Breast Cancer Overview
Part 1

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Breast Cancer overview

Objectives:

Students should be able to:

- Assess and realize the significance of risk factors.
- Take relevant focused history.
- Perform standardized breast clinical examination.
- Understanding and practicing triple assessment concept.

Breast Cancer Overview

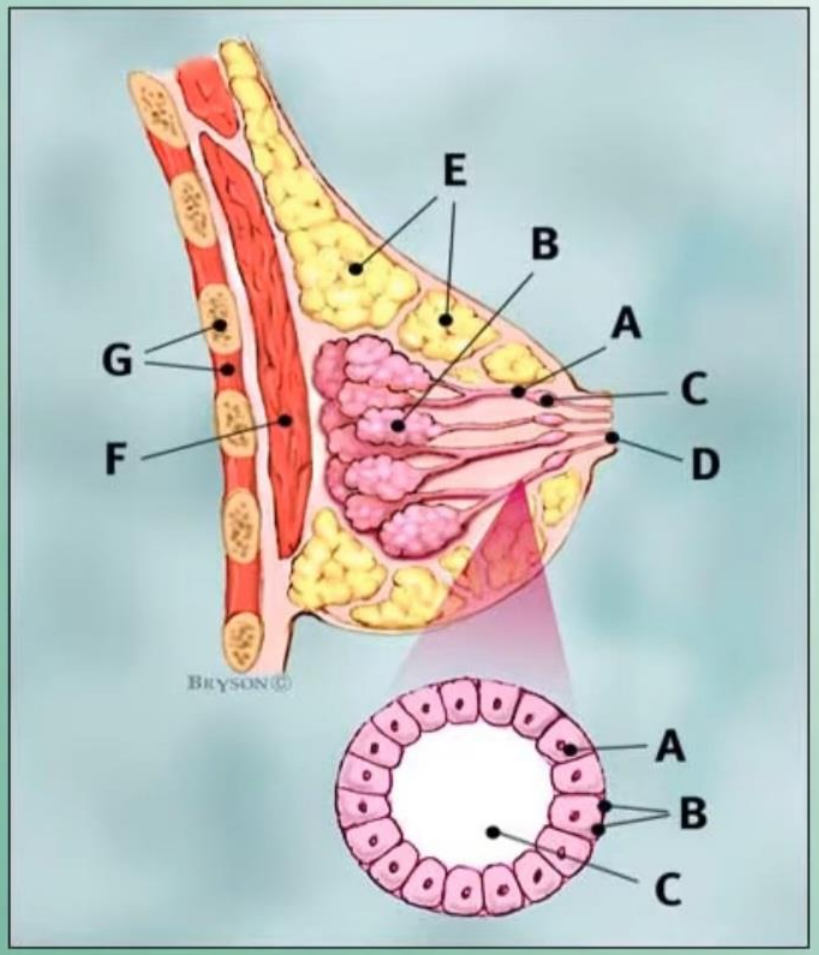
- **Lecture outlines:**
- Introduction:
- Relevant anatomy and physiology.
- Cancer facts.
- Focused history taking.
- Standardized Examination
- Breast imaging.
- Cytological and histological Examination
- Metastatic workup

Why Are We Concerned ?

- Body image and wellbeing.
- Positive psychological balance.

breast CA is the most common CA in females

Relevant Anatomy & Physiology



Breast profile:

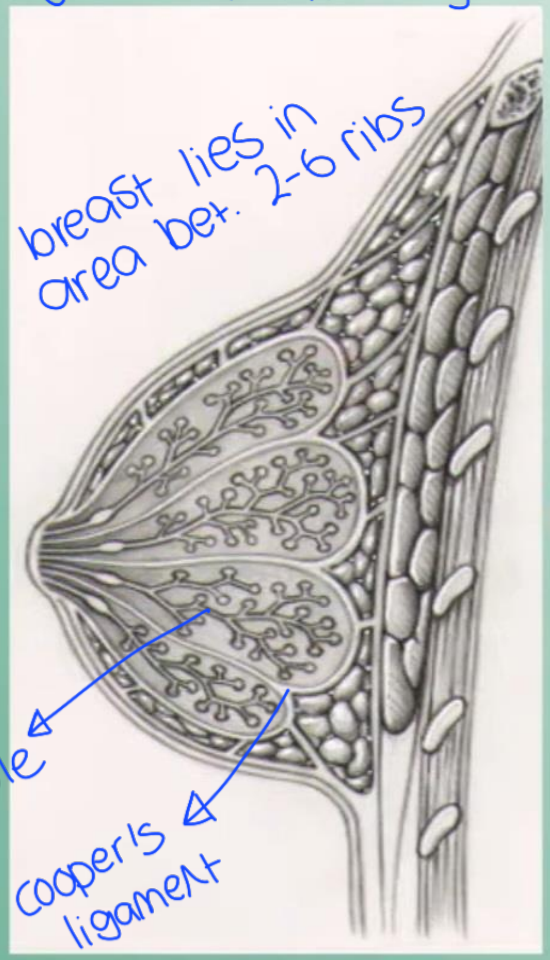
A ducts
B lobules
C dilated section of duct to hold milk
D nipple
E fat
F pectoralis major muscle
G chest wall/rib cage

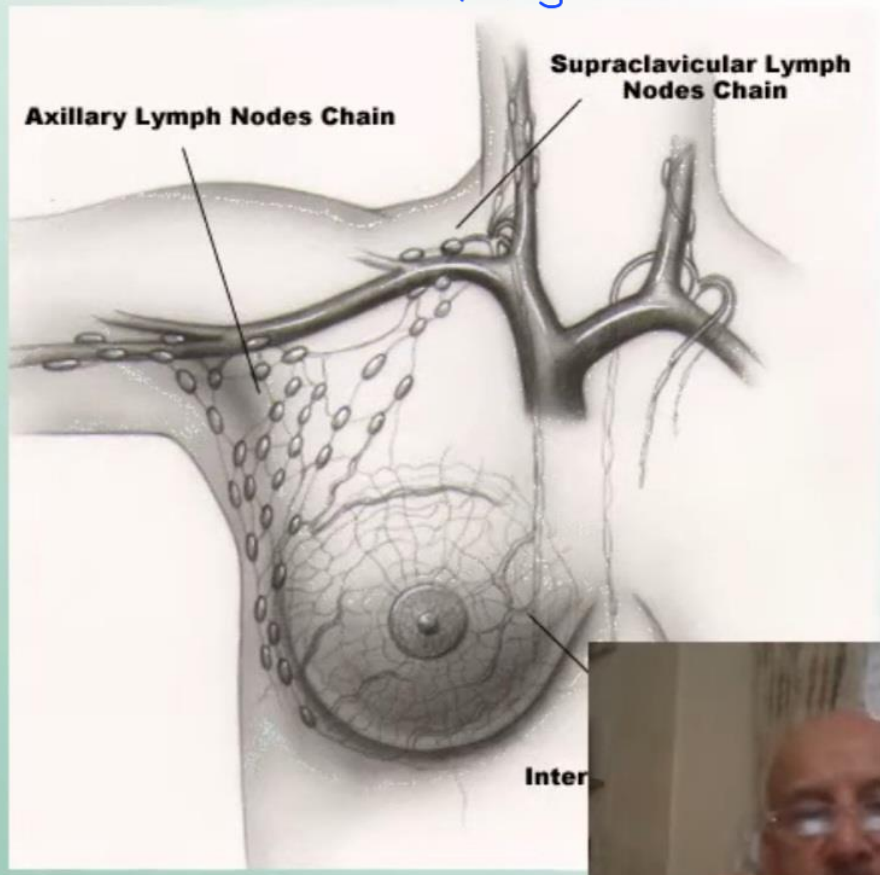
Enlargement:

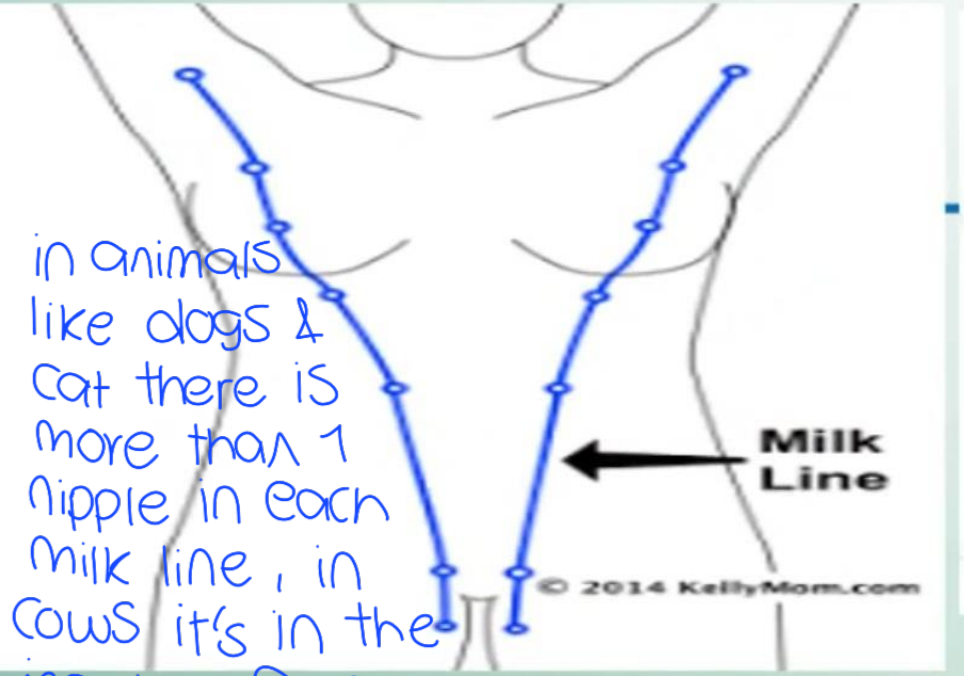
A normal duct cells
B basement memb
C lumen (center of

Anatomy of the Breast & Axilla

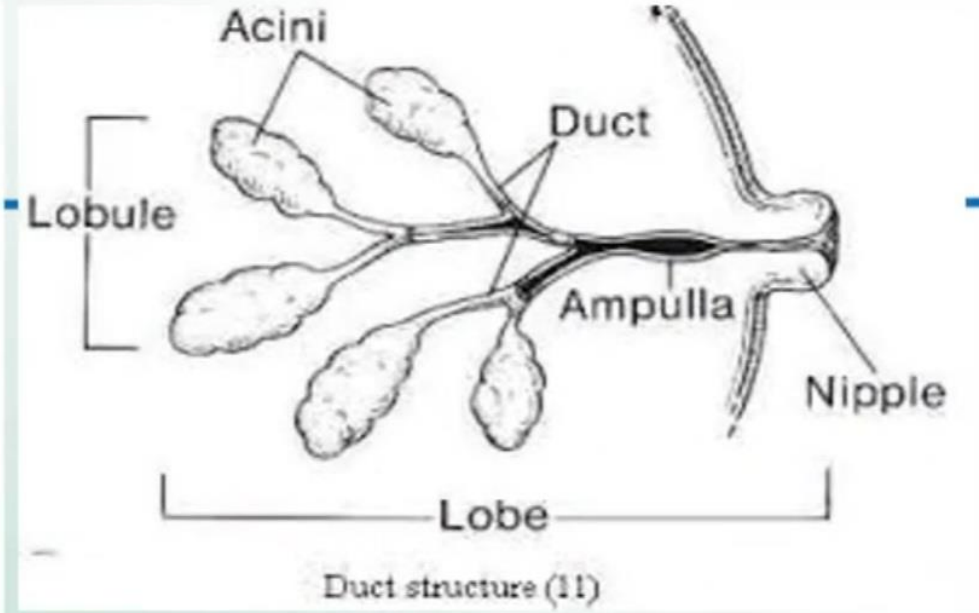
- cooper's ligament gives strands of fibrous tissue to pectoralis fascia & surrounding skin holding the breast in its position
- malignant CA invading Cooper's lig. causes skin dimpling



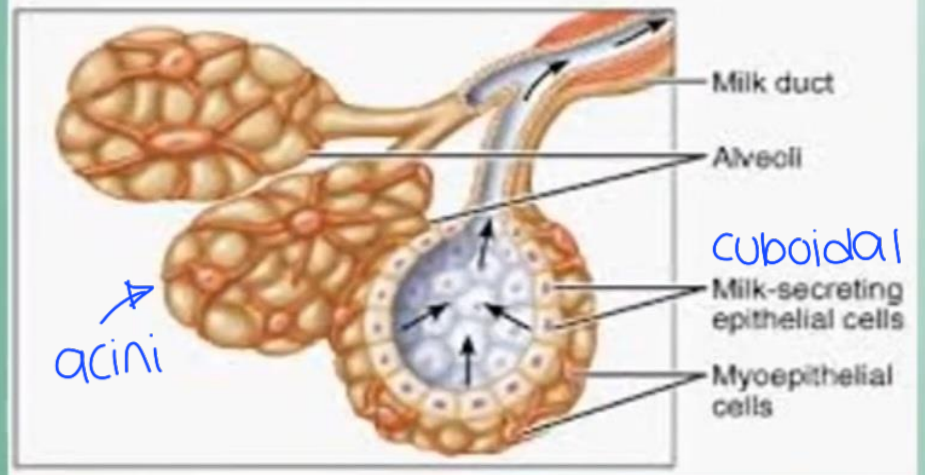




in animals like dogs & cat there is more than 1 nipple in each milk line, in cows it's in the inguinal area



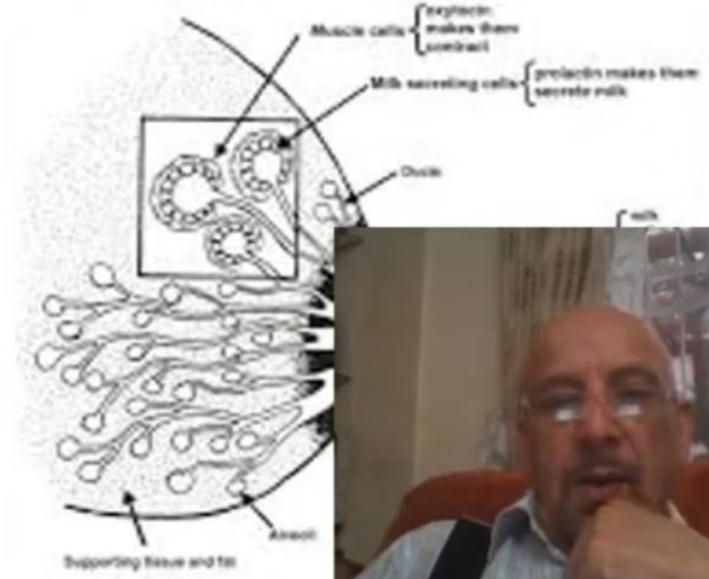
Duct structure (11)



acini

cuboidal

Breast Anatomy - Structure

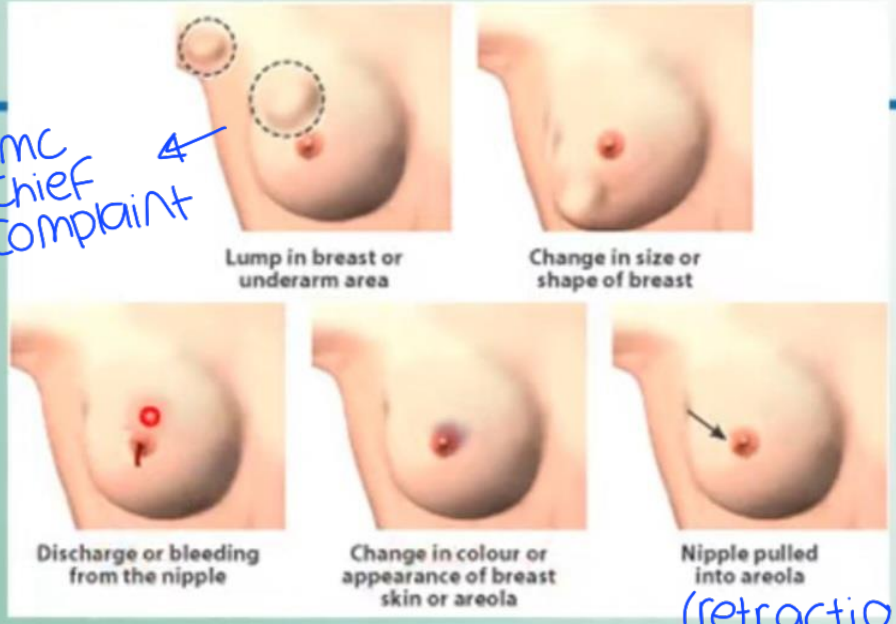


Triple Assessment

- Clinical Evaluation (history + physical)
- Imaging (ultrasound and/or mammography)
  - ↳ <35
  - ↳ >35
- Cytology or Histology
  - ↳ FNA
  - ↳ biopsy

breasts are sensitive to hormonal changes like estrogen, progesterone, prolactin

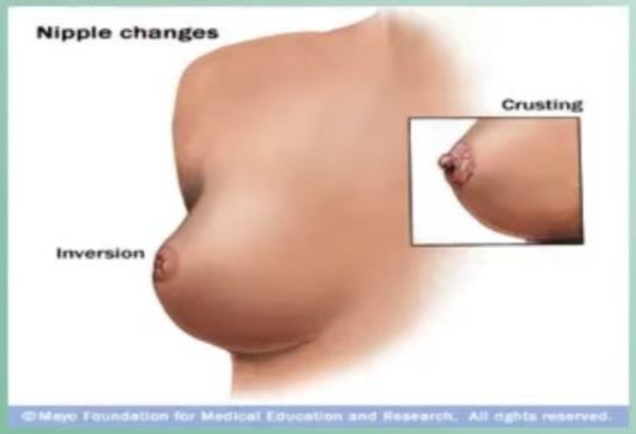
Symptoms



MC Chief Complaint

(retraction)

increase in size + red :
2 option :
① inflammation
② inflammatory carcinoma of breast (poor prognosis)



Risk factors

Age (avg. 52 yo. in Jordan)
Gender (100:1)
White race
Obesity .(BMI >30)
Exogenous hormones (HRT, OCPs)
- Reproductive factors. (early menarche, late menopause, late 1st pregnancy, ...)
- **previous suspicious breast biopsy**

Personal history of breast cancer
Family history of breast cancer
- one first-degree relative 2x
- 2 first degree relatives 3x

Inherited genetic mutations
- only 5-6% of all breast cancers are directly attributable to inheritance of a breast cancer susceptibility gene such as BRCA1, BRCA2, p53 (tumor suppressor genes)

Lifestyle factors
- Alcohol
- Smoking
- Exposure to therapeutic ionizing radiation.

70% of women have no risk factors!

BRCA1 affected women may undergo prophylactic mastectomy

New recommendations on breast cancer screening

The American Cancer Society has updated its guidelines for healthy women with an average risk of getting breast cancer.

	Mammogram		Clinical breast exam	
Age range	Old	New	Old	New
20-39	No	No	Every 3 years	No
40-44	Annual	Optional*	Annual	No
45-54	Annual	Annual	Annual	No
55+	Annual	Every one or two years*	Annual	No

(not useful in detecting small lesions)

*Based on discussion with doctor about benefits and risks of mammography.

NOTE: Screenings should continue as long as a woman has a life expectancy of 10 y
good candidate for breast cancer treatment.

Source: American Cancer Society

Standardized breast examination:

① permission, privacy, warm & well let, chaperone

② expose upper half

③ inspect breast (sitting position)
- comment on: changes (asymmetry, size, shape, texture), nipple changes & retraction / scars, dilated vessels / peau d' orange
- positions of examination:
  a) arms on sides
  b) raising hands (to expose lat. sides of breasts & axilla)
  c) hands on waist (contract pectoralis mi to make hidden retractions clearer)
  d) elevate breast to inspect inferior side of breast
  e) lean forward

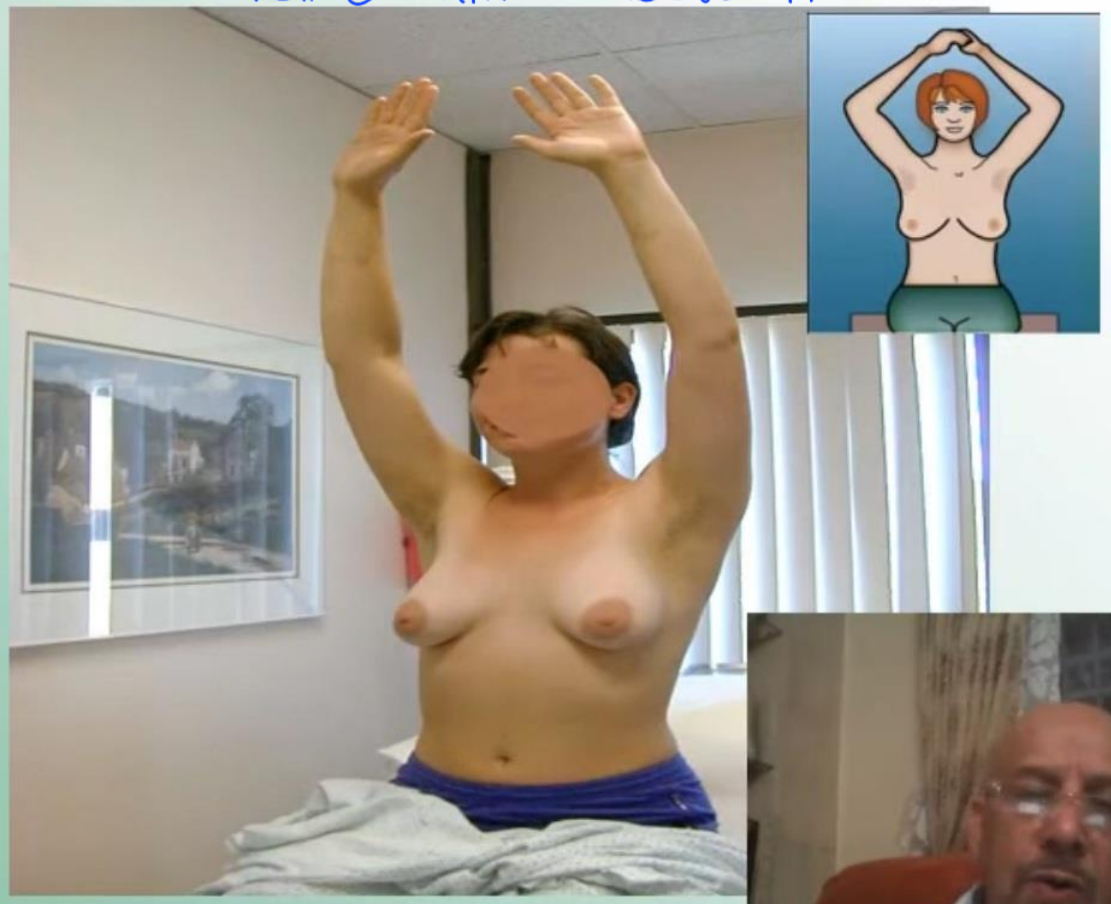
④ regional LNs (sitting position)
↳ supraclavicular, infraclavicular, axillary (apical, medial, anterior, posterior, lateral)

⑤ palpation (supine position & put hand above head)
↳ with your palmar aspect of middle 3 fingers in a "rolling & dipping movement"
↳ apply different pressures (the lump may be deep)

Standardized Breast Examination

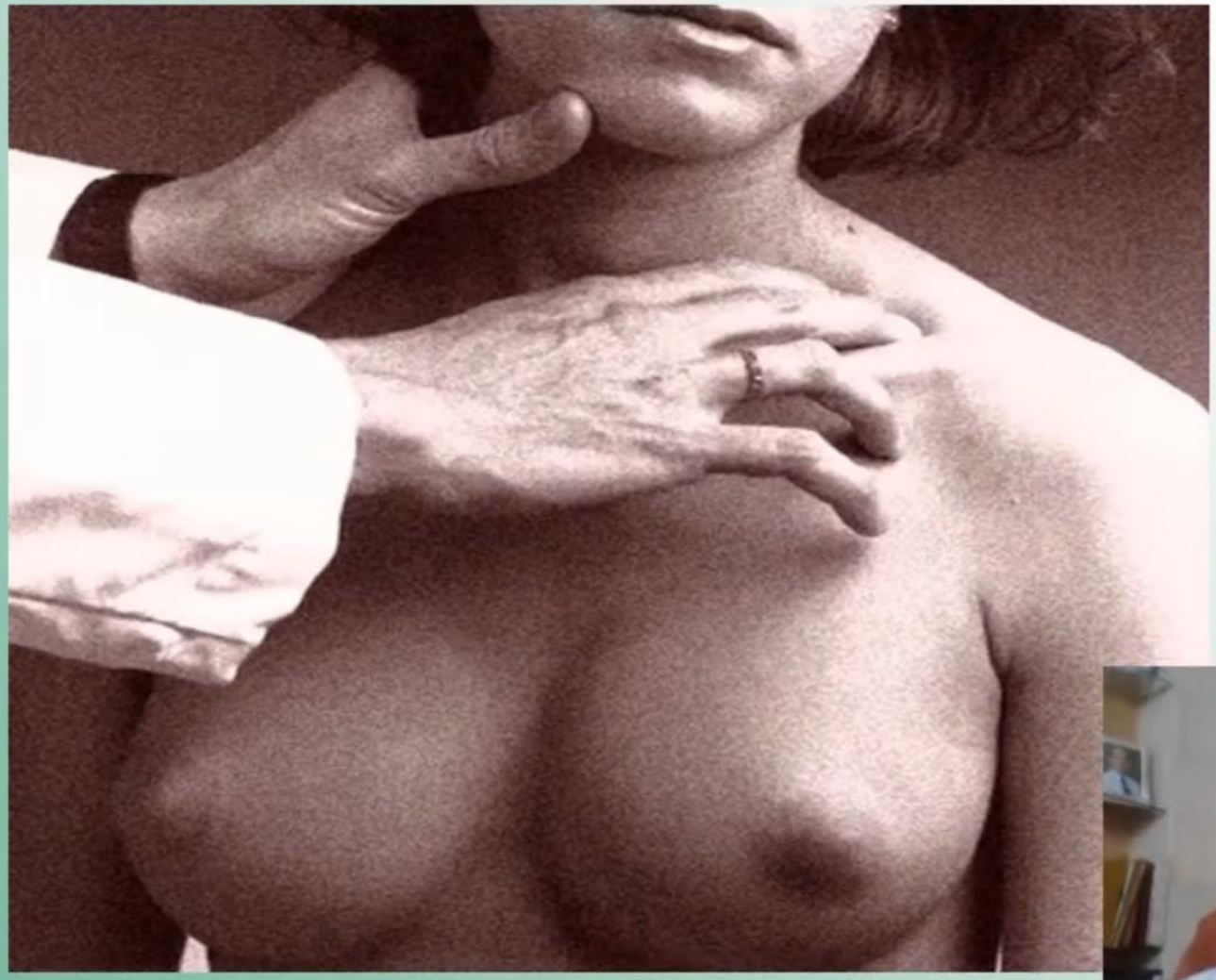
arms on Sides

raise arms above head



hands on waist

Supraclavicular LNs



Axillary LNs

palpation position

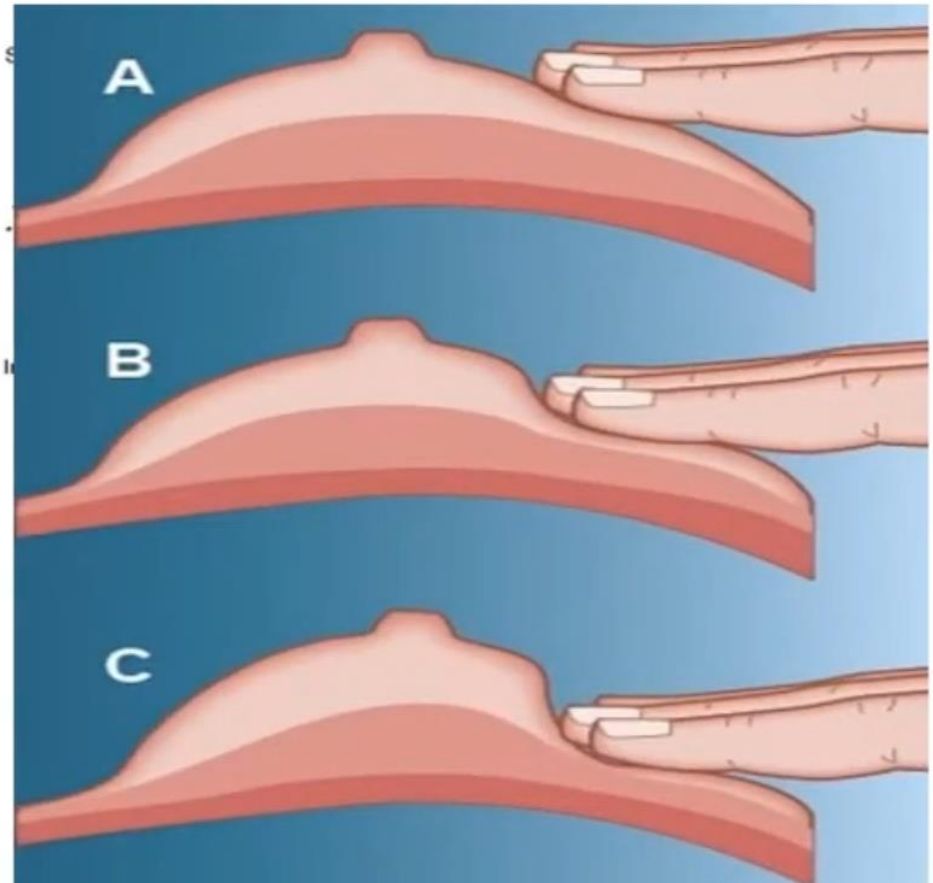
Breast Palpation Techniques

wedge

vertical

circular

Levels of Pressure for Palpation of Breast Tissue Shown in a Cross-sectional View of the Right Breast



Malignant Masses

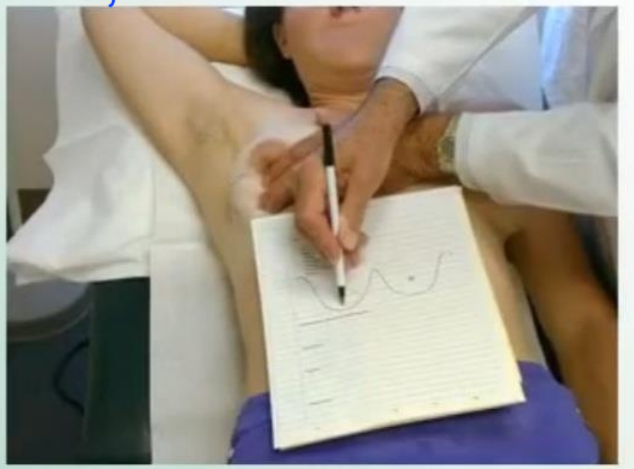
- Hard. → majority of invasive ductal carcinoma cases
- Painless: Malignant masses painful in only 10-15% of patients.
- Irregular.
- Skin Dimpling.
- Nipple Retraction.
- Bloody or Water Discharge. → rare type of malignancy
  ↳ most common cause is benign duct papilloma
- Possibly fixed to the skin or chest

exceptions:
- medullary carcinoma of breast is mostly firm
- inflammatory carcinoma & 2° inflammatory carcinoma of breast is are tender

- each pt has different glandular structure (most young people have a)
- inframammary fold doesn't have glandular structure + it is usually harder due to continous movement & pressure (trauma)
- no glandular structure in areola

a)

b)

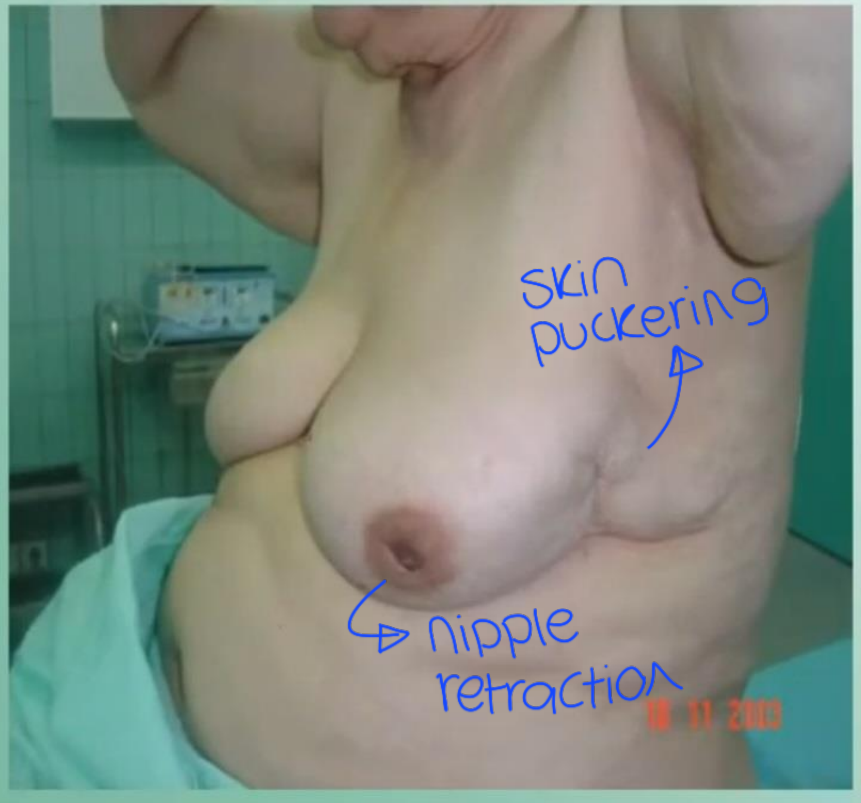


c)

d)

this is glandular structure (don't misdiagnose it as a mass)

- paget disease of nipple :
  - distruction & maceration of nipple / blood or serous discharge / itchy (may be misdiagnosed as eczema)
  - diagnosis : incisional biopsy



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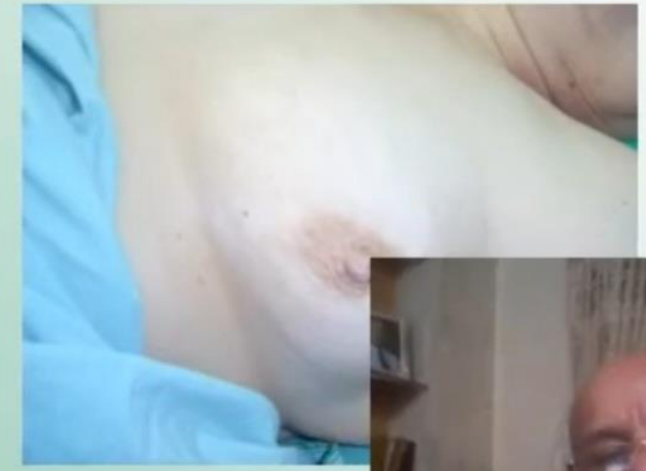
Single duct bloody discharge: maybe retroareolar duct papilloma or ductal carcinoma



- advanced malignancy
  - peau d orange
  - nipple retraction
  - surgical scar at lat. side of nipple

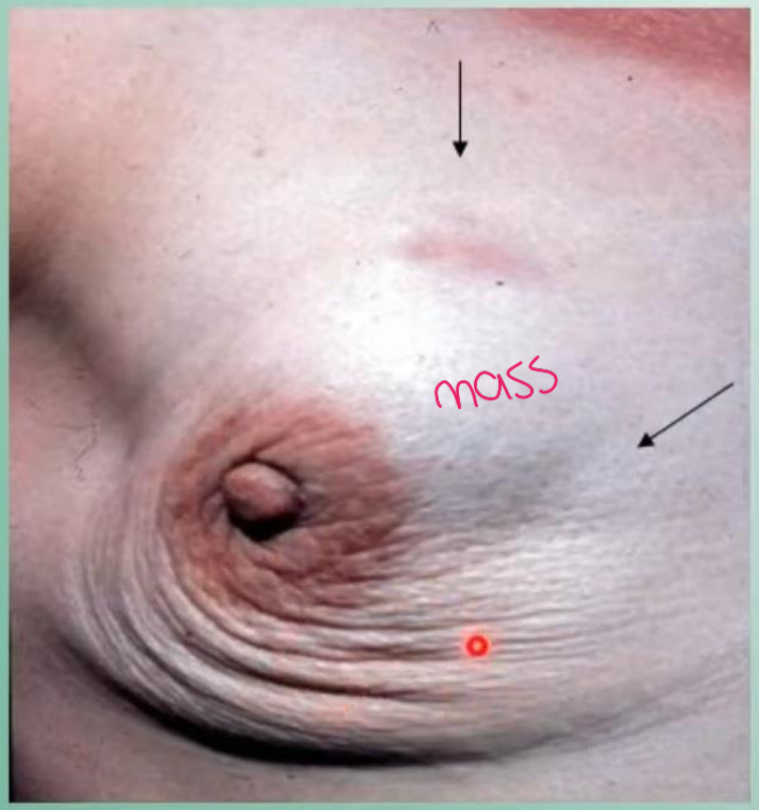
redness & mass shown when elevating arms

accessory nipple in axilla

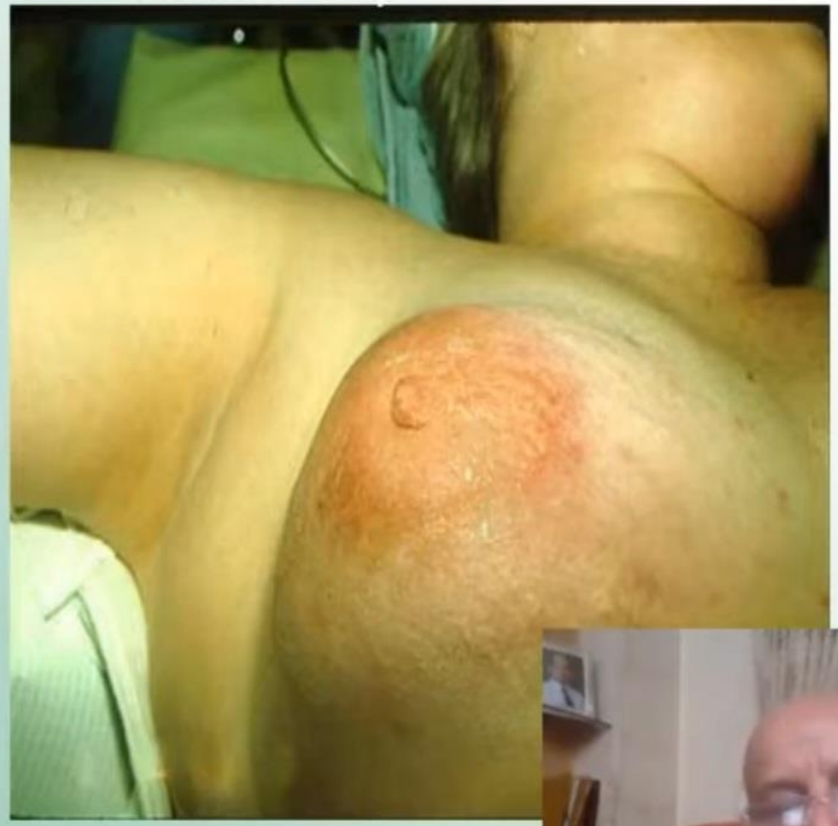
inflammatory carcinoma of breast

- red, hot, tender
- very firm (lymphatic fluid accumulation cuz of ↑ intra mammary pressure)

large mass causing clockwise twist of breast



nipple is not fully retracted yet



due to Obstruction of dermal lymphatics by malignant cells (T4 lesion)

Skin Ulceration

untreated Superficial mass

⇓

Ulceration

⇓

increased TNM Staging:

$T_{1,2} \rightarrow T_4$

Breast Ultrasound

- Ultrasound is useful in the assessment of breast lumps
- Complements mammography and is able to differentiate solid and cystic lesions
- Also able to guide fine needle aspiration and core biopsies
- Can be used to assess tumour size and response to therapy (neoadjuvant)
- In the diagnosis of malignancy it has a sensitivity and specificity of 75% and 97% respectively
- Cysts and solid lesions have typical appearances

11/2/2020

Simple cysts can be evacuated by a needle

Breast Imaging

always compare with other breast to see the normal

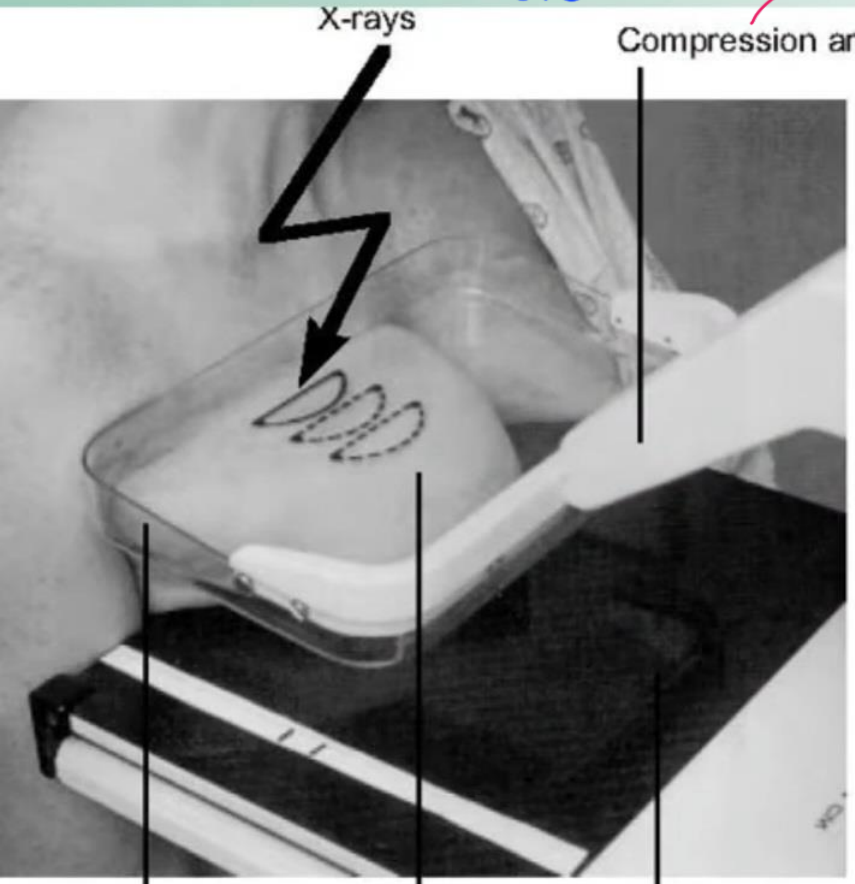
- The breast can be imaged with mammography, ultrasound or MRI.
- Mammography is the most sensitive of breast imaging modalities. + detects multifocal & multicentric lesions
- Sensitivity is reduced in young women due to the presence of increased glandular tissue.
- For symptomatic patients, imaging always be performed as part of triple assessment.

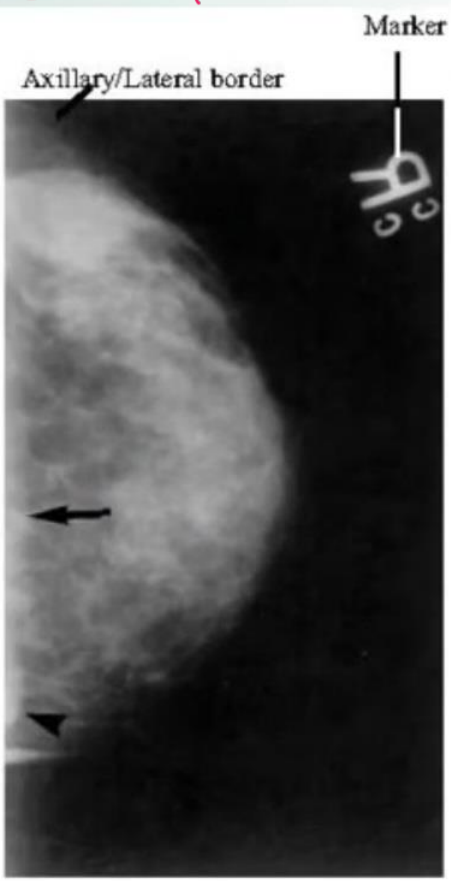
* don't do mammography if pt:
  - is premenstrual
  - has inflammatory process

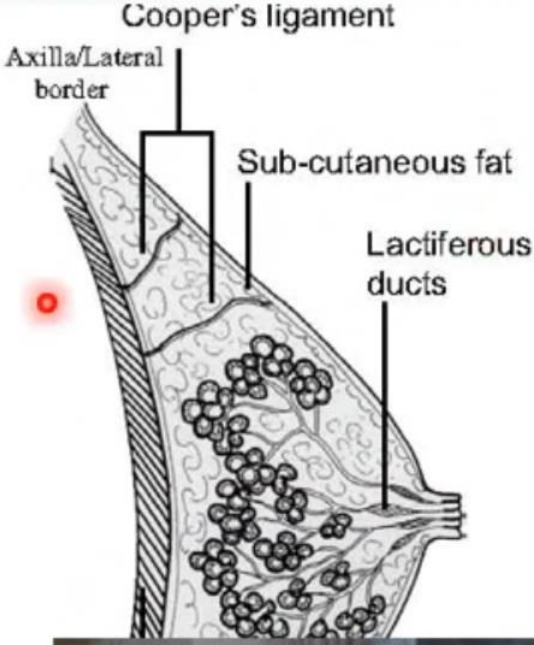
] cuz it will be more painful

Craniocaudal view

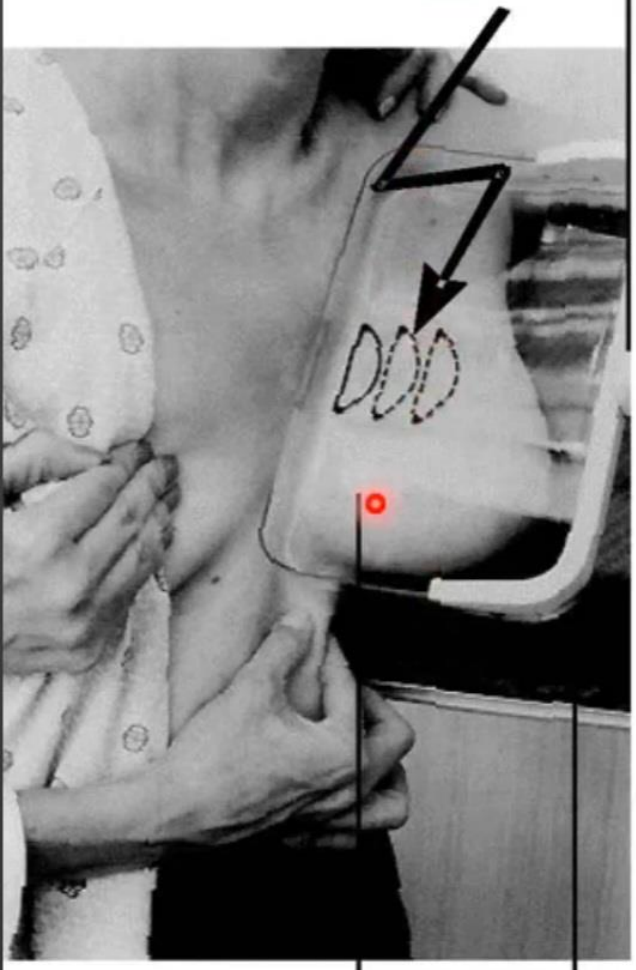
important so we don't miss deep masses

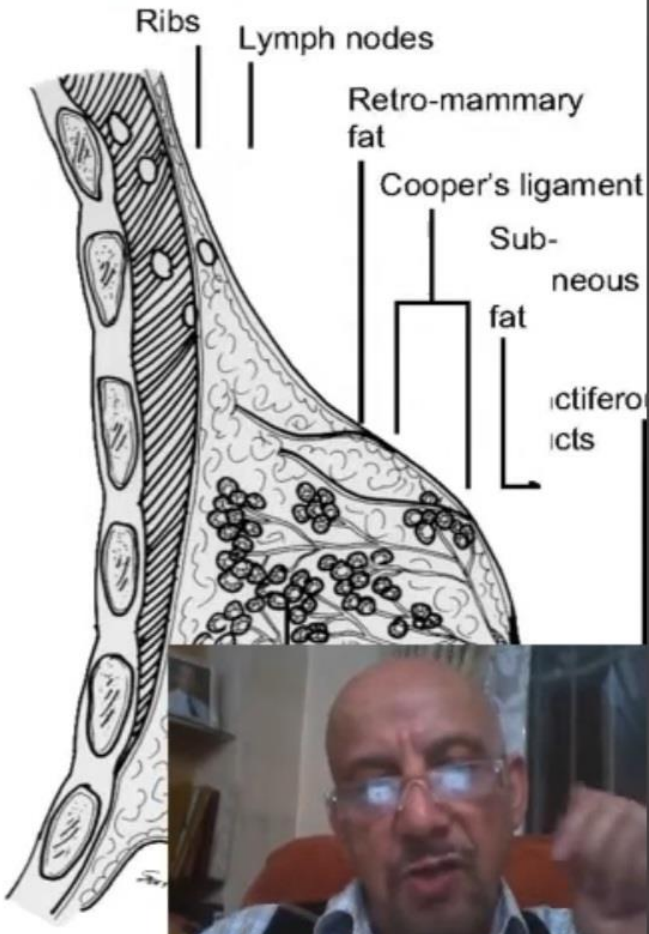




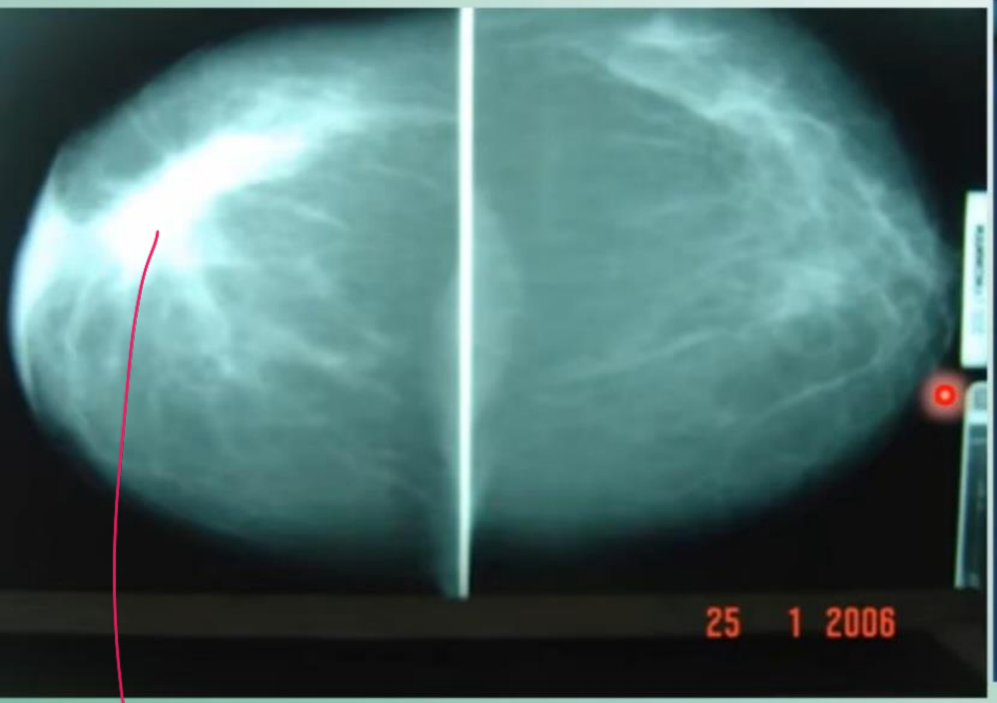


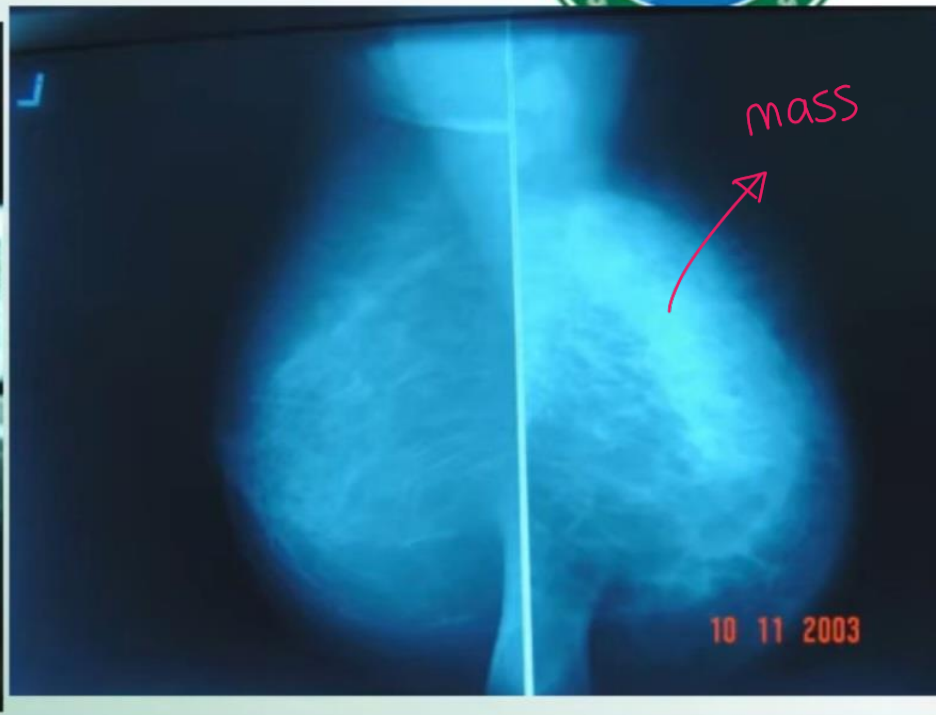
Oblique view → make Axillary area Clear





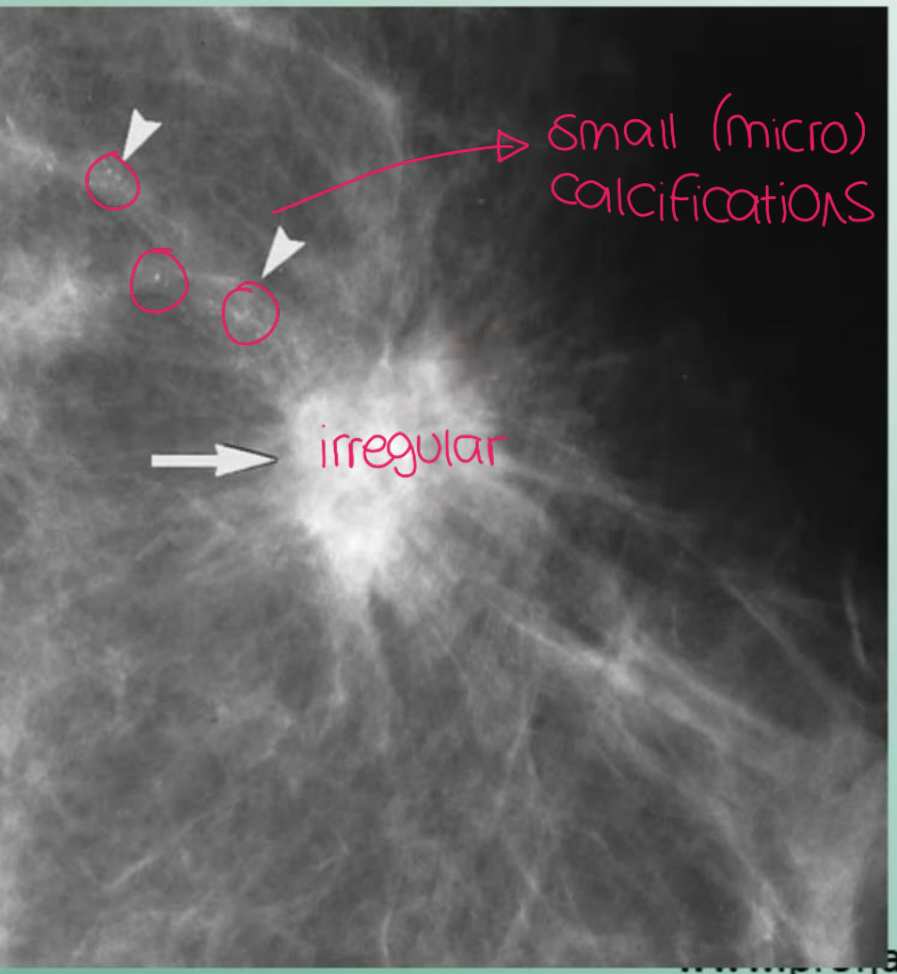
Compare both breasts!

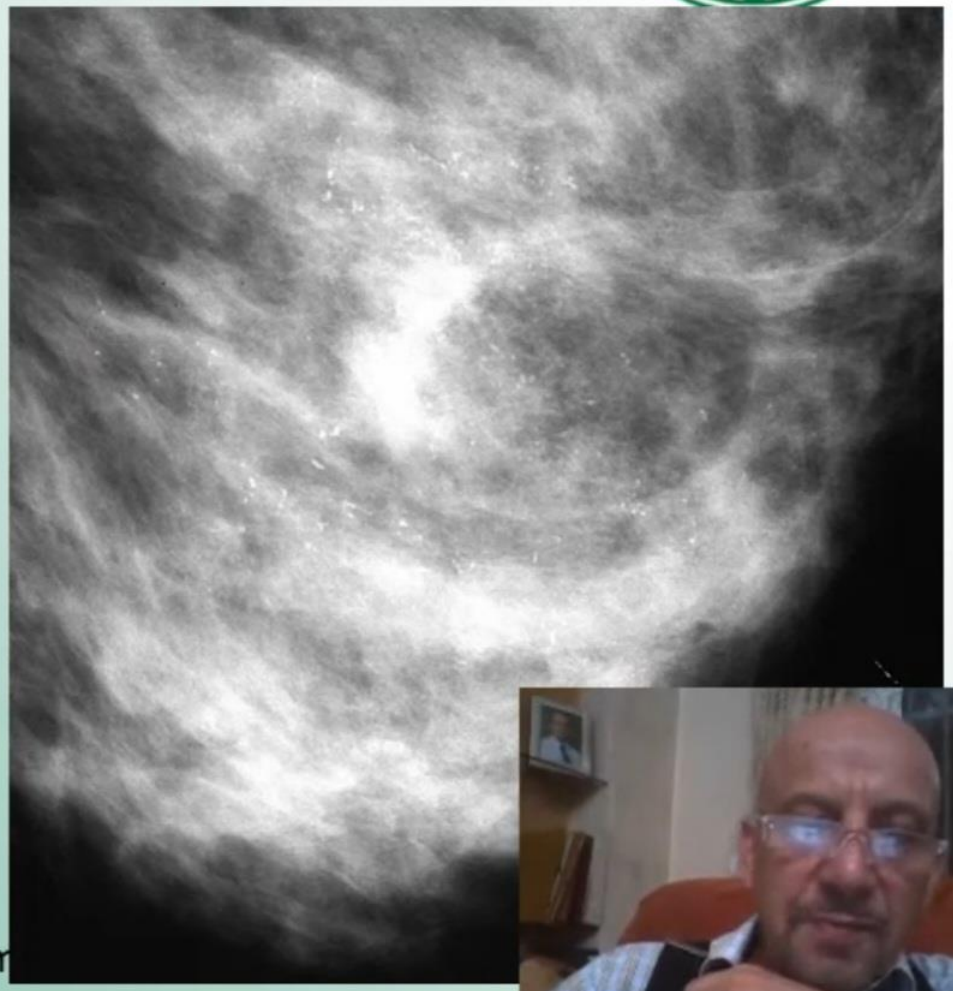




very dense irregular mass extending to nipple (typical appearance of malignancy)

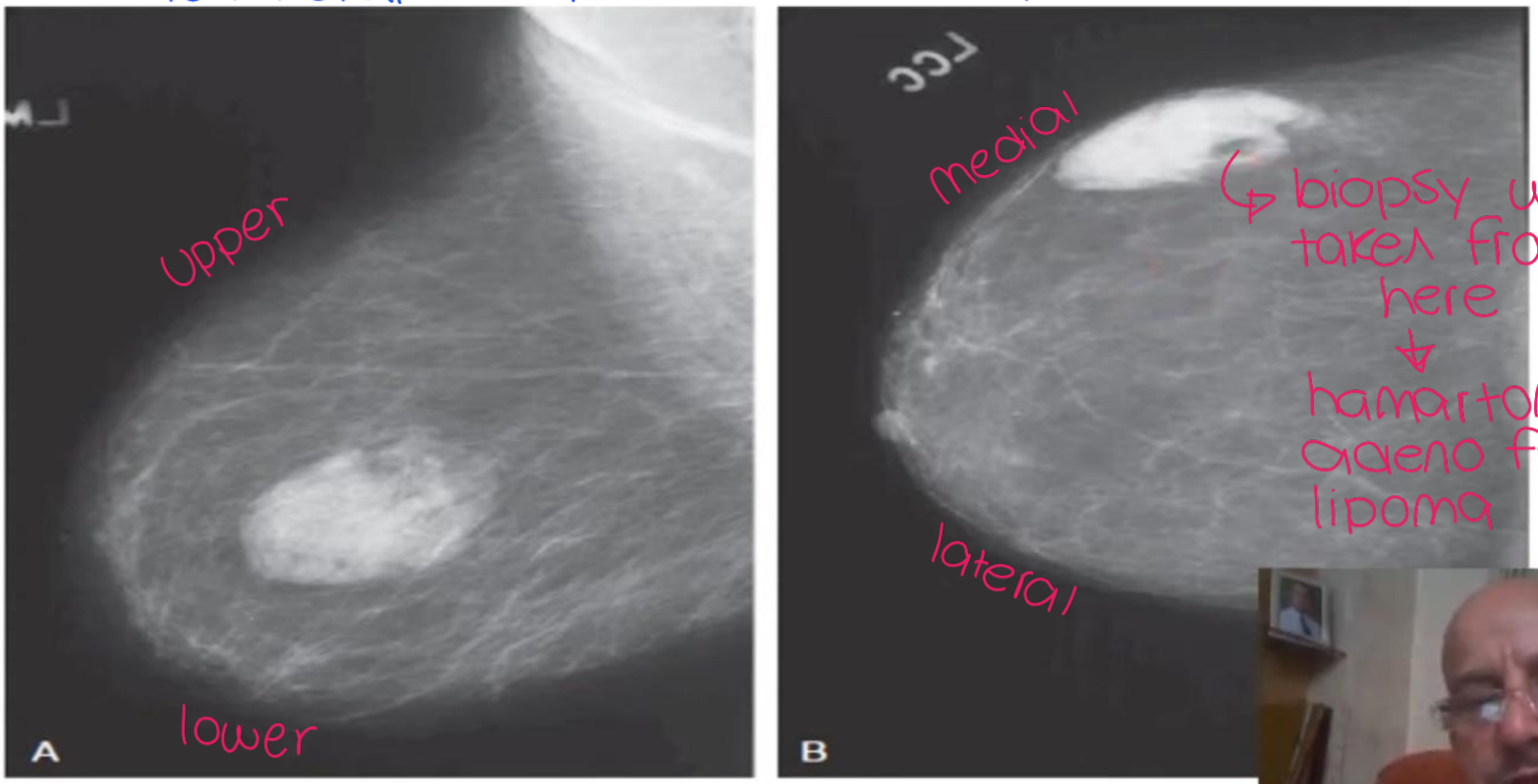
>5 microcalcifications → biopsy





Medio lateral Oblique

Cranio Caudal



↳ biopsy was taken from here
↓
hamartoma or adeno fibro-lipoma

Figure 2–4. Hamartomas have a very characteristic appearance on mammography, p
of fatty and soft tissue densities surrounded by a fibrous capsule. **A**, The MLO view s
within a breast" appearance of hamartoma. **B**, The CC view. (Images courtesy of Dr. Ale
Radiology, University of Michigan.)

Mediolateral Oblique

Craniocaudal

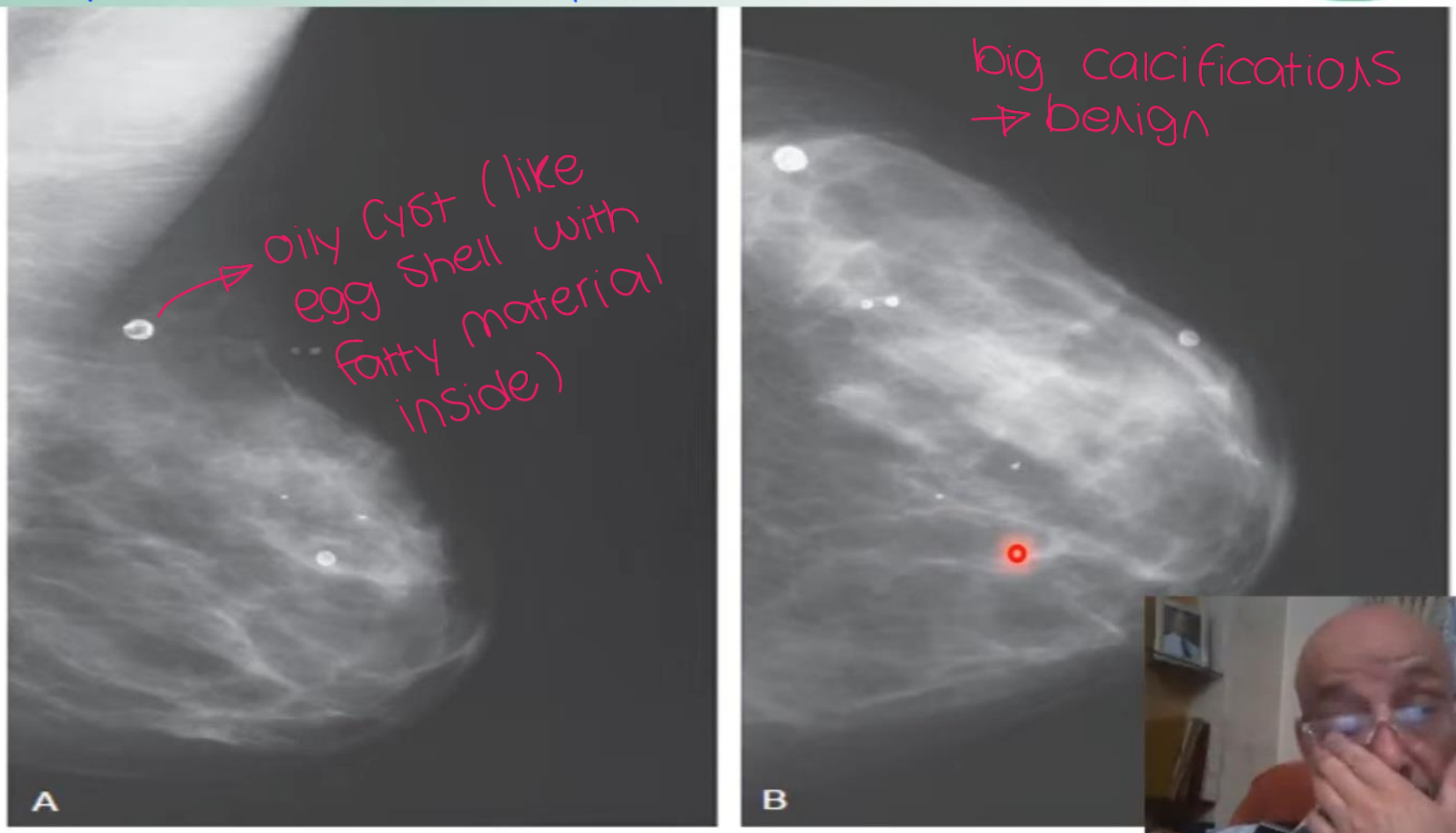


Figure 2–6. MLO and CC views of the right breast demonstrate benign calcificati
cysts. (Images courtesy of Dr. Alexis Nees, Department of Radiology, University o

Radiographic views of the breast

Standard views:

- **45* Medio lateral Oblique (MLO view) / Lundgren's view**
- **Craniocaudal view (CC view)**

RCC

Right Craniocaudal

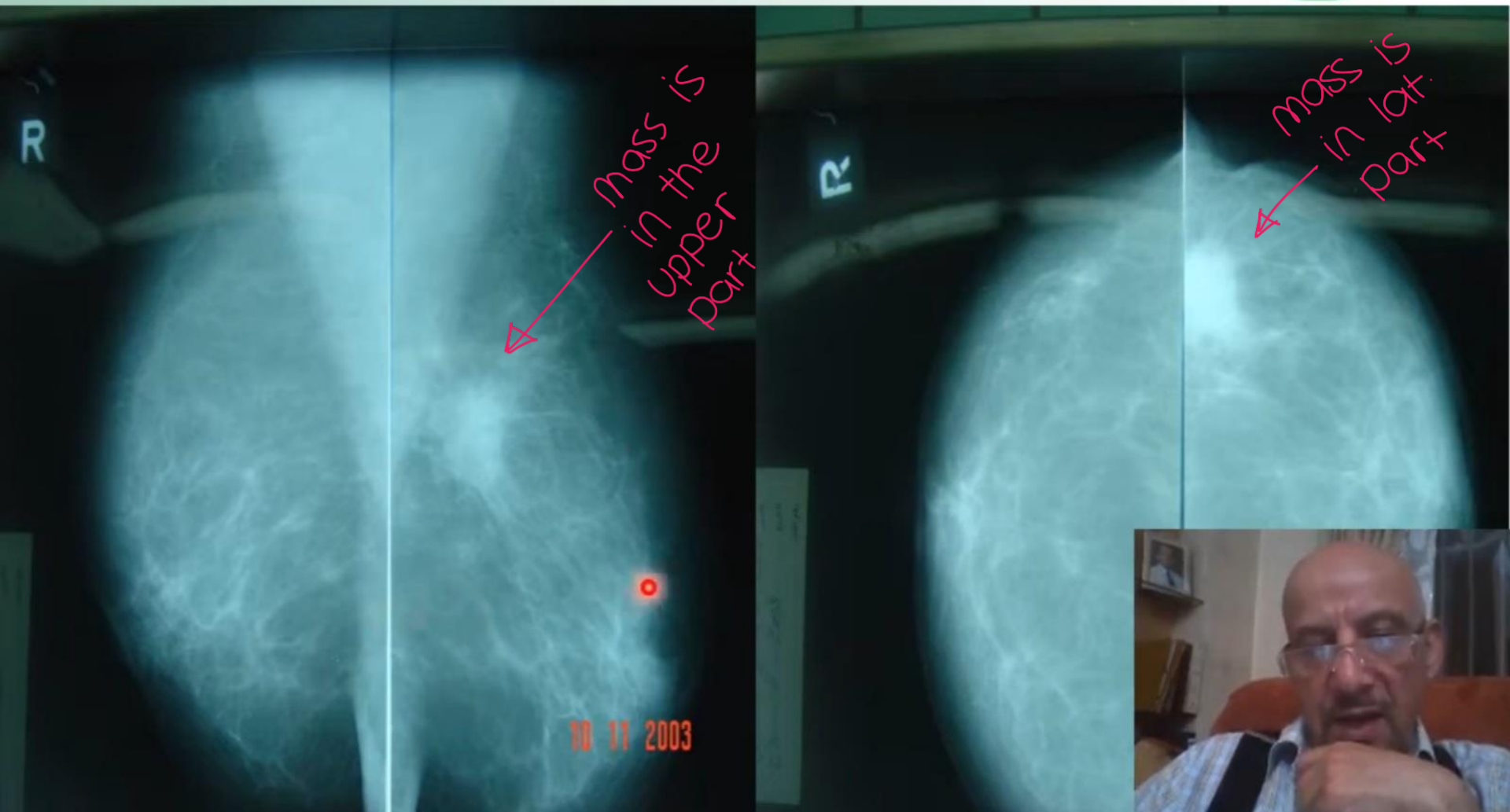
LCC

Left Craniocaudal

RMLO

Right Mediolateral Oblique

mass is in the upper outer quadrant of left breast



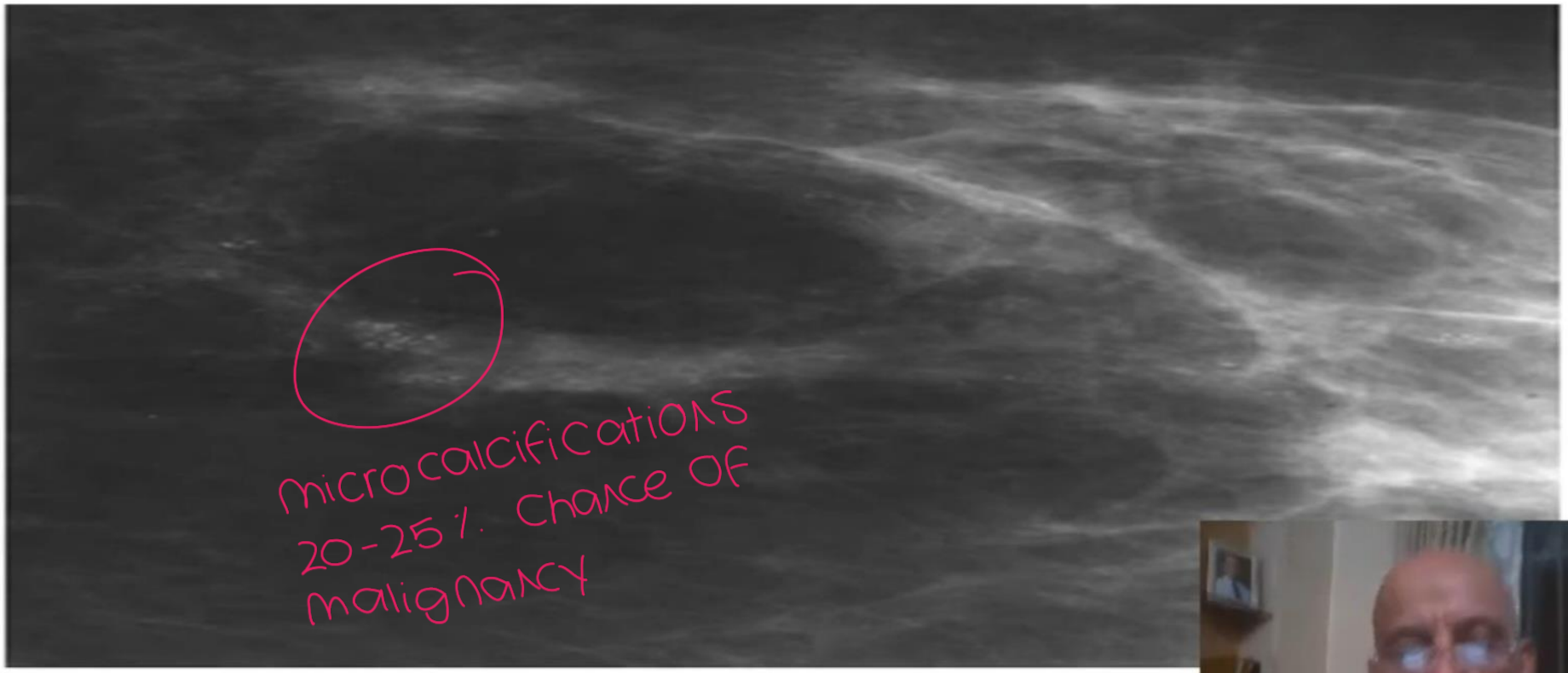


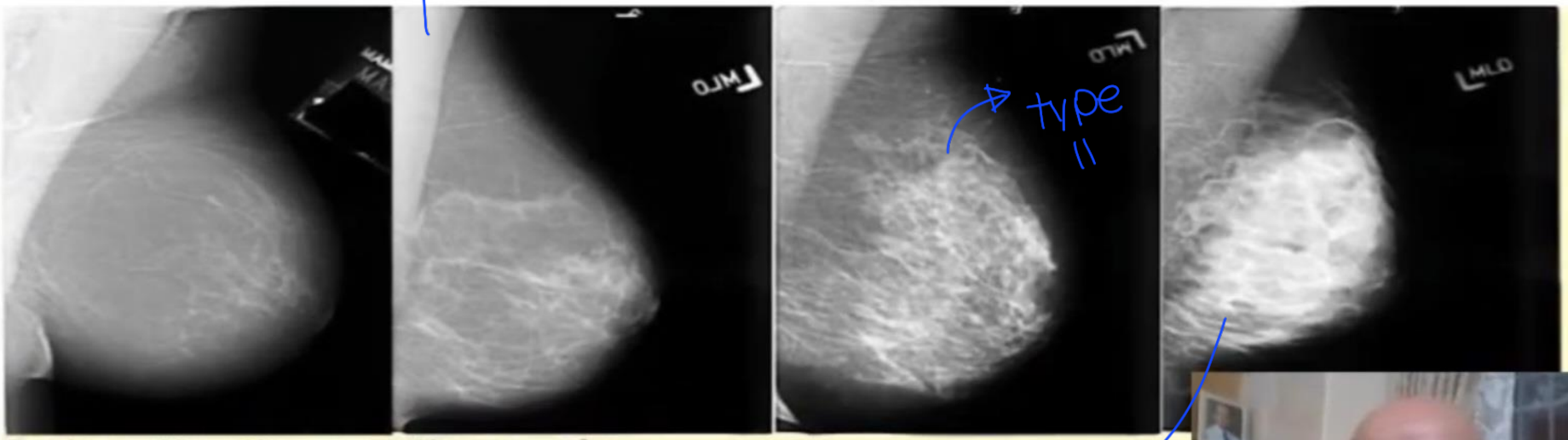
Figure 2–7. Magnification CC view de
segmentally distributed, pleomorphic ca
Pathology demonstrated DCIS and inva
carcinoma. (Image courtesy of Dr. A
Department of Radiology, University of M

- assume all following images are of women in the same age:

normal fatty breast (old age)

retroareolar glandular structure (prominant ductal pattern type I)

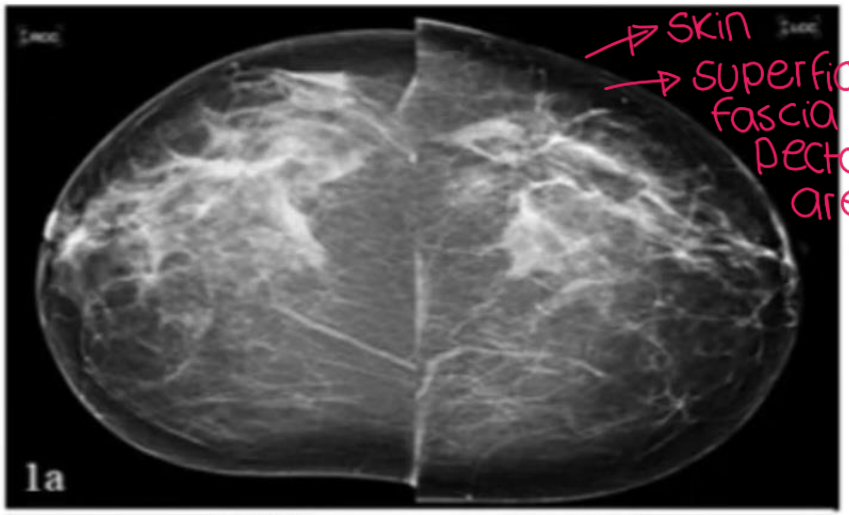
dysplastic breast & needs biopsy

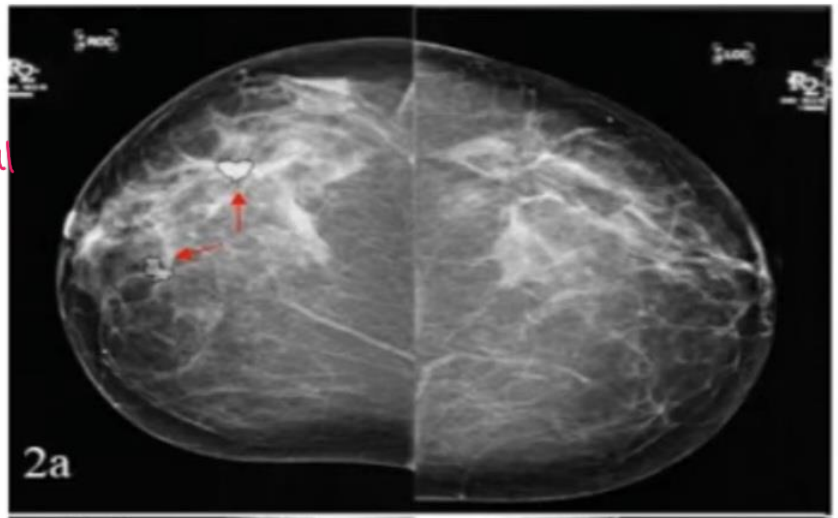


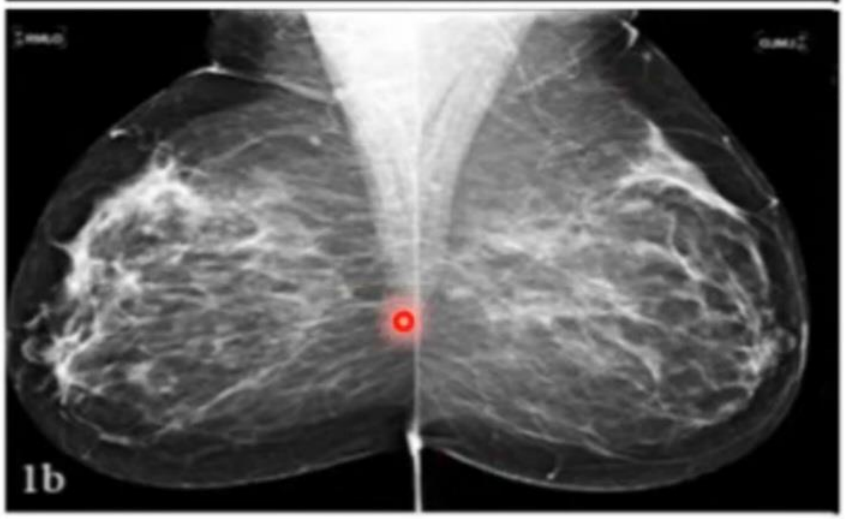
Breast composition and its mammographic appearance.[1]

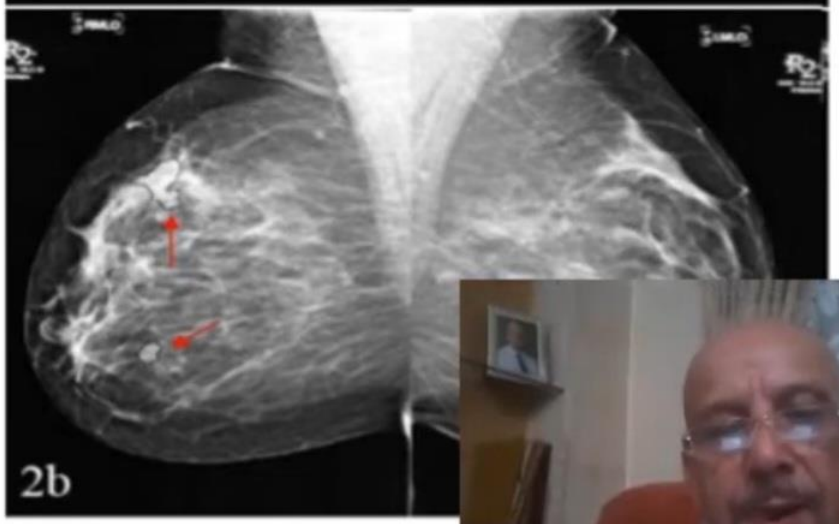
if a young female had this it would be normal (& glandular)

digital mammography









BI-RADS mammographic assessment categories

Assessment category	Recommendation	Probability of malignancy
0: Incomplete	Need for further evaluation	Not applicable
1: Normal	Normal interval follow-up	0 percent
2: Benign	Normal interval follow-up	0 percent
3: Probably benign	A short interval follow-up is recommended	<2 percent
4: Suspicious abnormality	A biopsy should be considered	≥2 to <95 percent
		(a) Low-risk
		(b) Intermediate-risk
		(c) Mo
5: Highly suggestive of malignancy	Biopsy or surgery should be performed	≥95 pe
6: Biopsy-proven carcinoma	Appropriate action should be taken	

BI-RADS: Breast Imaging Reporting and Data System.

Source: Breast Imaging Reporting and Data System (BI-RADS) Atlas. 4th Editi
Radiology, Reston, VA, 2003.

not painful, easy, can be done w/out U/S
for palpable lesions & w/ U/S for deep ones

Fine Needle Aspiration Biopsy (FNAB)

Fine needle aspiration biopsy is usually done in an office.

A small needle is inserted into the tumor and a sample of tissue is drawn up into the needle.

Material from the needle is put on a slide and examined for the presence of malignant cells.

It is a simple procedure done with minimal discomfort.

Disadvantage: May not always rule out cancer when it is negative.

Core biopsy

pt has central tumor & retracted nipple

local anesthesia

hormonal studies can't be done by FNA but with CNB

Biopsy

FNA

- relatively atraumatic
- sensitivity of %99-73
- ideal for simple cyst aspiration
- can't distinguish in-situ vs invasive cancer

CNB

- cutting needle
- greater trauma
- high sensitivity - 100%
- distinguishes between invasive and in-situ
- stereotactic with mammography and US

- hormonal studies can be done:
  - ↳ estrogen
  - ↳ progesterone
  - ↳ HER 2

Incisional biopsy

Incisional biopsy is done under local anesthesia, often with mild sedation.

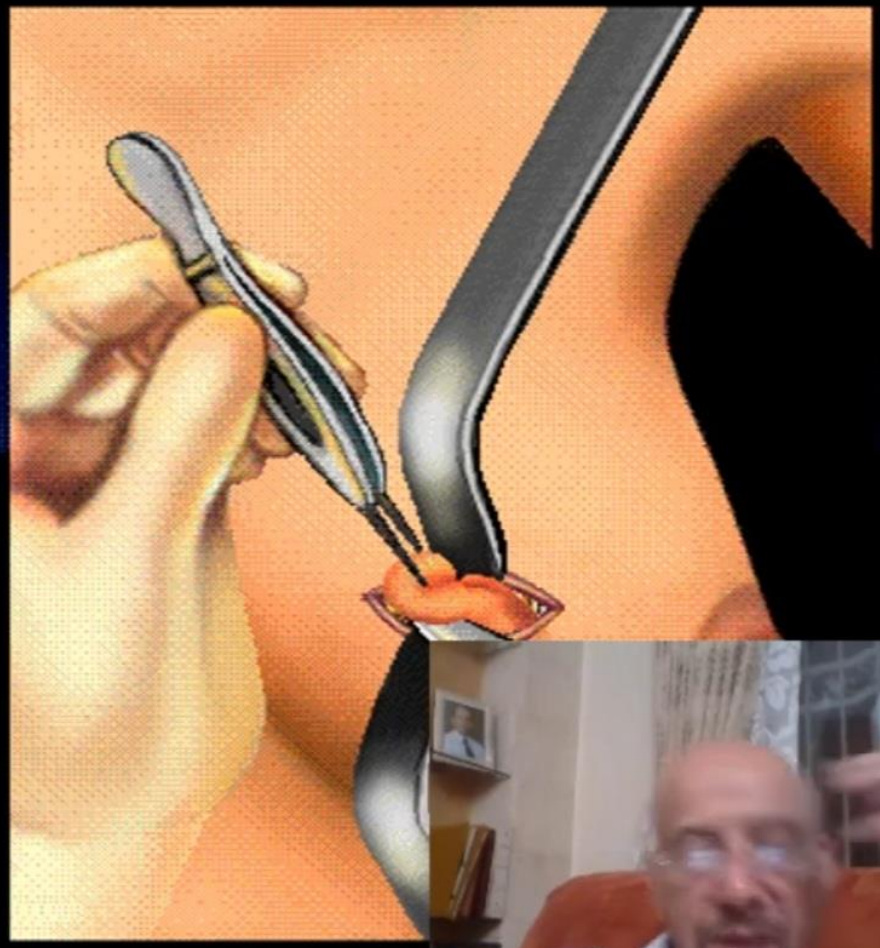
It is an outpatient procedure.

Only part of the tumor is removed for diagnosis.

Incisional biopsy is usually done when the tumor is large.

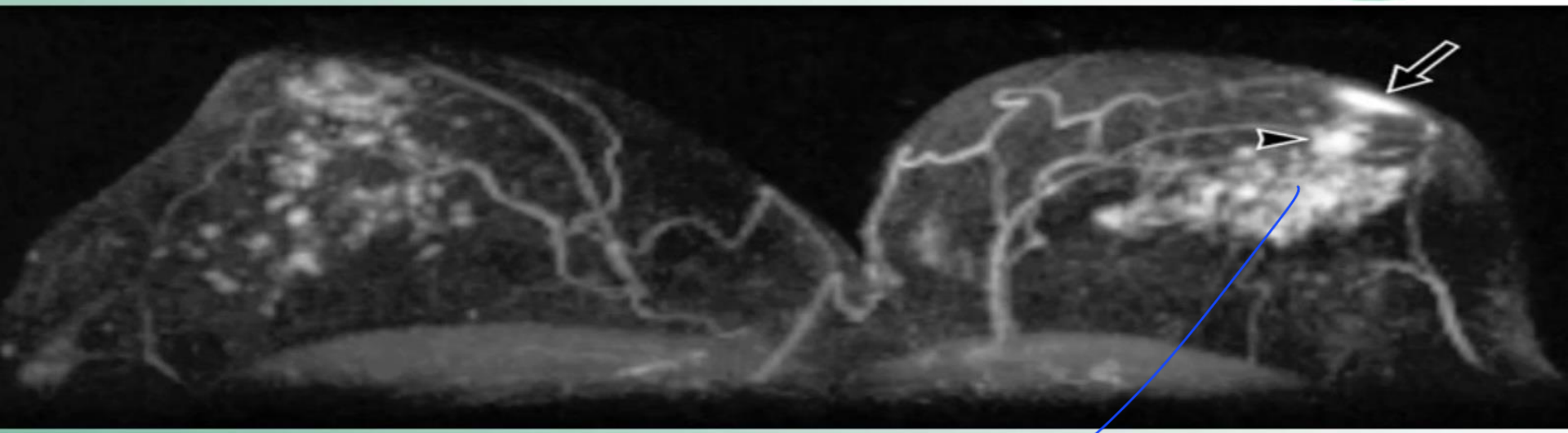
It is rarely performed except in special circumstances.

(remove mass without Safety margin)



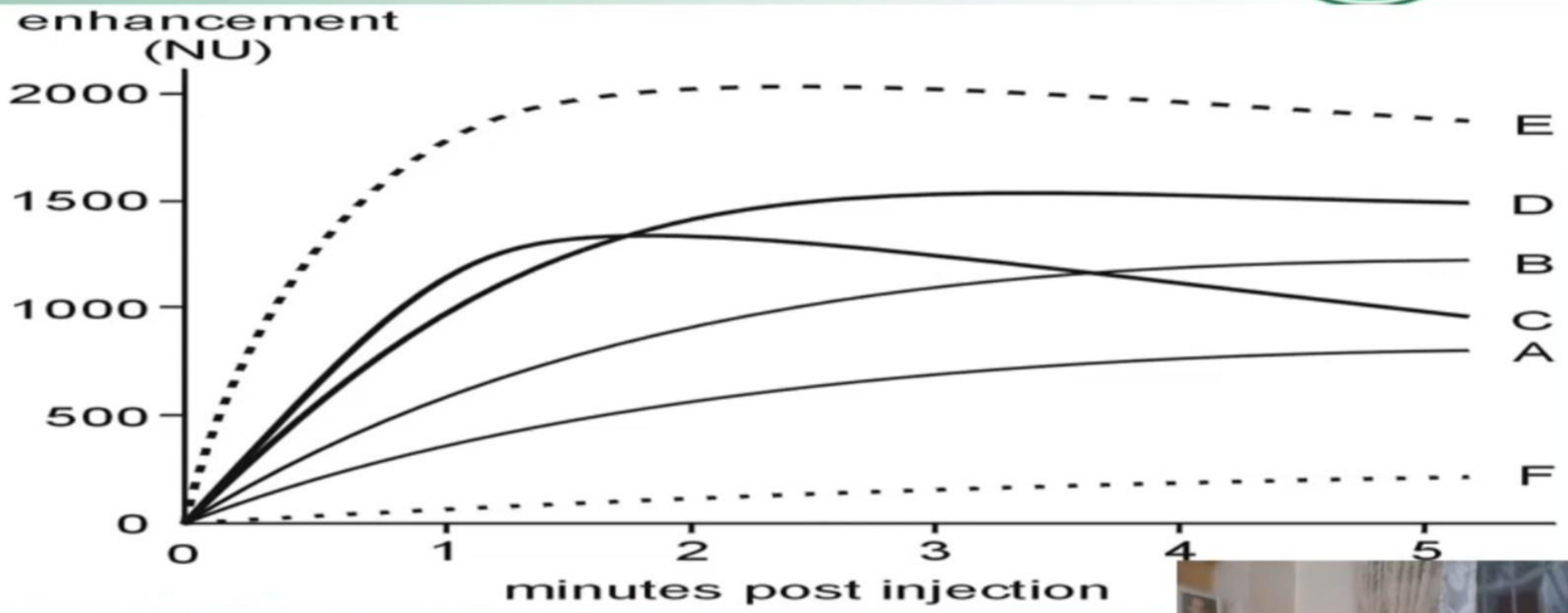
Paget's Disease of the Nipple

Strong family history → MRI at age 30



retro areolar carcinoma

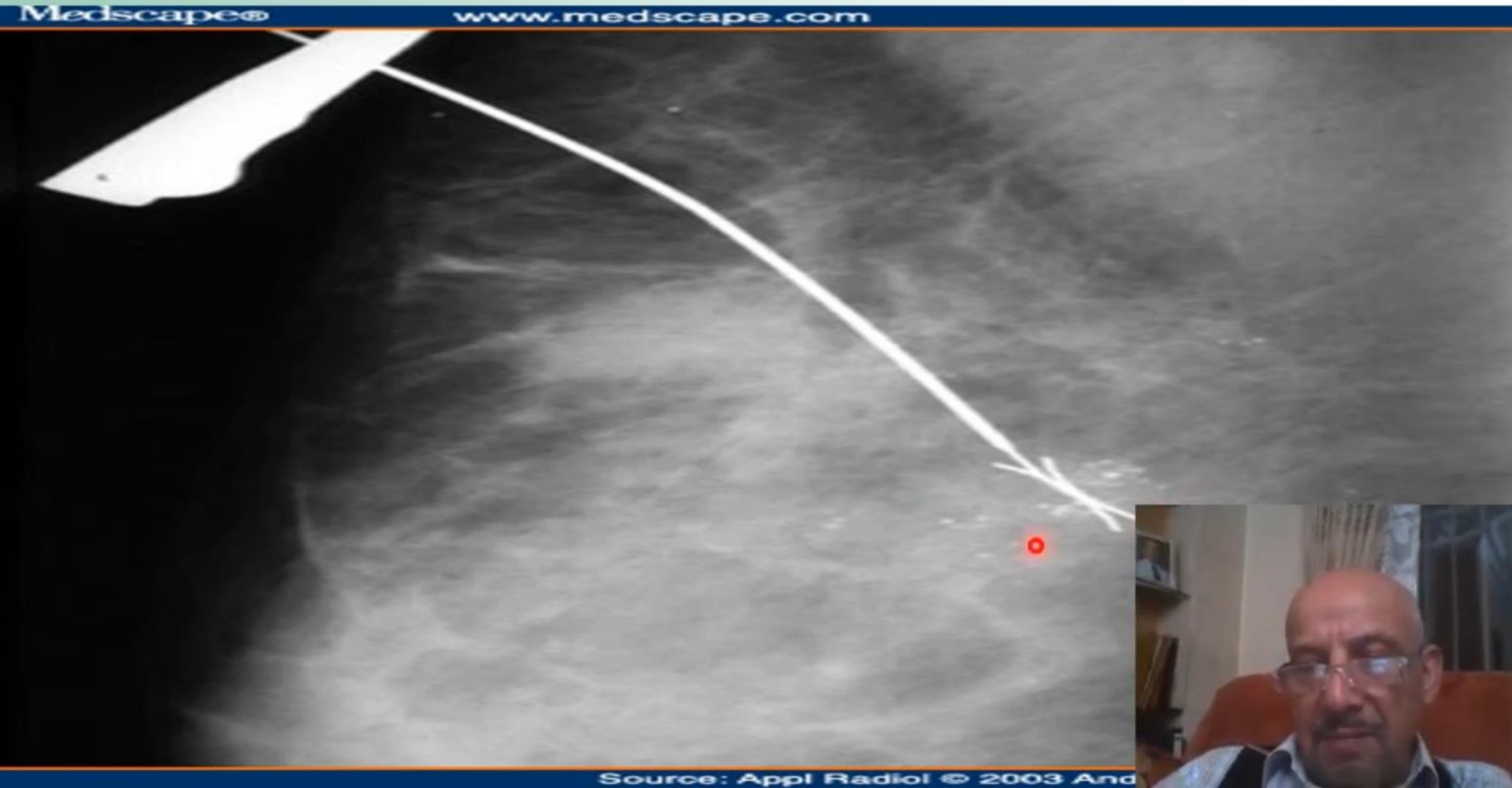
we usually give an IV dye (gadolinium) during MRI to help us to differentiate bet. benign & malignant masses depending on dye enhancement levels



MR Imaging, breast

Enhancement curves for carcinomas. About 90% of enhance according to the patterns represented by D and E. NU = normalized units

- We can use a guide wire inserted under U/S or mammogram & will be fixed around the tumor to help the surgeon know tumor location if it reduced in size with neoadjuvant



Stereotactic Image- Guided Breast Biopsy (preferred over guide wire)

- mainly done for calcifications
- radial scar or sclerosing adenosis masses can be excised completely by a rotating knife & a vaccum

Breast Cancer Overview Part 2

Staging & Surgical Management

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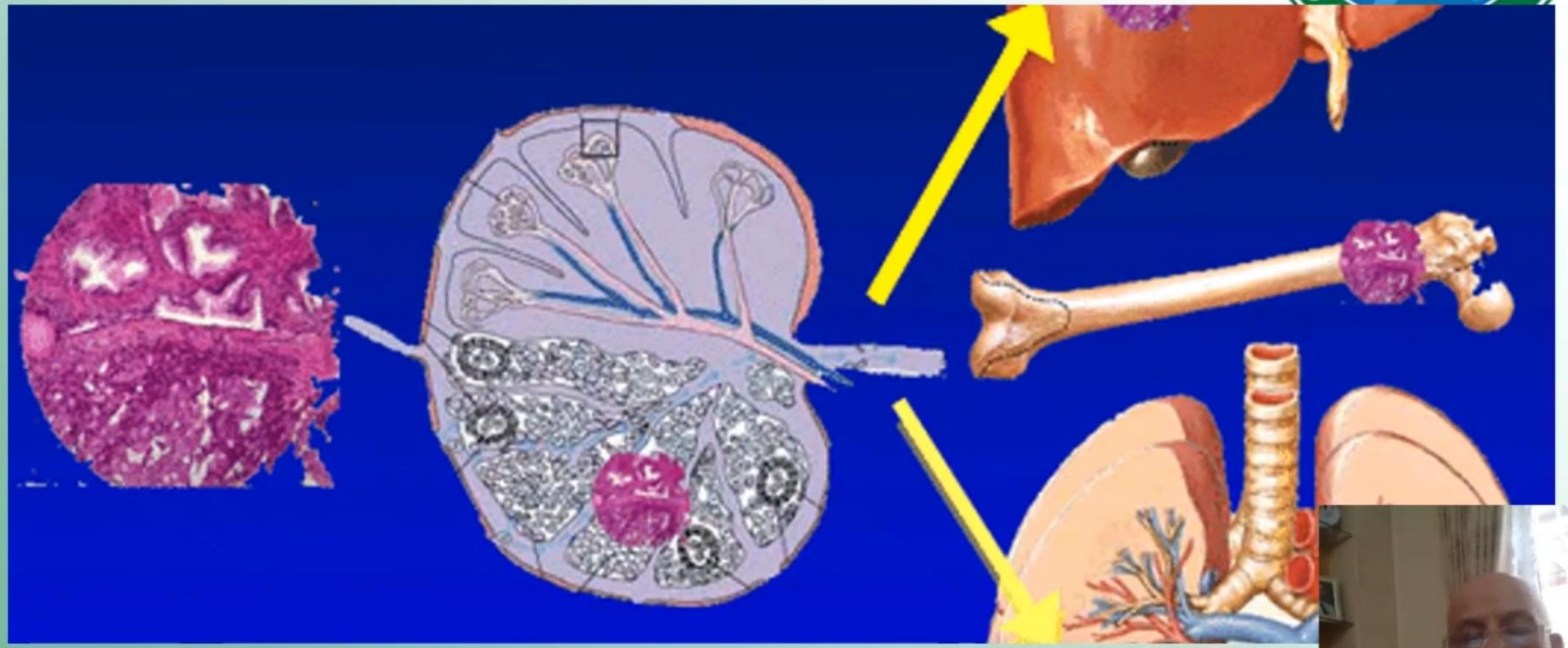
Amman, Jordan

most common site of breast CA mets:
bone → liver → lung
→ nervous

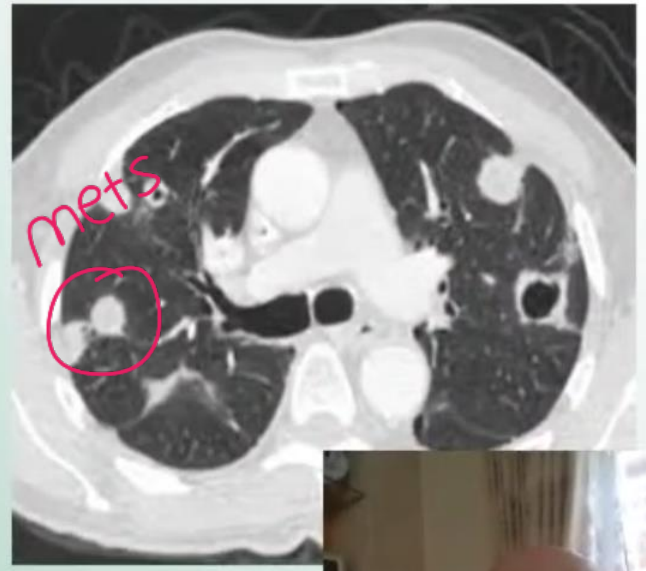
11/3/2020



- Staging should be done after doing the proper evaluation
- Of the primary tumor in the breast and axilla by imaging and
- Biopsy. (T&N)

Abdominal CT

Chest CT



- CBC count with differential and platelet count (pt may have anemia cuz of BM infiltration)
- Chemistry and renal function studies
- Liver function tests
- Tumor markers CA 15.3

Objectives of staging

- Provides useful prognostic information.
- Allows decisions to be made regarding adjuvant therapy.
- Allows comparison of treatment outcomes between different centers.

TNM Criteria

- T = Primary Tumor
  - Tis = carcinoma in situ
  - T1 = less than 2 cm in diameter
  - T2 = between 2 and 5 cm in diameter
  - T3 = more than 5 cm in diameter
  - T4 = any size, but extends to the skin or chest wall
- N = Regional Lymph nodes
  - N0 = no regional node involvement
  - N1 = metastasis to movable same side axillary nodes
  - N2 = metastasis to fixed same side axillary nodes
  - N3 = metastasis to same side internal mammary nodes
- M = Distant Metastasis
  - M0 = no distant metastasis
  - M1 = distant metastasis

T2N1M0

Clinical Staging

	T	N	M	5-Year Survival	
Stage 0	Tis	N0	M0	> 95%	
Stage I	T1	N0	M0	Overall = 85%	
Stage II				Overall = 66%	
(Stage IIA)	T0	N1	M0		
	T1	N1	M0		
	T2	N0	M0		
(Stage IIB)	T2	N1	M0		
	T3	N0	M0		
Stage III				Overall = 41%	
(Stage IIIA)	T0	N2	M0		
	T1	N2	M0		
	T2	N2	M0		
	T3	N1, N2	M0		
(Stage IIIB)	T4	Any N	M0		
	Any T	N3	M0		
Stage IV	Any T	Any N	M1	Overall 10	

Breast Cancer Staging Calculator

65% 14:42

Clinical | Pathological

T	T0	Tis	T1	T2	T3	T4
N	N0	N1mi	N1	N2	N3	
M	M0			M1		
PROGNOSTIC FACTORS	G1		G2		G3	
	HER2 +		ER +		PR +	
	HER2 -		ER -		PR -	

IIIC
Anatomic Stage

IIIA
Clinical Prognostic Stage

-2

TNM 8 CALCULATOR

1 small

Stage 0

Stage I

Stage II

1 & 1 LN

Stage III

1 & >1 LN

Stage IV

mets

5-year relative survival rates for breast cancer by stage

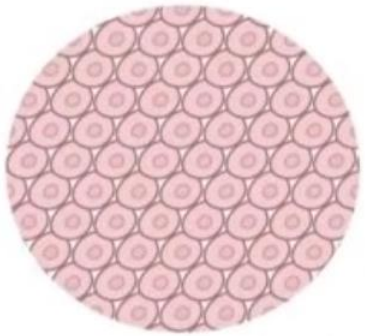
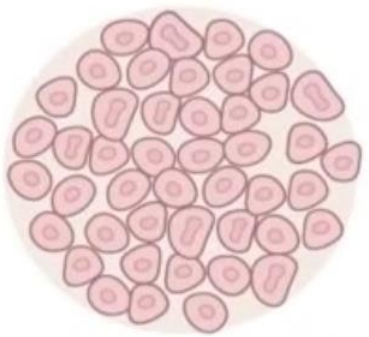
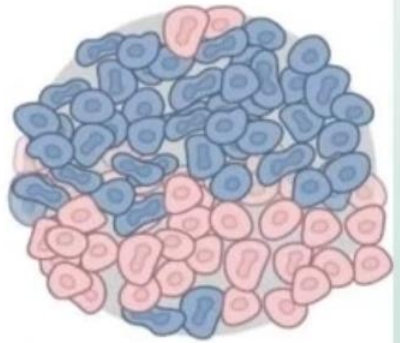
- The 5-year relative survival rate for women with stage I breast cancer is close to 100%.
- For women with stage II breast cancer, the 5-year relative survival rate is about 85%.
- The 5-year relative survival rate for stage III breast cancers is about 70%. But often, women with these breast cancers can be successfully treated.
- Breast cancers that have spread to other parts of the body are more difficult to treat and tend to have a poorer outlook. Metastatic, or stage IV breast cancers, have a 5-year relative survival rate of about 20%. Still, there are often many treatment options available for women with this stage of breast cancer.

Staging → prognosis & management

ex: advanced Stage → neoadjuvant then Surgery
triple negative → neoadjuvant then Surgery
early Stage → Surgery then adjuvant

Histological Grades

Prognosis — well differentiated — moderately differentiated — poorly differentiated — Grade

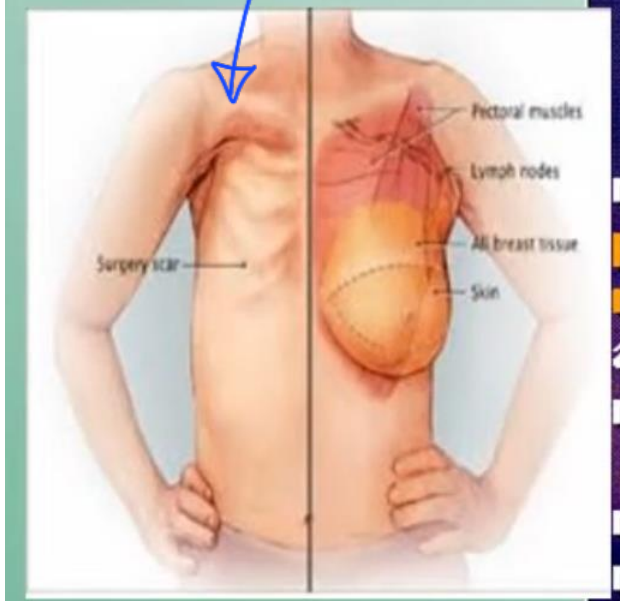
Grade 1	Grade 2	Grade 3
		
Glandular/Tubular Differentiation: >75% of tumor forms glands	**Glandular/Tubular Differentiation:** 10% to 75% of tumor forms glands	**Glandular/Tubular Differentiation:** <10% of tumor forms glands
Nuclear Pleomorphism: Uniform cells with small nuclei similar in size to normal breast epithelial cells	**Nuclear Pleomorphism:** Cells larger than normal with open vesicular nuclei, visible nucleoli, and moderate variability in size and shape	**Nuclear Pleomorphism:** Cells with vesicular nuclei, prominent nucleoli, marked variation in size and shape
Mitotic Count: < 7 mitoses per 10 high power fields	**Mitotic Count:** 8-15 mitoses per 10 high power fields	**Mitotic Count:** > 16 mitoses per 10 high power fields

Grade I tumors have a total score of 3-5

Grade II tumors have a total score of 6-7

Grade III tumors have a total score of 8-9

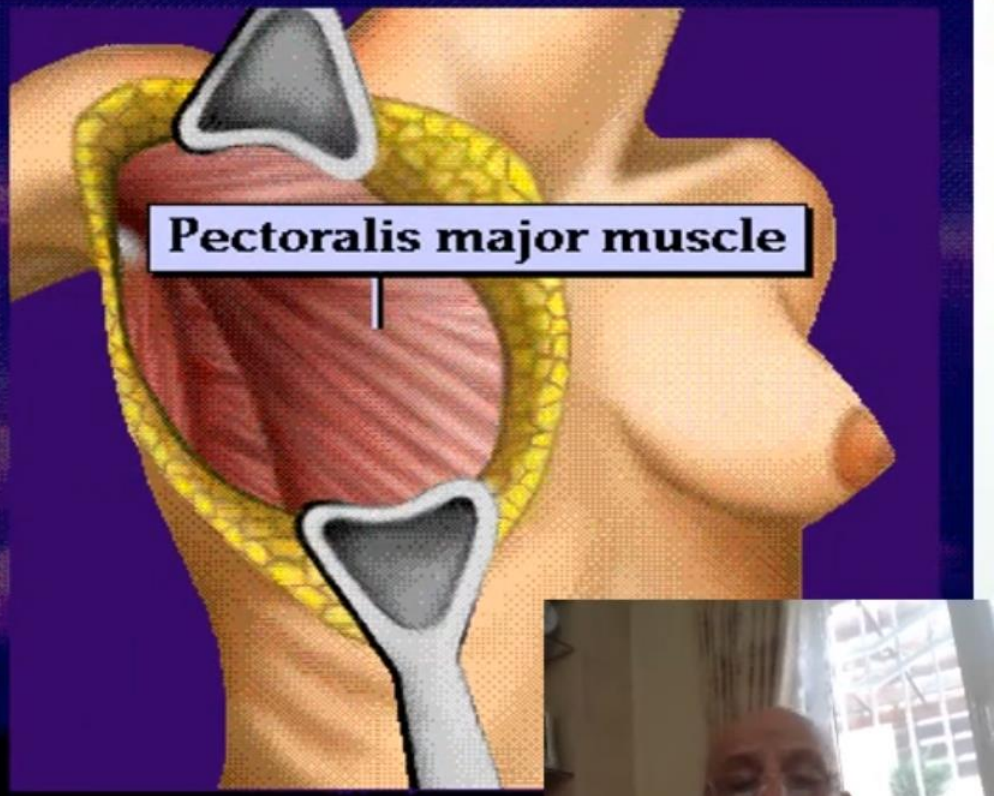
they used to do radical mastectomy till the 70s, cuz of: CA not cured mostly, Shoulder morbidity, loss of anterior axillary folds, no thing to protect pleura except skin & ribs & intercostal muscles (thin)



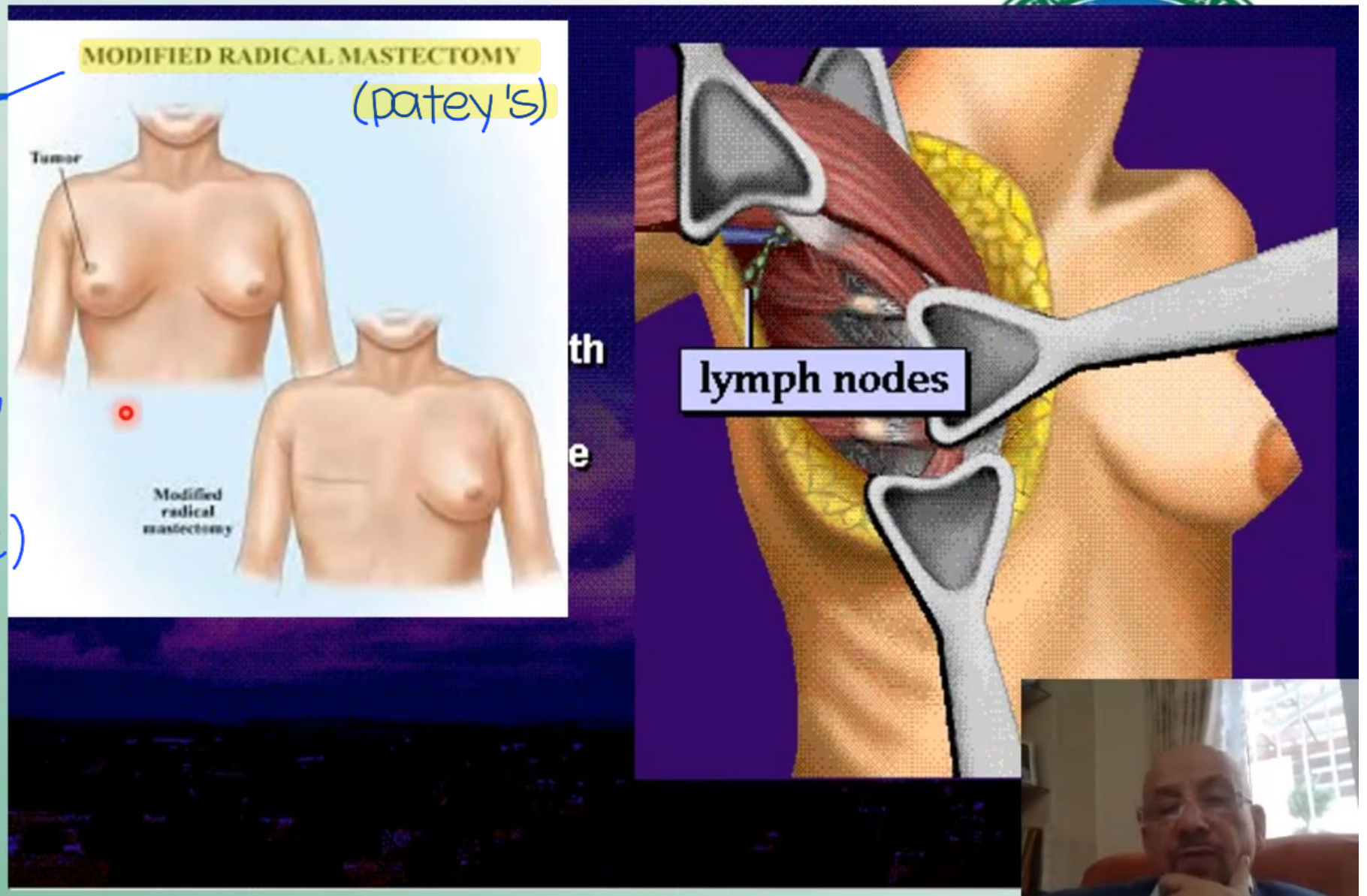
Radical mastectomy

In radical mastecomy the muscles of the chest (e.g., pectoralis major and pectoralis minor) along with the breast and lymph nodes are all removed.

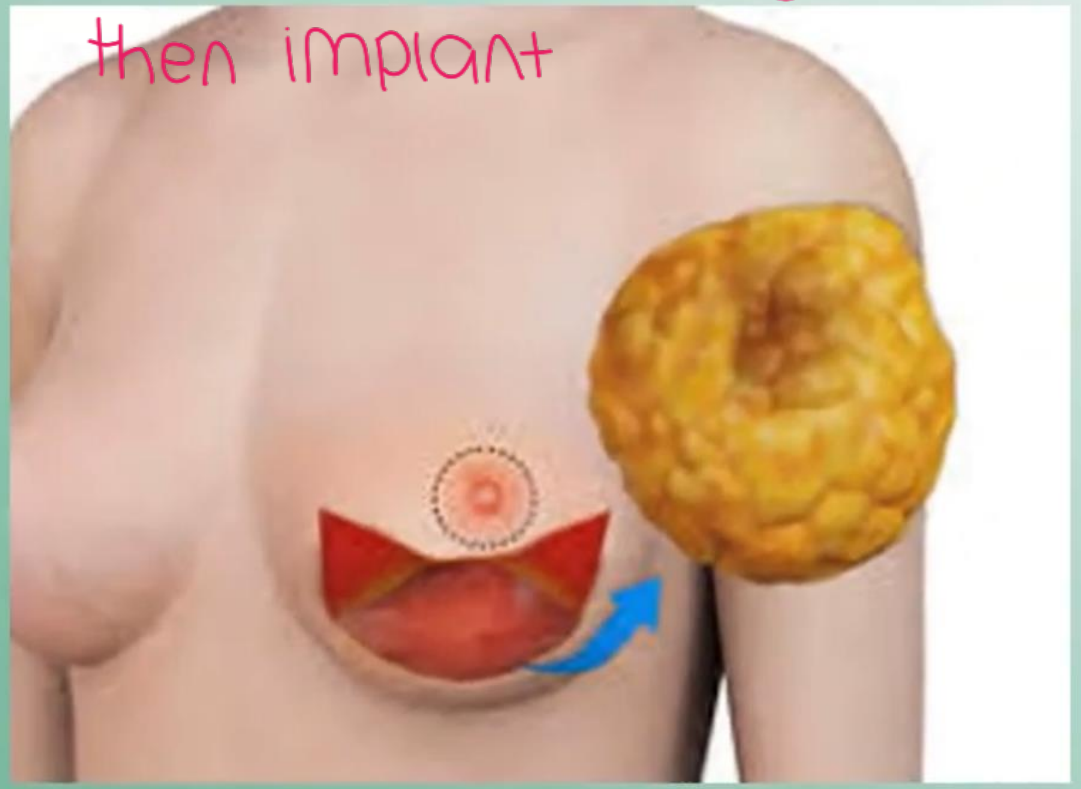
Radical mastecomy is now rarely performed. It is usually reserved for very large cancers that have grown into the muscle.



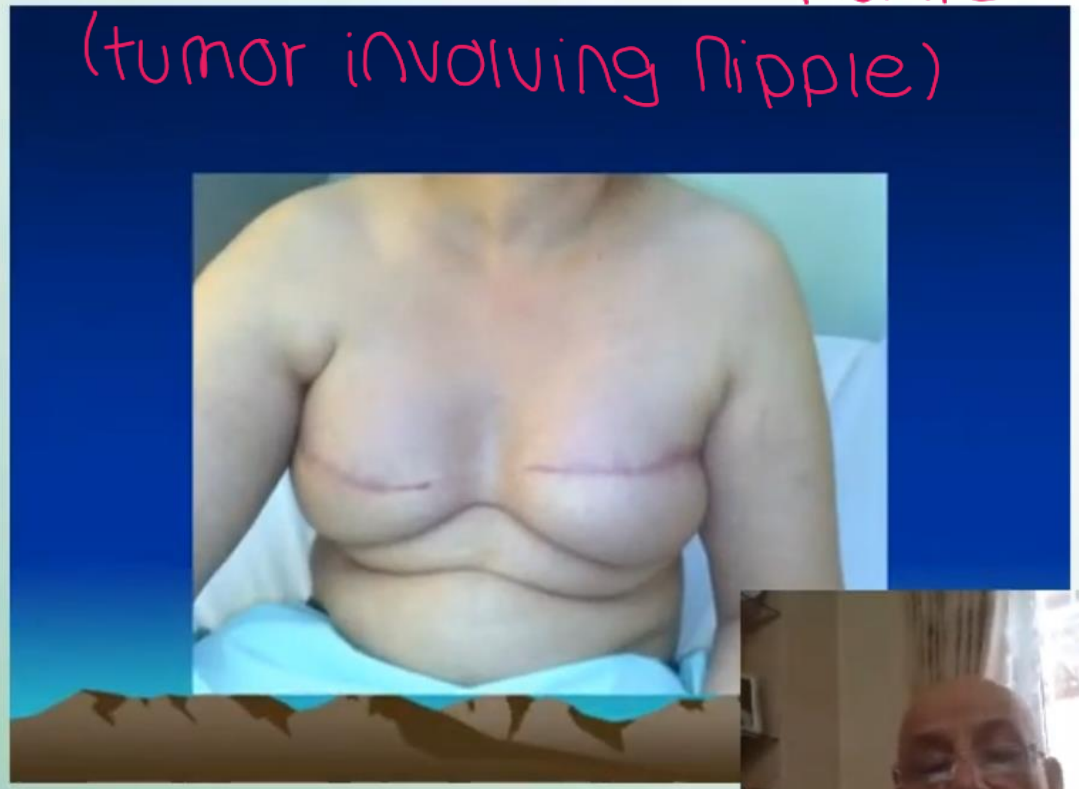
we don't remove muscles (less morbidity & better shape, same rate of local recurrence)



Skin & nipple sparing then implant



Skin Sparing then implants (tumor involving Nipple)



modified radical mastectomy then tram flap (transverse rectus abdominis myocutanous flap)

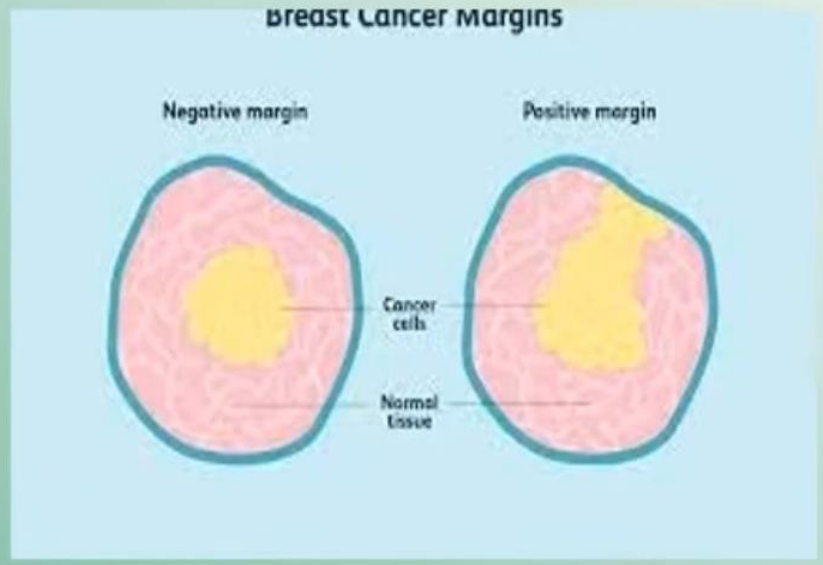
we take excess skin from lower abdomen, fat, part of muscle to reconstruct breast

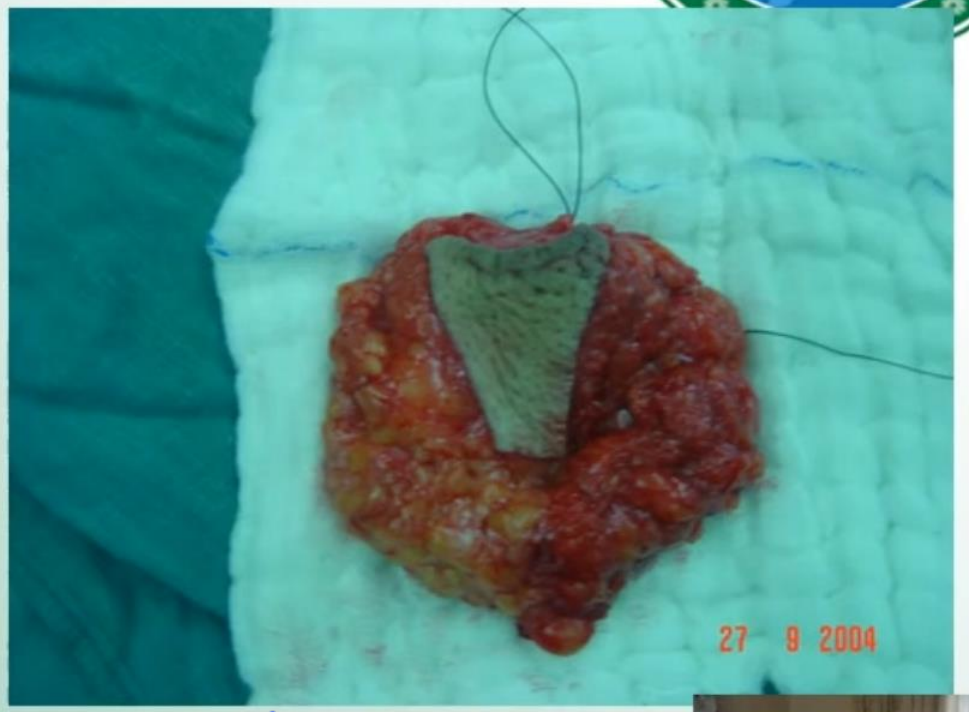
(long procedure, higher morbidity than implants)

tram flap with nipple & areola reconstruction

latssimus flap has higher survival & less complications than other flaps but loss of latssmus function (atrophy) & scarring (need graft)

most people need an implant behind the flap to keep volume & shape of breast





wide local exision

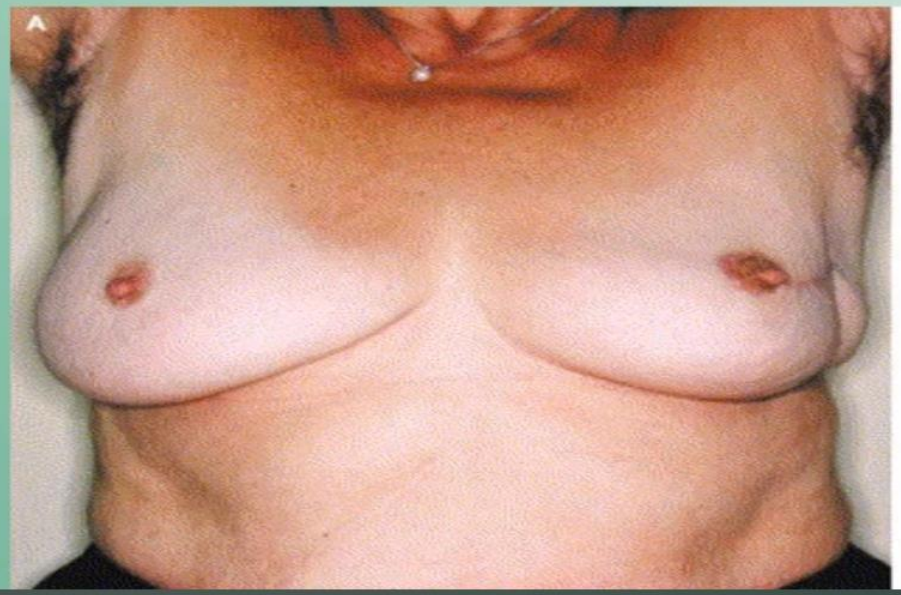
(good if pt has low tumor : breast ratio

ex: 2-3 cm tumor → so we remove tumor with a safety margin, same recurrence rate as radical but with better shape & wellbeing

Types of Breast Conserving Operations

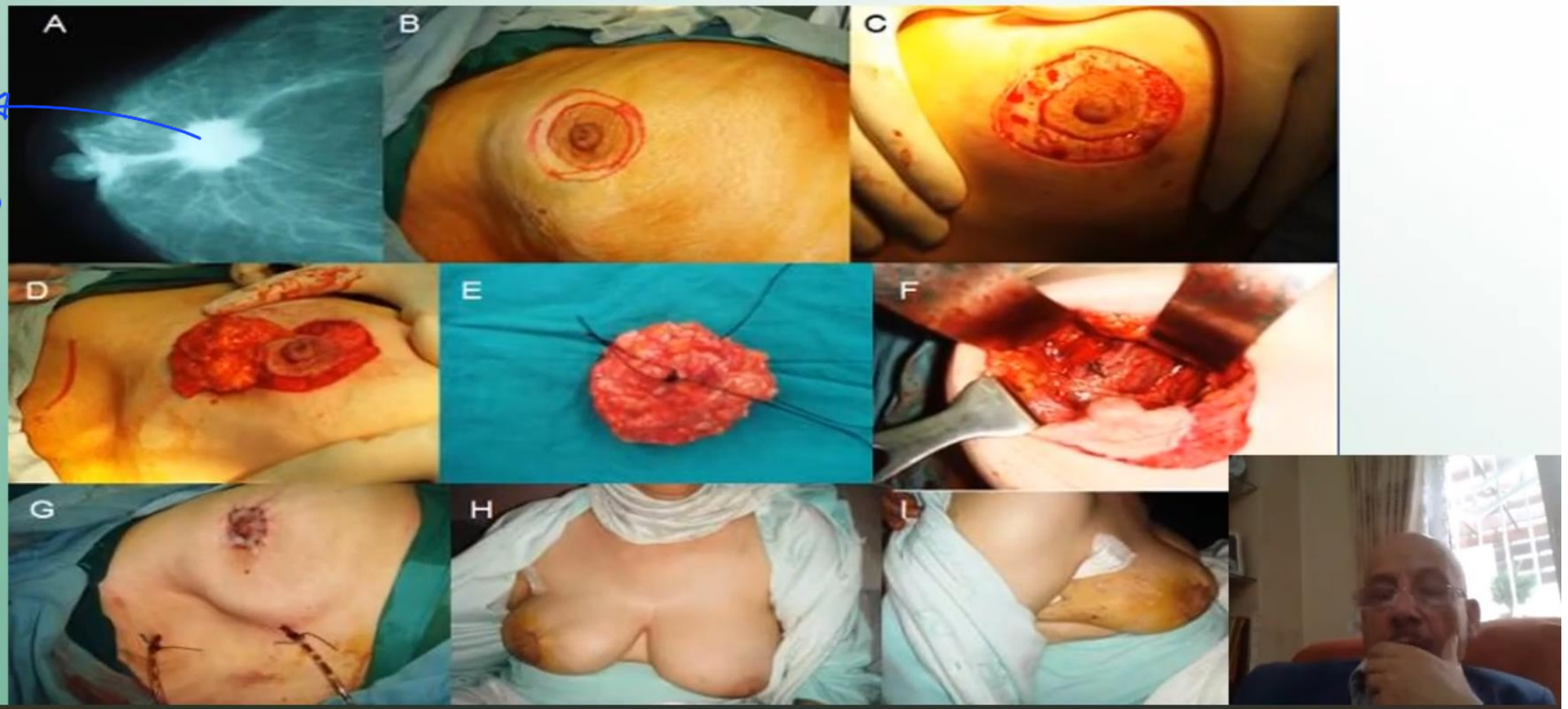
(leaves a scar & areola-nipple complex distortion)

- Segmental mastectomy, quadretectomy, Partial mastectomy



donut mastopexy lumpectomy → donut Shaped removal of dermis around nipple leaving deep dermis in place then remove tumor then gather surrounding skin & suture it to areola

Central tumor with a tail to the nipple



Wide local exision then local flap (from lateral side of Chest wall)

Sentinel LN biopsy : inject patent blue dye subareolar or around tumor, after 10 mins we take sentinel LN & examine it , if positive we complete axillary dissection (to avoid unnecessary axillary dissection which caries long term morbidity especially if pt had radiotherapy after surgery → edema, hyposthesia, Shoulder morbidity)