كلية العلوم التطبيقية هيت
قسم الفيزياء الحياتية

المرحلة الرابعة - الاجهزة الطبية

Mammography

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Mammography

Mammography is presently the most reliable method for detecting lesions in the breast. It:

- Requires high standards of image quality and equipment performance because the contrast between normal and pathological areas in the breast is extremely low;
- Performed on symptomatic (medically referred) patients as well as on asymptomatic women who satisfy selection criteria for approved breast cancer screening programmes. Such programmes are common in many countries.

Specific requirements

Mammography shall be carried out using dedicated, special purpose x-ray equipment with:

- Generators capable of relatively low x-ray tube potentials: e.g. 25-30 kV peak;

- X-ray tubes with a molybdenum or rhodium target (anode) and mo or rh filtration. In modern mammography units different anode / filter combinations are available;

- The use of an anti-scatter grid and automatic exposure control (AEC) system are strongly recommended.

Compression

- Radiolucent breast compression device - the application of firm compression to the breast during mammography provides immobilisation, reduces tissue thickness and ensures greater uniformity in thickness.

- Compression contributes to improved image quality by minimizing blurring and by reducing both the exposure required and the intensity of scattered radiation.

Mammographic Equipment

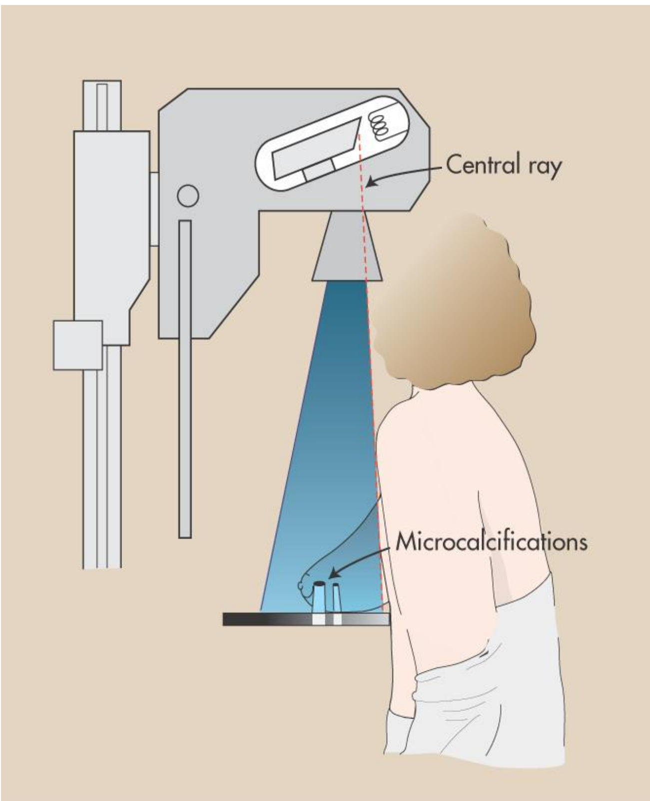
Special (dedicated) equipment for mammography

Malfunctions affecting radiation protection

Basically the same as for general x-ray systems but tests performed and measuring instruments used must be adapted to the characteristics of mammography systems, e.g.

- Inaccuracy and inconsistency of the x-ray tube voltage and radiation output.
- Misalignment between the x-ray beam and the image receptor, non-uniformity of the x-ray field.
- Unsatisfactory film storage conditions, image development and viewing conditions
- Improperly calibrated automatic exposure control (aec), etc.

Mammography Equipment



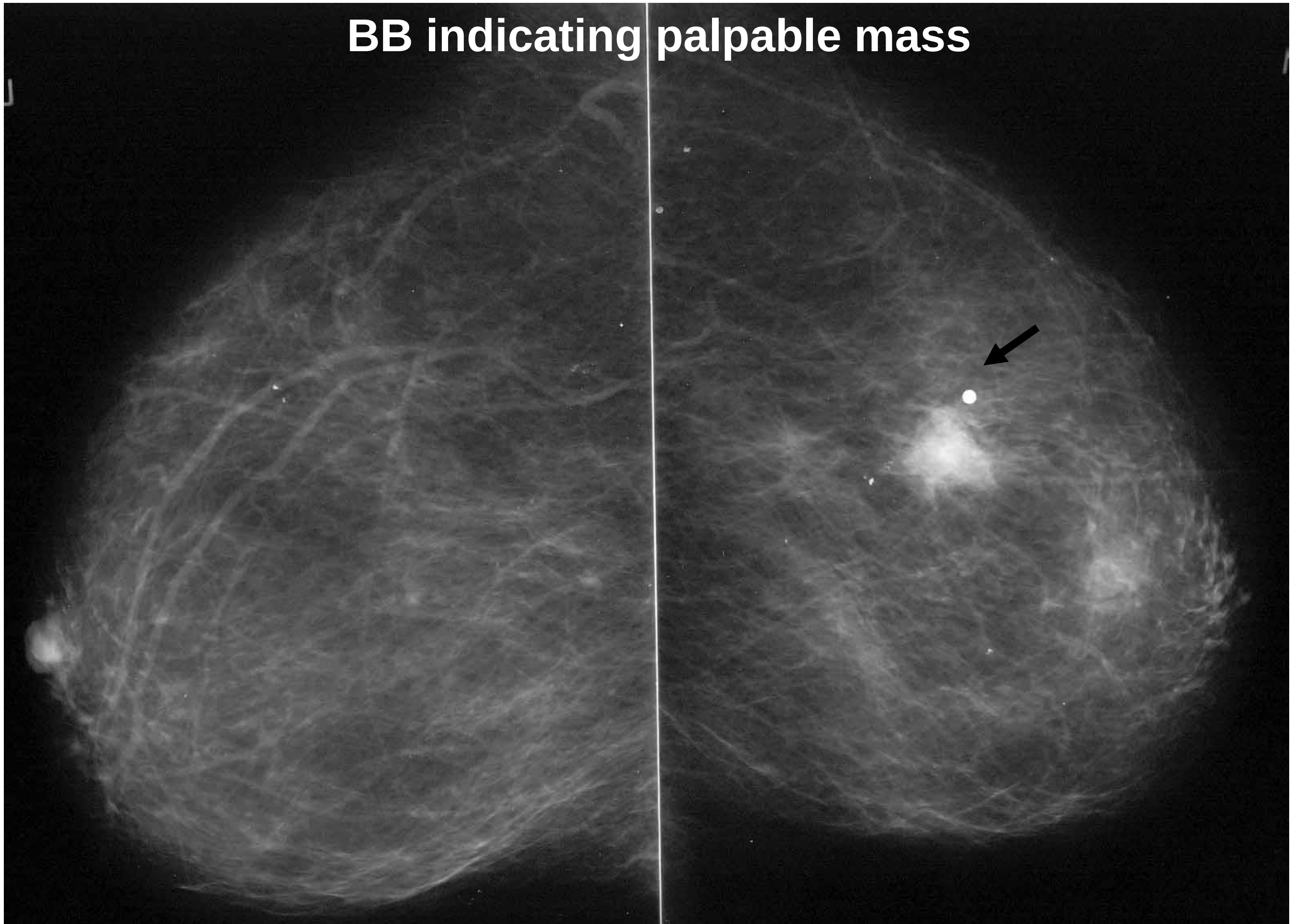
When the x-ray tube is tilted in its housing, the effective focal spot is small, the x-ray intensity is more uniform, and tissue against the chest is imaged.

Assessment category

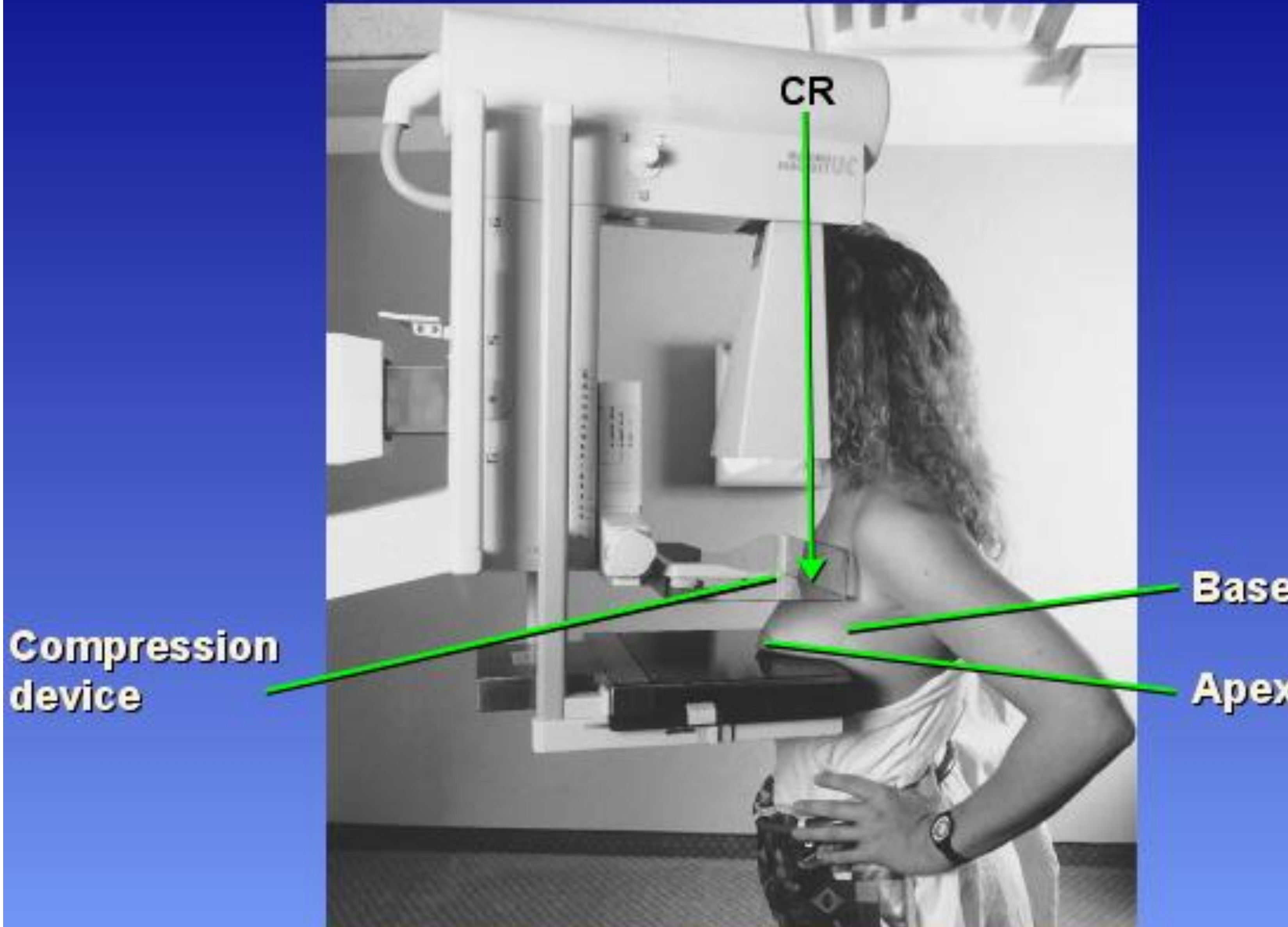
- 1 Normal
- 2 Benign finding
- 3 Probably benign 6 months follow-up
- 4 Suspicious-biopsy
- 5 Malignant-biopsy

Breast Imaging

The area of concern is marked with a BB.



Breast Positioning



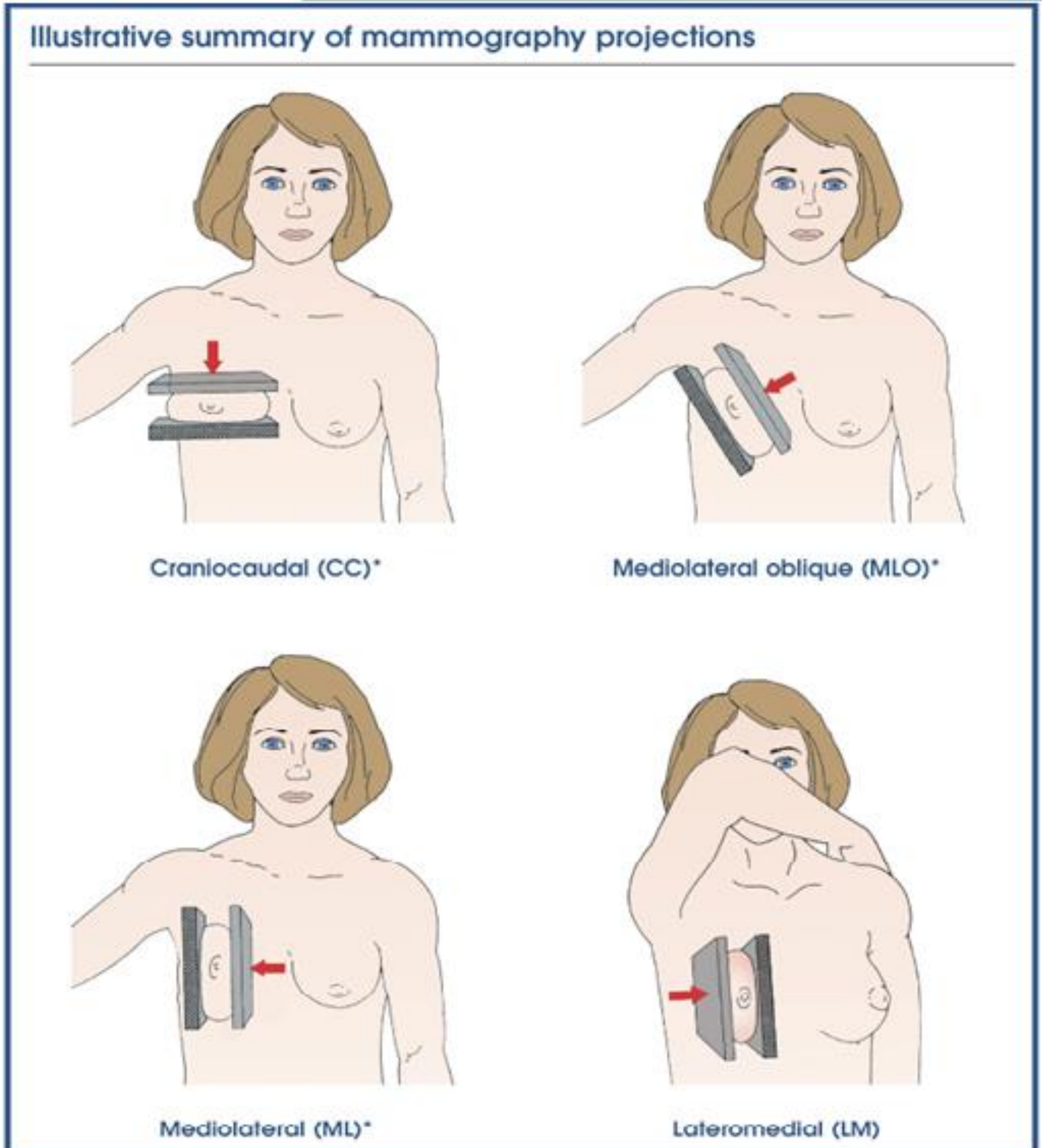
Positioning Routine Images

CC - Cranio-caudad

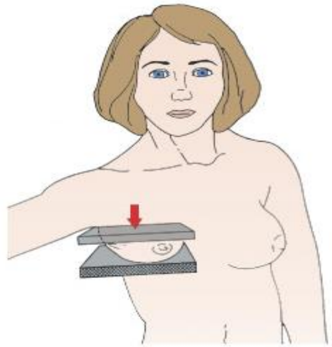
MLO – mediolateral oblique

ML -- mediolateral

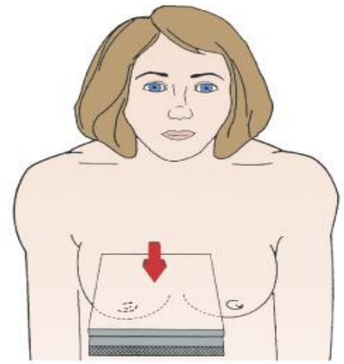
LM-- lateral-medio



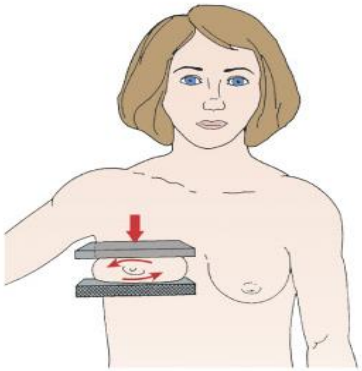
Illustrative summary of mammography projections—cont'd



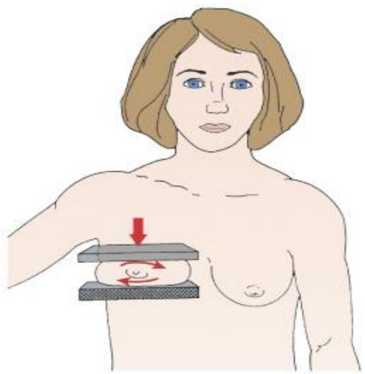
Exaggerated craniocaudal (XCCL)*



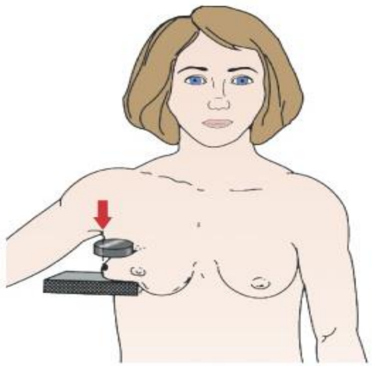
Craniocaudal for cleavage (CV)



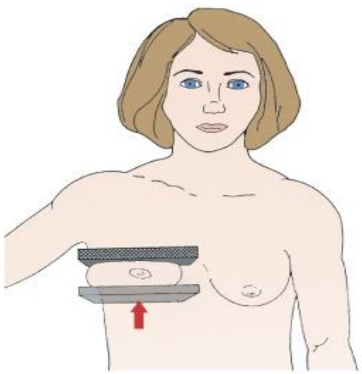
Craniocaudal with roll lateral (RL)



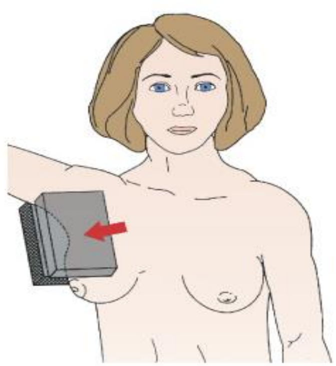
Craniocaudal with roll medial (RM)



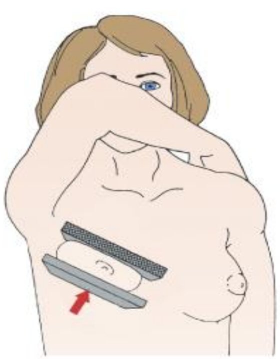
Tangential (TAN)



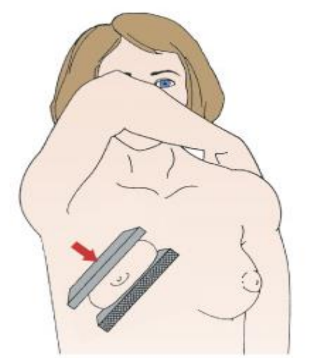
Caudocranial (FB)



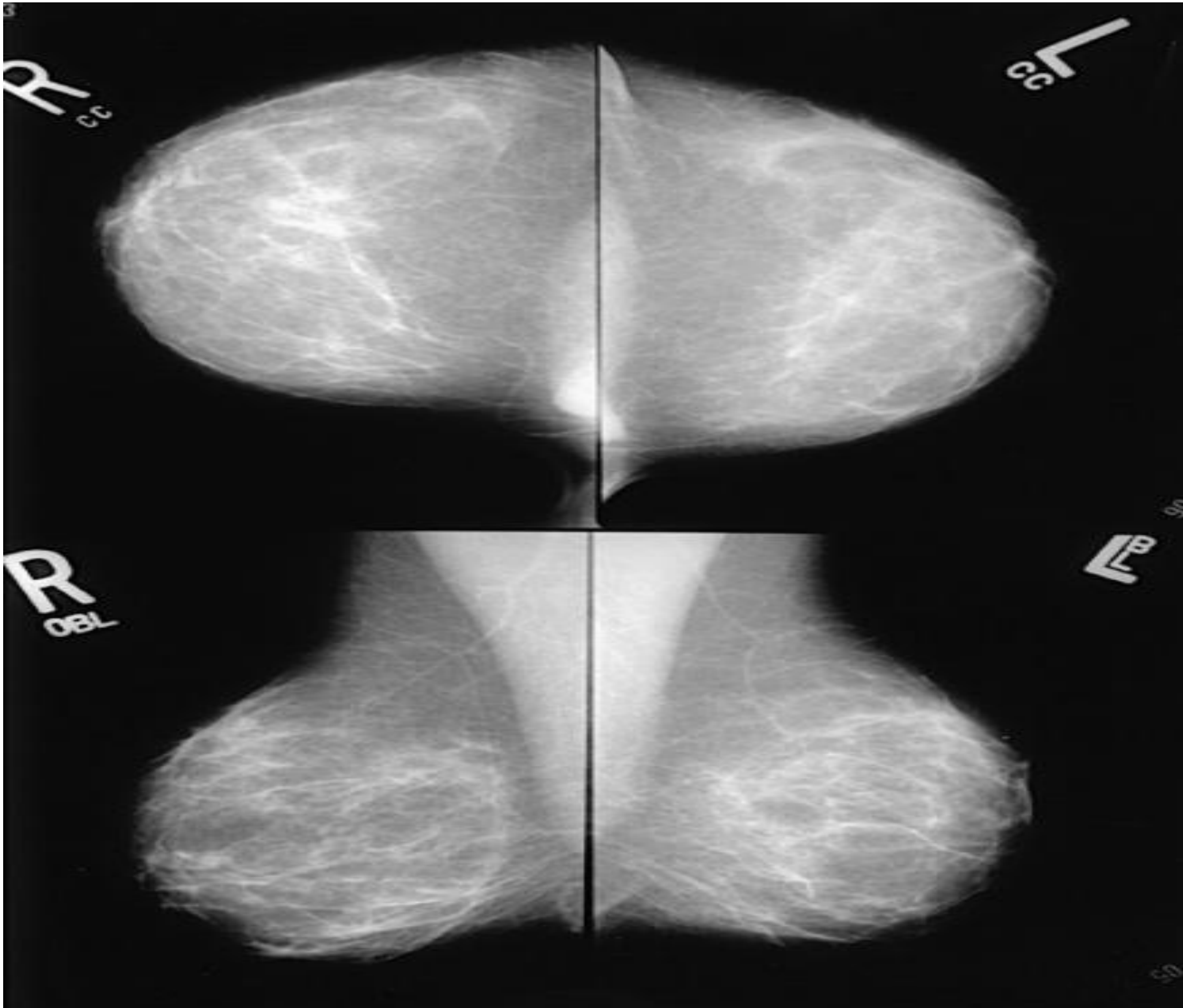
Mediolateral oblique for auxilary tail (AT)



Lateromedial oblique (LMO)

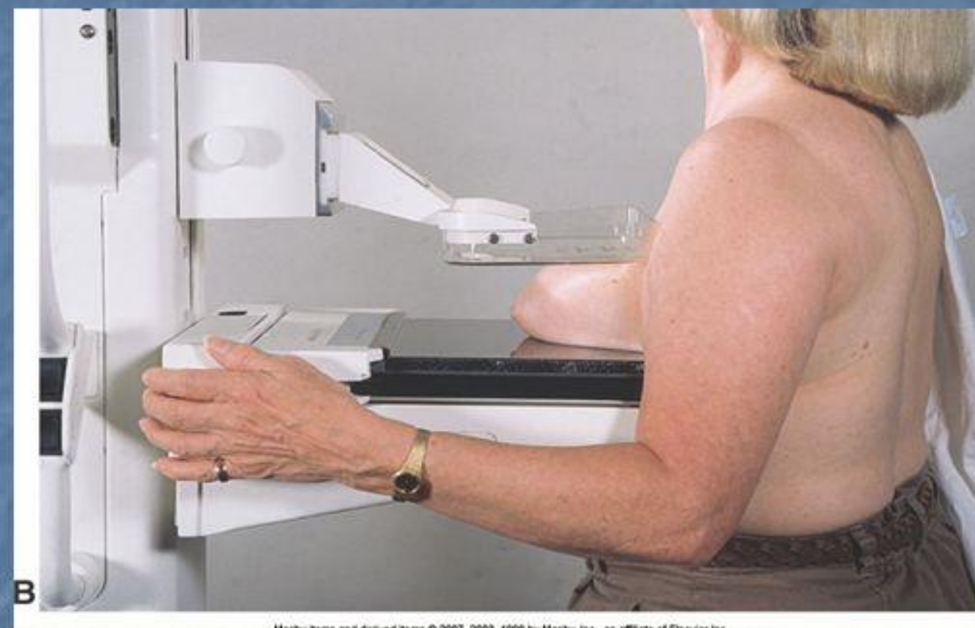


Superlateral to inferomedial oblique (SIO)


R
CC
L
CC
R
OBL
L
OBL

Compression

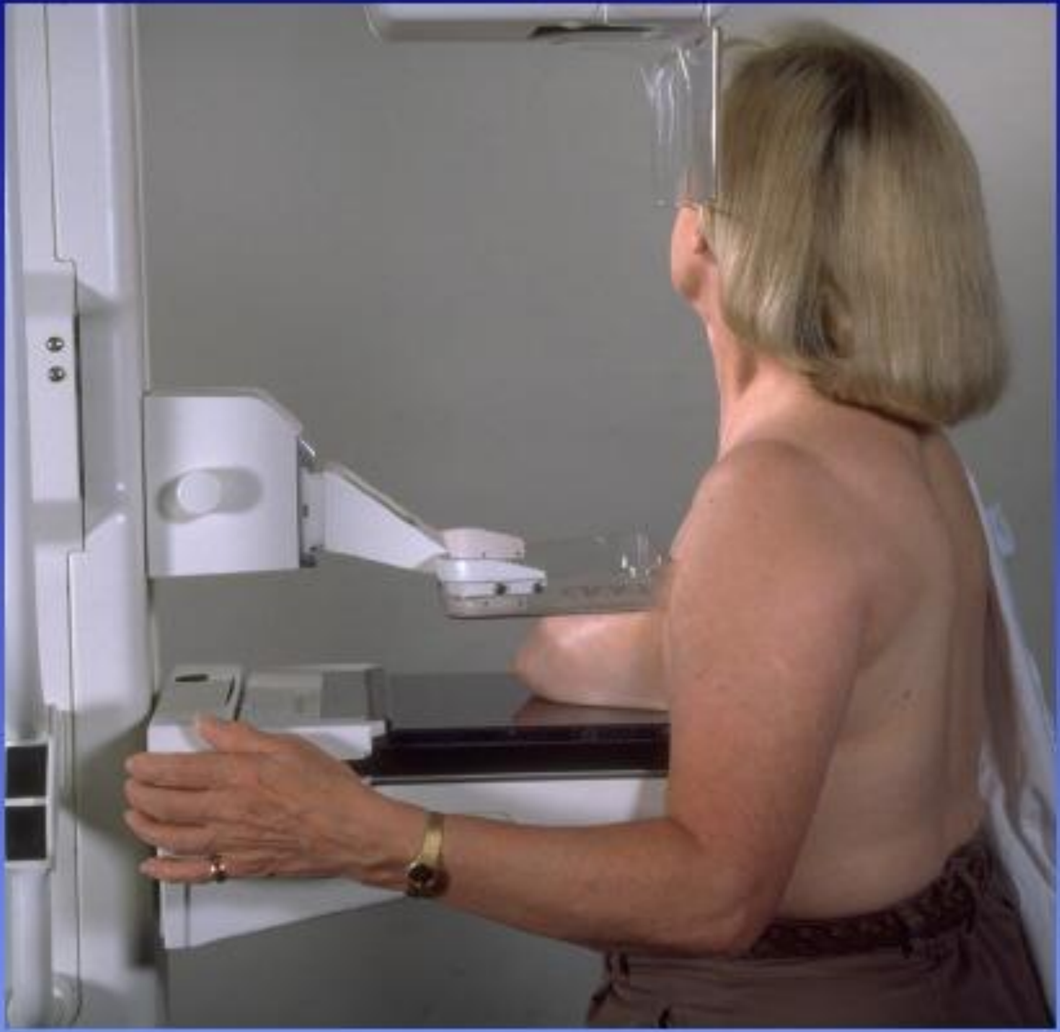
- Decreases thickness of breast- thus reduces exposure dose
- Decreases magnification and scatter
- Increases contrast
- Reduces motion unsharpness



Basic
- CC

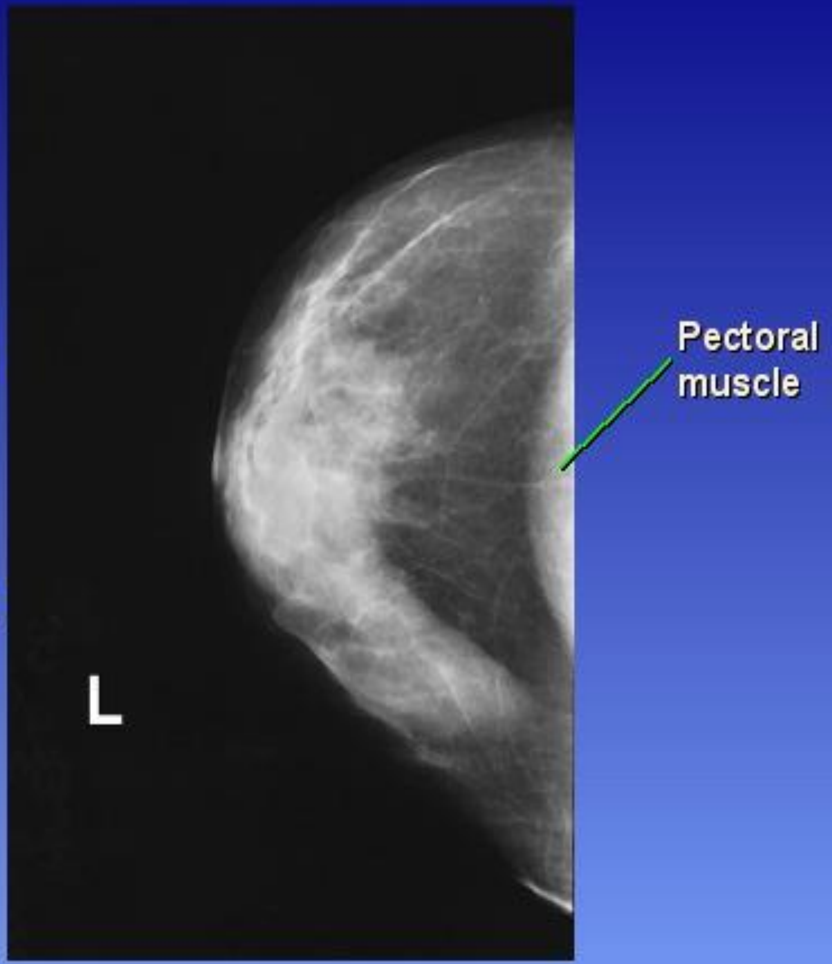
Craniocaudal (CC) Projection

- CR perpendicular
- Film tray to height of inframammary crease
- Nipple in profile
- Wrinkles and folds smoothed out
- Compression applied



Criteria Summary:
(CC)

- No motion
- Nipple in profile
- All pertinent anatomy demonstrated
- Tissue thickness distributed evenly
- Dense areas penetrated
- High contrast and optimal resolution
- Absence of artifacts
- Marker and patient ID visible

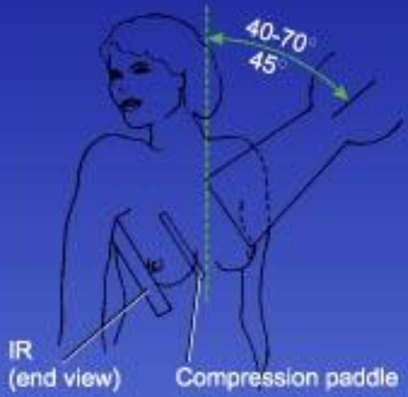


MLO – RT BREAST

Basic
- CC
- MLO

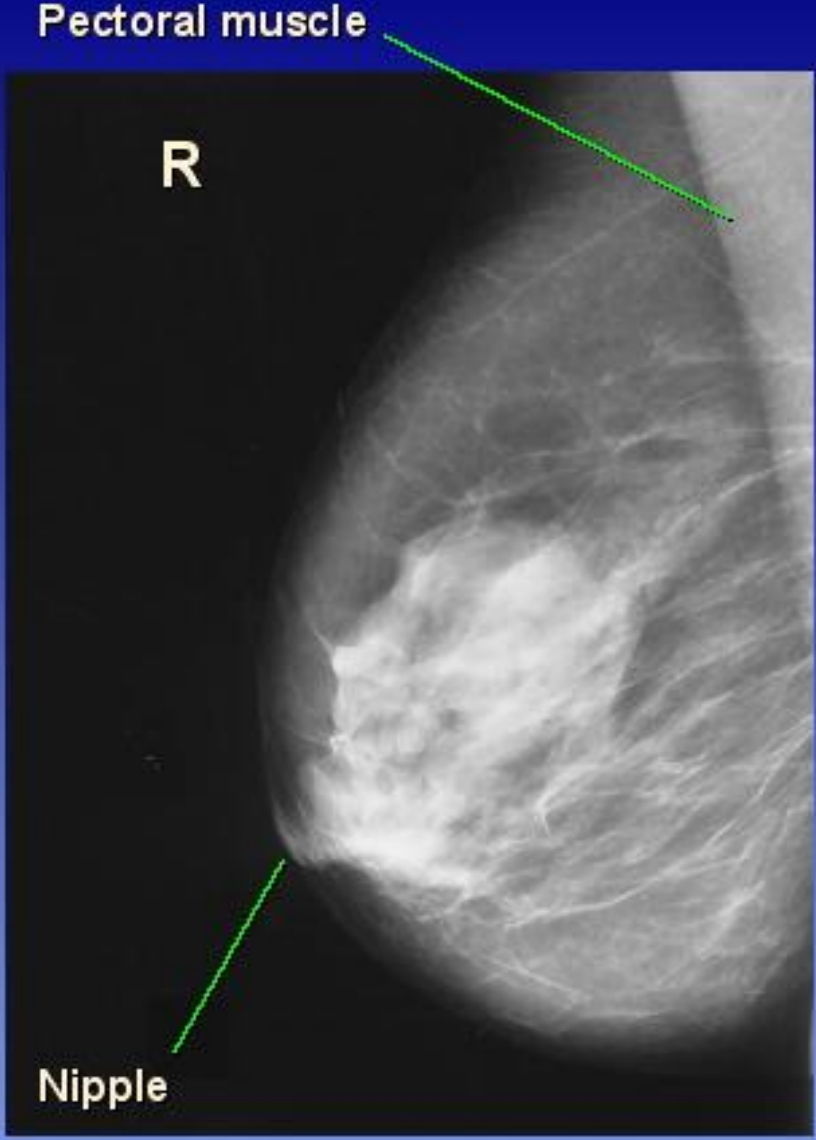
Mediolateral Oblique (MLO)

- CR and Cassette (IR) angled ≈45°
- Top of Cassette (IR) at axilla
- Compression applied
- Nipple in profile



Criteria Summary: (MLO)

- No motion
- Pectoral muscle to level of nipple visualized
- Breast pulled away from chest wall
- Nipple in profile
- Dense areas penetrated
- High contrast and optimal resolution
- Absence of artifacts



Breast Cancer Statistics

- Most common malignancy in American women (except skin)
- Approximately one third of new cancers diagnosed
- Second leading cause of death from cancer
- 211,300 new cases of invasive cancer this year
- 55,700 new cases of DCIS this year
- Leading cause of premature mortality- average 18.5 potential years of life lost

Breast Cancer Statistics

If breast cancer is diagnosed while the disease is local survival is 96%.

Survival for regional disease is 78%.

Survival for distant disease is 21%.

Methods of detection of breast cancer:

1. Breast Self Examination
2. Clinical Breast Exam
3. Mammography

Methods of Detection of Breast Cancer

Breast Self Examination and Clinical Breast Examination are used in the women under 40 yo to detect palpable masses.

At 40 and older Breast Self Examination and Clinical Breast Examination are used to detect breast cancers not seen on a mammogram because of technical limitations, interval tumor growth or breast cancers missed on the mammogram.

- At 40 and older mammography is used to screen for breast cancer in women without symptoms.
- Mammography is the most sensitive examination for detection of early breast cancers.

Recommendations for Screening Mammography

- Begin screening at age 40 unless the woman has a mother or sister who developed breast cancer before menopause.
- Screen annually.
- No end age for screening mammography.