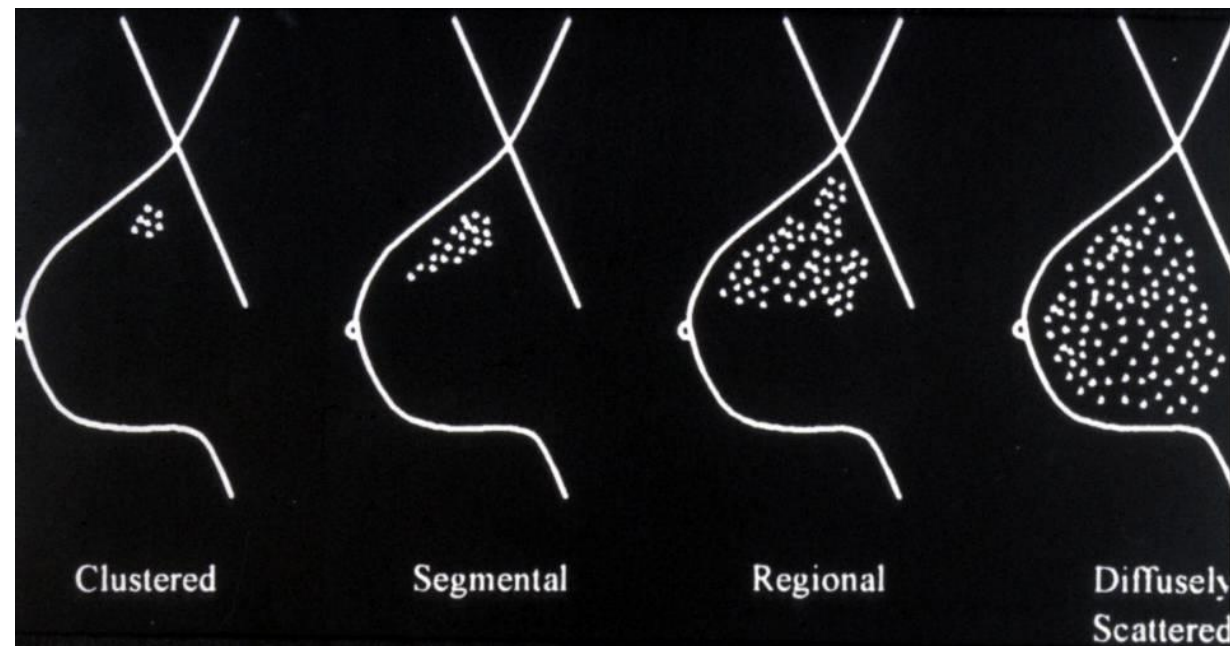
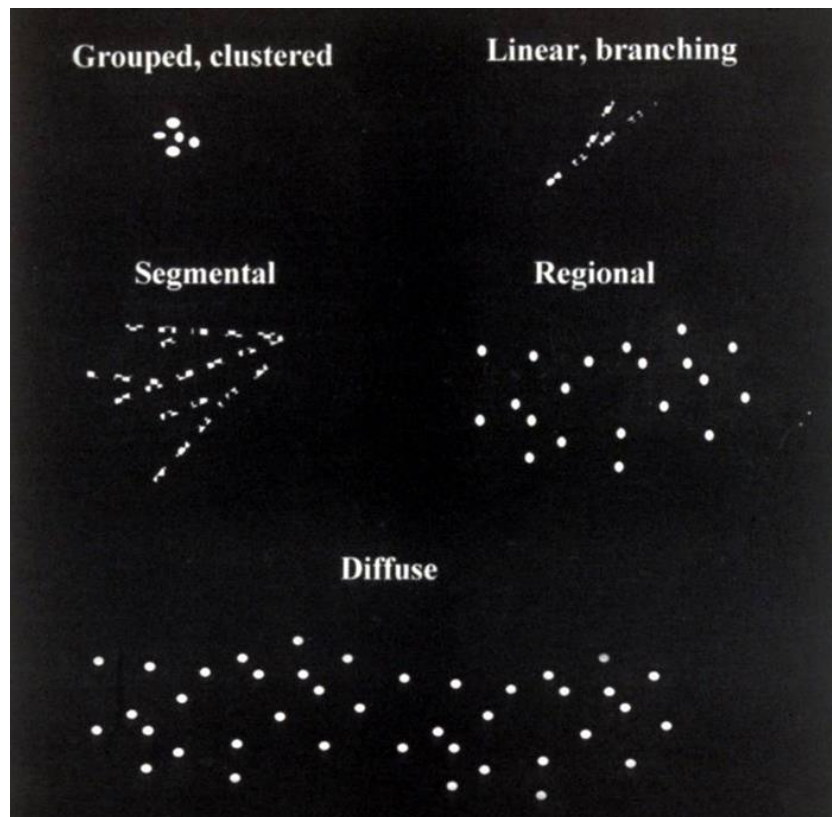


Noncancerous (benign)
calcifications



Cancerous (malignant)
calcifications





DIGITAL MAMMOGRAPHY

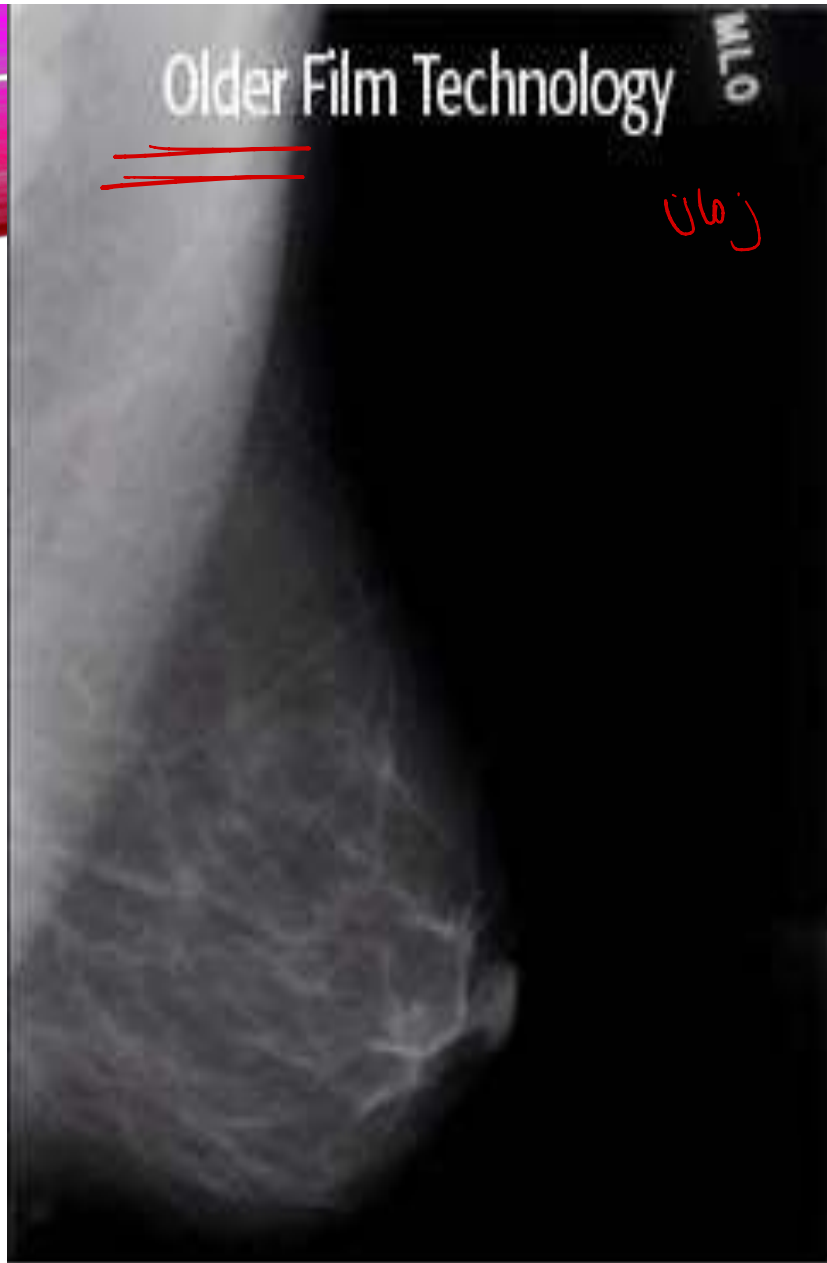


مساحه بيضيه → Pleomor
مختلفين عن بعضه

Older Film Technology

MLO

زمان



New Digital Technology

LMLO

فیلد



ADVANTAGES OF DIGITAL MAMMOGRAPHY

چکیت انسان

1. Acquired in less than a minute as compared to conventional mammography .
2. Spot view digital systems are available to help guide breast biopsy .
3. Superior contrast resolution especially in dense breast tissues
4. Offers the possibility of three dimensional breast tomography using relatively low doses .
5. conventional film mammography will remain better able to detect subtle tissue changes such as microcalcifications
6. In dense breast tissues even digital mammography may overlook some lesions that are masked by overlying structures. Sensitivity in dense breast 84% and in fatty breast 98%

BI-RADS

* هذو الامهات

- CATEGORY 0 -Need additional Imaging evaluation

→ مش قادر تشخص

* لازم تراجع كمان

- CATEGORY I - Negative (No B+M)

→ مش عمله خدش
موره

→ Benign calcifications or cyst

- CATEGORY 2-Benign finding = Cyst

→ Fibroadenoma follow up every 6 months

- CATEGORY 3-Probably benign findings

بس ما بتأكد

→ Biopsy

بخليها تراجع بعد 6 اشهر

- CATEGORY 4-Suspicious abnormality

→ Biopsy, nipple retraction

- CATEGORY 5 -Highly suggestive of a malignancy

- Category 6 » proven biopsy

* مثلاً وحدة بتاخذ chemo و بدهم يشوفوا ال prognosis و ال response او بدها تعمل عملية reduction و

بالصدفة اكتشفوا عندها mass او مريضة عندها very enlarged lymph nodes و ال breast كان

normal و لما اخدنا biopsy منهم كان metastasis of primary breast cancer origin

af

BREAST IMAGING- REPORTING AND DATA SYSTEM

- **BI-RADS CAT. 0:** NEED ADDITIONAL IMAGING &/OR PRIOR MAMMOGRAMS.
- **CATEGORY 1:** Negative-no findings to comment on
- **CATEGORY 2:** Benign finding(s). Normal, with characteristic benign finding(s) on mammogram
- **BI-RADS CAT. 3:** PROB. BENIGN. INITIAL SHORT-INTERVAL FOLLOWUP SUGGESTED
 - Has less than 2% risk of malignancy
 - Recommendation: 6-month protocol

- 
- BI-RADS CAT. 4: have 2-95% chance of malignancy
 - CAT. 4 A -LOW SUSPICION OF MALIGNANCY
 - CAT. 4 B -INTERMED. SUSPIC. OF MALIGNANCY
 - CAT. 4 C -MODERATE CONCERN

BI-RADS CAT. 5 : HIGHLY SUGGEST. OF MALIG.-APPROP. ACTION BE TAKEN
Has at least 95% prob. of malignancy. (skin ,nipple changes ,LAP)

BI-RADS CAT. 6 :PROVEN MALIGNANCY.

INDICATION FOR BREAST ULTRASONOGRAPHY

1. Evaluation of palpable breast masses (SOLID /CYST) and asymmetrical density
2. Evaluation if there are sign of infection, discharge and thickening .
3. Evaluation of abnormalities detected on mammography or MRI.
3. Initial imaging evaluation of breast symptom and signs (masses, nipple discharge, ..) in women under 30 years of age who are not at high risk for development of breast cancer,
4. In lactating and pregnant women.
6. Evaluation of palpable mass after mammogram

امسك View بالـ mammog..
بـتحقیق ٥٠٪ مـت breast

INDICATION FOR BREAST ULTRASONOGRAPHY

- 4. Evaluation of problems associated with breast implants.
- 5. Supplement to mammography in dense breast .
- 6. screening for occult cancers in women.
- 7. Guidance of breast biopsy and other interventional procedures.
- 8. Evaluation of axilla



ultrasound ← lymph Node

Operator dependent , non invasive

Breast Ultrasound

Imaging Characteristics

size

shape

border definition

internal echogenicity

posterior enhancement

architectural changes

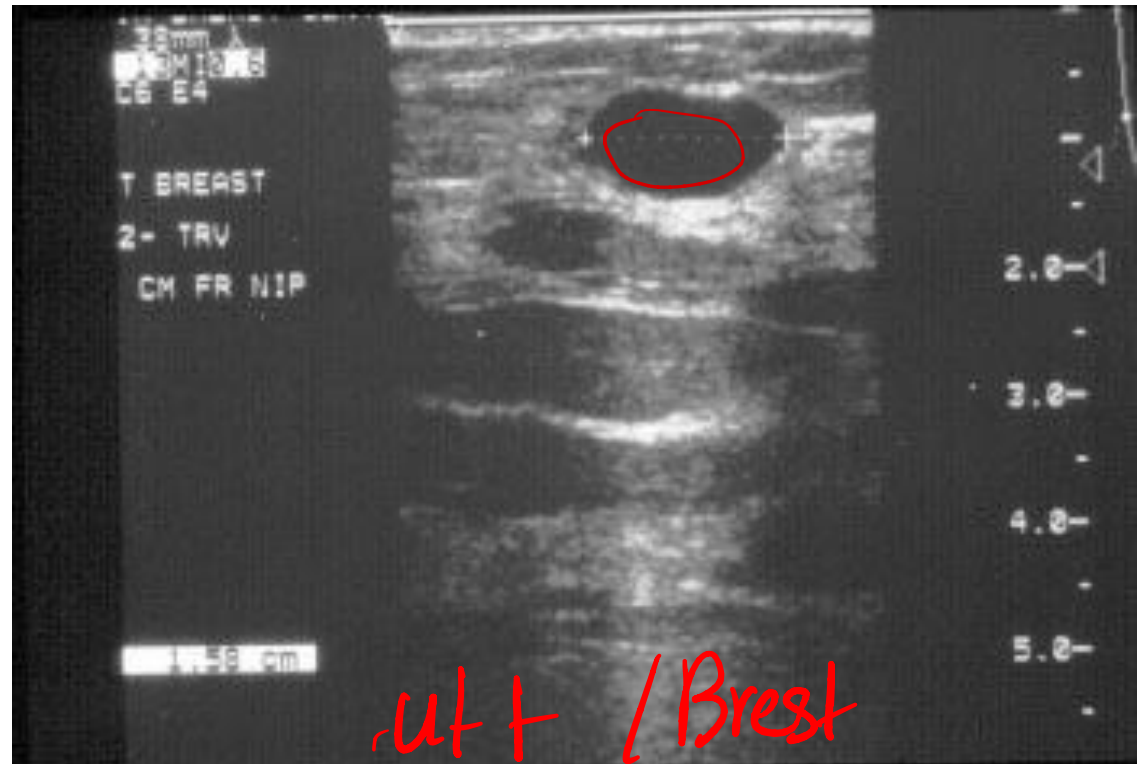
هونديسي اساي اسمو hyper (امرومه متقدمه)

- Simple Cysts Category 2 صفا
- anechoic
- smooth, thin margins
- posterior acoustic enhancement

الاشي الي بكون اسود كثير بكون فيه fluids

بال ultrasound بنحكيه anechoic

hyper → x
 { hypo / anech
 ↓
 كثير اسود



ut + / Brest

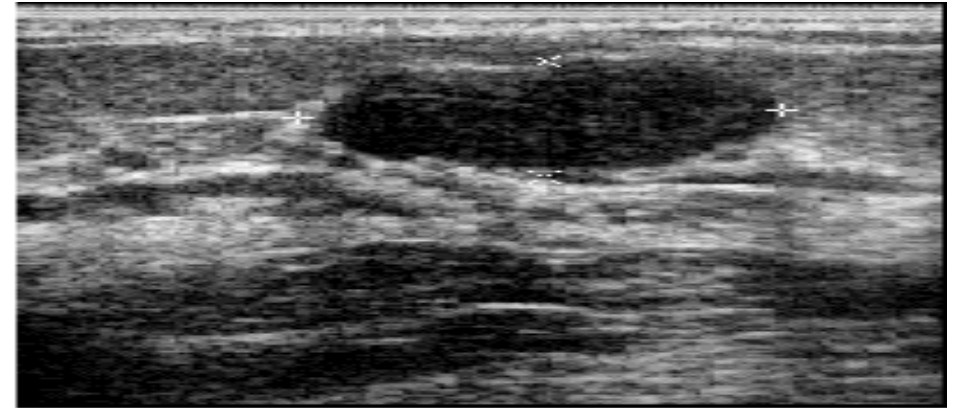
Anec / cyst / 2

حينها سوي بياخه

☆ ☆
+ Hypoechoic, category 3

Solid Lesions - Benign

- Round or oval shape
- Smooth well defined borders
- gentle lobulations



☆ ال hypoechoic يكون لونها اسود بس مش

زي ال anechoic و بتكون most likely

benign لانه حوافها بتكون مرتبة

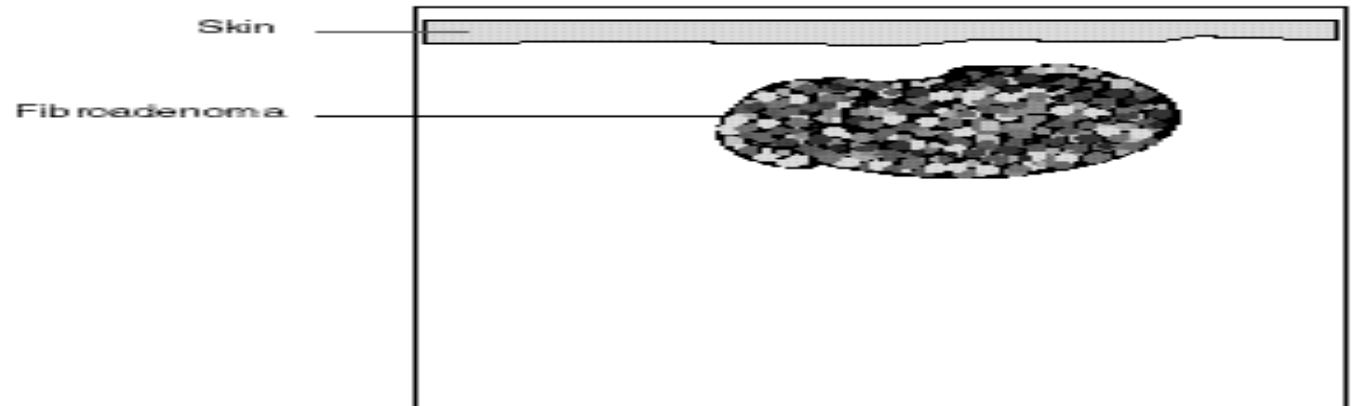


Figure 26

+ Category 4 (biopsy)

Solid Mass - Malignant

- ✦ • Irregular shape
and borders
- ✦ • hypoechoic
- Angular margin
- Taller than wide
- Thick echogenic rim
- ✦ • Posterior shadowing

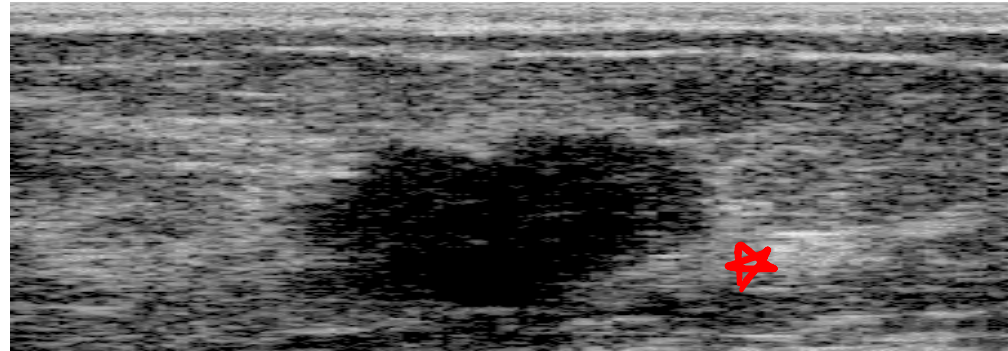
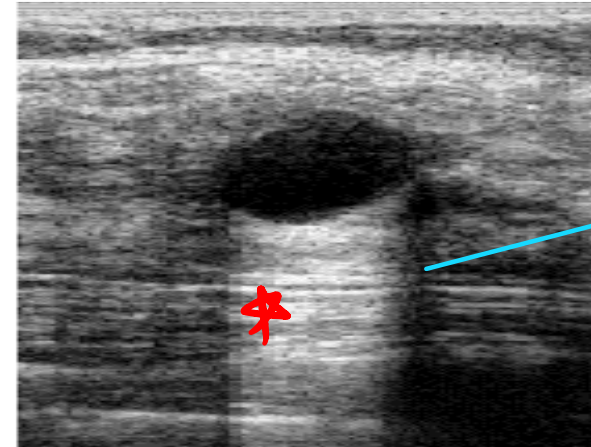
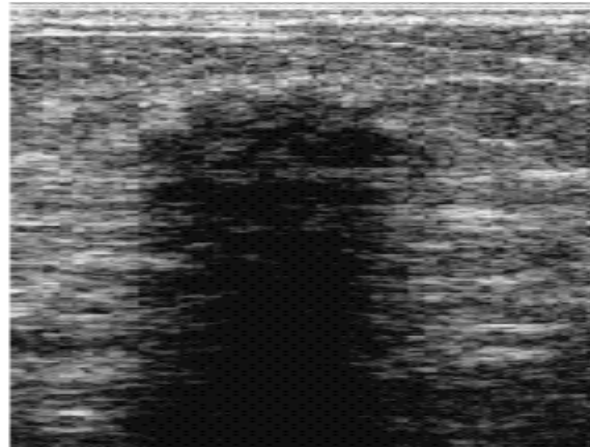


Figure 39

MALIGNANT VS. BENIGN

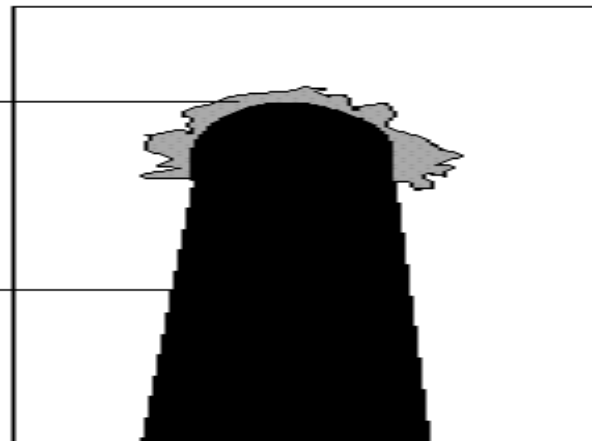


✦ Enhancement (shadowing)
✦ category 4

α

Hyperechoic Rim

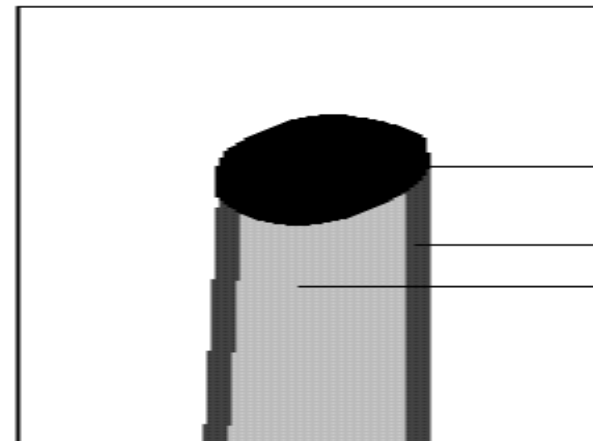
Posterior Shadow



Cyst

Edge Artifact

Posterior Enhancement



Irregular⁺ spiculated hypoechoic mass
at 6 :00 position of the right breast

→ Operator dependent

