BREAST CANCER

DIAGNOSIS & TREATMENT

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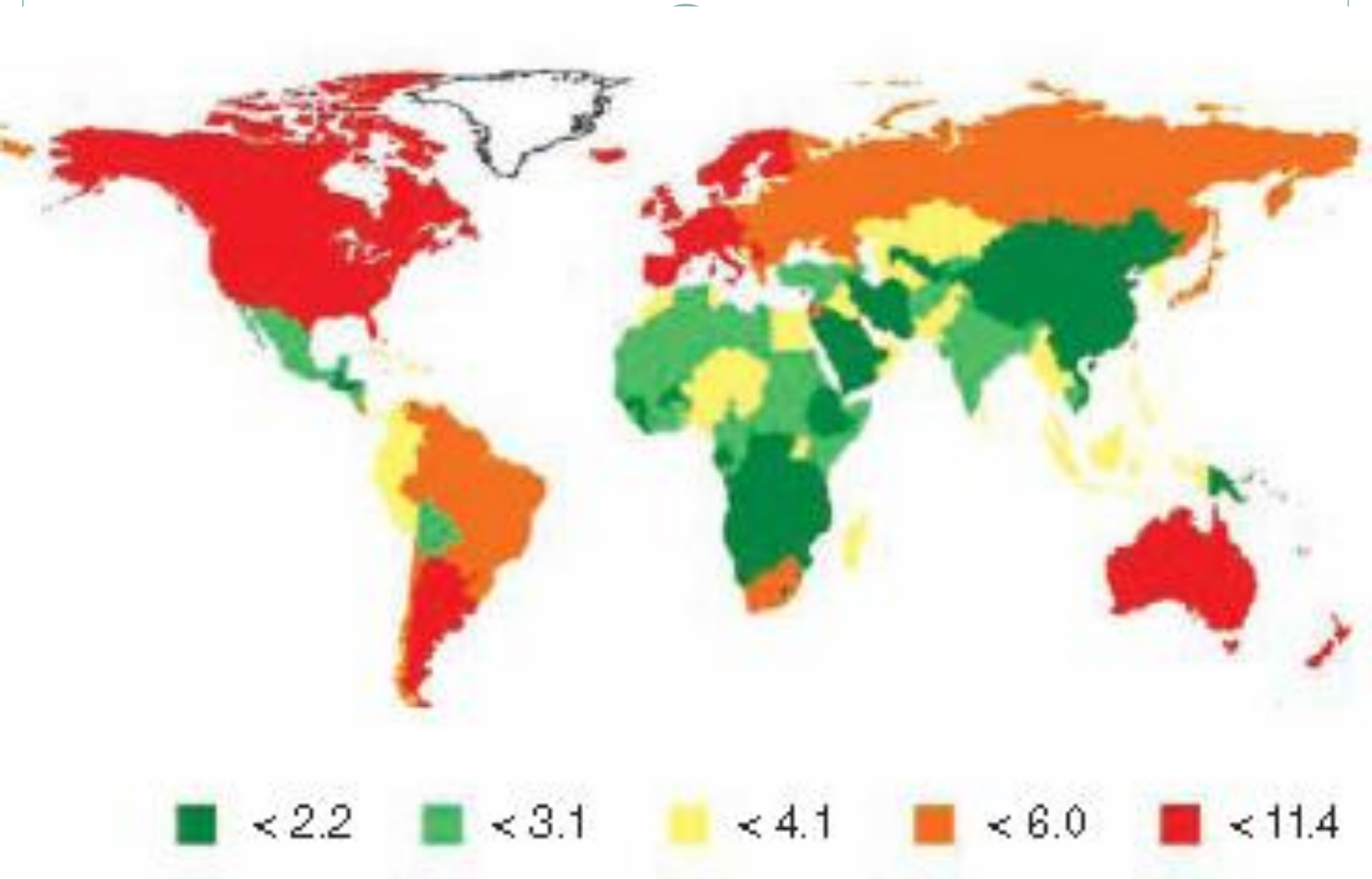
Breast cancer incidence worldwide in 2008. (per 100,000)

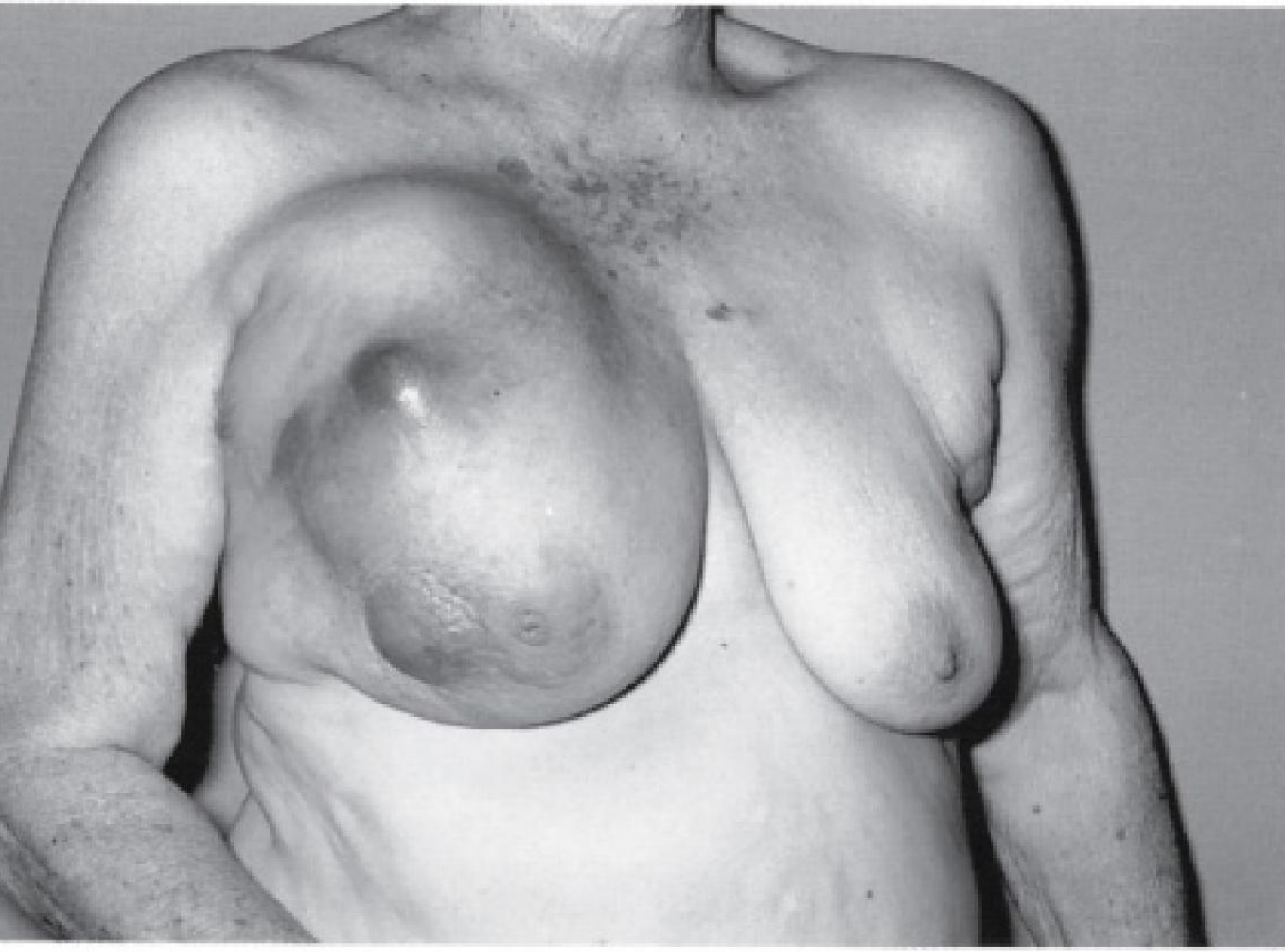


Risk Factors of breast cancer

- **Being female**
- **Increasing age**
- **A personal history of breast cancer**
- **A family history of breast cancer**
- **Inherited genes that increase cancer risk (**BRCA1 and BRCA2)
- **Radiation exposure** (radiation treatments to chest of a child or young adult)
- **Obesity**
- **Menarche at a younger age(** before age 12)
- **Beginning menopause at an older age**
- **Having the first child at an older age (**after age 35)
- **Having never been pregnant**
- **Exogenous hormone use** (OCP and postmenopausal hormone)
- **Drinking alcohol**
- **Low Physical activity**
- **Benign breast disease and mammographic density**

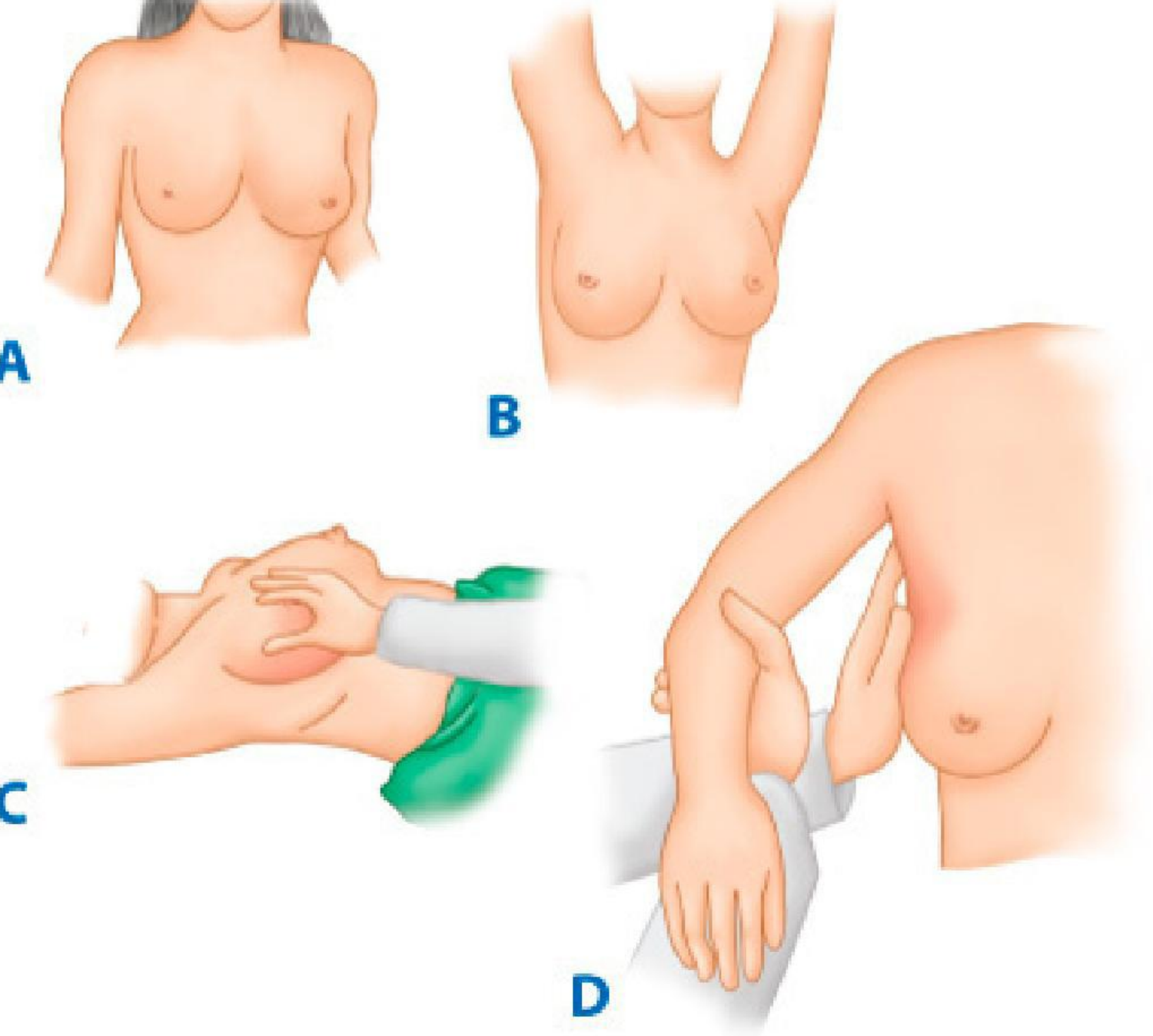
Sign & Symptoms

- A breast lump or thickening that feels different from the surrounding tissue
- Bloody discharge from the nipple
- Change in the size or shape of a breast
- Changes to the skin over the breast, such as dimpling
- Inverted nipple
- Peeling, scaling or flaking of the nipple or breast skin
- Redness or pitting of the skin over your breast, like the skin of an orange
- With continued growth, cancer cells invade the skin, and eventually ulceration occurs.
- As new areas of skin are invaded, small satellite nodules appear near the primary ulceration



Diagnosis

- **Breast examination** (any lumps or other abnormalities).
- **Mammogram** (to screen for breast cancer).
- **Breast ultrasound (**help distinguish between a solid mass and a fluid-filled cyst).
- **Breast biopsy:** (type),(aggressiveness & grade),(hormone receptors: ER- PR),(other receptors:Her2-Ki67)
- **Breast MRI**


A
B
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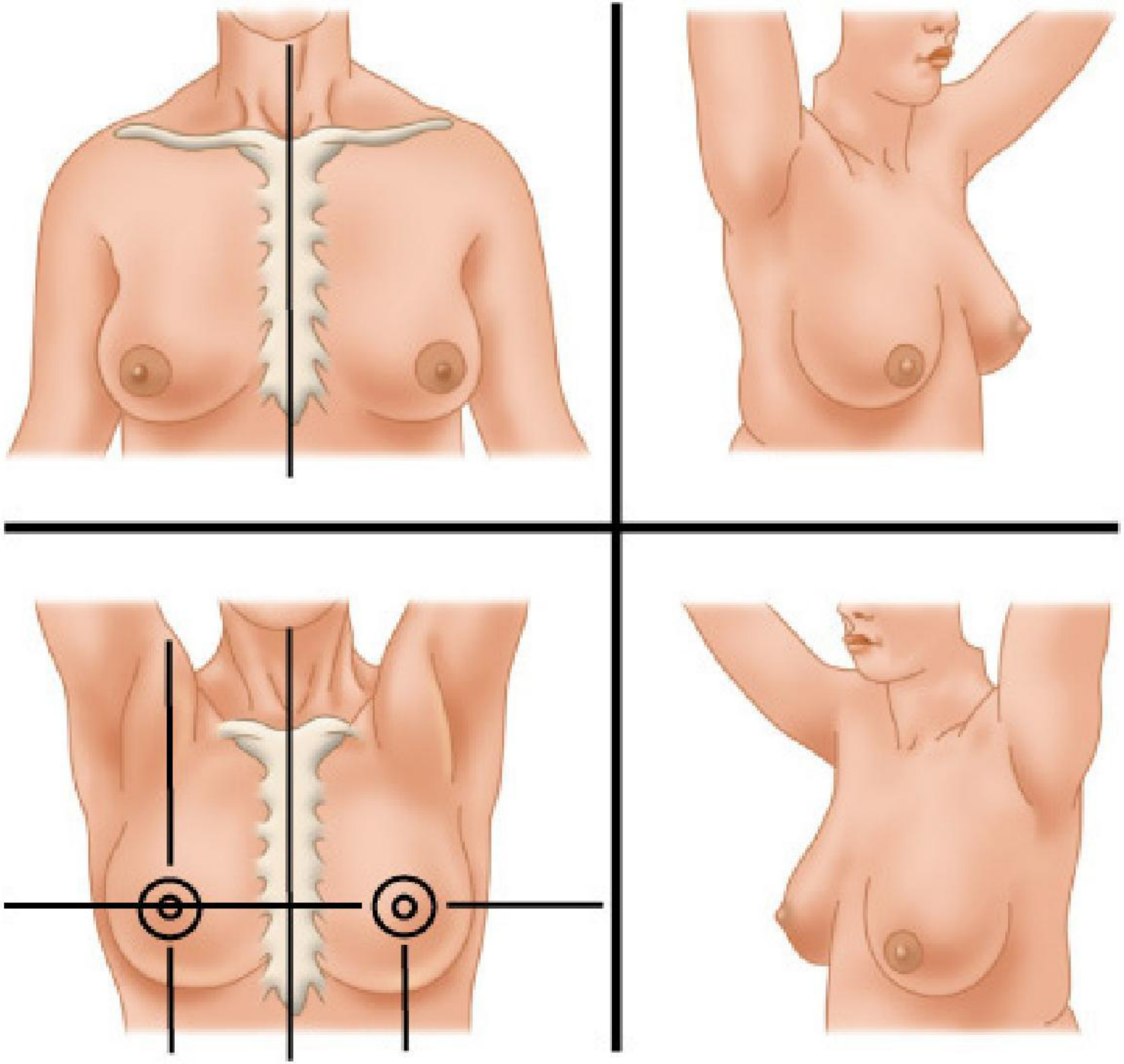


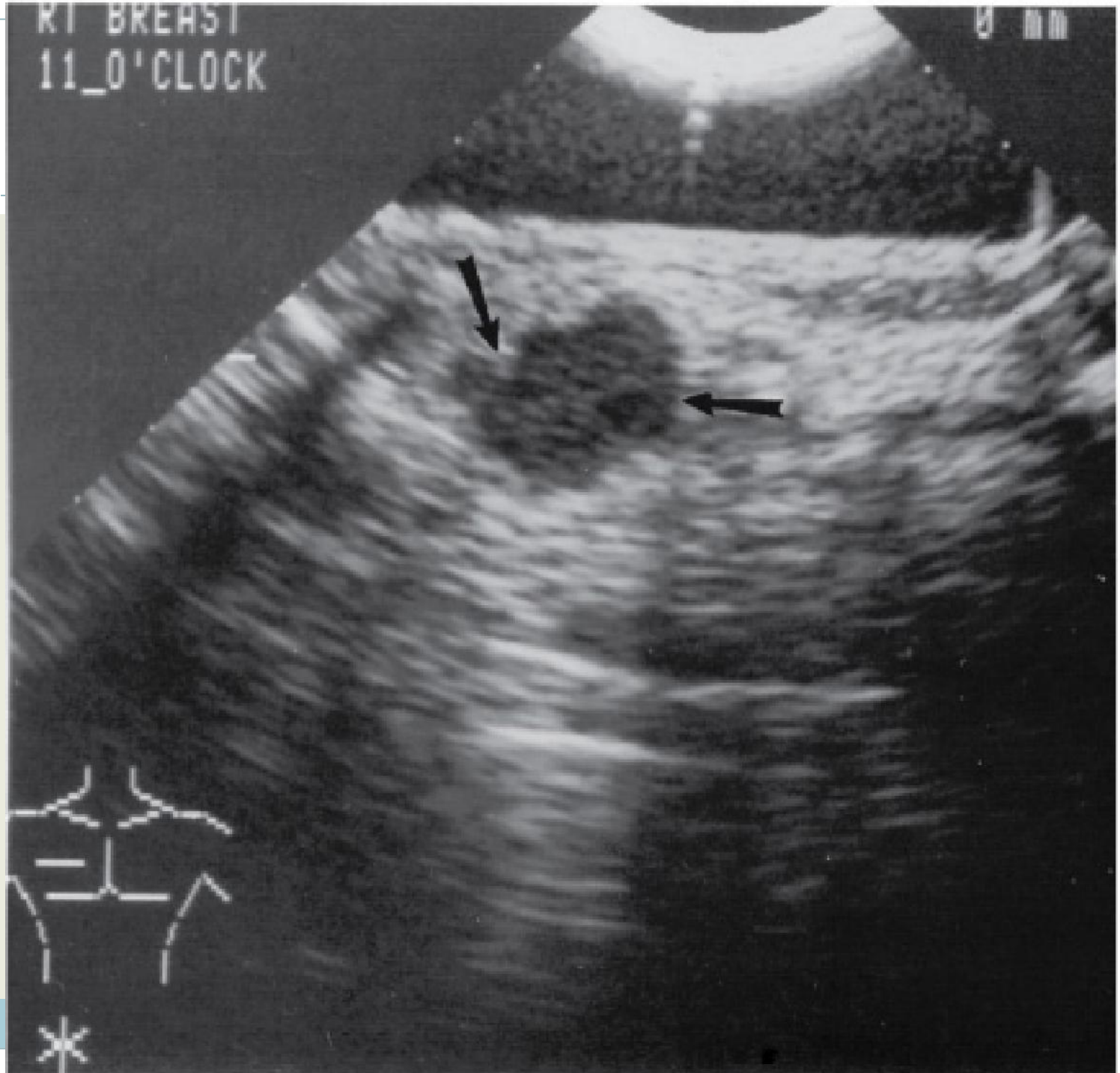
ULTRASONOGRAPHY

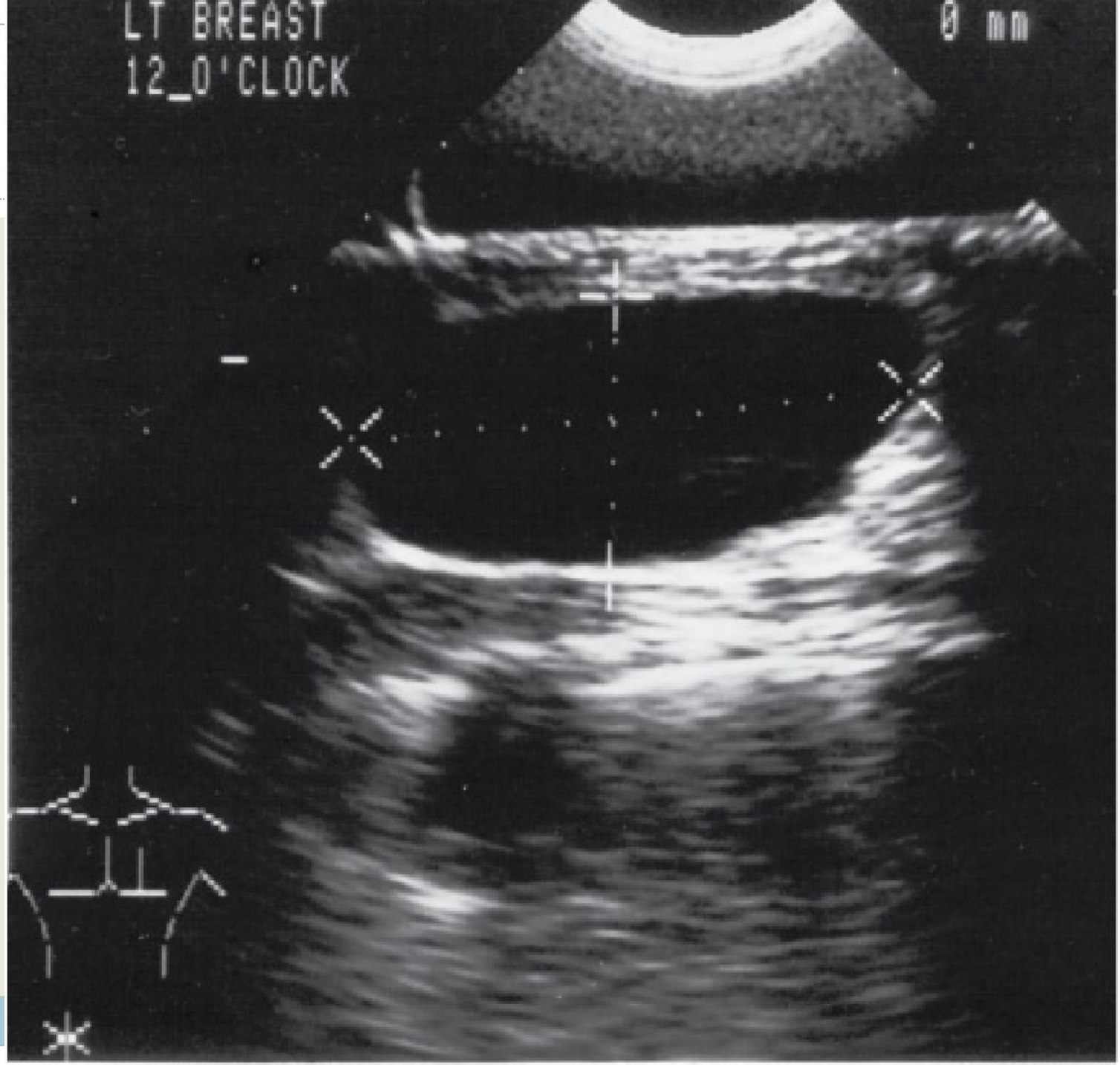
- **Breast cysts are well circumscribed, with smooth margins and an echo-free center.**

- **Benign breast masses usually show smooth contours, round or oval shapes, weak internal echoes, and well-defined anterior and posterior margins.**

- **Breast cancer characteristically has irregular walls but may have smooth margins with acoustic enhancement.**
- **Ultrasonography is used to guide fine-needle aspiration biopsy, core-needle biopsy, and needle localization of breast lesions.**

- **It does not reliably detect lesions ≤1 cm in diameter.**


RT BREAST
11_O'CLOCK
0 mm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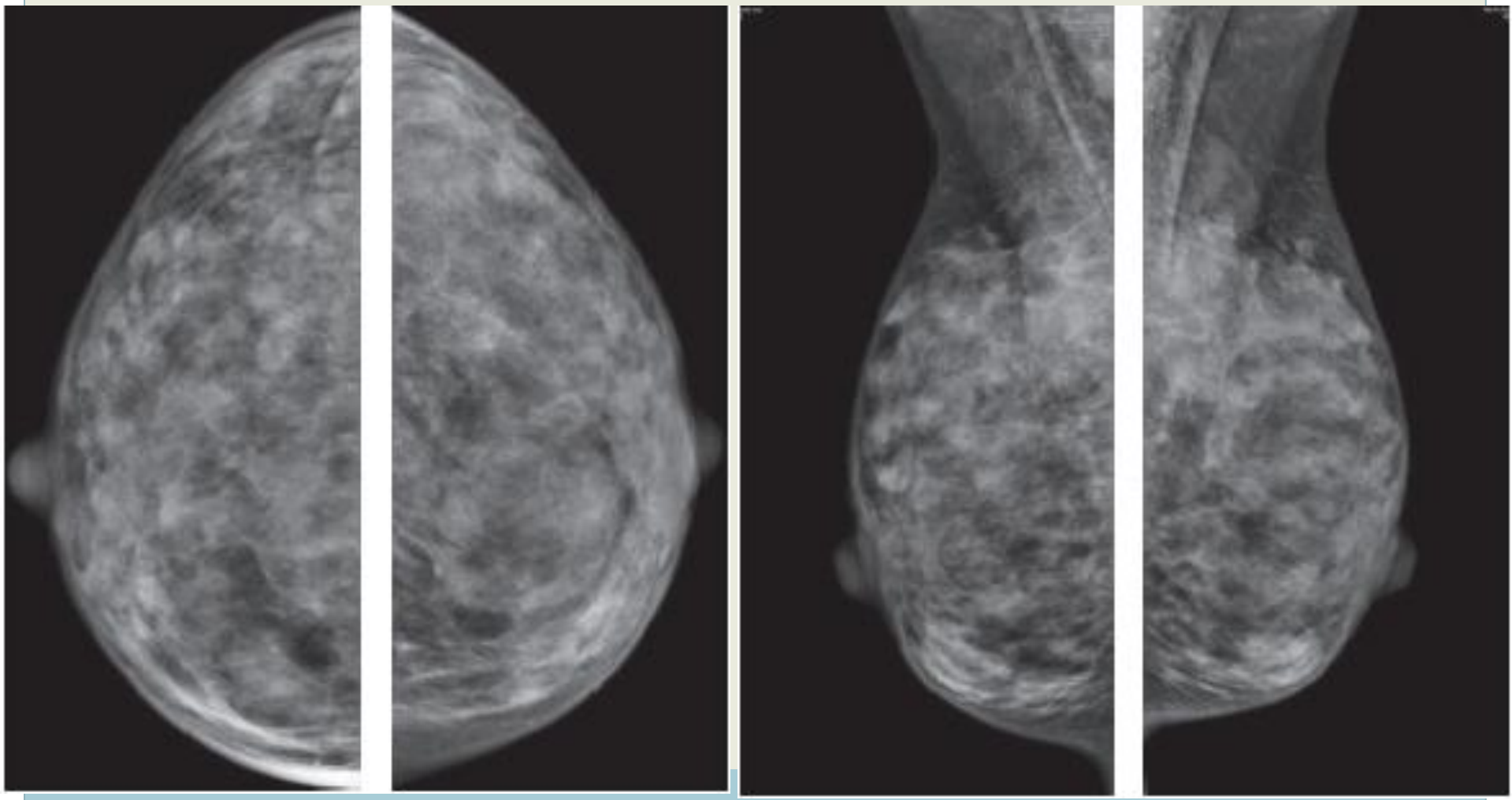
Imaging Techniques

MAMMOGRAPHY

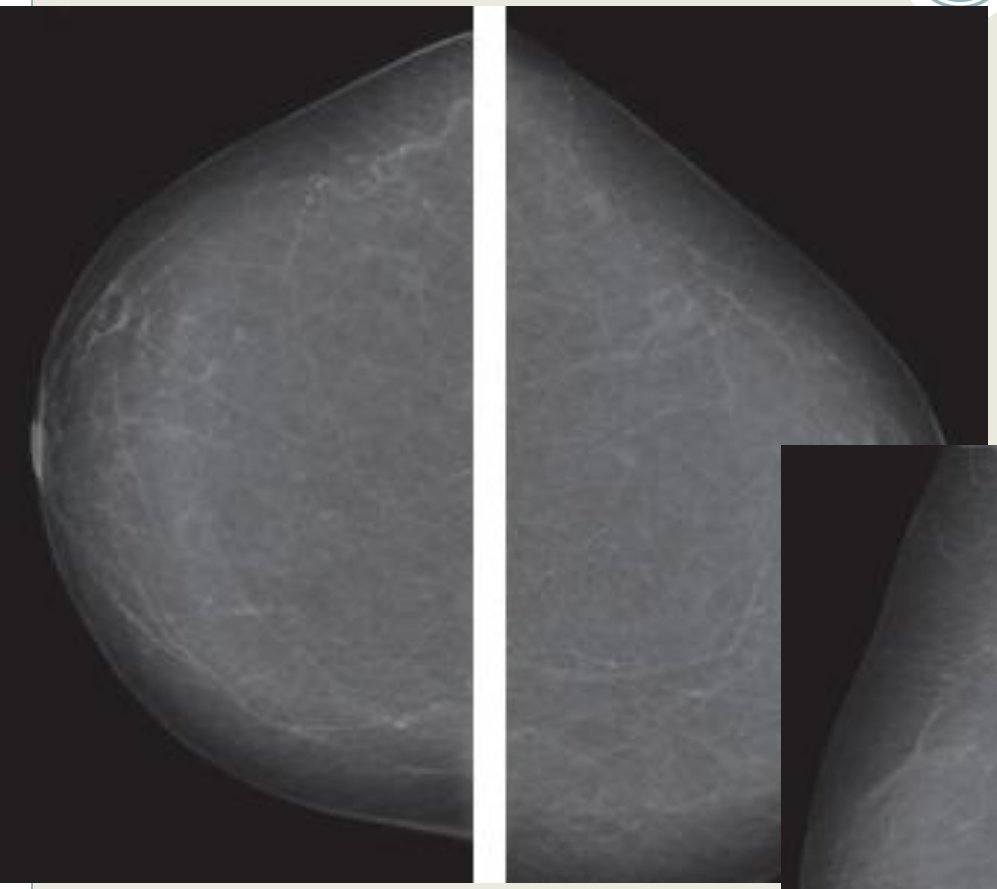
- **Mammography has been used in North America since the 1960s.**
- **Conventional mammography delivers a radiation dose of 0.1 cGy per study (CXR delivers 25% of this dose).**
- **There is no increased breast cancer risk associated with the radiation dose delivered with screening mammography.**
- **False-positive rate of 10% and a false-negative rate of 7%.**

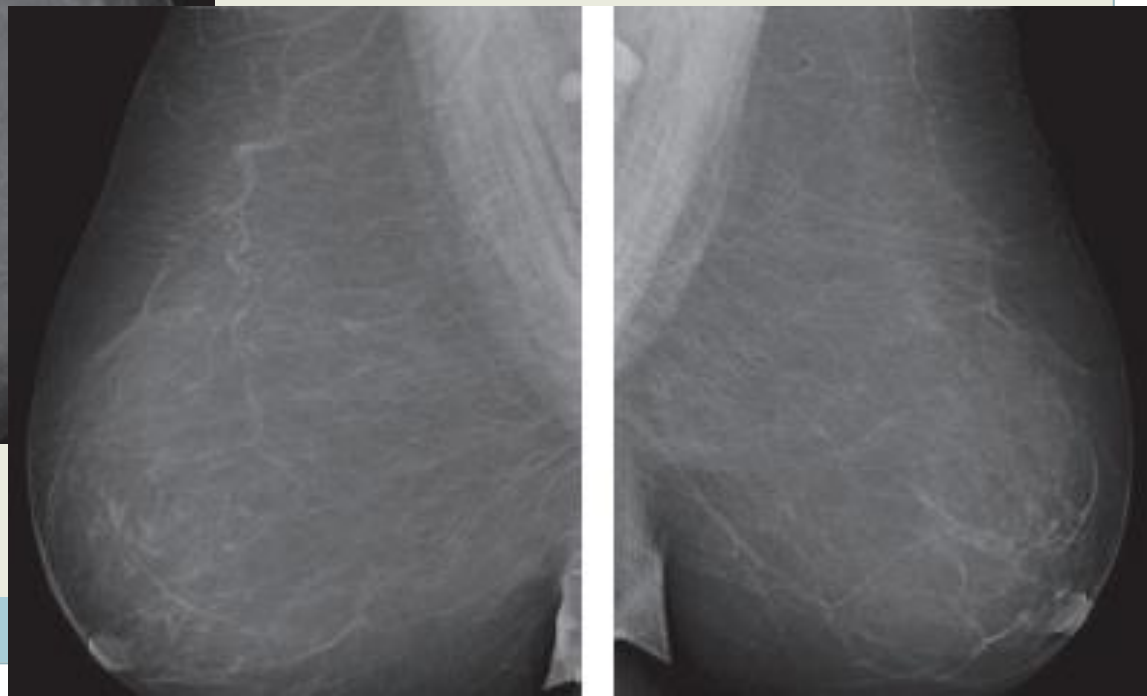
- **Screening mammography, two views:**
  -Craniocaudal view(CC)(medial aspect)
  -Mediolateral oblique view(MLO)(UUQ & axillary tail)
- **Other views: 90-degree lateral and spot compression views**

Mammogram of a premenopausal breast (dense fibroglandular pattern)



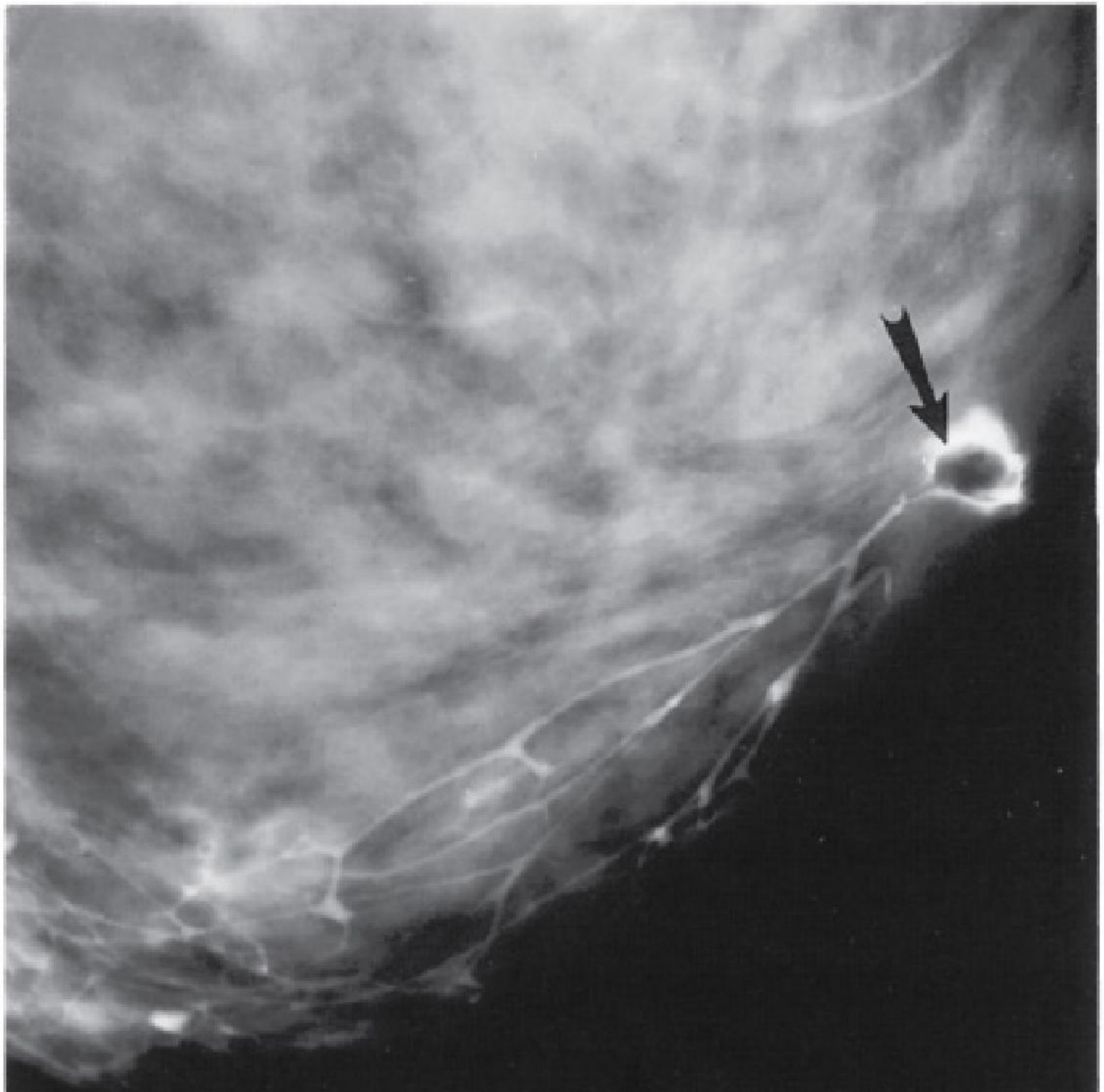
Mammogram of a postmenopausal breast (sparse fibroglandular pattern)



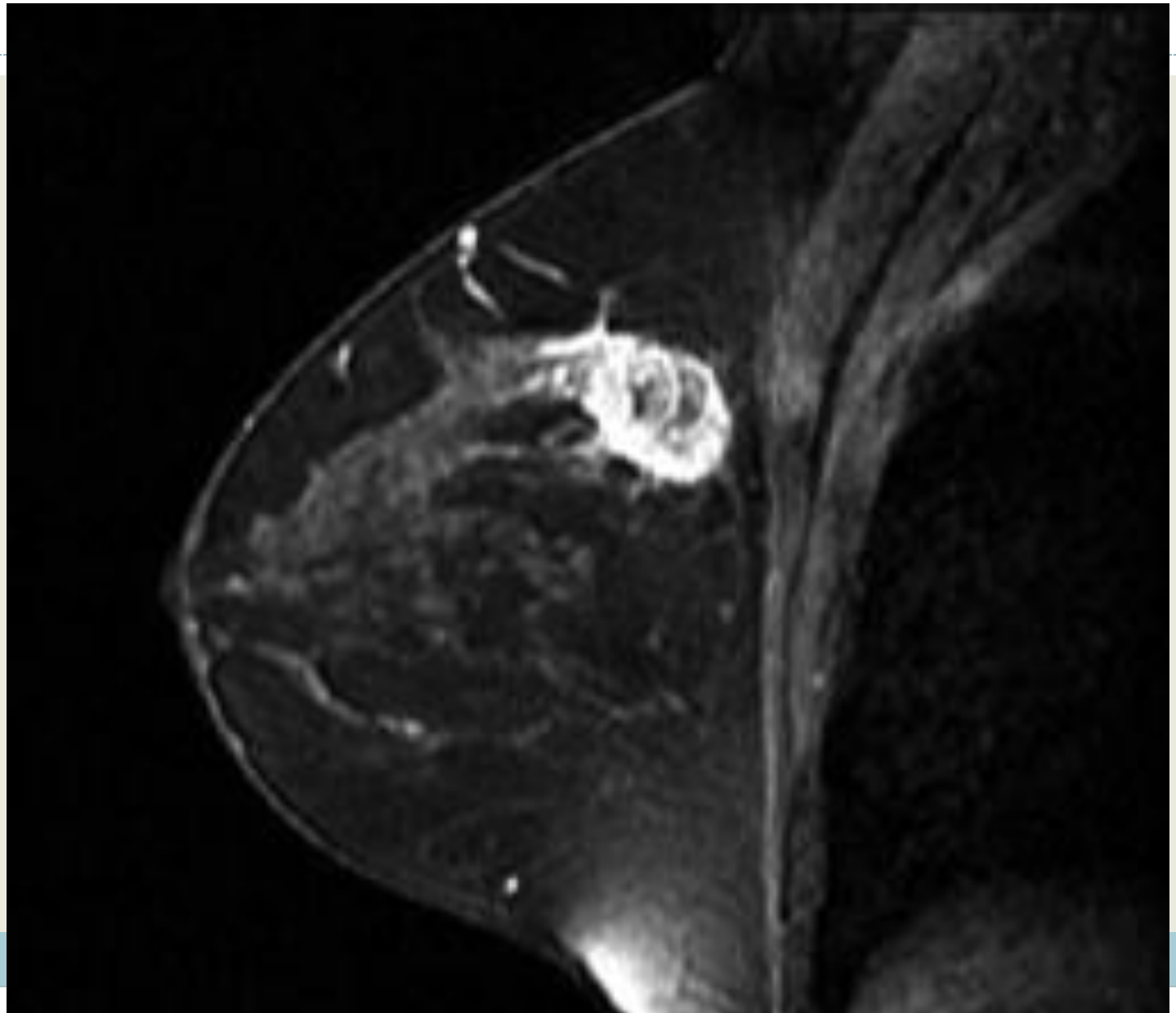


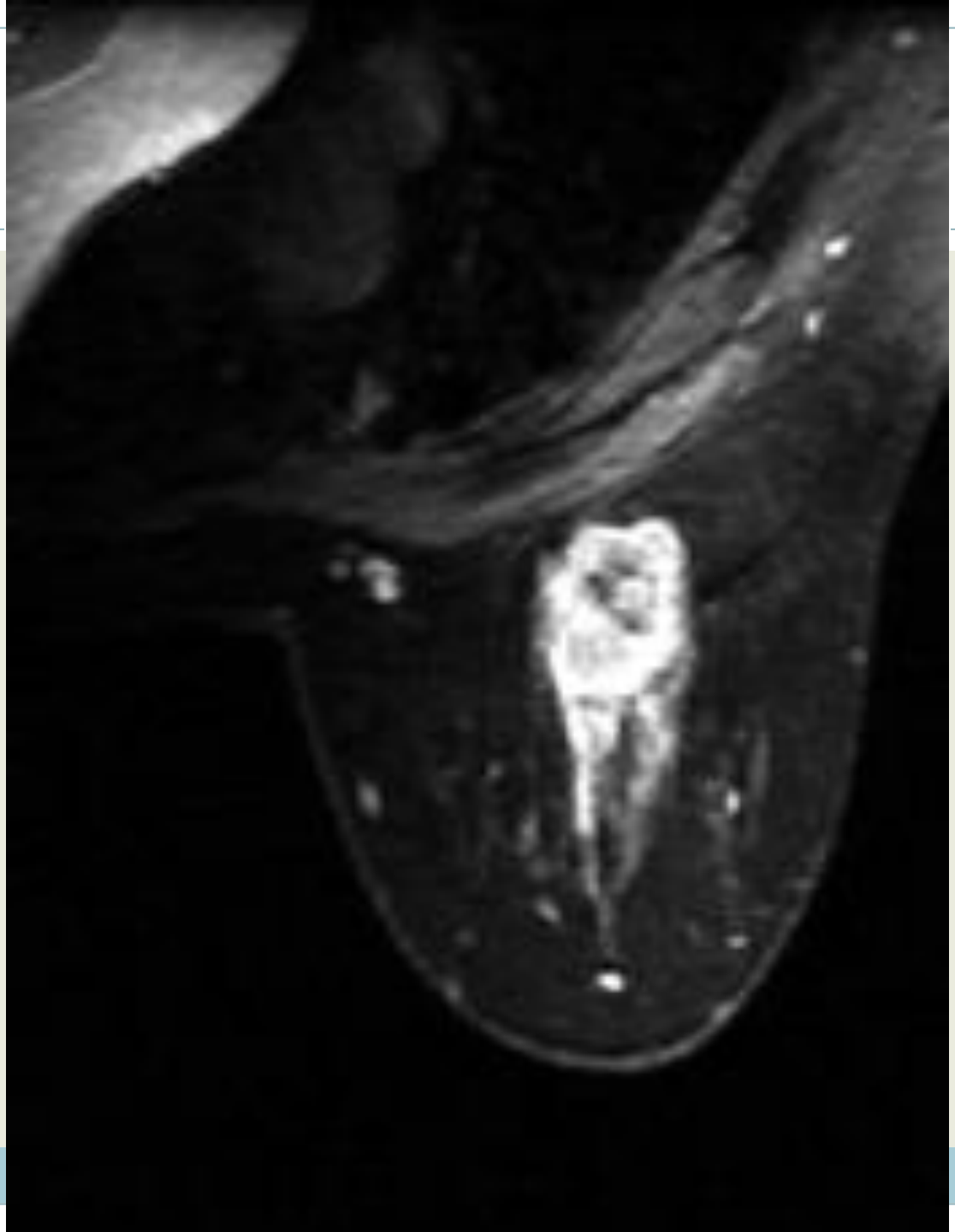
DUCTOGRAPHY

- **Indication : nipple discharge, particularly when the fluid contains blood.**
- **Radiopaque contrast media , 0.1 to 0.2 mL is injected into one or more of the major ducts and mammography is performed.**
- **Intraductal papillomas are seen as small filling defects surrounded by contrast media.**
- **Cancers may appear as irregular masses or as multiple intraluminal filling defects.**

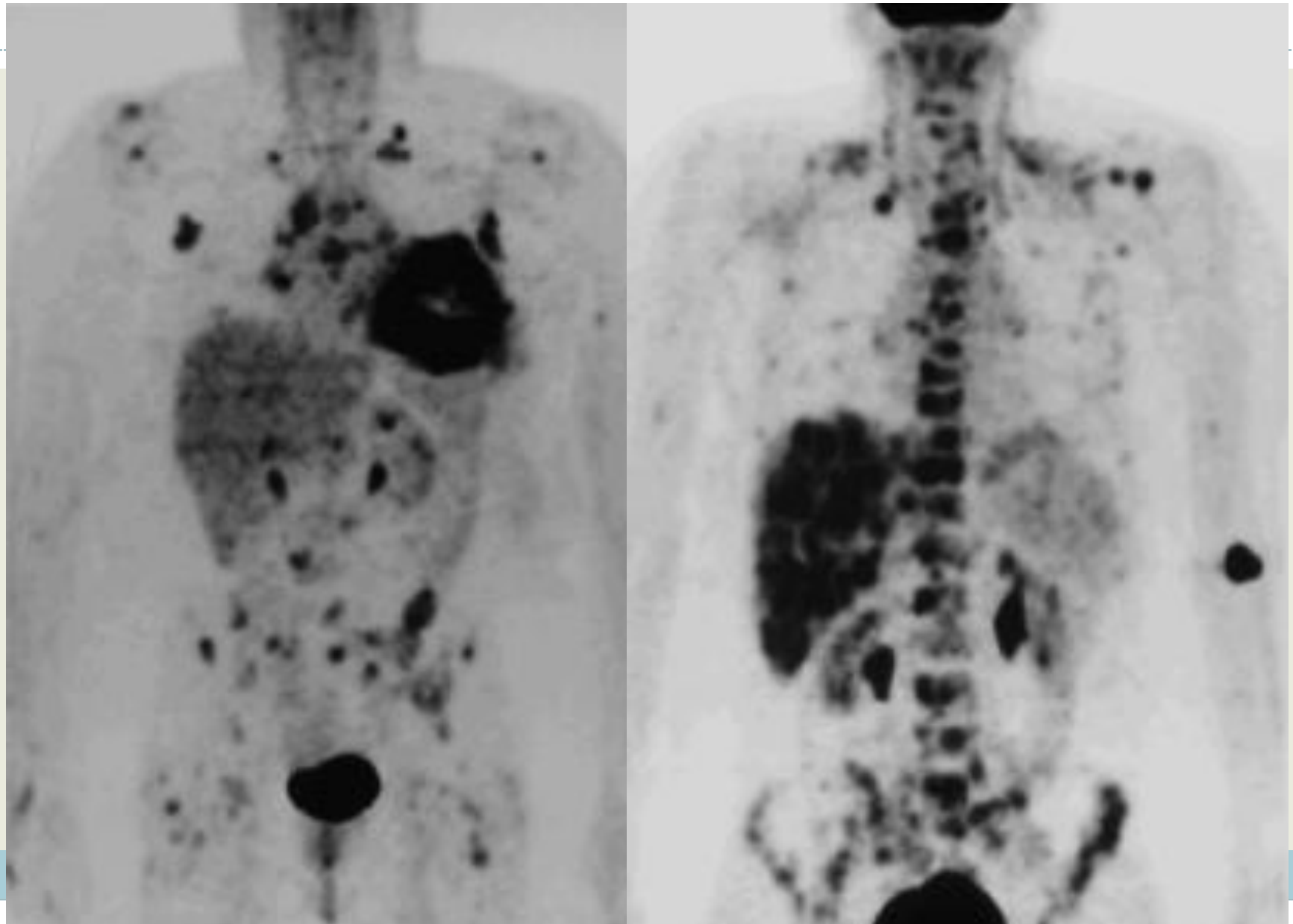


MRI





PET Scan



Pathologic Classification (invasive breast cancer)

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

TNM Staging

• Stage 0	Tis	N0	M0
• Stage I	T1a	N0	M0
• Stage IIA	T0	N1	M0
	T1 a	N1	M0
	T2	N0	M0
• Stage IIB	T2	N1	M0
	T3	N0	M0
• Stage IIIA	T0	N2	M0
	T1a	N2	M0
	T2	N2	M0
	T3	N1	M0
	T3	N2	M0
• Stage IIIB	T4	N0	M0
	T4	N1	M0
	T4	N2	M0
• Stage IIIC	Any T	N3	M0
• Stage IV	Any T	Any N	M1

Primary breast cancer

- More than 80% of breast cancers show productive fibrosis that involves the epithelial and stromal tissues.
- Desmoplastic response entraps and shortens Cooper‘s suspensory ligaments to produce a characteristic *skin retraction*.
- Localized edema (*peau d'orange*) develops when drainage of lymph fluid from the skin is disrupted.
- With continued growth, cancer cells invade the skin, and eventually *ulceration* occurs.
- As new areas of skin are invaded, small *satellite nodules* appear near the primary ulceration.
- The size of the primary breast cancer correlates with disease-free and overall survival, but there is a close association between cancer size and axillary lymph node involvement.
- In general, up to 20% of breast cancer recurrences are local-regional, >60% are distant, and 20% are both local-regional and distant.

- **In Situ Breast Cancer (Stage 0)**

- LCIS:

- Bilateral mammography is performed to determine the extent of the in situ cancer and to exclude a second cancer.

- LCIS is considered a marker for increased risk and the risk of invasive cancer is equal for both breasts.

- Current treatment options for LCIS : observation, chemoprevention with tamoxifen, and bilateral total mastectomy.

- The use of tamoxifen as a risk reduction strategy should be considered in women with a diagnosis of LCIS.

- **DCIS:**
- DCIS and evidence of extensive disease (>4 cm of disease or disease in more than one quadrant) usually require mastectomy.
- For women with limited disease, lumpectomy and radiation therapy are recommended.
- Low-grade DCIS of the solid, cribriform, or papillary subtype that is <0.5 cm in diameter may be managed by lumpectomy alone without radiation if the margins of resection are widely free of disease.
- For nonpalpable DCIS, needle localization techniques are used to guide the surgical resection.
- Adjuvant tamoxifen therapy is considered for DCIS patients.

Early Invasive Breast Cancer (Stage I, IIA, or IIB)

- Disease-free, distant disease-free, and overall survival rates for lumpectomy with or without radiation therapy were similar to those observed after total mastectomy.
- In-breast recurrence was higher in the lumpectomy group not receiving radiation therapy.
- There was no difference in disease free survival rates after total mastectomy or after lumpectomy with or without adjuvant radiation therapy.

Advanced Local-Regional Breast Cancer (Stage IIIA or IIIB)

- Neoadjuvant chemotherapy should be considered in the initial management of all patients with locally advanced stage III breast cancer.
- Surgical therapy for women with stage III disease is usually a modified radical mastectomy, followed by adjuvant radiation therapy.
- Chemotherapy is used to maximize distant disease-free survival, whereas radiation therapy is used to maximize local-regional disease-free survival.

Axillary lymph node metastases

- Lymph nodes that contain metastatic cancer are at first ill defined and soft but become firm or hard
- Eventually the lymph nodes adhere to each other and form a conglomerate mass and finally erode capsule and fix to contiguous structures in the axilla, including the chest wall.
- Although >95% of the women who die of breast cancer have distant metastases, the most important prognostic correlate of disease-free and overall survival is axillary lymph node status.
- Women with node-negative disease have less than a 30% risk of recurrence, compared with as much as a 75% risk for women with node-positive disease.

- **Internal Mammary Lymph Nodes**

- Metastatic disease to internal mammary lymph nodes may be occult, may be evident on chest radiograph or CT scan, or may present as a painless parasternal mass with or without skin involvement.

- There is no need for internal mammary lymph node radiation therapy in women who are at increased risk for occult involvement (cancers involving the medial aspect of the breast, axillary lymph node involvement) but who show no signs of internal mammary lymph node involvement.

- Systemic chemotherapy and radiation therapy are indicated in the treatment of grossly involved internal mammary lymph nodes.

Distant metastases

- At 20th cell doubling (neovascularization), shedding into systemic venous blood and seeding the pulmonary circulation via the axillary and intercostal veins or the vertebral column via Batson's plexus of veins.
- Successful implantation occurs after the primary cancer exceeds 0.5 cm in diameter,(27th cell doubling).

- For 10 years after initial treatment, distant metastases are the most common cause of death in breast cancer patients. 60% of distant metastases will occur within 24 months of treatment. Metastases may become evident as late as 20 to 30 years after treatment of the primary cancer.
- Common sites of metastases (in order of frequency):

  - bone, lung, pleura, soft tissues, and liver.

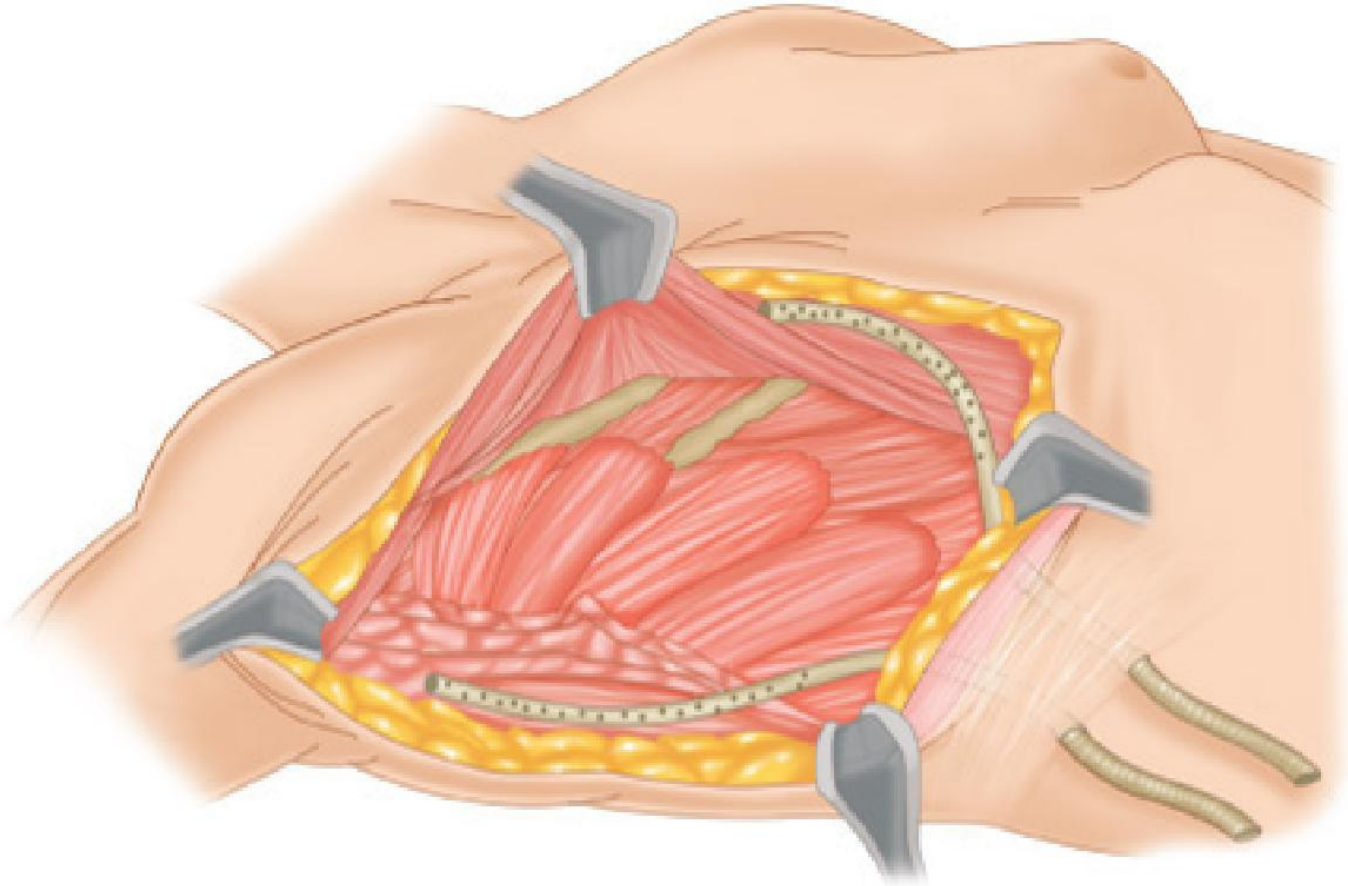
Treatment

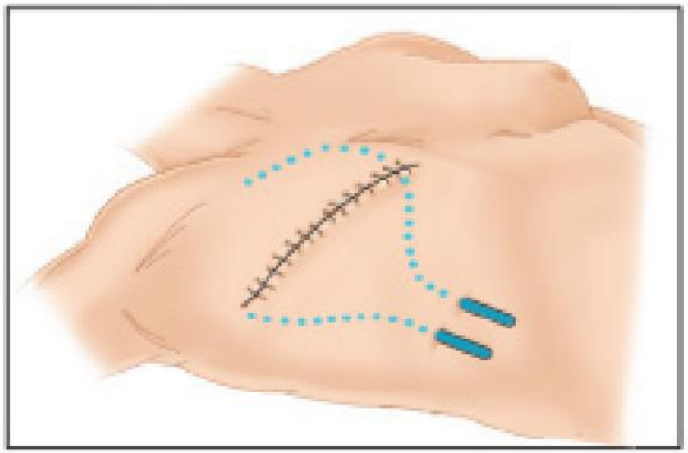
Surgery

- **Removing the breast cancer (lumpectomy) :**removes the tumor and a small margin of surrounding healthy tissue.

- **Removing the entire breast (mastectomy)** the lobules, ducts, fatty tissue and some skin, including the nipple and areola (*simple mastectomy*). In a *skin-sparing mastectomy*, the skin over the breast is left intact to improve reconstruction and appearance.

- **Removing a limited number of lymph nodes (sentinel node biopsy)**
- **Removing several lymph nodes (axillary lymph node dissection)**
- **Removing both breasts** (contralateral prophylactic mastectomy) if they have a very increased risk of cancer





Chemotherapy

(adjuvant systemic chemotherapy)

- Chemotherapy is sometimes given before surgery (Neoadjuvant systemic chemotherapy) in women with larger breast tumors. The goal is to shrink a tumor to a size that makes it easier to remove with surgery.
- Chemotherapy is also used in women whose cancer has already spread to other parts of the body. Chemotherapy may be recommended to try to control the cancer and decrease any symptoms the cancer is causing.
- Common side effects :

- hair loss, nausea, vomiting, fatigue and an increased risk of developing infection. Rare side effects can include premature menopause, damage to the heart and kidneys, nerve damage, and, very rarely, blood cell cancer.

- **Radiation therapy**
  (external beam radiation) (brachytherapy).
- External beam radiation is commonly used after lumpectomy for early-stage breast cancer. Also recommend radiation therapy after mastectomy for larger breast cancers or cancers that have spread to the lymph nodes.

- Side effects:

- fatigue and a red, sunburn-like rash where the radiation is aimed. Breast tissue may also appear swollen or more firm.
- Rarely, more-serious problems may occur, such as damage to the heart or lungs or, very rarely, second cancers in the treated area.

Hormone therapy

- **Medications that block hormones from attaching to cancer cells.**Selective estrogen receptor modulator (SERM). SERMs, which can be used in both pre- and postmenopausal women, include tamoxifen, raloxifene (Evista) and toremifene (Fareston).

- Side effects: hot flashes, night sweats and vaginal dryness. More significant risks include blood clots, stroke, uterine cancer and cataracts.

- **Medications that stop the body from making estrogen after menopause.** Called aromatase inhibitors. These drugs are effective only in postmenopausal women. Aromatase inhibitors include anastrozole (Arimidex), letrozole (Femara) and exemestane (Aromasin). Side effects include hot flashes, night sweats, vaginal dryness, joint and muscle pain, as well as an increased risk of bone thinning (osteoporosis).

- **A drug that targets estrogen receptors for destruction.** The drug fulvestrant (Faslodex) blocks estrogen receptors on cancer cells and signals to the cell to destroy the receptors. Fulvestrant is used in postmenopausal women. Side effects that may occur include nausea, hot flashes and joint pain.
- **Surgery or medications to stop hormone production in the ovaries.** In premenopausal women, surgery to remove the ovaries or medications to stop the ovaries from making estrogen can be an effective hormonal treatment.

Prevention

- **Breast cancer screening (**clinical breast exams and mammograms)
- **Breasts through breast self-exams**
- **Drink alcohol in moderation (**less than one drink a day)
- **Exercise most days of the week (** 30 minutes on most days)
- **Limit postmenopausal hormone therapy**
- **Maintain a healthy weight**

Follow-up for breast cancer survivors

- **History/PE:** Every 3 to 6 months for first 3 years
  Every 6 to 12 months for years 4 and 5
  Annualy thereafter

- **Mammography:** Annually (beginning no earlier than 6 months after RT)

- **Breast self examination:** Monthly

- **Pelvic examination:** Annually

- **Not recommended for routin survillance:**
  - CBC, LFT
  - CXR, Bone scan, Liver ultrasound, CT scan, PET scan, breast MRI
  - Antigen 15-3, 27.29, CEA

Multidisciplinary Management

- Surgical Oncologist
- Radiologist
- Pathologist
- Medical Oncologist
- Radiation Oncologist
- Psychlogist
- Nursing Care

+ (in Pregnancy):

- Obstetrician
- Maternal –fetal medicine specialist