



SURGICAL TECHNIQUES IN BREAST CANCER THERAPY

Author: Dr. Mehdi Hashemi
General Surgeon

Embryology & Anomaly of the Breast



The 5th or 6th week of fetal → 2 milk lines

- Polymastia (Accessory breasts)
- Polythelia (accessory nipples)
- Amastia (Absence of the breast)
- Poland's syndrome

consists of hypoplasia or complete absence of the breast, costal cartilage and rib defects, hypoplasia of the subcutaneous tissues of the chest wall, and brachysyndactyly

- Symmastia (webbing between the breasts)



Breast Developing



An ingrowth of ectoderm in the mesenchyme → primary bud → 15 to 20 secondary buds → Epithelial cords

Major (lactiferous) ducts → open into a shallow mammary pit.

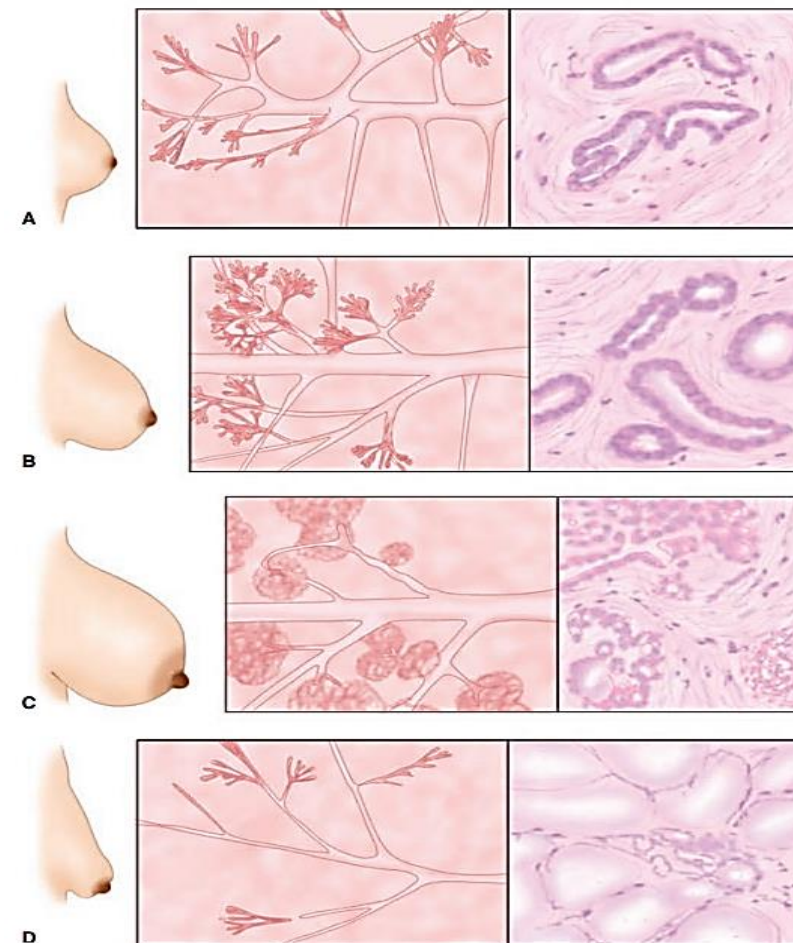
During infancy, a proliferation of mesenchyme : mammary pit → nipple

Puberty: estrogen & progesterone

→ Enlargement & Proliferation

→ epithelial and connective tissue

Pregnancy: completely developed

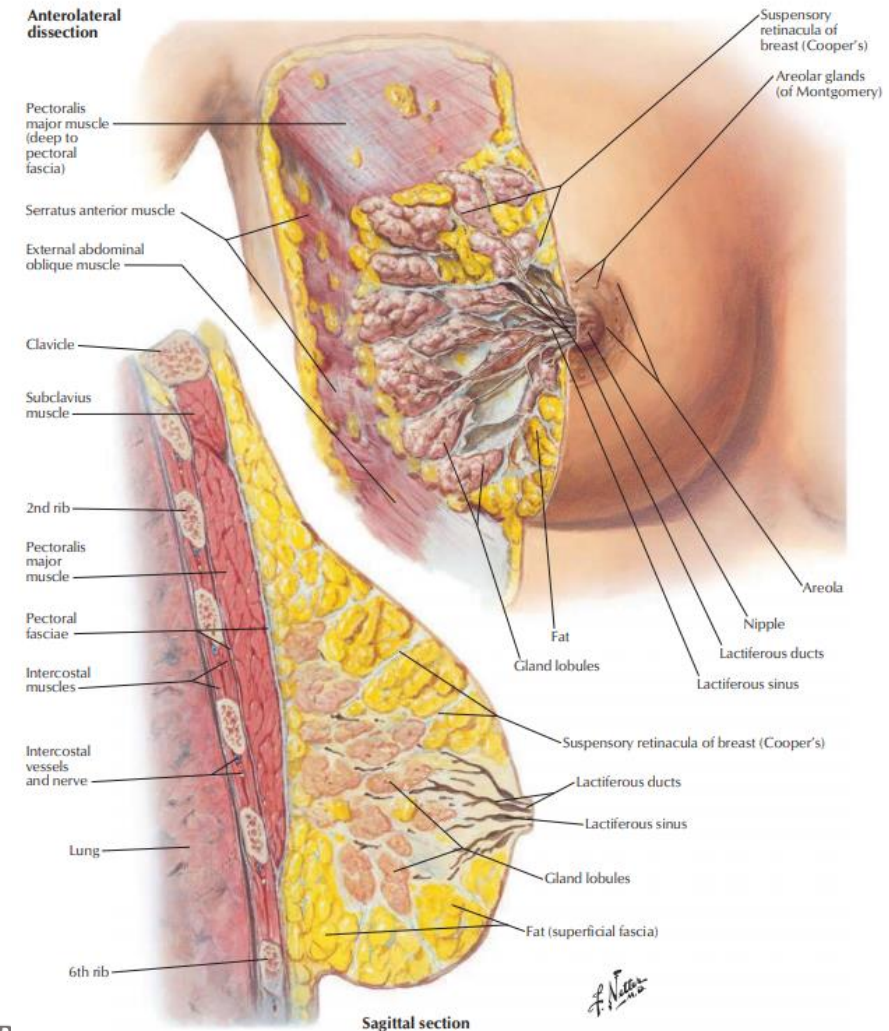


Surface Anatomy of Breast

- ❑ **Upper Border:** 2nd or 3rd rib
- ❑ **Lower Border:** IMF (6th or 7th rib)
- ❑ **Lateral Border:** anterior axillary line
- ❑ **Medial Border:** sternum
- ❑ **Deep or Posterior Border:**
fascia of the pectoralis major, serratus anterior, and external oblique abdominal muscles, and the upper extent of the rectus sheath
- ❑ **axillary tail of Spence:** extends laterally across the anterior axillary fold.

(Cooper's suspensory ligaments): Fibrous bands of connective tissue

- perpendicularly into the dermis
- provide structural support



Nipple-Areola Complex(NAC)

The areola contains :

- ❖ **sebaceous glands**
- ❖ **sweat glands**
- ❖ **accessory glands → elevations on the surface of the areola (Montgomery's tubercles)**

Smooth muscle bundle fibers: responsible for the nipple erection

- ✓ **Dense connective tissue: circumferentially**
- ✓ **Along the major ducts: longitudinally**

Sensory nerve endings and Meissner's corpuscles: dermal papilla at the tip of the nipple

Arterial Supply

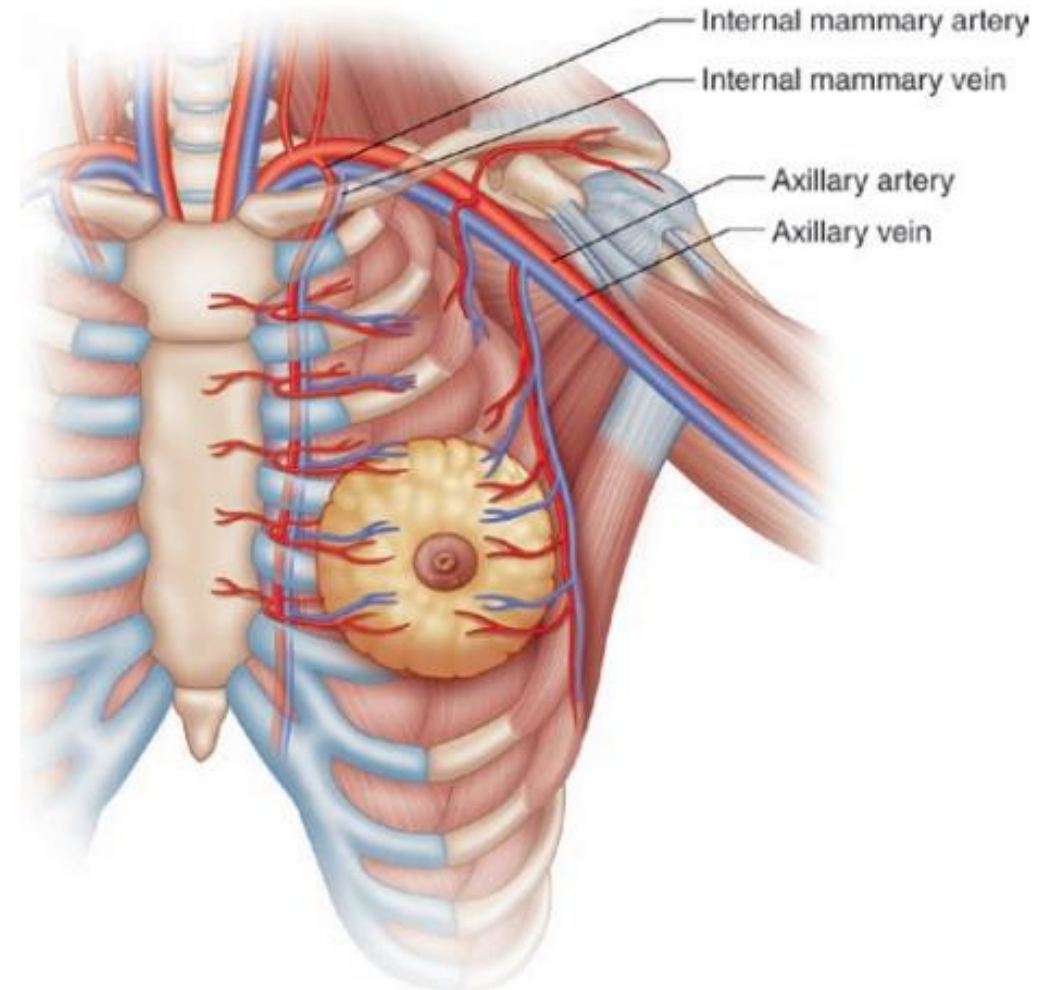
- (a) perforating branches of the internal mammary artery
- (b) lateral branches of the posterior intercostal arteries
- (c) branches from the axillary artery, including the highest thoracic, lateral thoracic, and pectoral branches of the thoracoacromial artery

Veins of the breast

- (a) perforating branches of the internal thoracic vein,
- (b) perforating branches of the posterior intercostal veins,
- (c) tributaries of the axillary vein

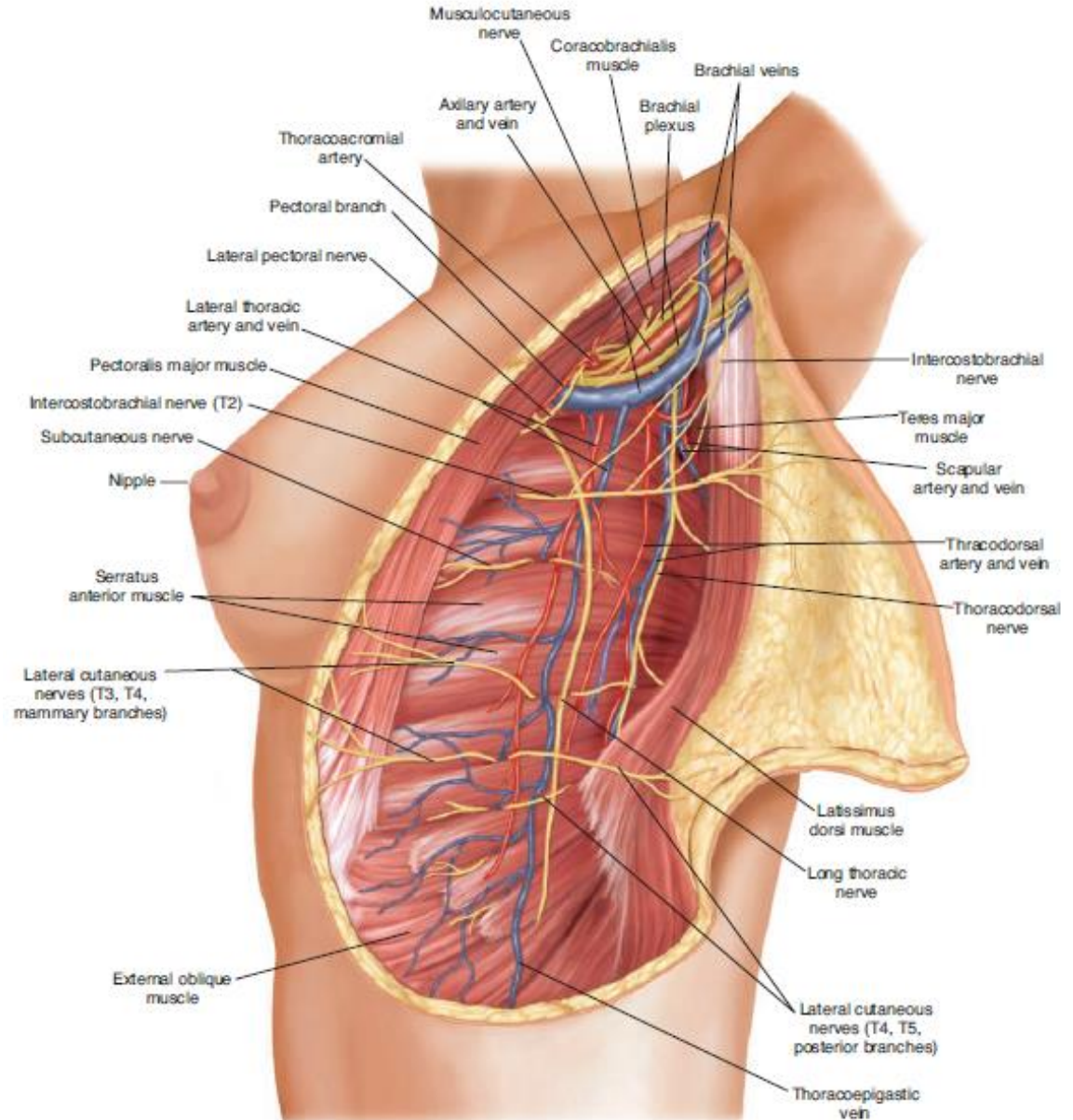
* Batson's vertebral venous plexus

which invests the vertebrae and extends from the base of the skull to the sacrum, may provide a route for breast cancer metastases to the vertebrae, skull, pelvic bones, and central nervous system



Innervation of Breast

- 3rd to 6th intercostal nerves → Lateral cutaneous branches (lateral mammary branches) : innervation of the breast and of the anterolateral chest wall.
- That arise from the cervical plexus → Cutaneous branches (specifically the anterior branches of the supraclavicular nerve) : limited area of the upper portion of the breast
- The 2nd intercostal nerve → lateral cutaneous branch (intercostobrachial nerve)



Lymphatic Drainage of the Breast (3 level & 6 Group)

Level I : lateral & below the lower border of the pectoralis minor

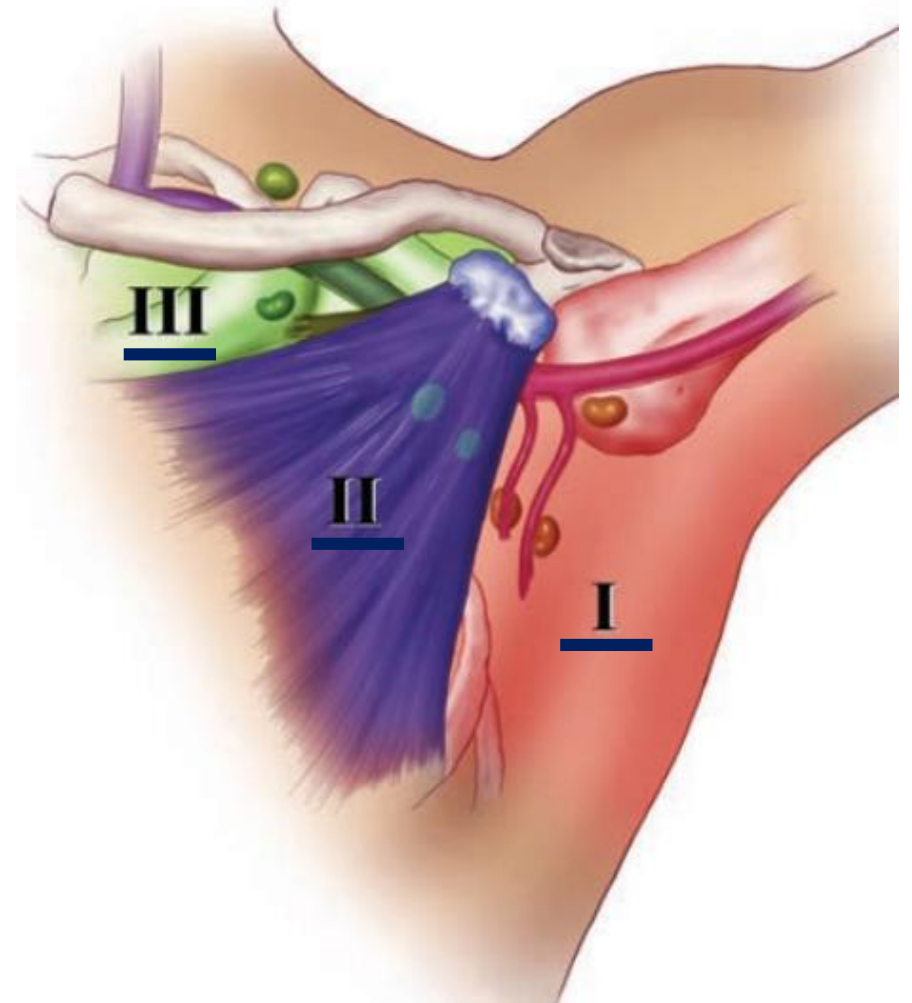
- (a) The axillary vein group (lateral)
- (b) The external mammary group (anterior or pectoral group)
- (c) The scapular group (posterior or subscapular)

level II: superficial or deep to the pectoralis minor

- (d) The central group
- (e) The interpectoral group (Rotter's lymph nodes)

level III: medial & above the upper border of the pectoralis minor

- (f) The subclavicular group (apical)



Risk Reducing Breast Surgery



Identifying hereditary risk factors and strategies for BRCA1 and BRCA2 mutation carriers:

- (a) obtaining a complete, multigenerational family history
- (b) assessing the appropriateness of genetic testing for a particular patient
- (c) counseling the patient (10% risk of breast cancer)
- (d) interpreting the results of testing

(without mastectomy → postmenopausal women HRT not done)

2. Risk-reducing mastectomy → added almost 3 years of life,

➤ lifetime risk of 85% prophylactic mastectomy → added >5 years of life
If not done → TVS & CA125 yearly

3. Intensive surveillance for breast and ovarian cancer:

breast examination every 6 months from 25 years old

mammography every 12 months from 25 years old

MRI yearly

4. Chemoprevention:

Tamoxifen in BRCA2

Incidence of sporadic, familial, and hereditary breast cancer

Sporadic breast cancer	65%–75%
Familial breast cancer	20%–30%
Hereditary breast cancer	5%–10%
<i>BRCA1</i>^a	45%
<i>BRCA2</i>	35%
p53^a (Li-Fraumeni syndrome)	1%
STK11/LKB1^a (Peutz-Jeghers syndrome)	<1%
PTEN^a (Cowden disease)	<1%
MSH2/MLH1^a (Muir-Torre syndrome)	<1%
ATM^a (Ataxia-telangiectasia)	<1%
Unknown	20%

Cancer risk associated with benign breast disorders and in situ carcinoma of the breast

Classification of benign breast disorders

Nonproliferative disorders of the breast

Cysts and apocrine metaplasia
Duct ectasia
Mild ductal epithelial hyperplasia
Calcifications
Fibroadenoma and related lesions

Proliferative breast disorders without atypia

Sclerosing adenosis
Radial and complex sclerosing lesions
Ductal epithelial hyperplasia
Intraductal papillomas

Atypical proliferative lesions

Atypical lobular hyperplasia
Atypical ductal hyperplasia

ABNORMALITY	RELATIVE RISK
Nonproliferative lesions of the breast	No increased risk
Sclerosing adenosis	No increased risk
Intraductal papilloma	No increased risk
Florid hyperplasia	1.5 to 2-fold
Atypical lobular hyperplasia	4-fold
Atypical ductal hyperplasia	4-fold
Ductal involvement by cells of atypical ductal hyperplasia	7-fold
Lobular carcinoma in situ	10-fold
Ductal carcinoma in situ	10-fold

LCIS & DCIS

LCIS:

1. observation with screening
2. chemoprevention
3. risk-reducing bilateral mastectomy

DCIS:

limited disease: lumpectomy + RT

Extensive disease (>4 cm of disease or disease in more than one quadrant) :mastectomy

DCIS & ER-positive: tamoxifen



Salient characteristics of in situ ductal (DCIS) and lobular (LCIS) carcinoma of the breast

	LCIS	DCIS
Age (years)	44–47	54–58
Incidence ^a	2%–5%	5%–10%
Clinical signs	None	Mass, pain, nipple discharge
Mammographic signs	None	Microcalcifications
Premenopausal	2/3	1/3
Incidence of synchronous invasive carcinoma	5%	2%–46%
Multicentricity	60%–90%	40%–80%
Bilaterality	50%–70%	10%–20%
Axillary metastasis	1%	1%–2%
Subsequent carcinomas:		
Incidence	25%–35%	25%–70%
Laterality	Bilateral	Ipsilateral
Interval to diagnosis	15–20 y	5–10 y
Histologic type	Ductal	Ductal

1. **Paget's disease of the nipple**
2. **Invasive ductal carcinoma—Adenocarcinoma with productive fibrosis (scirrhous, simplex, NST), 80%**
3. **Medullary carcinoma, 4%**
4. **Mucinous (colloid) carcinoma, 2%**
5. **Papillary carcinoma, 2%**
6. **Tubular carcinoma, 2%**
7. **Invasive lobular carcinoma, 10%**
8. **Rare cancers (adenoid cystic, squamous cell, apocrine)**

Diagnosis of Breast Cancer

In ~30% of cases, the woman discovers a lump in her breast
other signs and symptoms of breast cancer include:

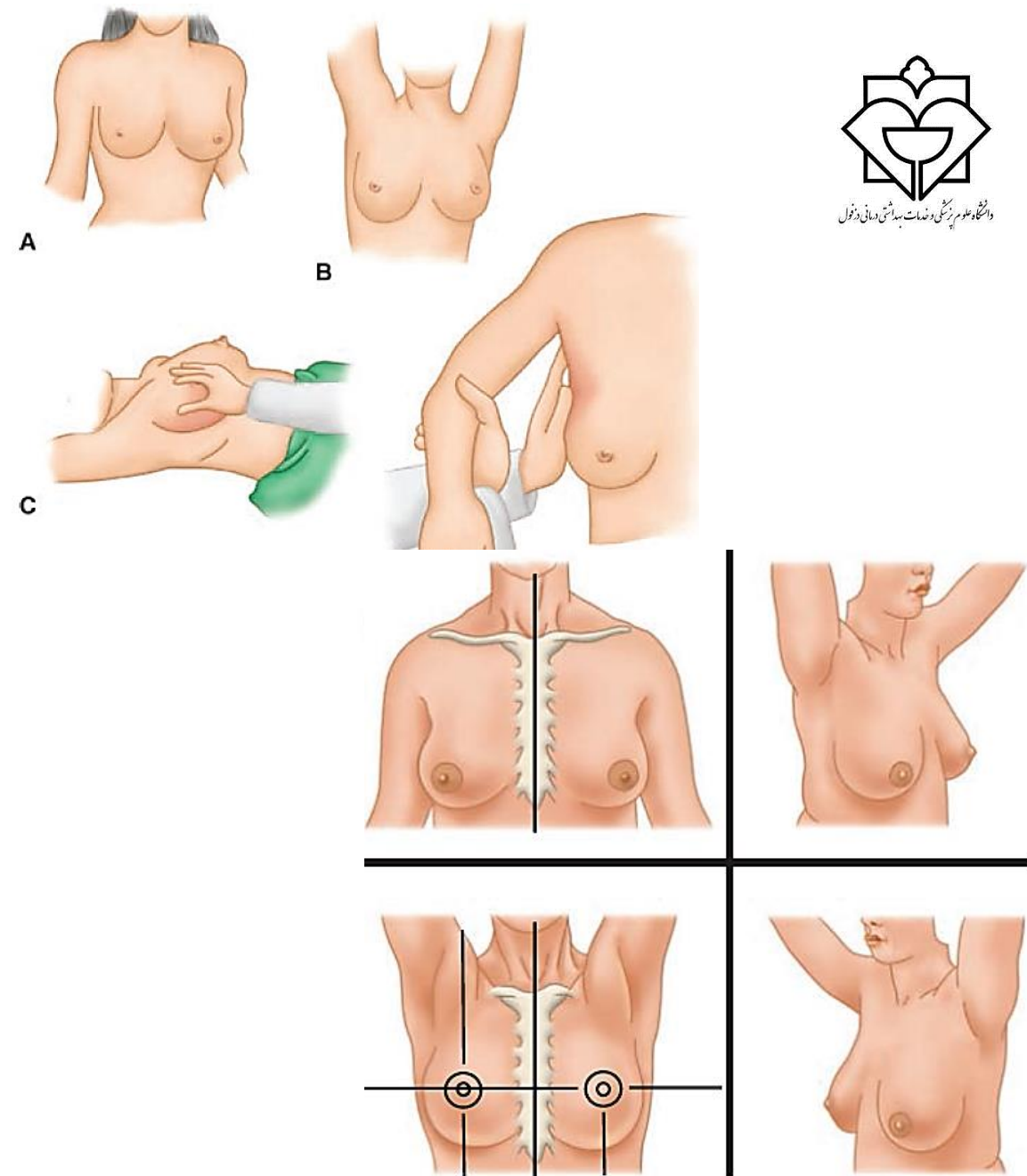
- (a) breast enlargement or asymmetry;
- (b) nipple changes, retraction, or discharge;
- (c) ulceration or erythema of the skin of the breast;
- (d) an axillary mass;
- (e) musculoskeletal discomfort.

- 50% of women presenting with breast complaints have no physical signs of breast pathology.
- Breast pain usually is associated with benign disease.

Inspection

Symmetry, size, and shape of the breast are recorded, as well as any evidence of edema (peau d'orange), nipple or skin retraction, or erythema.

Palpation



Imaging Techniques



Mammography

Conventional mammography delivers a radiation dose of 0.1 cGy per study.

By comparison, chest radiography delivers 25% of this dose.

Screening mammography:

CC: medial aspect of the breast and permits greater breast compression

Ductography

MLO: The greatest volume of breast tissue, including the upper outer quadrant and the axillary tail of Spence

The primary indication for ductography is nipple discharge, particularly when the fluid contains blood

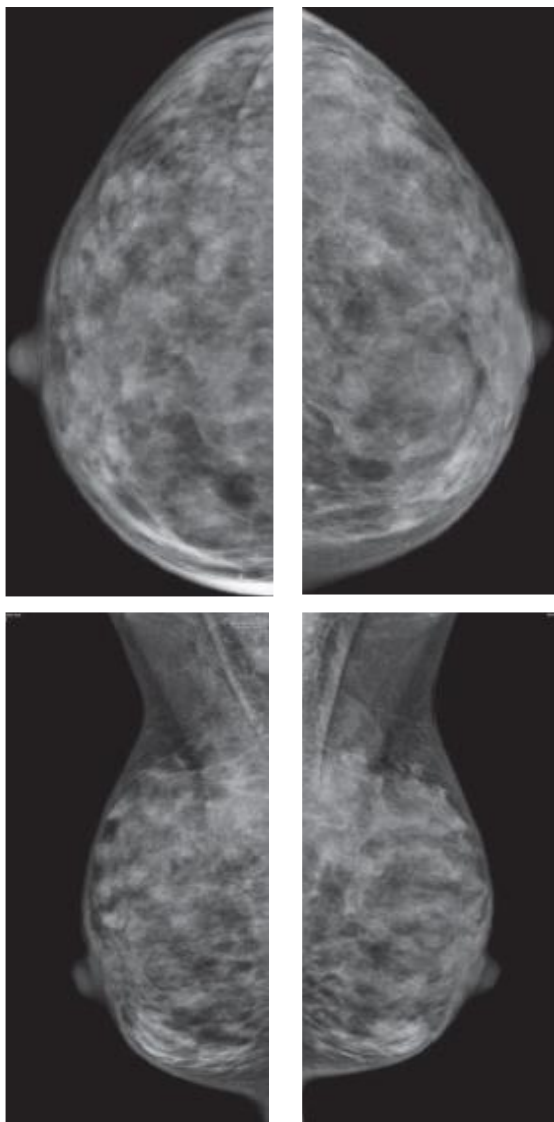
DIAGNOSTIC mammography: CC & MLO & 90° lateral and spot compression views

Intraductal papilloma's are seen as small filling defects surrounded by contrast media Cancers may appear

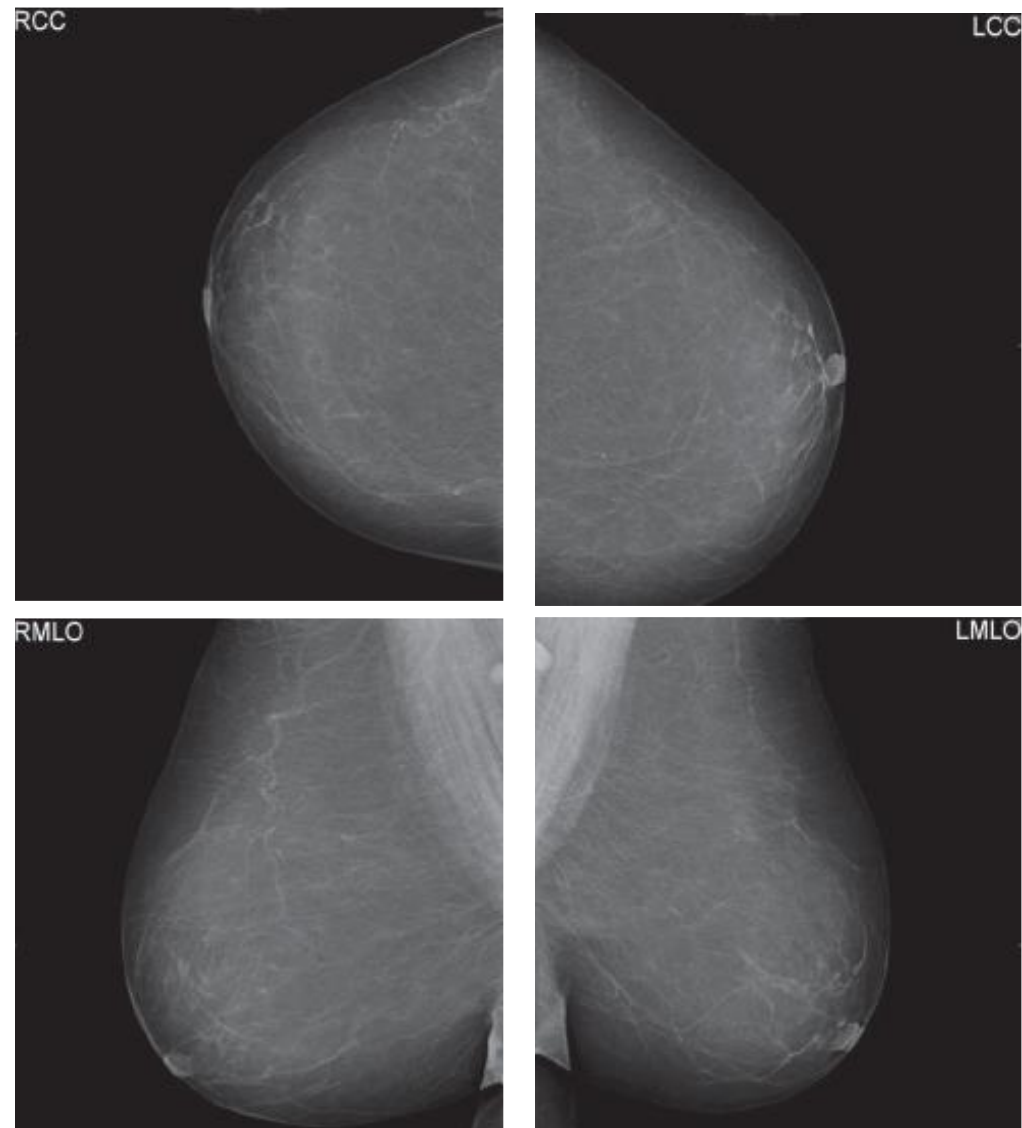
Contrast-enhanced digital mammography (CEDM)

as irregular masses or as multiple intraluminal filling defects

Mammography also is used to guide interventional procedures, including needle localization and needle biopsy

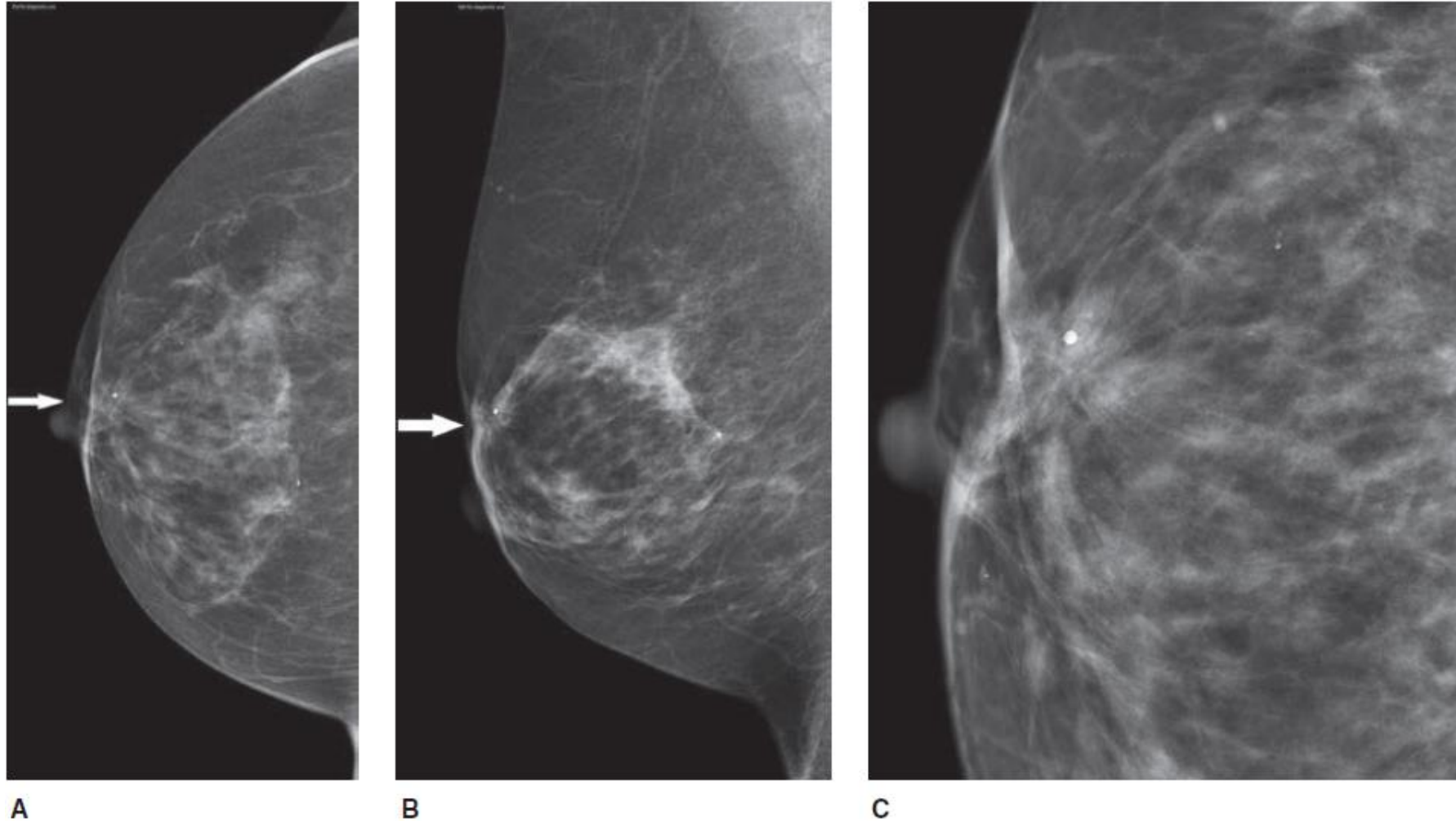


***Mammogram of a premenopausal breast
with a dense fibroglandular pattern.***

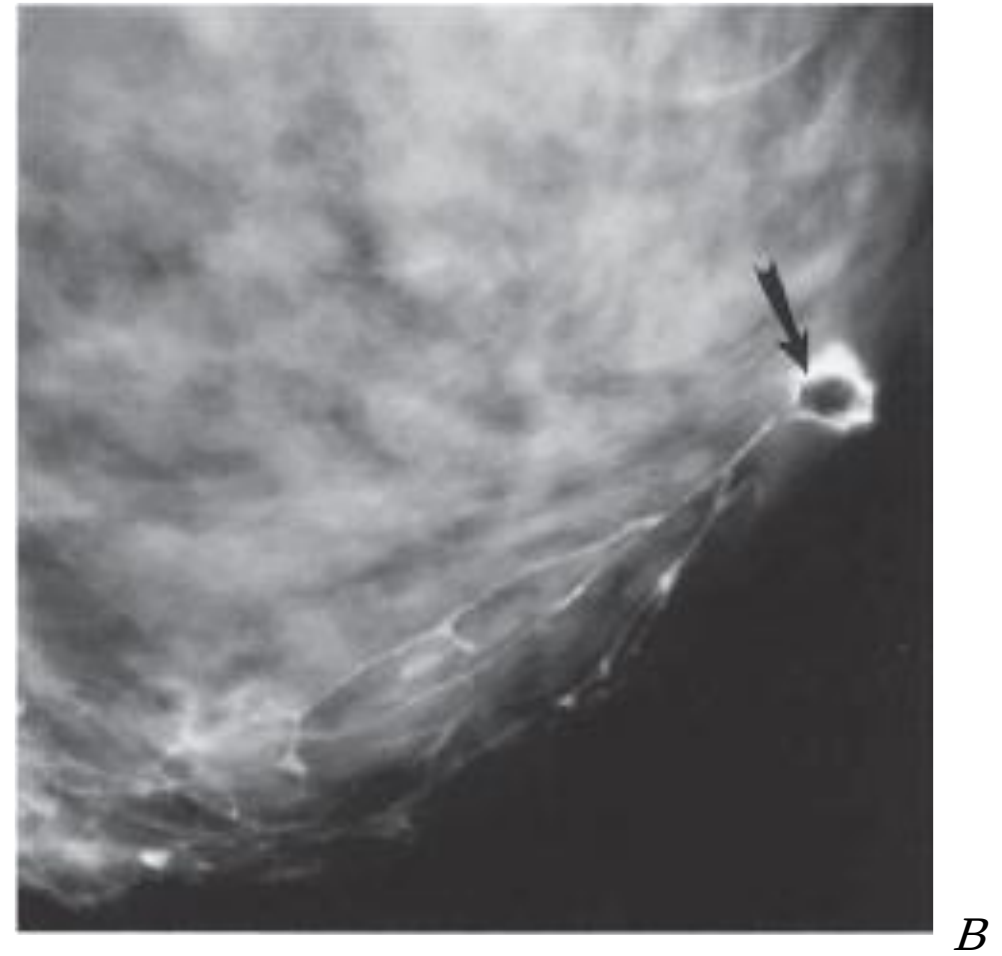
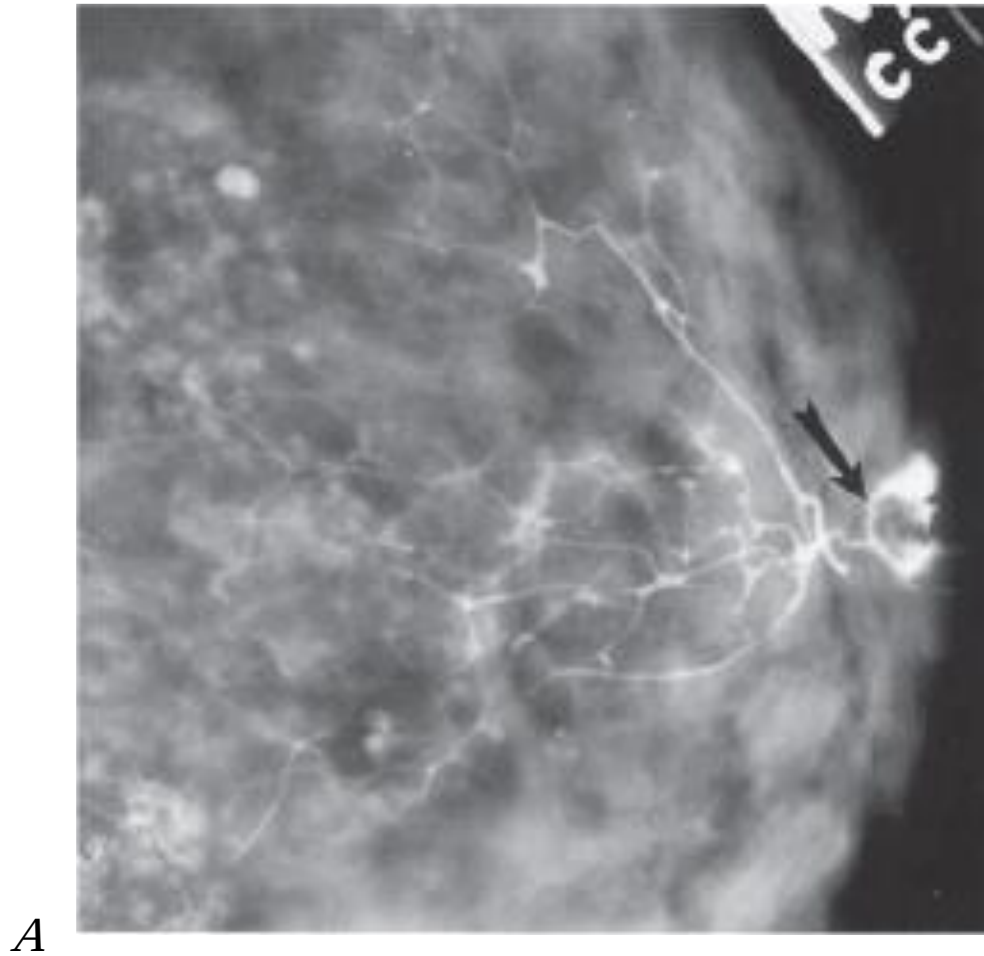


***Mammogram of a postmenopausal breast
with a sparse fibroglandular pattern***

Mammogram revealing a small, spiculated mass in the right breast



- A. A small, spiculated mass is seen in the right breast with skin tethering (CC view).***
- B. Mass seen on oblique view of the right breast.***
- C. Spot compression mammography view of the cancer seen in A and B. The spiculated margins of the cancer are accentuated by compression.***



Ductogram. Craniocaudal (A) and mediolateral oblique (B) mammographic views demonstrate a mass (arrows) posterior to the nipple and outlined by contrast, which also fills the proximal ductal structures.

Ultrasonography



❖ in frequency for breast imaging after mammography

- **Breast cysts:** well circumscribed; smooth margins; an echo-free center.
- **Benign breast masses:** smooth contours; round or oval shapes; weak internal echoes; well-defined margins.
- **Breast cancer:** irregular walls; smooth margins with acoustic enhancement

Guide

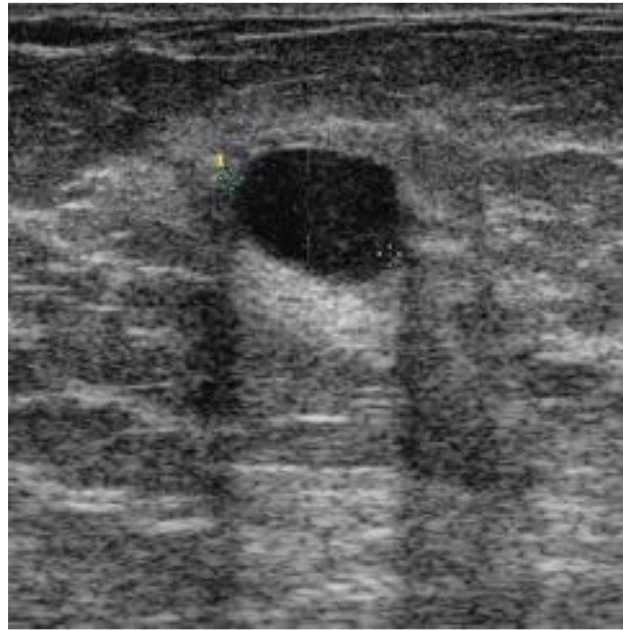
1. fine-needle aspiration biopsy
2. core-needle biopsy
3. needle localization of breast lesions

The sensitivity : 35% to 82% & specificity : from 73% to 97%

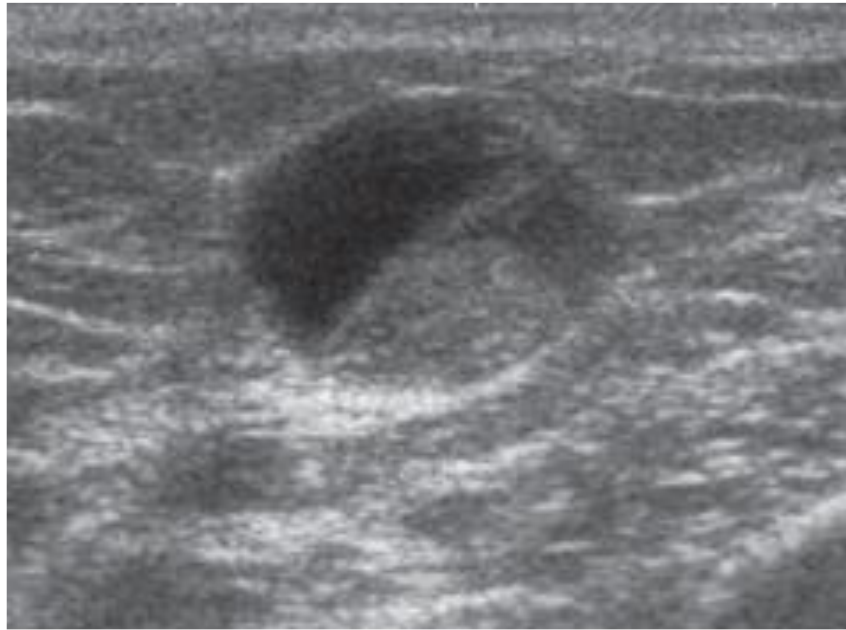
The malignant features of a lymph node:

- ✓ cortical thickening,
- ✓ change in shape of the node to more circular appearance,
- ✓ size larger than 10 mm,
- ✓ absence of a fatty hilum
- ✓ hypoechoic internal echoes

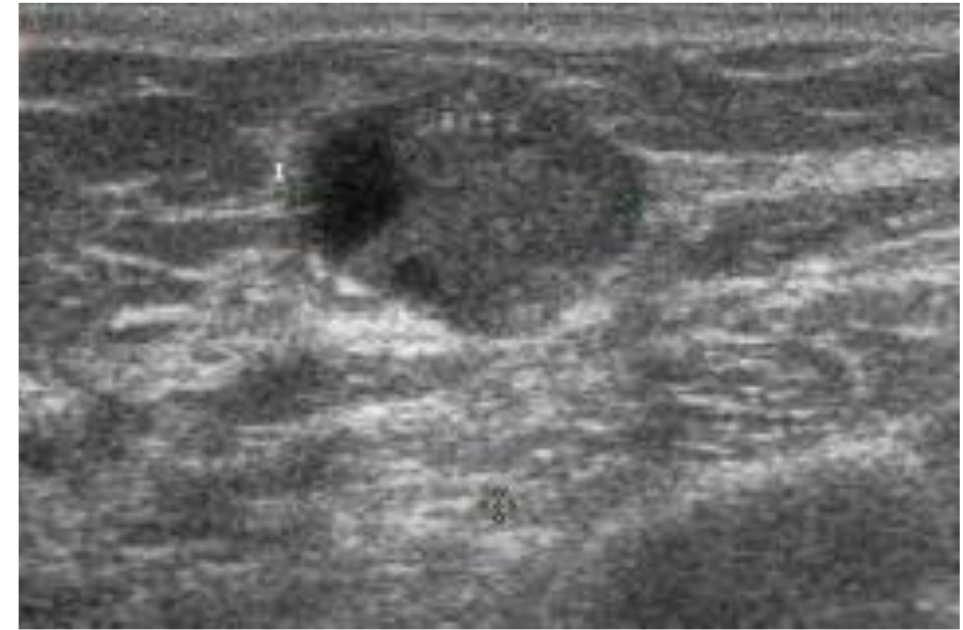
Breast cyst



A



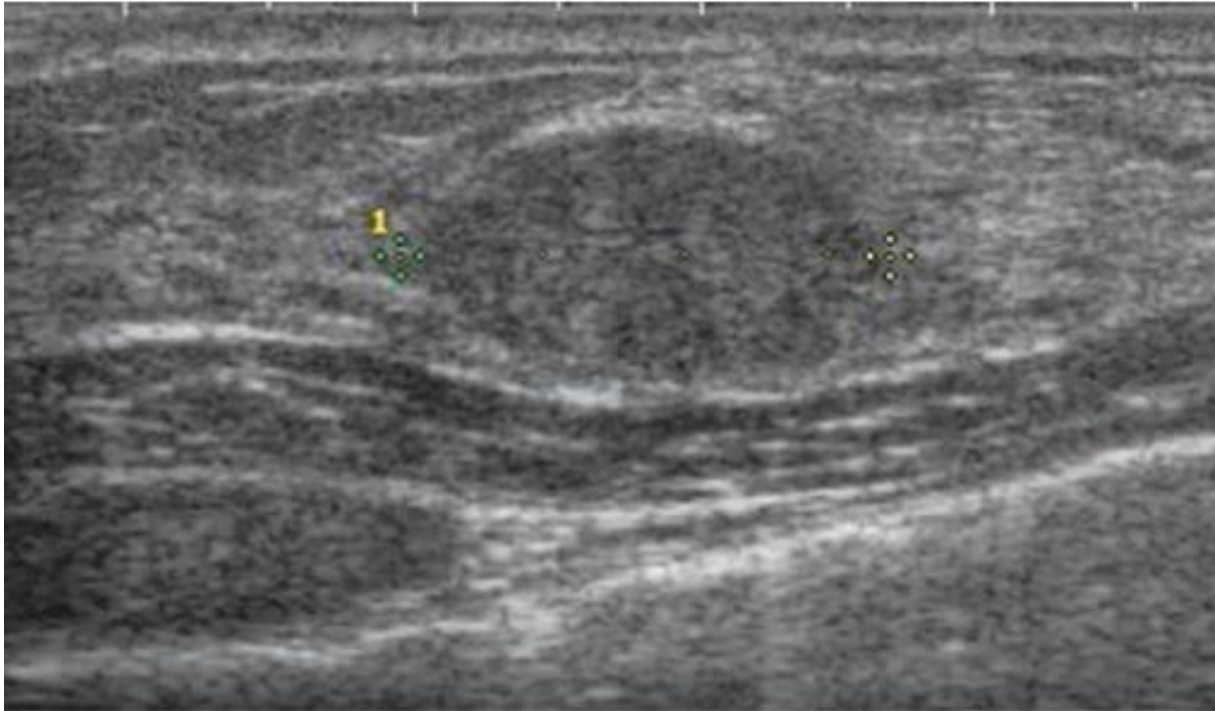
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C

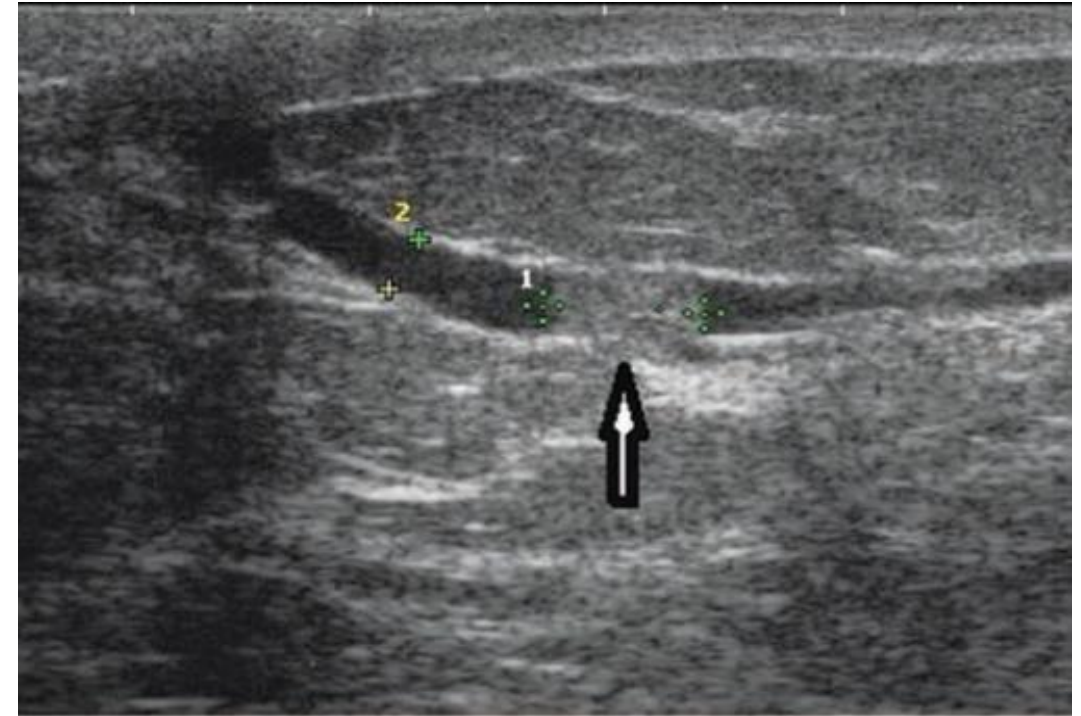
- A. Simple cyst. Ultrasound image of the mass shows it to be anechoic with a well-defined back wall, characteristic of a cyst.*
- B. Complex solid and cystic mass.*
- C. Complex solid and cystic mass characteristic of intracystic papillary tumor.*

Ultrasonography images of benign breast tumors



A

.A. Fibroadenoma.



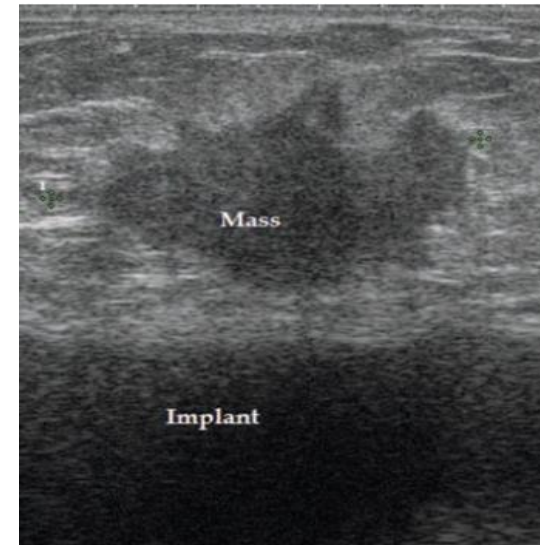
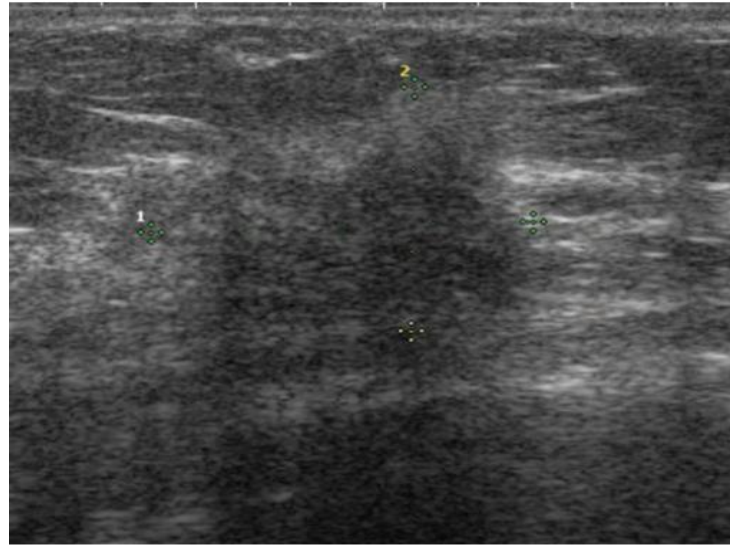
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B. Intraductal papilloma (see arrow)

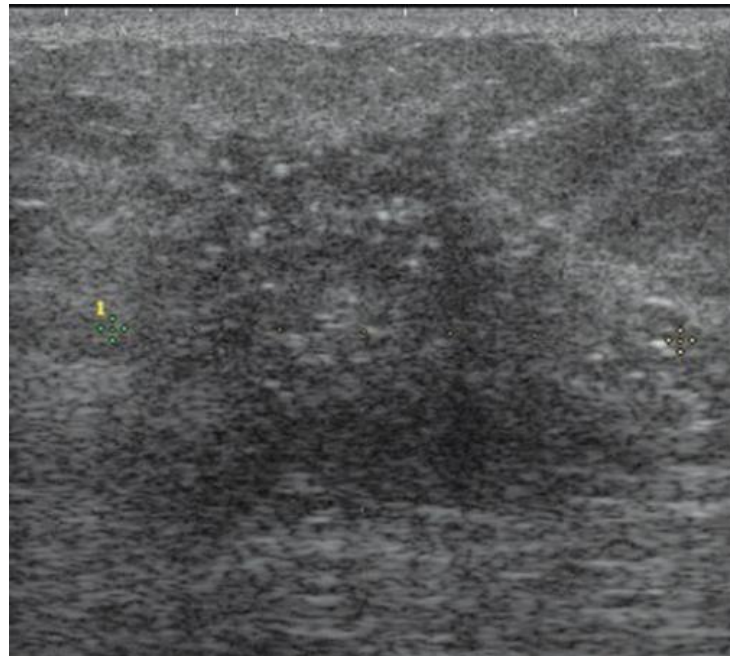
Ultrasonography images of malignant breast lesions



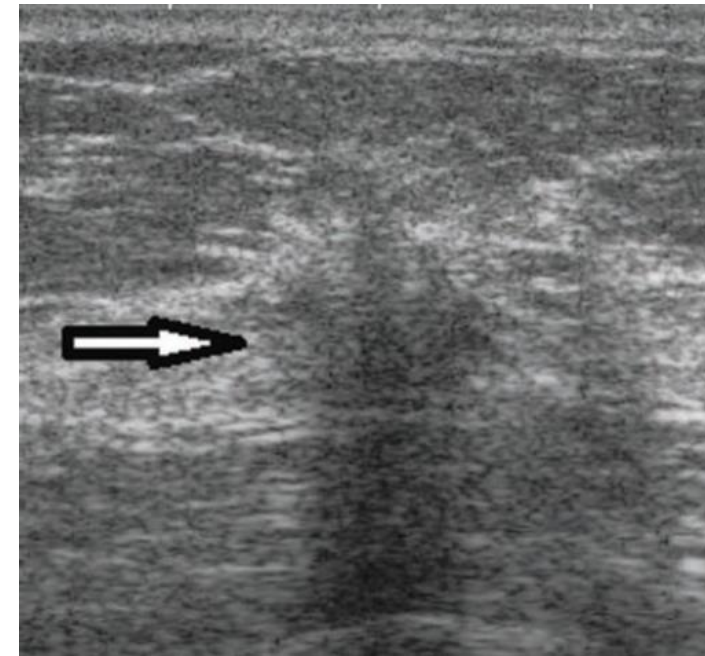
*Ultrasound breast
cancer with
calcification.*



25 mm irregular mass.



*Ultrasound 30 mm mass
anterior to an implant*

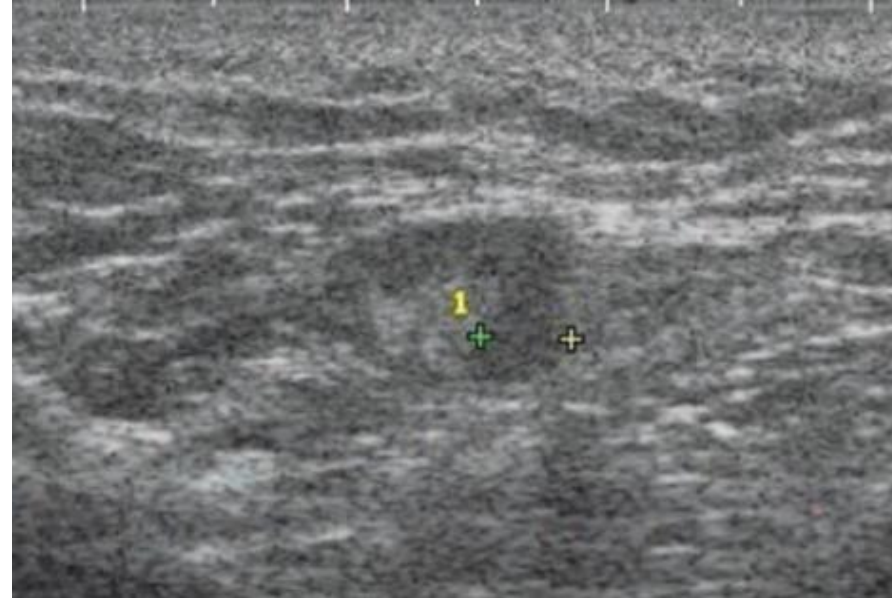


*Ultrasound
shows a 9 mm
spiculated mass
(see arrow) with
attenuation*

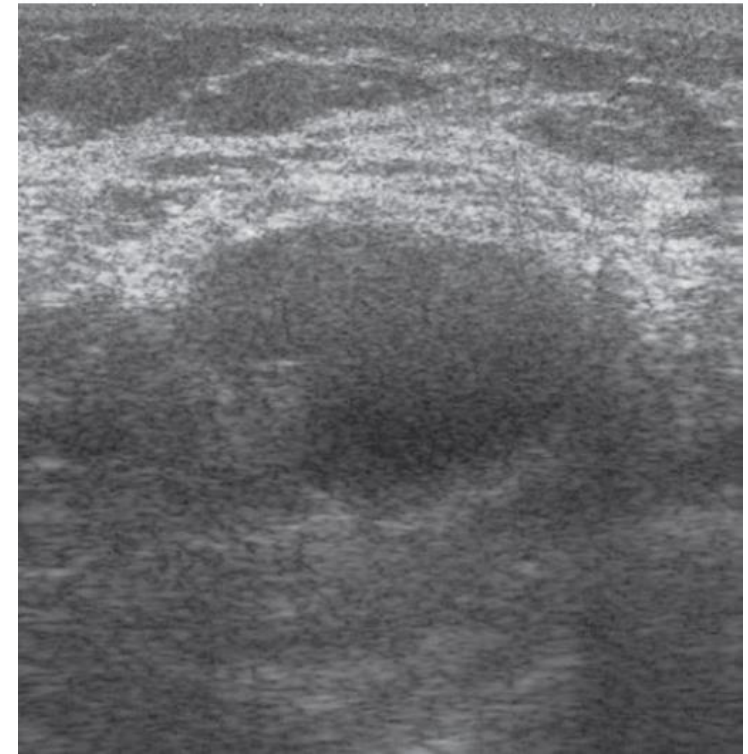
Ultrasonography images of lymph nodes



Normal axillary lymph node (see arrows)



Indeterminate axillary lymph node



Malignant appearing axillary lymph node

MRI

If mammography and physical examination are negative →

probability of a breast cancer being diagnosed by MRI is extremely low

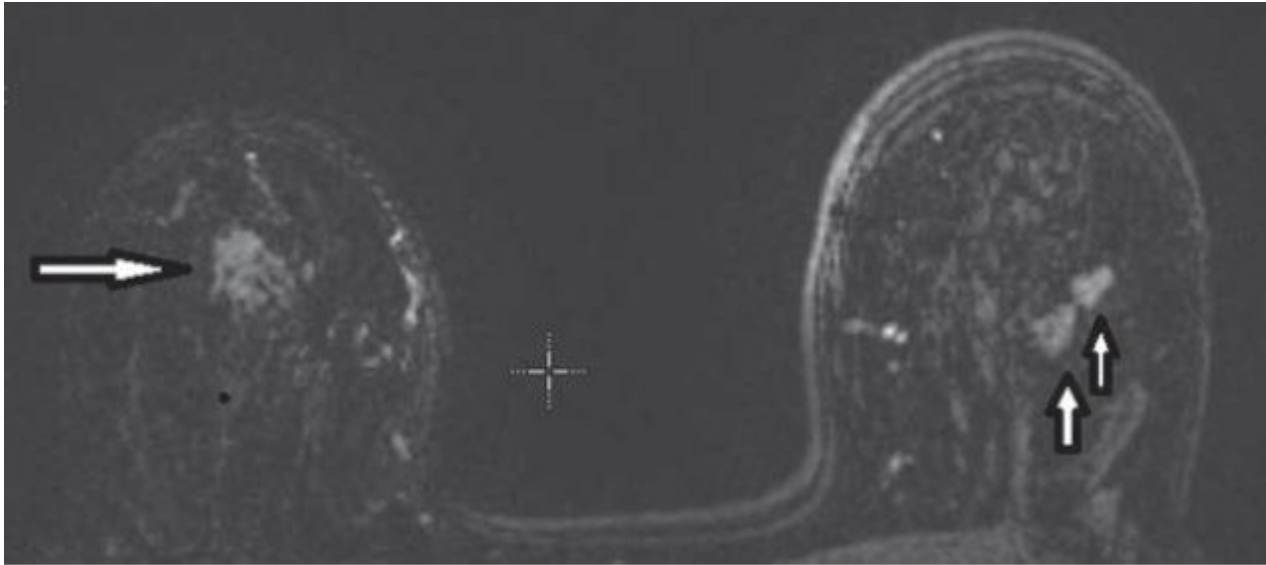
Is used to:

- Screening of high-risk women
- newly diagnosed breast cancer
- strong family history
- Who carry known genetic mutations
- contralateral breast in known breast cancer

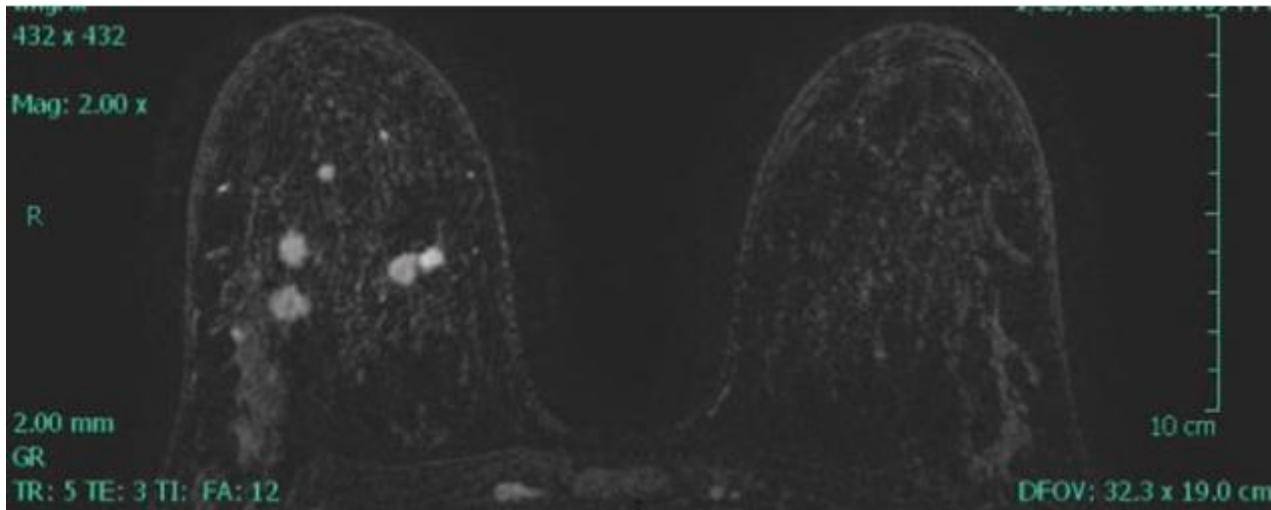
Some clinical scenarios where MRI may be useful include:

- ❖ presents with nodal metastasis from breast cancer without an identifiable primary tumor
- ❖ to assess response to therapy in the setting of neoadjuvant systemic treatment
- ❖ to select patients for partial breast irradiation techniques
- ❖ evaluation of the treated breast for tumor recurrence





MRI examination revealing contralateral breast cancer (see arrows) in a patient diagnosed with unilateral breast cancer on mammography (two arrows).



MRI imaging of the breast revealing multifocal tumors not detected with standard breast imaging.

Breast Biopsy

1. FNA (A 1.5-in, 22-gauge needle attached to a 10-mL syringe)
2. Core Needle Biopsy (14-gauge)
3. Vacuum-assisted core biopsy devices (with 8–10 gauge needles):
are commonly utilized with image guidance where between 4 and 12 samples can be acquired at different positions within a mass, area of architectural distortion or micro calcifications.
4. Incisional Biopsy
5. Excisional Biopsy

Nonpalpable Lesions

Image-guided breast biopsy

The combination of diagnostic mammography, ultrasound or stereotactic localization, and fine-needle aspiration (FNA)

biopsy achieves almost 100% accuracy in the preoperative diagnosis of breast cancer

SURGICAL TECHNIQUES IN BREAST CANCER THERAPY



- **Excisional Biopsy With Needle Localization**
- **Sentinel Lymph Node Dissection**
- **Breast Conservation**
- **Mastectomy and Axillary Dissection**
- **Modified Radical Mastectomy**
- **Reconstruction of the Breast and Chest Wall**

Excisional Biopsy With Needle Localization



Excisional biopsy: complete removal of a breast lesion with a margin of normal-appearing breast tissue
excisional biopsy should be reserved for:

in which the needle biopsy results are discordant with the imaging findings or clinical examination

CNBx is the preferred diagnostic method:

- ✓ **single surgical procedure**
- ✓ **low complication rate**
- ✓ **minimal scarring**
- ✓ **lower cost**

Incision to access the lesion:

- 1. circumareolar incisions: (to access lesions that are subareolar or within a short distance of the NAC)**
- 2. in the upper half of the breast: curvilinear incisions (Radial incisions → displacement of NAC)**
- 3. in the lower half of the breast : Radial incisions (curvilinear incisions → displace the NAC downward)**

Excisional Biopsy With Needle Localization

After excision of a suspicious breast lesion



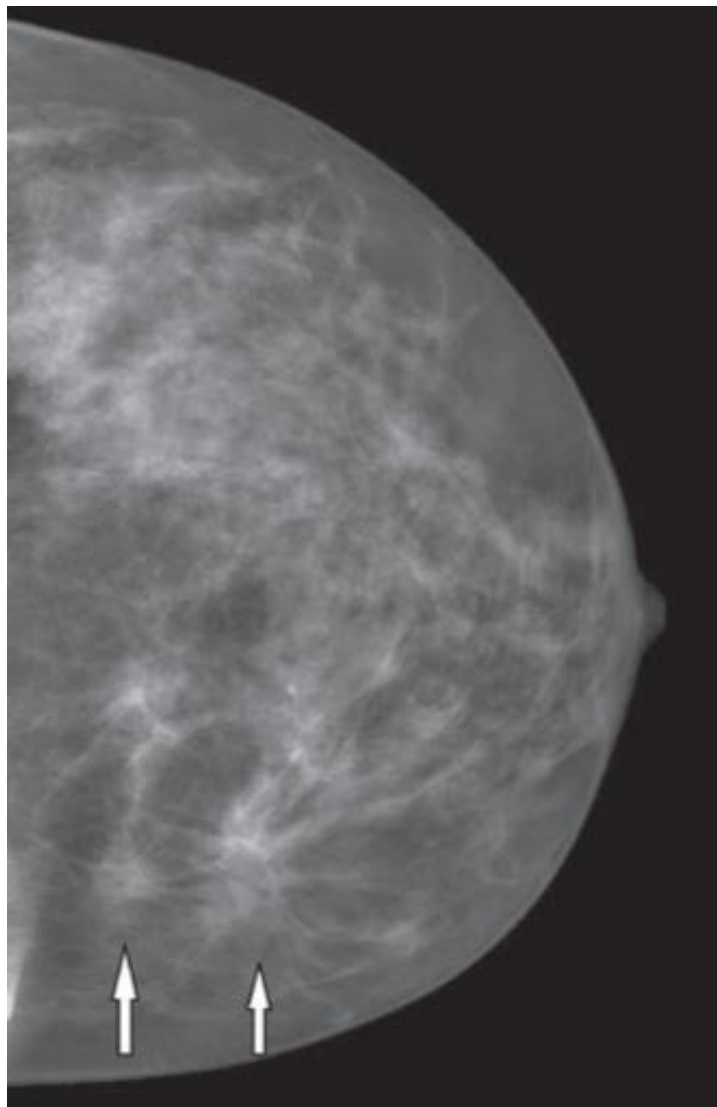
- 1) the specimen should be X-rayed to confirm that the lesion has been excised with appropriate margins.
- 2) The biopsy tissue specimen is orientated for the pathologist using sutures, clips, or dyes.
- 3) Additional margins (superior, inferior, medial, lateral, superficial, and deep) may be taken from the surgical bed if the specimen X-ray shows the lesion is close to one or more margins.
- 4) Some surgeons also take additional shavings from the margins as one approach to confirm complete excision of the suspicious lesion.
- 5) Electrocautery or absorbable ligatures are used to achieve wound hemostasis.
- 6) Cosmesis may be facilitated by approximation of the surgical defect using 3-0 absorbable sutures.
- 7) A running subcuticular closure of the skin using 4-0 or 5-0 absorbable monofilament sutures is performed.
- 8) Wound drainage is usually not required

Excisional Biopsy With Needle Localization

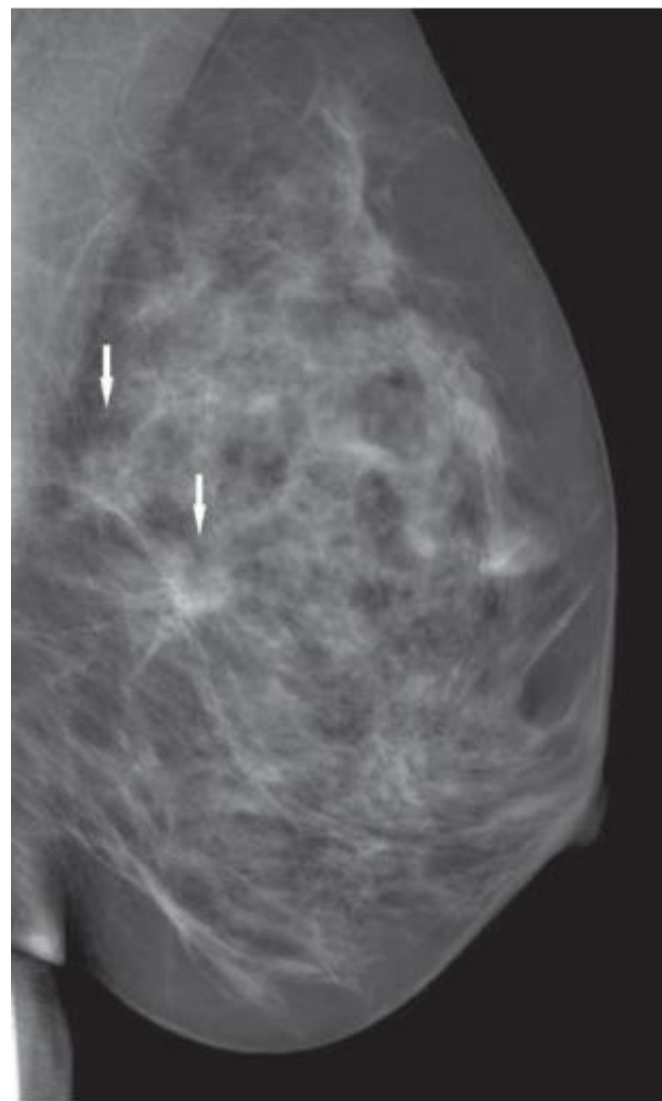
Excisional biopsy with needle or seed localization requires a preoperative visit to the mammography suite for placement of a localization wire or a radioactive or magnetic seed that can be detected intraoperatively with a handheld probe.

The lesion can also be targeted by sonography in the imaging suite or in the operating room

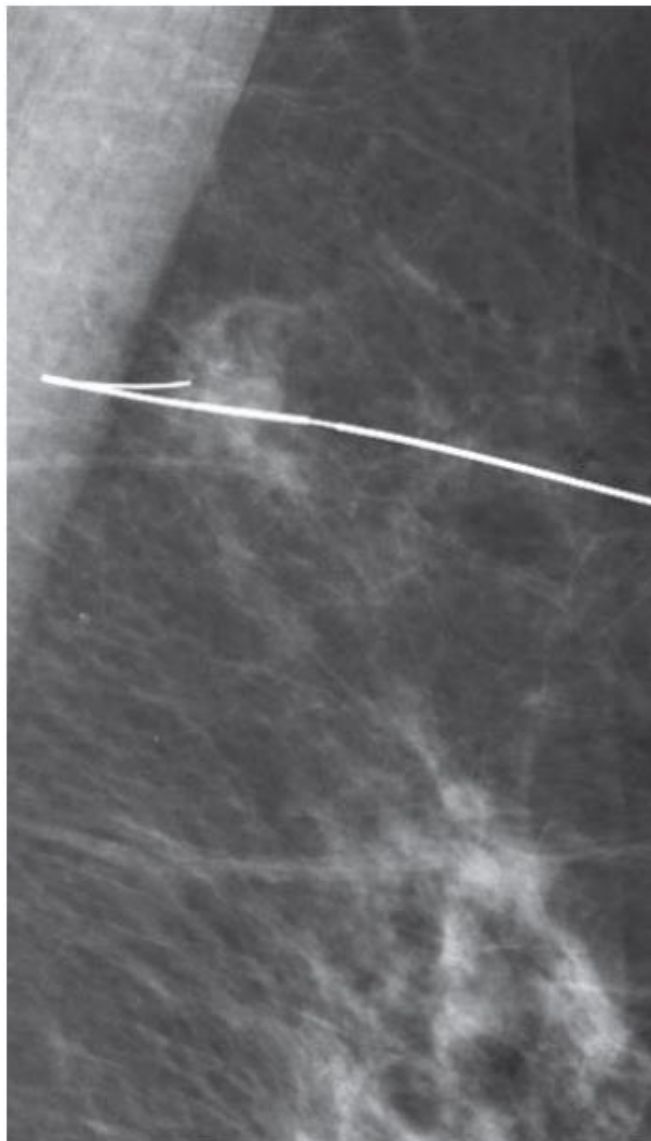
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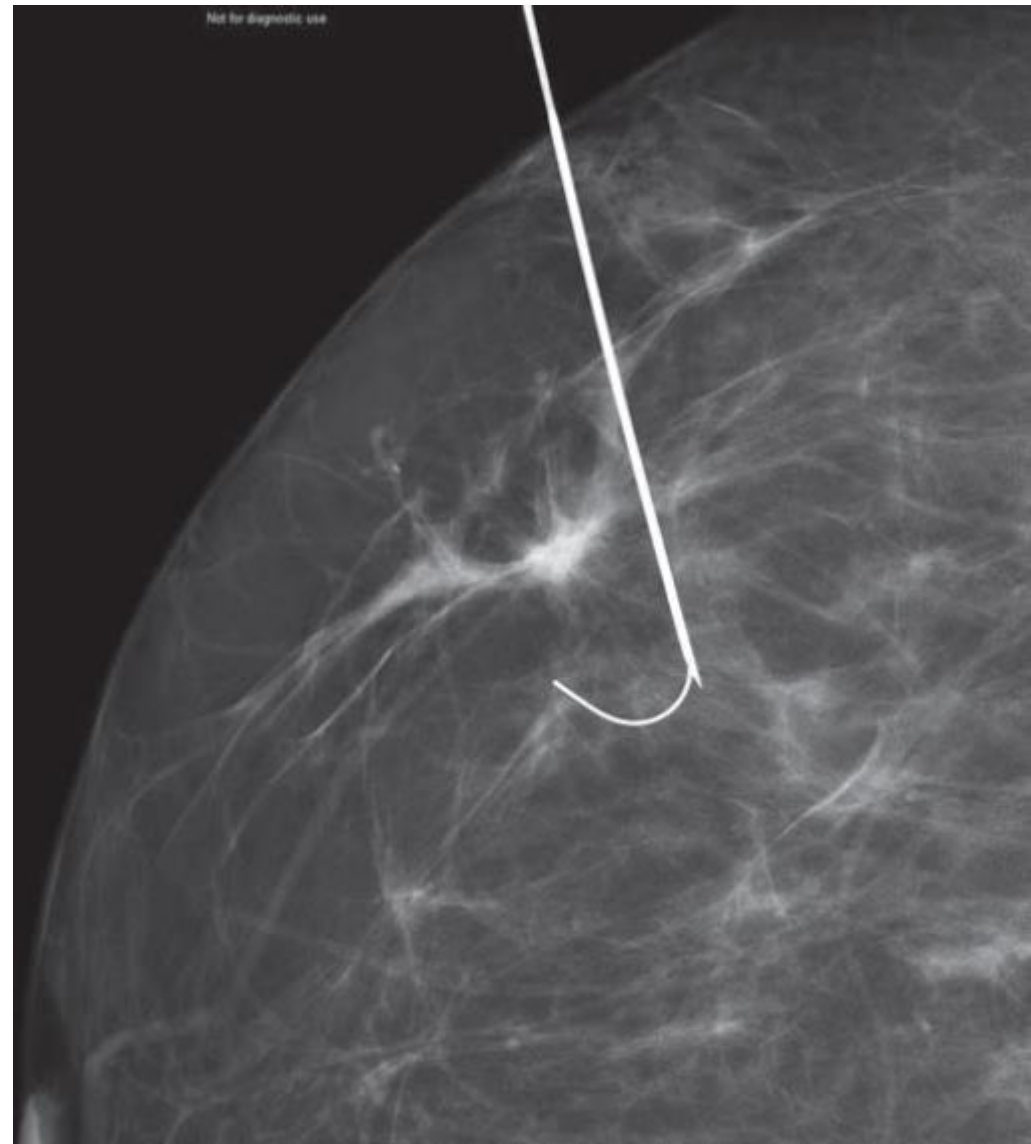
B



Lesion to be targeted for excisional biopsy. A. Craniocaudal view of the left breast demonstrating 2 lesions (arrows) to be targeted for needle localization and excision. B. Oblique view demonstrating target lesions.

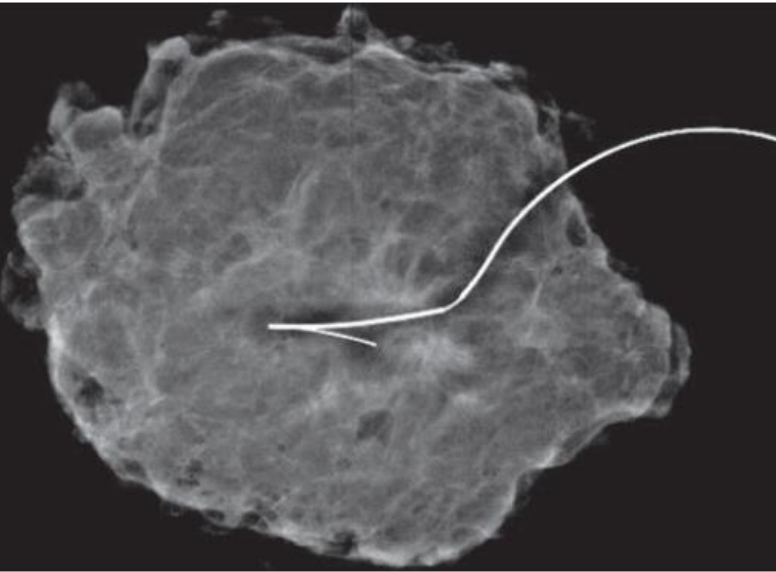


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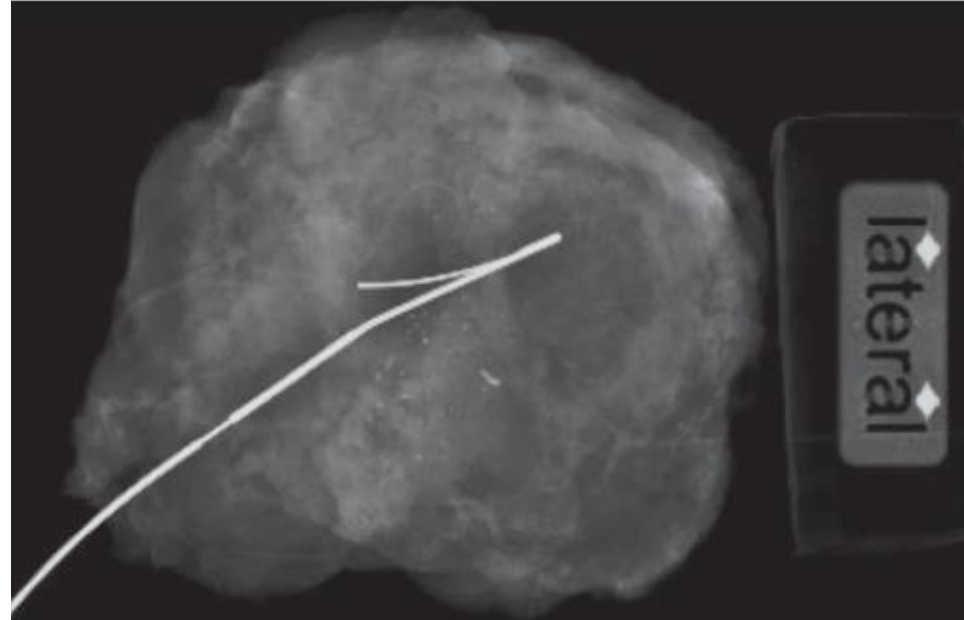


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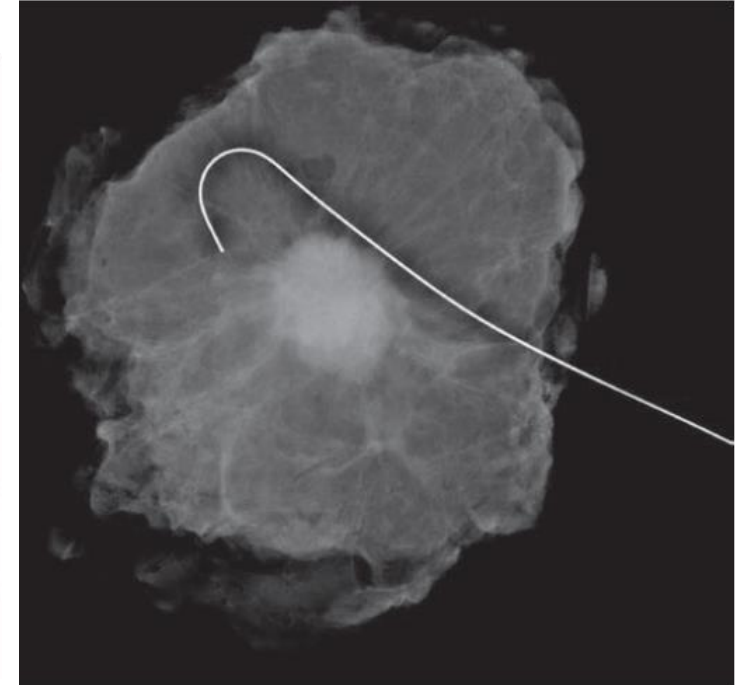
Wire localization procedure. Mammographic images of hookwire in place targeting lesions for excision in the left breast (A) and the right breast (B).



A



B



C

Specimen mammography. Specimen mammograms demonstrating excision of targeted (A) density, (B) calcifications, and (C) spiculated mass seen on preoperative imaging.

Sentinel Lymph Node Dissection

SLN indications:

- ✓ assess the regional lymph nodes
- ✓ early breast cancers
- ✓ clinically node-negative by physical examination and imaging studies
- ✓ staging of the axilla after chemotherapy in clinically node-negative disease at initial presentation

SLN contraindication:

- inflammatory breast cancers
 - those with biopsy proven metastasis
 - DCIS without mastectomy
 - prior axillary surgery
- ❖ SLN in pregnancy is safe with the radioactive colloid without the use of blue dye.

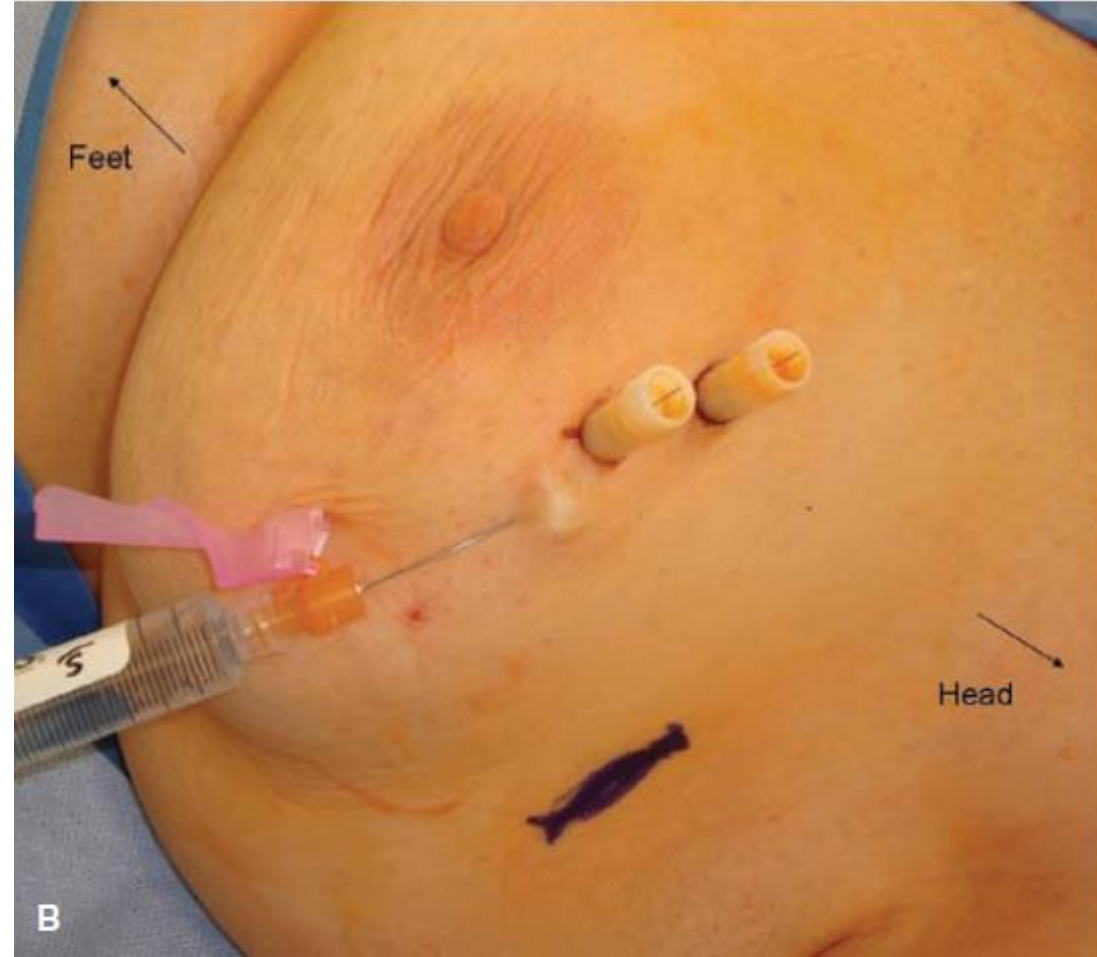
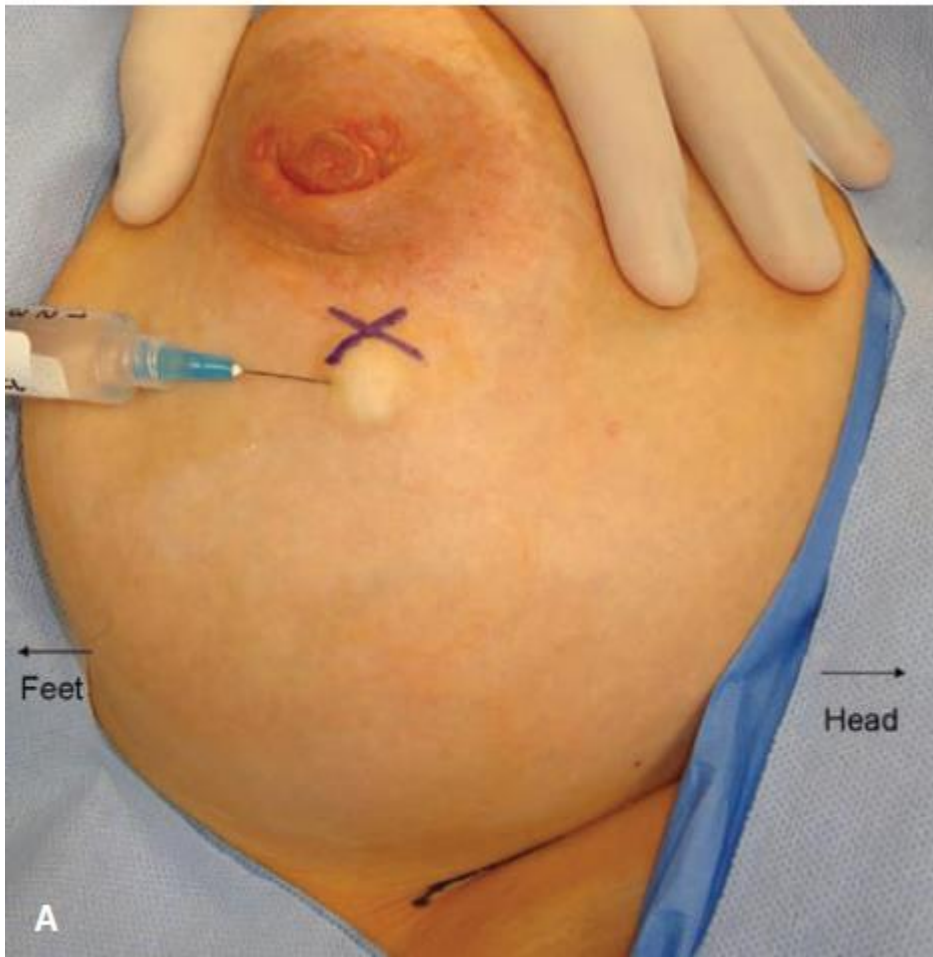
Sentinel Lymph Node Dissection

Identification of SLNs

1. intraoperative gamma probe detection of radioactive colloid
2. intraoperative visualization of blue dye (isosulfan blue dye or methylene blue)
3. the combination of two method is more accurate than the use of either agent alone
4. Some surgeons use preoperative lymphoscintigraphy, although it is not required

colloid injection method:

- ❖ With a 25-gauge needle, 0.5 mCi (on the day of surgery) or 2.5 mCi (On the day before surgery) of 0.2- μ m technetium 99m-labeled sulfur colloid is injected (around the primary tumor or prior biopsy site, subareolar region, or subdermally in proximity to the primary tumor site)
- ❖ Later, in the operating room, 3 to 5 mL of blue dye is injected either in the breast parenchyma or in the subareolar location.
- ❖ For nonpalpable cancers, the injection solution can be guided by ultrasound or by mammographic guidance
- ❖ who have undergone previous excisional biopsy, the injections are made in the breast parenchyma around the biopsy cavity but not into the cavity itself.



Radiocolloid injection using an intradermal injection method in a patient with a palpable breast cancer (A) or a nonpalpable breast cancer (B). In the case of patients with palpable breast cancers (“X” marks the palpable tumor), the injection is administered in a peritumoral location. In the case of patients with nonpalpable breast cancers, the injection is administered in nonpigmented skin in a location adjacent to but not involving the pigmented areolar skin in the same radial “o’clock” position in which the breast cancer is located. In both cases, an attempt is made to create a visible, raised, dermal skin wheal.

Sentinel Lymph Node Dissection



Side effect of colloid injection:

❖ **isosulfan blue dye injection :**

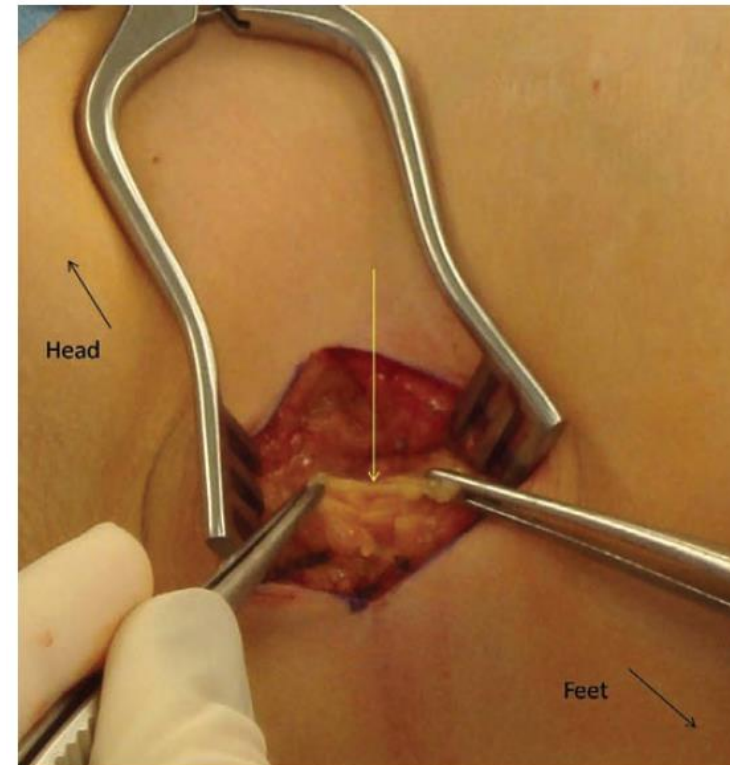
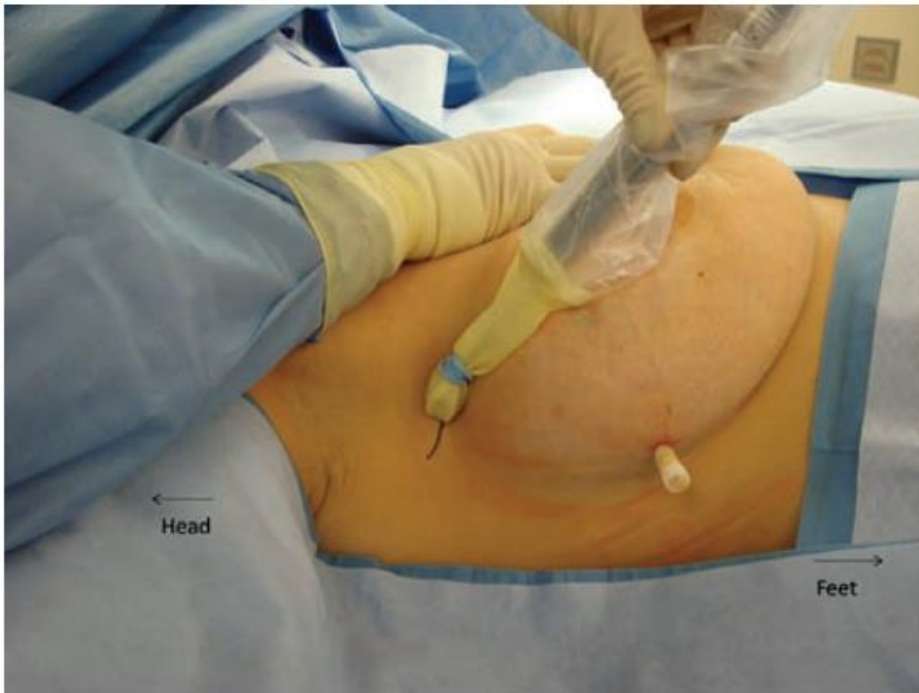
- **color of their urine**
- **allergic reaction to the dye (1in 10,000): preoperatively prophylactic →antihistamine, steroids, H-2 Blocker**
- ❖ **The use of radioactive colloid is safe, and radiation exposure is very low.**

Sentinel Lymph Node Dissection

gamma counter

A hand-held gamma counter is used to transcutaneously identify the location of the SLN.

A 3- to 4-cm incision is made in line with that used for an axillary dissection, which is a curved transverse incision in the lower axilla just below the hairline.



Sentinel Lymph Node Dissection

- Before the SLN is removed, a 10-second in vivo radioactivity count is obtained
 - After removal of the SLN, a 10-second ex vivo radioactive count is obtained
- and the node is then sent to the pathology laboratory for either permanent- or frozen-section analysis

“10% rule”:

The lowest false-negative rates for SLN dissection have been obtained when

1. all blue lymph nodes
2. all lymph nodes with counts $>10\%$ of the 10-second ex vivo count of the SLN

removal of four SLNs : 98% of all positive SLNs will be recovered

false negative rate for SLN dissection (NSABP B-32 trial):

- ☐ tumor location,
- ☐ type of diagnostic biopsy,
- ☐ and number of SLNs removed at surgery

tumors located in the lateral breast were more likely to have a false-negative SLN

Breast Conservation (segmental mastectomy, lumpectomy, partial mastectomy, wide local excision, and tylectomy)



Breast conservation:

- resection of the primary breast cancer with a margin of normal-appearing breast tissue
- adjuvant radiation therapy
- assessment of regional lymph node status

overall survival (OS) rate & disease-free survival (DFS) rates: BCT = mastectomy

BCT is the standard treatment for:

- ❖ stage 0, I, or II invasive breast cancer
- ❖ DCIS require only resection of the primary cancer and adjuvant radiation therapy without assessment of regional lymph nodes.

BCT contraindication:

- who are less concerned about cosmetic
- who have extensive micro calcifications
- large cancers that occupy the subareolar and central portions of the breast
- multicentric primary cancers

Breast Conservation



Skin excision is not necessary unless there is direct involvement of the overlying skin by the primary tumor

The breast cancer is removed with an envelope of normal-appearing breast tissue that is adequate to achieve a cancer-free margin

Margin of incision

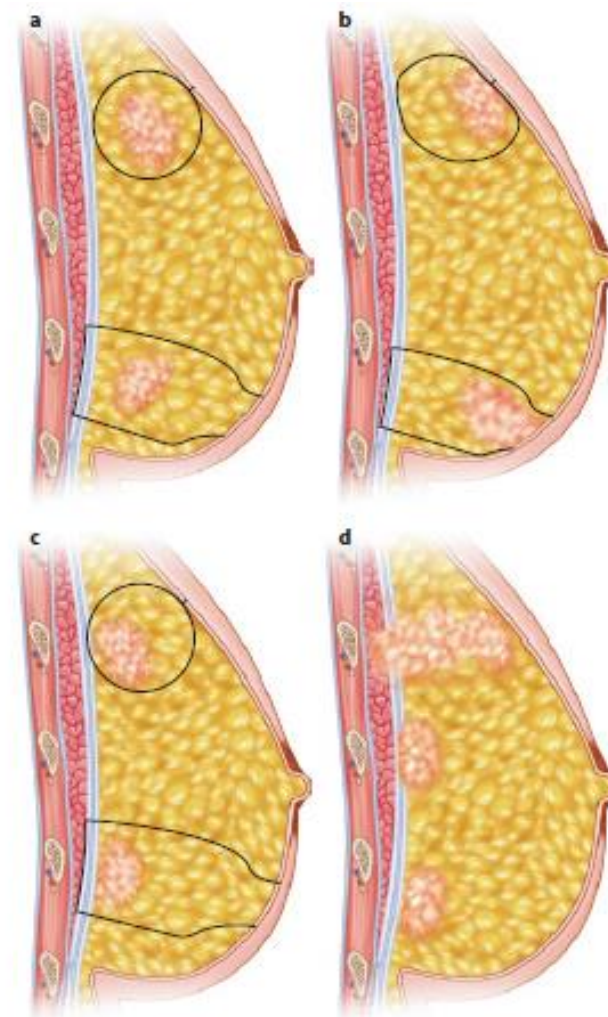
- **“no tumor on ink” to be the standard definition of a negative margin for invasive stages I and II breast cancer in patients who undergo breast conserving surgery with whole-breast irradiation.**
- **increasing the margin width does not affect local recurrence rates as long as the inked or transected margin is microscopically negative.**
- **Requests for determination of ER, PR, and HER2 status are conveyed to the pathologist.**
- **If negative margins are not obtainable with reexcision, mastectomy is required**



Pulling wire into center of cavity



Wire in center of cavity preparing for dissection around wire



Breast Conservation

oncoplastic surgery:

- a) immediate & delayed
- b) simple reshaping of breast tissue
- c) pedicled flaps
- d) breast reduction techniques

Oncoplastic techniques are of *prime consideration* when:

- 1) a significant area of breast skin will need to be resected with the specimen to achieve negative margins;
- 2) a large volume of breast parenchyma will be resected resulting in a significant defect
- 3) the tumor is located between the nipple and the inframammary fold, an area often associated with unfavorable cosmetic outcomes;
- 4) excision of the tumor and closure of the breast may result in malpositioning of the nipple

Mastectomy and Axillary Dissection



- A. Scar of previous biopsy
- B. All breast tissue
- C. NAC
- D. Skin
- E. level I axillary lymph nodes
- F. level II & III axillary lymph nodes
- G. pectoralis major and pectoralis minor muscles

skin-sparing mastectomy = A & B & C

A total (simple) mastectomy = A & B & C & D

extended simple mastectomy = A & B & C & D & E

A modified radical (“Patey”) mastectomy = A & B & C & D & E & F

The Halsted radical mastectomy = A & B & C & D & E & F & G

Nipple-areolar sparing mastectomy in risk-reducing mastectomy in high risk women:

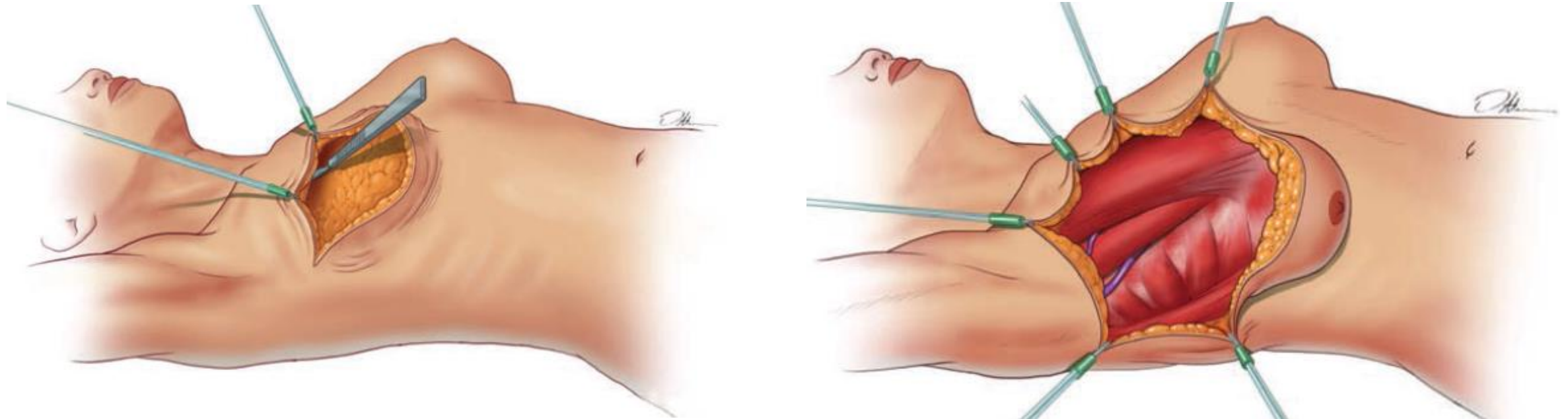
- tumor located more than 2 to 3 cm from the border of the areola
- smaller breast size
- minimal ptosis
- no prior breast
- surgeries with periareolar incisions
- body mass index less than 40 kg/m²
- no active tobacco use
- no prior breast irradiation
- and no evidence of collagen vascular disease

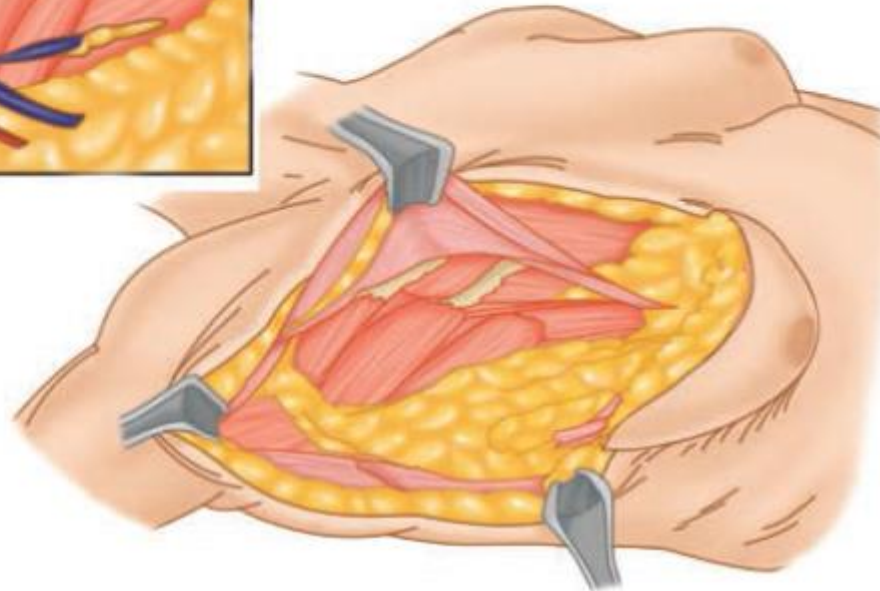
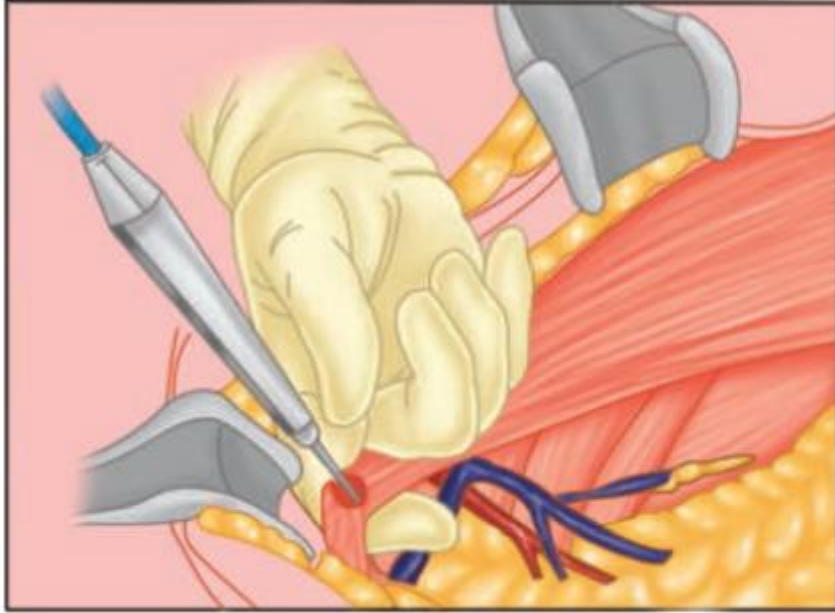
Modified Radical Mastectomy(MRM)



- laterally : the anterior margin of the latissimus dorsi muscle
- medially : the midline of the sternum
- superiorly : the subclavius muscle
- inferiorly :the caudal extension of the breast 2 to 3 cm inferior to the inframammary fold

Skin-flap thickness varies with body habitus but ideally is 7 to 8 mm inclusive of skin and tela subcutanea





Modified radical mastectomy (Patey): axillary lymph node dissection. The dissection proceeds from lateral to medial, with complete visualization of the anterior and inferior aspects of the axillary vein. Loose areolar tissue at the junction of the axillary vein and the anterior margin of the latissimus dorsi muscle is swept inferomedially inclusive of the lateral (axillary) lymph node group (level I). Care is taken to preserve the thoracodorsal artery, vein, and nerve in the deep axillary space. The lateral lymph node group is resected in continuity with the subscapular lymph node group (level I) and the external mammary lymph node group (level I). Dissection anterior to the axillary vein allows removal of the central lymph node group (level II) and the apical (subclavicular) lymph node group (level III). The superomedial limit of this dissection is the clavipectoral fascia (Halsted's ligament). Inset depicts division of the insertion of the pectoralis minor muscle at the coracoid process. The surgeon's finger shields the underlying brachial plexus. (Reproduced with permission from Bland KI, Copeland EMI: The Breast: Comprehensive Management of Benign and Malignant Diseases, 4th ed. Philadelphia, PA: Elsevier/Saunders; 2009.)

Modified Radical Mastectomy

axillary lymph node dissection process

The most lateral extent of the axillary vein is identified, and the areolar tissue of the lateral axillary space is elevated as the vein is cleared on its anterior and inferior surfaces

The areolar tissues and subscapular lymph node groups (level I), are cleared

Care is taken to preserve the thoracodorsal neurovascular bundle

The dissection then continues medially with clearance of the central axillary lymph node group (level II)

The long thoracic nerve of Bell is identified and preserved as it travels in the investing fascia of the serratus anterior muscle

Every effort is made to preserve this nerve because permanent disability with a winged scapula and shoulder weakness will follow denervation of the serratus anterior muscle

MRM Complications



- ❖ **Seromas: most frequent (30%) ; closed-system suction until drainage diminishes to <30 mL per day**
- ❖ **Wound infections: infrequently (result of skin-flap necrosis) ; Cultures of specimens → debridement, and antibiotic therapy**
- ❖ **Moderate or severe hemorrhage: rare ; early wound exploration & reestablishment of closed-system suction drainage**
- ❖ **lymphedema : (20%) ; (50% to 60% when postoperative radiation) ; physical therapy & compressive sleeves**

Predisposing factors :

- **Extensive axillary lymph node dissection**
- **the delivery of radiation therapy**
- **the presence of pathologic lymph nodes**
- **obesity**

Reconstruction of the Breast and Chest Wall



The goals of reconstructive surgery : (immediate or delayed)

✓ wound closure

→ simple approximation

→ pedicled myocutaneous (the latissimus dorsi muscle)

✓ breast reconstruction

→ same time as the mastectomy: early-stage breast cancer

→ delayed until after completion of adjuvant radiation therapy: locally advanced breast cancer

Process of Reconstruction:

expander implant reconstruction

autologous tissue :

- i. pedicled myocutaneous flap : latissimus dorsi & rectus abdominis myocutaneous
- ii. free flap using microvascular techniques

Reconstruction of the Breast and Chest Wall



latissimus dorsi myocutaneous flap:

- ✓ thoracodorsal artery
- ✓ contributions from the posterior intercostal arteries

Transverse rectus abdominis myocutaneous (TRAM) flap :

- ✓ vessels from the deep inferior epigastric artery (microvascular anastomoses)

reconstruction of the bony defect of chest wall:

1. 1 or 2 ribs are resected → soft tissue coverage (latissimus dorsi or TRAM flap)
2. > 2 ribs are sacrificed → stabilize prosthetic material

TNM staging system for breast cancer	
Primary tumor (T)	
The T classification of the primary tumor is the same regardless of whether it is based on clinical or pathologic criteria, or both. Size should be measured to the nearest millimeter. If the tumor size is slightly less than or greater than a cutoff for a given T classification, it is recommended that the size be rounded to the millimeter reading that is closest to the cutoff. For example, a reported size of 1.1 mm is reported as 1 mm, or a size of 2.01 cm is reported as 2.0 cm. Designation should be made with the subscript “c” or “p” modifier to indicate whether the T classification was determined by clinical (physical examination or radiologic) or pathologic measurements, respectively. In general, pathologic determination should take precedence over clinical determination of T size.	
TX	Primary tumor cannot be assessed
T0	No evidence of primary tumor
Tis (DCIS)*	Ductal carcinoma <i>in situ</i>
Tis (Paget)	Paget disease of the nipple NOT associated with invasive carcinoma and/or carcinoma <i>in situ</i> (DCIS) in the underlying breast parenchyma. Carcinomas in the breast parenchyma associated with Paget disease are categorized based on the size and characteristics of the parenchymal disease, although the presence of Paget disease should still be noted.
T1	Tumor ≤20 mm in greatest dimension
T1mi	Tumor ≤1 mm in greatest dimension
T1a	Tumor >1 mm but ≤5 mm in greatest dimension (round any measurement >1.0–1.9 mm to 2 mm).
T1b	Tumor >5 mm but ≤10 mm in greatest dimension
T1c	Tumor >10 mm but ≤20 mm in greatest dimension
T2	Tumor >20 mm but ≤50 mm in greatest dimension
T3	Tumor >50 mm in greatest dimension
T4	Tumor of any size with direct extension to the chest wall and/or to the skin (ulceration or macroscopic nodules); invasion of the dermis alone does not qualify as T4
T4a	Extension to the chest wall; invasion or adherence to pectoralis muscle in the absence of invasion of chest wall structures does not qualify as T4
T4b	Ulceration and/or ipsilateral macroscopic satellite nodules and/or edema (including peau d’orange) of the skin that does not meet the criteria for inflammatory carcinoma
T4c	Both T4a and T4b are present
T4d	Inflammatory carcinoma (see section “Rules for Classification”)
*Note: Lobular carcinoma <i>in situ</i> (LCIS) is a benign entity and is removed from TNM staging in the <i>AJCC Cancer Staging Manual, 8th edition</i> .	
Regional lymph nodes—Clinical (N)	
cNX*	Regional lymph nodes cannot be assessed (e.g., previously removed)
cN0	No regional lymph node metastases (by imaging or clinical examination)
cN1	Metastases to movable ipsilateral Level I, II axillary lymph node(s)
cN1mi**	Micrometastases (approximately 200 cells, larger than 0.2 mm, but none larger than 2.0 mm)
cN2	Metastases in ipsilateral Level I, II axillary lymph nodes that are clinically fixed or matted; <i>or</i> in ipsilateral internal mammary nodes in the absence of axillary lymph node metastases
cN2a	Metastases in ipsilateral Level I, II axillary lymph nodes fixed to one another (matted) or to other structures
cN2b	Metastases only in ipsilateral internal mammary nodes in the absence of axillary lymph node metastases
cN3	Metastases in ipsilateral infraclavicular (Level III axillary) lymph node(s) with or without Level I, II axillary lymph node involvement; <i>or</i> in ipsilateral internal mammary lymph node(s) with Level I, II axillary lymph node metastases; <i>or</i> metastases in ipsilateral supraclavicular lymph node(s) with or without axillary or internal mammary lymph node involvement
cN3a	Metastases in ipsilateral infraclavicular lymph node(s)
cN3b	Metastases in ipsilateral internal mammary lymph node(s) and axillary lymph node(s)
cN3c	Metastases in ipsilateral supraclavicular lymph node(s)

TNM staging system for breast cancer (<i>Continued</i>)	
Regional lymph nodes—Pathologic (pN)	
pNX	Regional lymph nodes cannot be assessed (e.g., not removed for pathological study or previously removed)
pN0	No regional lymph node metastasis identified or ITCs only
pN0(i+)	ITCs only (malignant cell clusters no larger than 0.2 mm) in regional lymph node(s)
pN0(mol+)	Positive molecular findings by reverse transcriptase polymerase chain reaction (RT-PCR); no ITCs detected
pN1	Micrometastases; or metastases in 1–3 axillary lymph nodes; and/or clinically negative internal mammary nodes with micrometastases or macrometastases by sentinel lymph node biopsy
pN1mi	Micrometastases (approximately 200 cells, larger than 0.2 mm, but none larger than 2.0 mm)
pN1a	Metastases in 1–3 axillary lymph nodes, at least one metastasis larger than 2.0 mm
pN1b	Metastases in ipsilateral internal mammary sentinel nodes, excluding ITCs
pN1c	pN1a and pN1b combined
pN2	Metastases in 4–9 axillary lymph nodes; or positive ipsilateral internal mammary lymph nodes by imaging in the absence of axillary lymph node metastases
pN2a	Metastases in 4–9 axillary lymph nodes (at least one tumor deposit larger than 2.0 mm)
pN2b	Metastases in clinically detected internal mammary lymph nodes with or without microscopic confirmation; with pathologically negative axillary nodes
pN3	Metastases in 10 or more axillary lymph nodes; <i>or</i> in infraclavicular (Level III axillary) lymph nodes; <i>or</i> positive ipsilateral internal mammary lymph nodes by imaging in the presence of one or more positive Level I, II axillary lymph nodes; <i>or</i> in more than three axillary lymph nodes and micrometastases or macrometastases by sentinel lymph node biopsy in clinically negative ipsilateral internal mammary lymph nodes;
pN3a	<i>or</i> in ipsilateral supraclavicular lymph nodes
pN3b	Metastases in 10 or more axillary lymph nodes (at least one tumor deposit larger than 2.0 mm); <i>or</i> metastases to the infraclavicular (Level III axillary lymph) nodes
pN3c	pN1a or pN2a in the presence of cN2b (positive internal mammary nodes by imaging); <i>or</i> pN2a in the presence of pN1b
	Metastases in ipsilateral supraclavicular lymph nodes
Note: (sn) and (f) suffixes should be added to the N category to denote confirmation of metastasis by sentinel node biopsy or FNA/core needle biopsy respectively, with NO further resection of nodes.	
Distant metastasis (M)	
M0	No clinical or radiographic evidence of distant metastases*
cM0(i+)	No clinical or radiographic evidence of distant metastases in the presence of tumor cells or deposits no larger than 0.2 mm detected microscopically or by molecular techniques in circulating blood, bone marrow, or other nonregional nodal tissue in a patient without symptoms or signs of metastases
cM1	Distant metastases detected by clinical and radiographic means
pM1	Any histologically proven metastases in distant organs; or if in non-regional nodes, metastases greater than 0.2 mm

TNM stage groupings

When T is...	And N is...	And M is...	Then the stage group is...
Tis	N0	M0	0
T1	N0	M0	IA
T0	N1mi	M0	IB
T1	N1mi	M0	IB
T0	N1	M0	IIA
T1	N1	M0	IIA
T2	N0	M0	IIA
T2	N1	M0	IIB
T3	N0	M0	IIB
T0	N2	M0	IIIA
T1	N2	M0	IIIA
T2	N2	M0	IIIA
T3	N1	M0	IIIA
T3	N2	M0	IIIA
T4	N0	M0	IIIB
T4	N1	M0	IIIB
T4	N2	M0	IIIB
Any T	N3	M0	IIIC
Any T	Any N	M1	IV

- 1. T1 includes T1 mi.***
- 2. T0 and T1 tumors with nodal micro metastases (N1mi) are staged as Stage IB.***
- 3. T2, T3, and T4 tumors with nodal micro metastases (N1mi) are staged using the N1 category.***
- 4. M0 includes M0(i+).***
- 5. The designation pM0 is not valid; any M0 is clinical.***
- 6. If a patient presents with M1 disease prior to neoadjuvant systemic therapy, the stage is Stage IV and remains Stage IV regardless of response to neoadjuvant therapy.***
- 7. Stage designation may be changed if postsurgical imaging studies reveal the presence of distant metastases, provided the studies are performed within 4 months of diagnosis in the absence of disease progression, and provided the patient has not received neoadjuvant therapy.***
- 8. Staging following neoadjuvant therapy is denoted with a “yc” or “yp” prefix to the T and N classification. There is no anatomic stage group assigned if there is a complete pathological response (pCR) to neoadjuvant therapy, for example, ypT0ypN0cM0.***

Traditional prognostic and predictive factors for invasive breast cancer

TUMOR FACTORS	HOST FACTORS
Nodal status	Age
Tumor size	Menopausal status
Histologic/nuclear grade	Family history
Lymphatic/vascular invasion	Previous breast cancer
Pathologic stage	Immunosuppression
Hormone receptor status	Nutrition
DNA content (ploidy, S-phase fraction)	Prior chemotherapy
Extent of intraductal component	Prior radiation therapy
HER2/neu expression	

***Diagnostic studies
for breast cancer patients***



	CANCER STAGE				
	0	I	II	III	IV
History & physical	X	X	X	X	X
Complete blood count, platelet count			X	X	X
Liver function tests and alkaline phosphatase level			X	X	X
Chest radiograph			X	X	X
Bilateral diagnostic mammograms, ultrasound as indicated	X	X	X	X	X
Hormone receptor status	X	X	X	X	X
HER2/neu expression		X	X	X	X
Bone scan				X	X
Abdominal (without or without pelvis) computed tomographic scan or ultrasound or magnetic resonance imaging				X	X