Positioning: Beyond the CC and MLO Views Supplemental views

Advanced Health Education Center

Objectives

- To understand the role of additional mammographic views

Objectives

- To view diagnostic mammography as a tailored examination
- To select appropriate diagnostic views
  - By the radiologist
  - By the technologist

Clinical Correlation

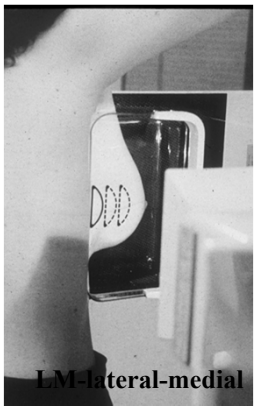
- Information from the patient
- Information from the doctor
- Information from the technologist
- Appropriately mark the area
- Ensure inclusion of the clinical area on the images
- Correlative physical exam in areas of mammographic concern

Special Mammographic Views

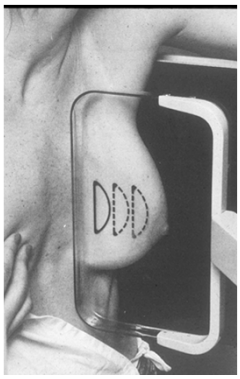
- 90 degree lateral (ML and LM)
- Rolled views
- SIO
- Magnification
- Exaggerated CC
- Tangential
- LMO

90 degree LM or ML

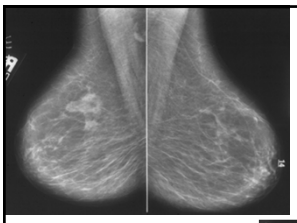
- 90 degree lateral views
  - Most commonly used additional view
  - For anterior compression when unable to achieve on routine MLO view
  - To triangulate the exact location of lesions in the breast in conjunction with the standard views
  - To demonstrate gravity-dependent calcifications (milk of calcium)



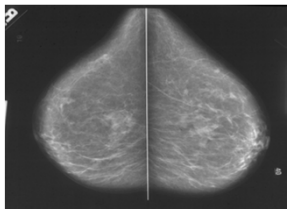
LM-lateral-medial



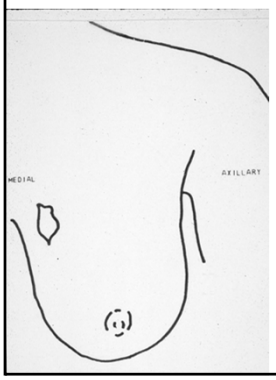
ML-medial-lateral

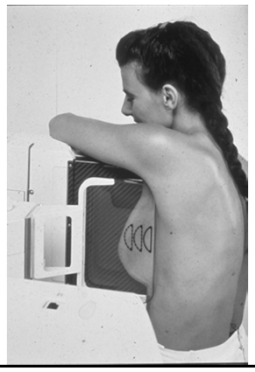


For anterior compression

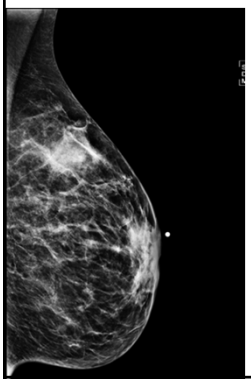


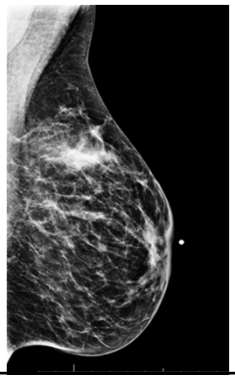
For Pathology in order to reduce Geometric Unsharpness



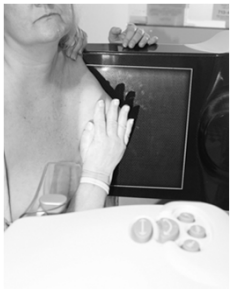


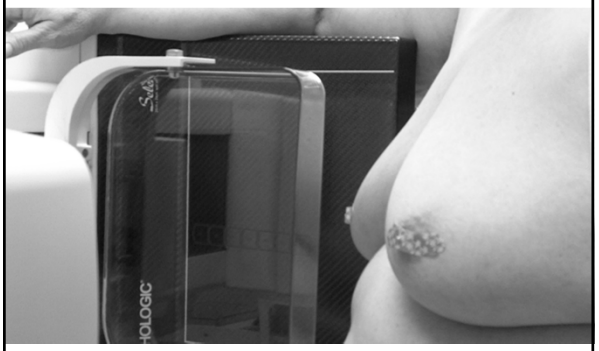
FOR ANTERIOR COMPRESSION





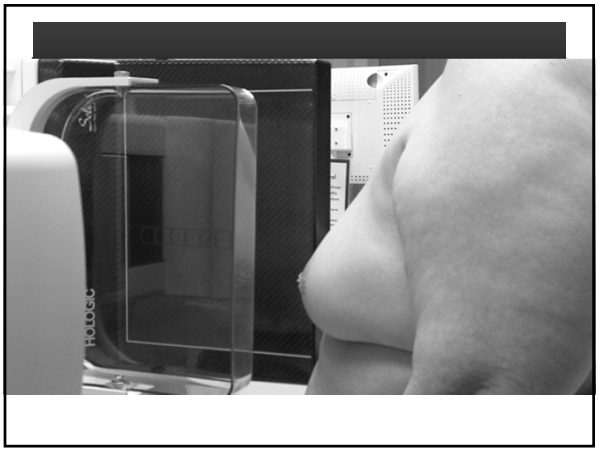
ML – Medial Lateral view



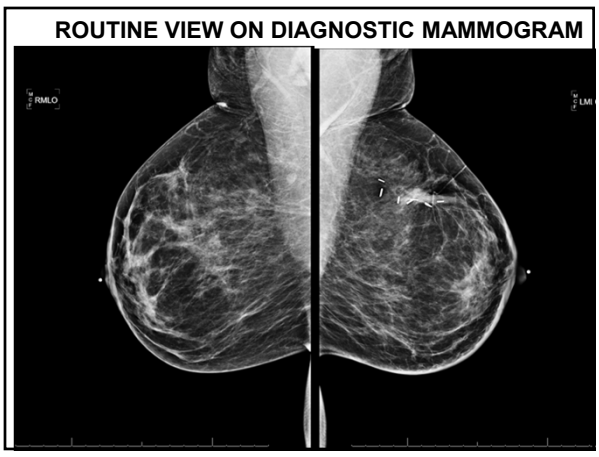



FLEX


LM – Lateral Medial view
RLM

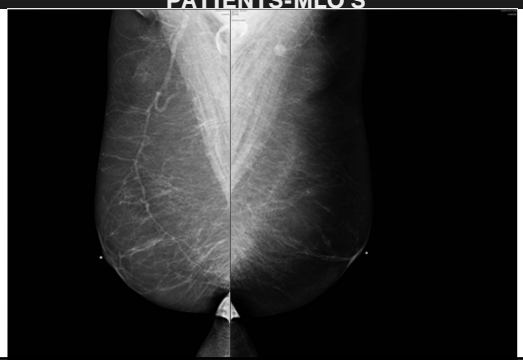

Hologic


FLEX

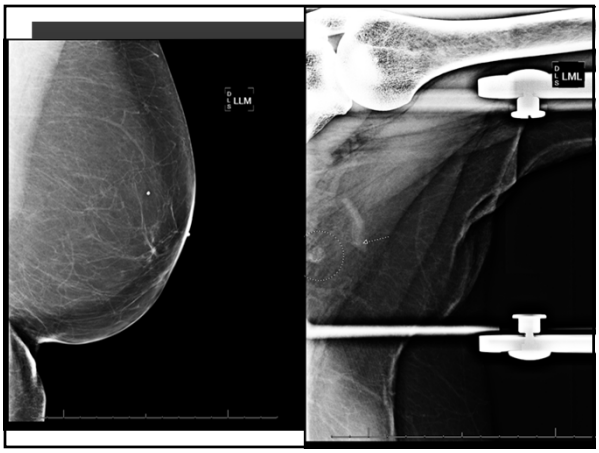

ROUTINE VIEW ON DIAGNOSTIC MAMMOGRAM
RMLO


RLM

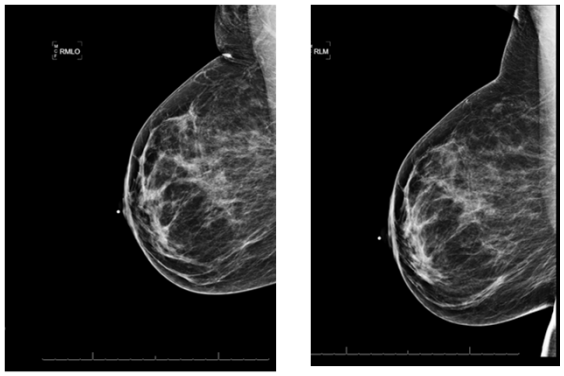
FOR OPTIMAL COMPRESSION AND POSITIONING on DIFFICULT TO POSITION PATIENTS-MLO'S



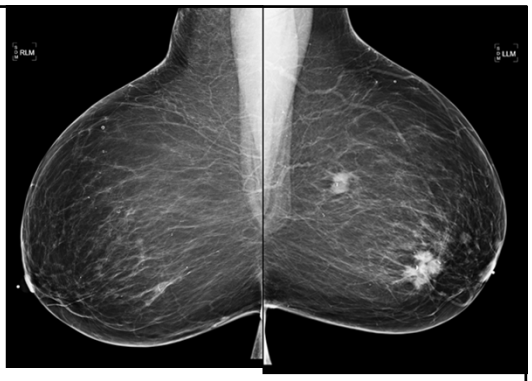
LM'S



FOR IMF



2011 Major folds and wrinkles



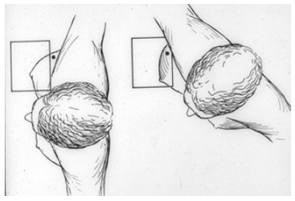
2012 No folds or wrinkles

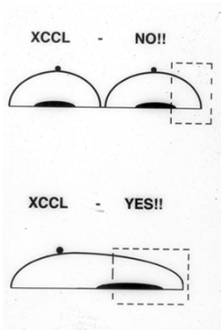
Exaggerated CC Views

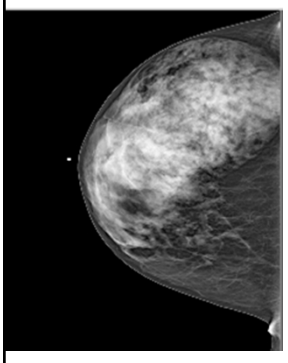
- For evaluating posterior outer breast
- Helpful for imaging post-operative scars in the outer breast
- For deep lesion or deep breast tissue in the outer aspect of the breast
  - The only view where the feet are NOT facing the machine.

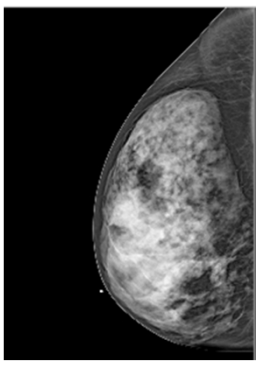
Exaggerated CC Views

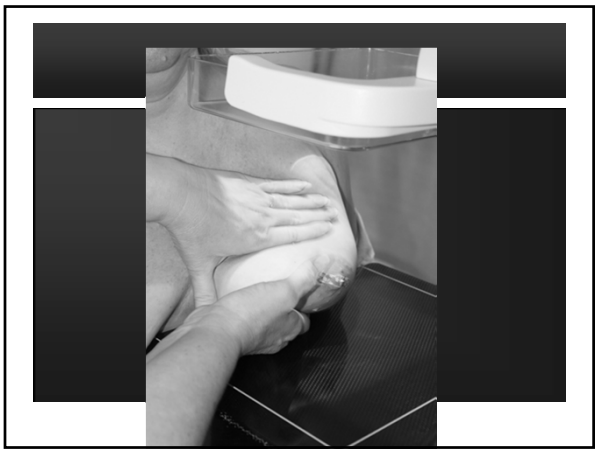
- For evaluating posterior outer breast
- Helpful for imaging post-operative scars in the outer breast

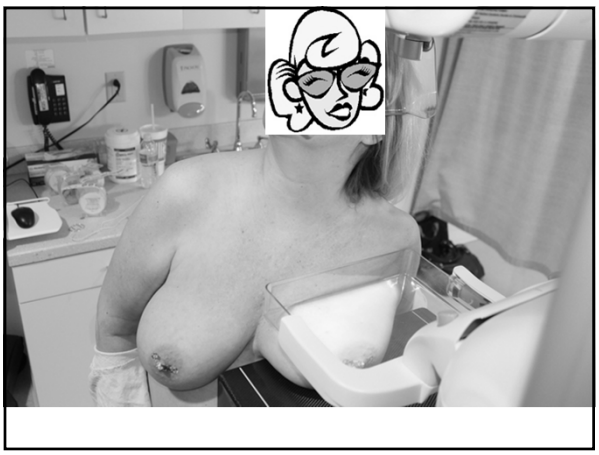


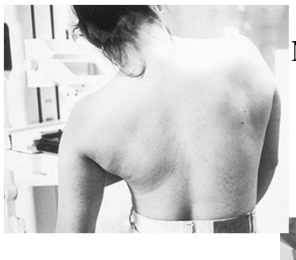






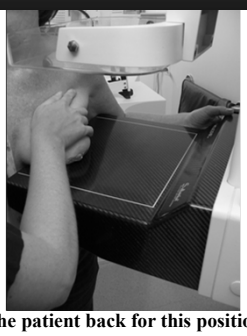






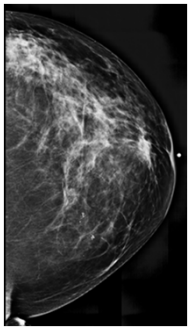
Never lean the patient

Positioning Challenges

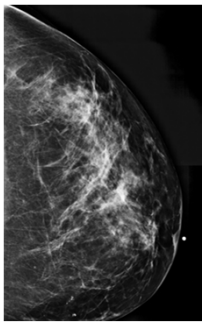


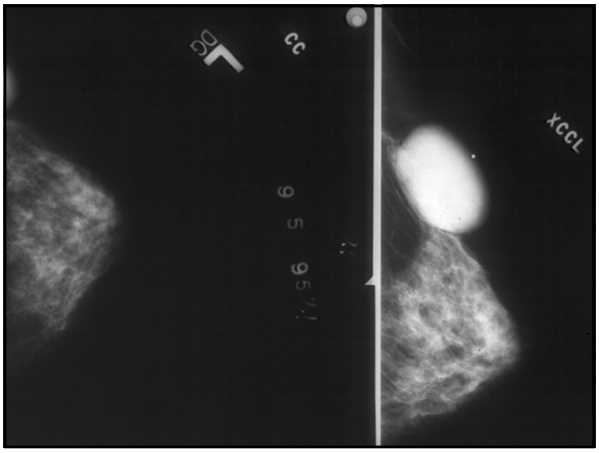
Do NOT lean the patient back for this position. (That would make it an axillary tail or MLO view. Giving the radiologist misleading information.)

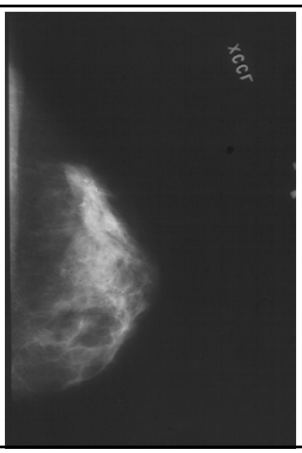
CC

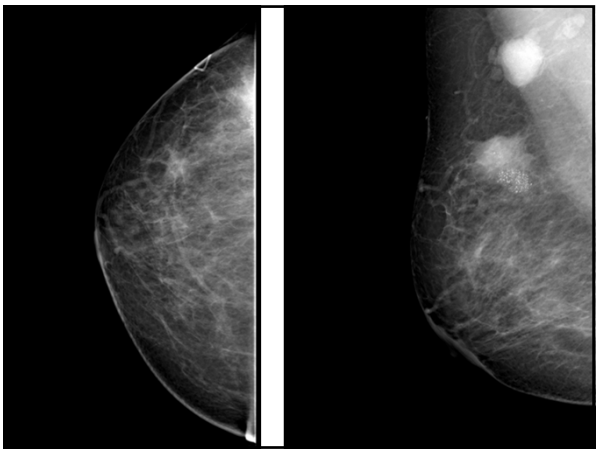


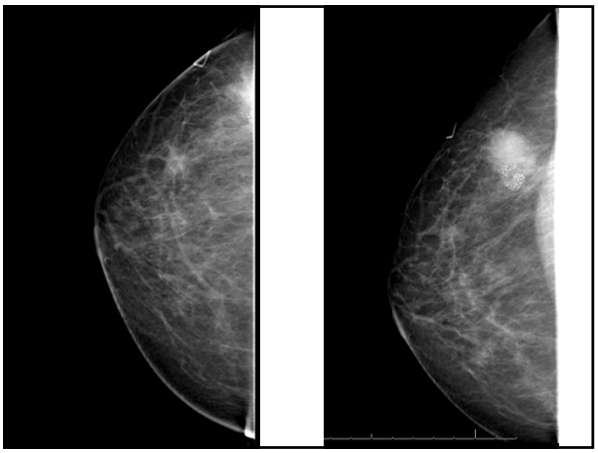
XCCL

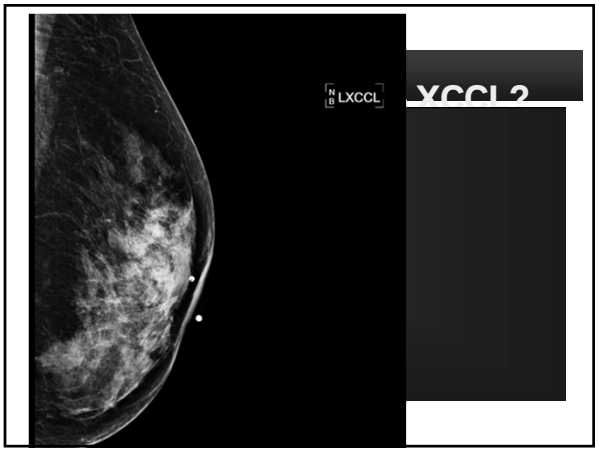


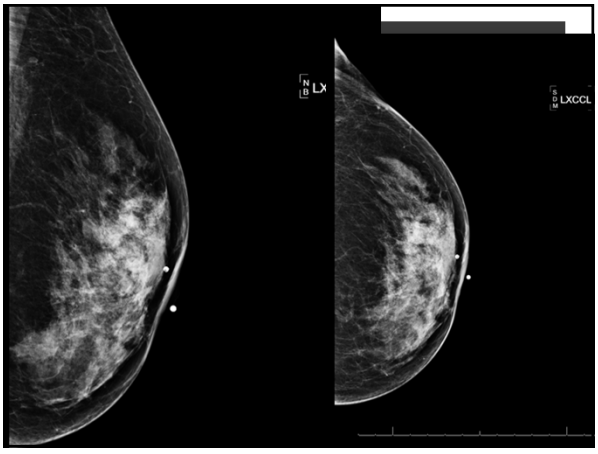


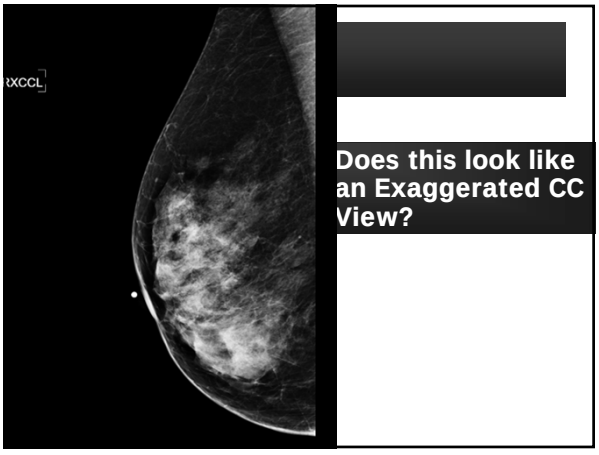


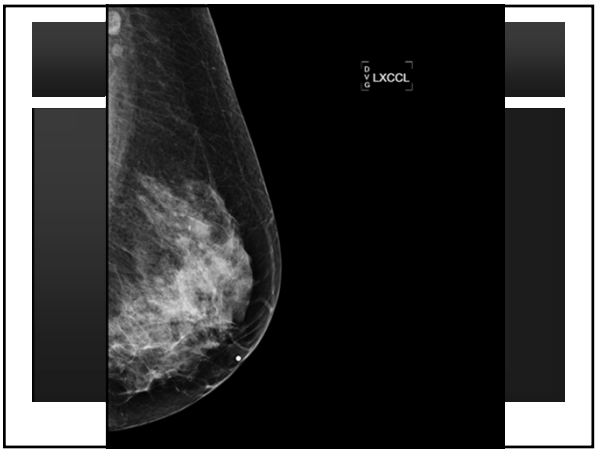


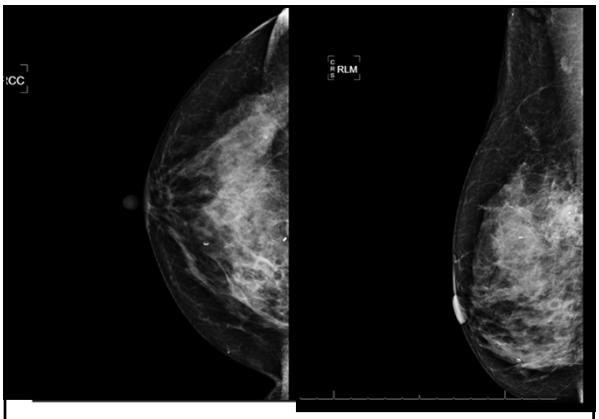



LXCCL

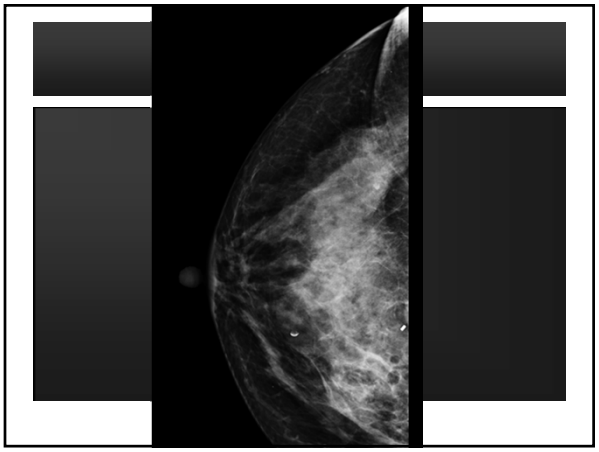

LXCCL

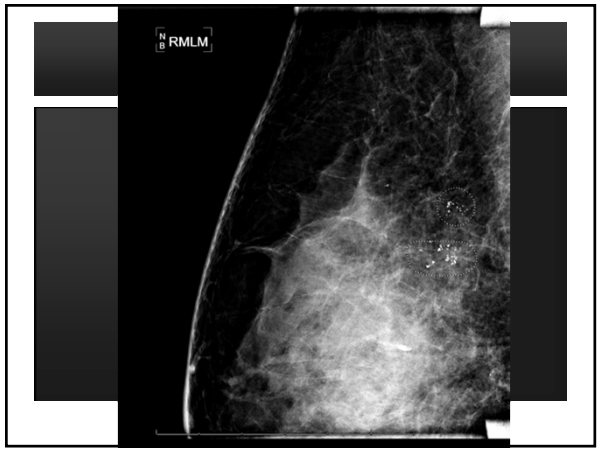

Does this look like an Exaggerated CC View?

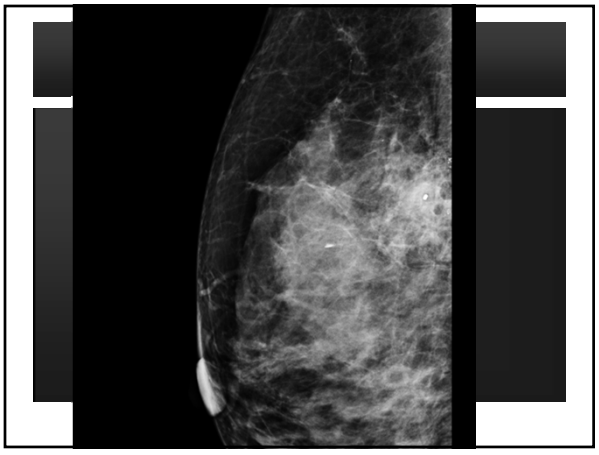

LXCCL

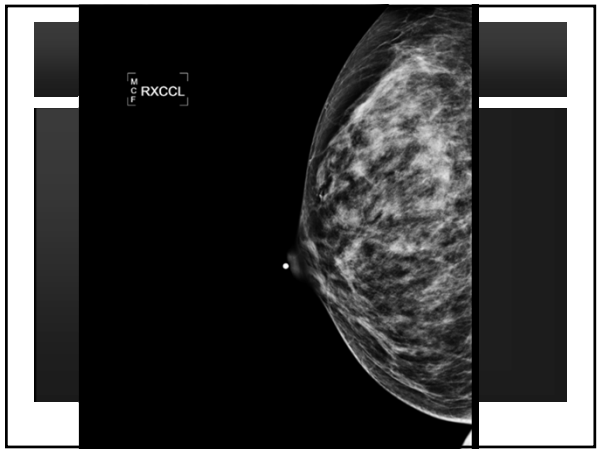


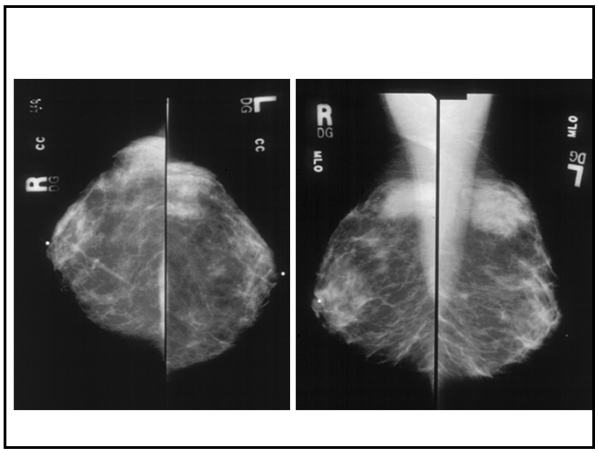
XCCL GONE WRONG

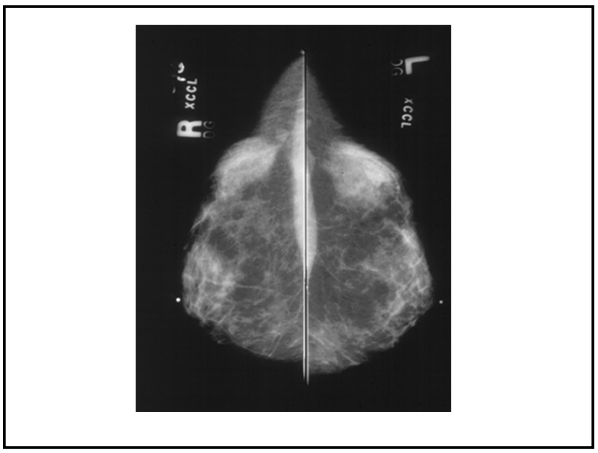


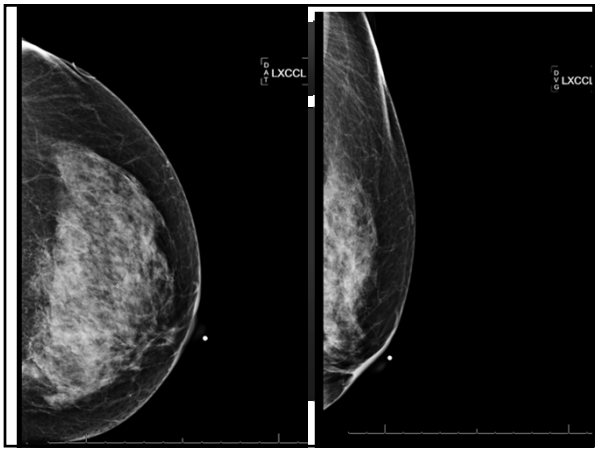




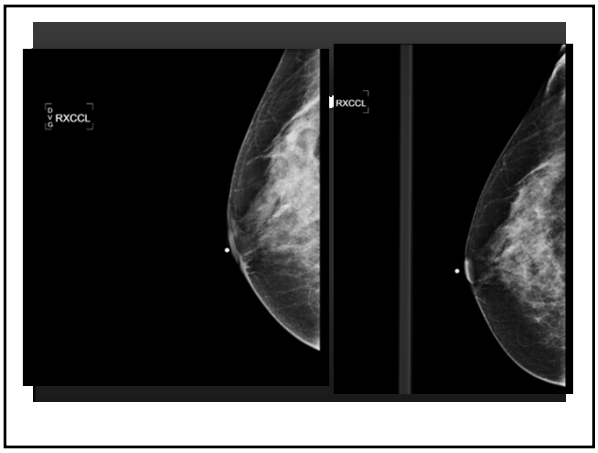


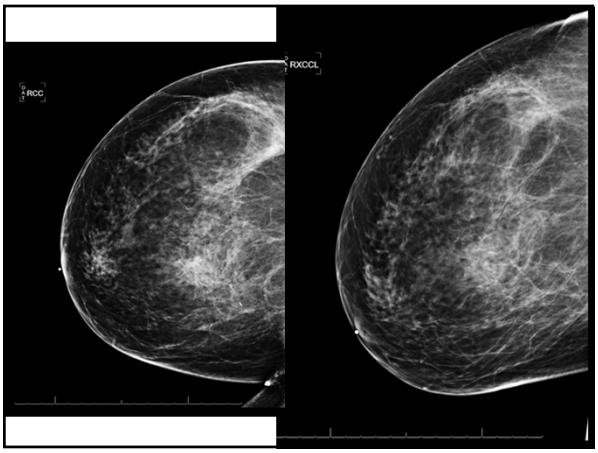

R
CC
L
CC
R
MLO
L
MLO

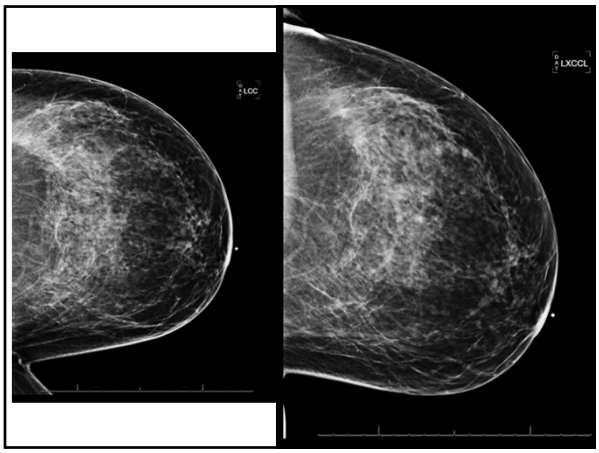

R
XCCL
L
XCCL


LXCCL
LXCCL

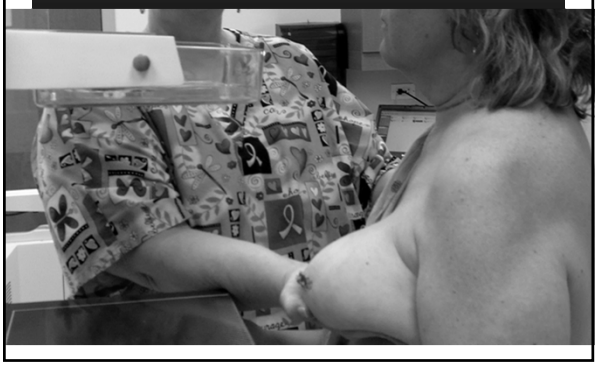

RXCCL
LXCCL


RXCCL
RXCCL


RCC
RXCCL



XCCL



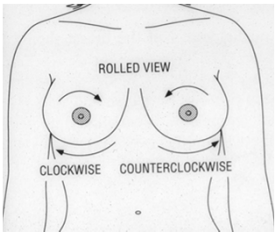
Roll Views

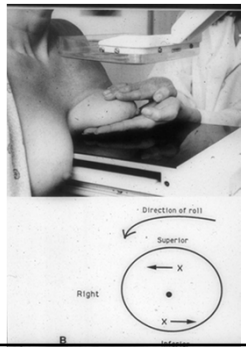
- To determine if a lesion is real
- To determine location of a lesion seen only on CC view
  - Top of breast rolled medial or lateral
  - Useful in removing superimposed tissue

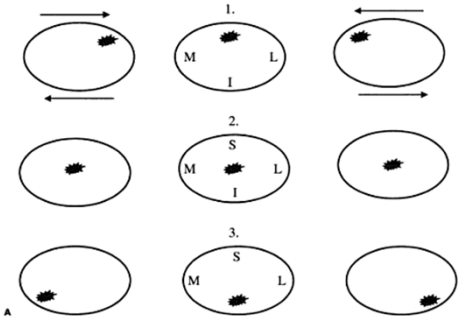
ROLLED OR CHANGE-OF-ANGLE VIEWS

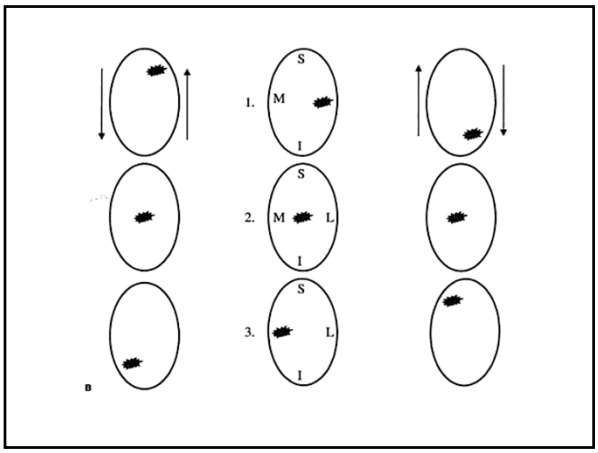
Rolled or change-of-angle views are commonly used in conjunction with spot compression views in establishing the presence of a lesion. These views are done using the spot compression paddle. Breast tissue is often planar, changing significantly in appearance as tissue is rolled or the angle of the incident beam is changed. In contrast, most breast cancers [except some invasive lobular carcinomas and small (less than 5 mm) invasive ductal carcinomas] are three dimensional. As tissue is rolled, the contour and appearance of most cancers does not change significantly.

ROLLED CC MEDIAL









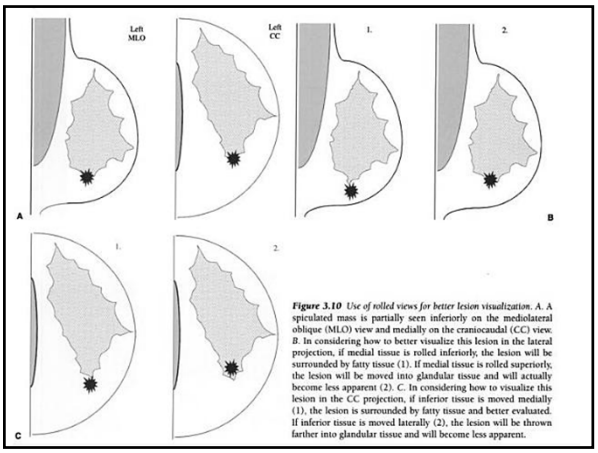


Figure 3.10 *Use of rolled views for better lesion visualization.* A. A spiculated mass is partially seen inferiorly on the mediolateral oblique (MLO) view and medially on the craniocaudal (CC) view. *B.* In considering how to better visualize this lesion in the lateral projection, if medial tissue is rolled inferiorly, the lesion will be surrounded by fatty tissue (1). If medial tissue is rolled superiorly, the lesion will be moved into glandular tissue and will actually become less apparent (2). *C.* In considering how to visualize this lesion in the CC projection, if inferior tissue is moved medially (1), the lesion is surrounded by fatty tissue and better evaluated. If inferior tissue is moved laterally (2), the lesion will be thrown farther into glandular tissue and will become less apparent.

General Rule of Thumb

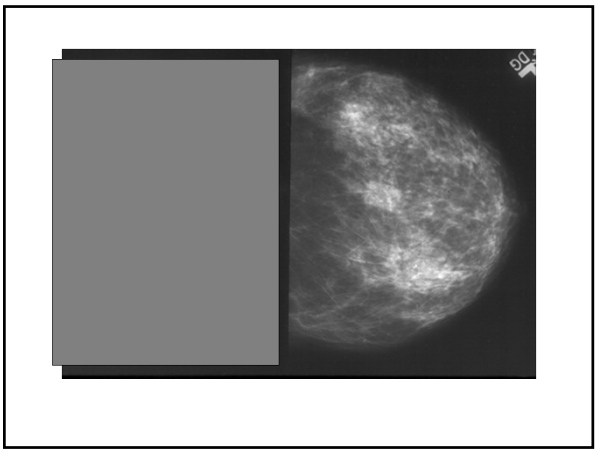
- The rolled lateral view is performed and if the mass moves toward the axilla the mass must be in the upper part of breast. If the mass moves medially on rolled lateral view the mass is in the inferior part of the breast.

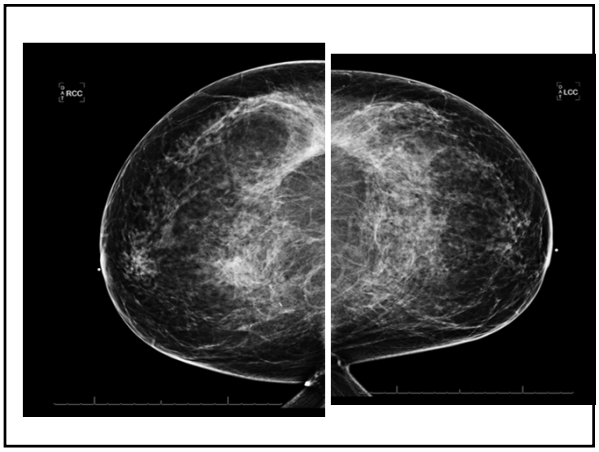
Rolled Views-CC

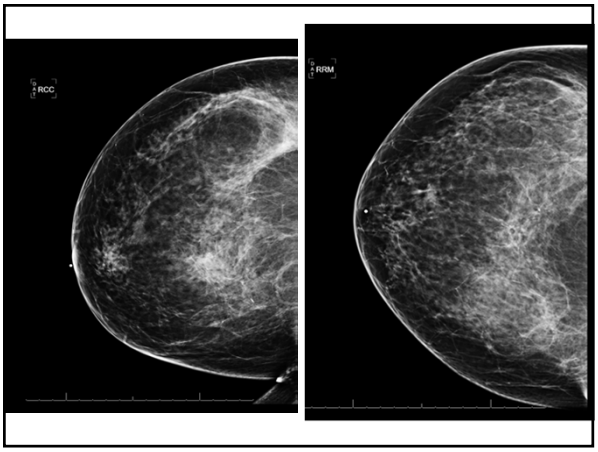
- RM-Rolled Medial
  - From the CC position the portion of the breast furthest from the image receptor is rolled medial and the lower portion laterally

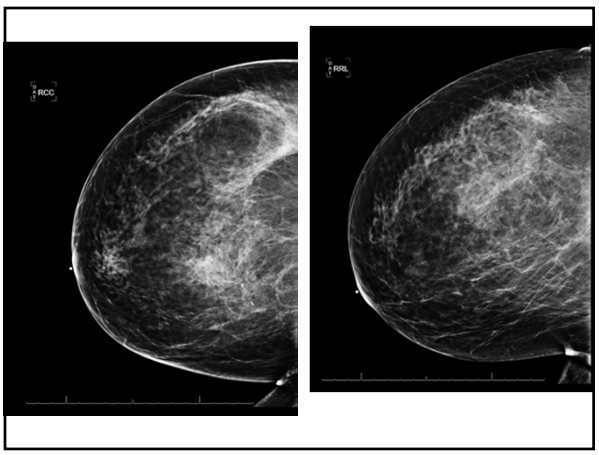
Rolled Views-CC

- RL-Rolled Lateral
  - From the CC position the portion of the breast furthest from the image receptor is rolled lateral and the lower portion medially









Rolled Views

- **RS-Rolled Superior**
  - **From the lateral position the portion of the breast furthest from the image receptor is rolled superiorly and the lower portion inferiorly**

Rolled Views

- **RI-Rolled Inferior**
  - **From the lateral position the portion of the breast furthest from the image receptor is rolled inferiorly and the lower portion superiorly**

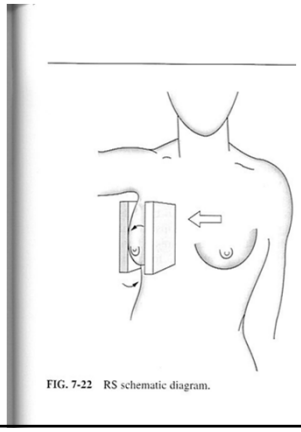
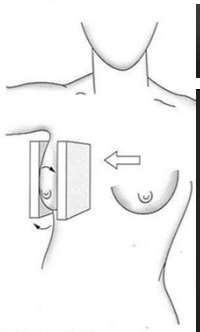
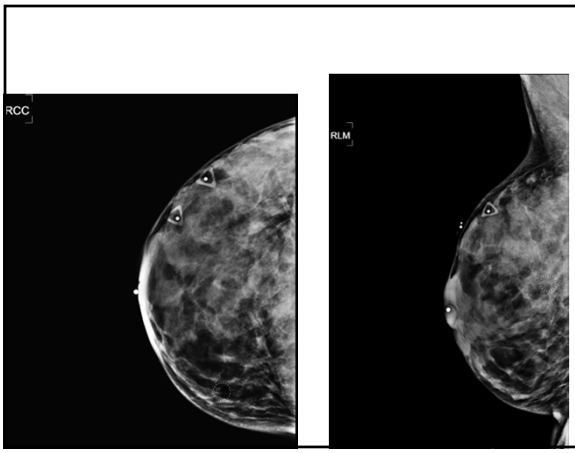


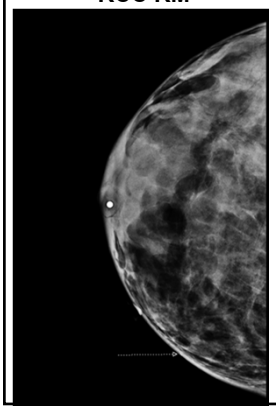
FIG. 7-22 RS schematic diagram.



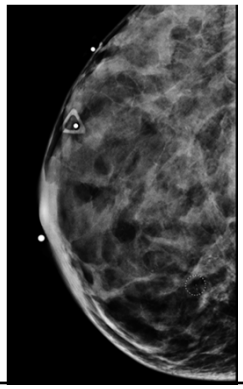
G. 7-23 RI schematic diagram.

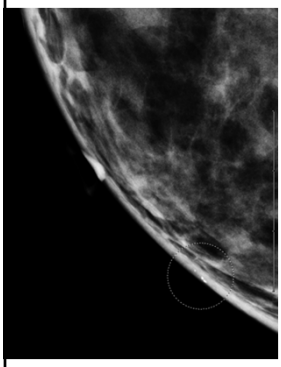
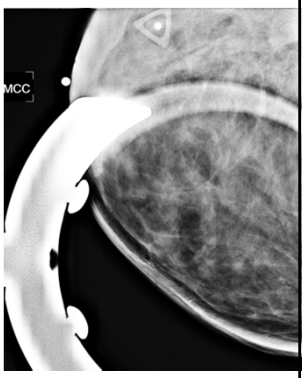


RCC RM



RCC RL



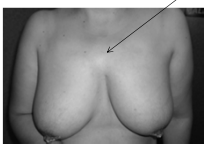



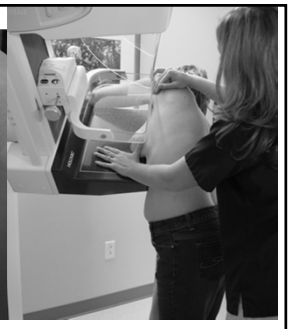
SIO-Superior-to-Inferomedial Oblique

- An oblique with the central ray directed upper-outer to lower-inner
- Limited usefulness as a whole breast projection
- Demonstrates the upper inner quadrant and the lower outer and the lower outer quadrant of the breast free of superimposition
- Useful when imaging patients with implants
- Provides a perpendicular projection to the MLO to assist in distinguishing

SIO Projection

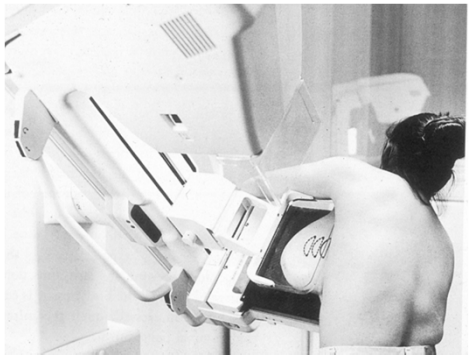
- To visualize more medical tissue on the wraparound breast
- To visualize more posterior and inferior tissue on patient's whose abdomen does not allow full access
- Image patients with postur

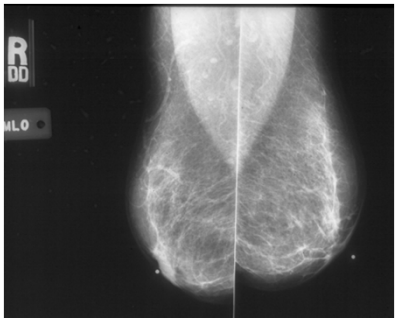


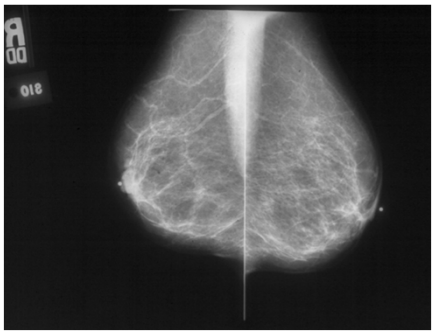



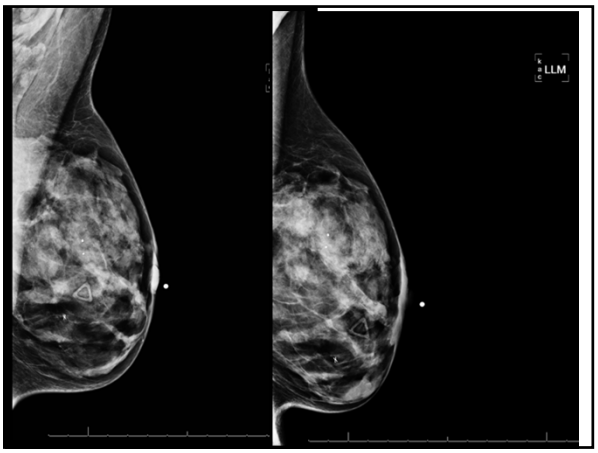
SIO VIEW
Used for whole-breast projection

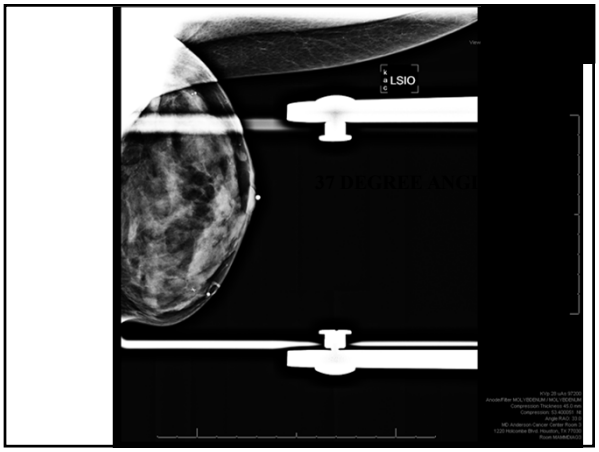
The machine is positioned like a MLO, but the patient is positioned like a LM.

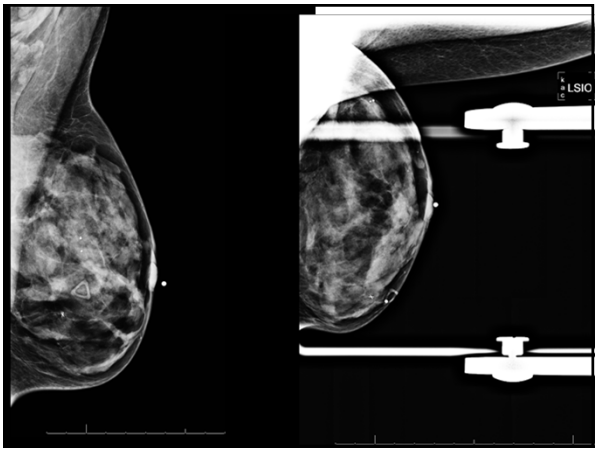


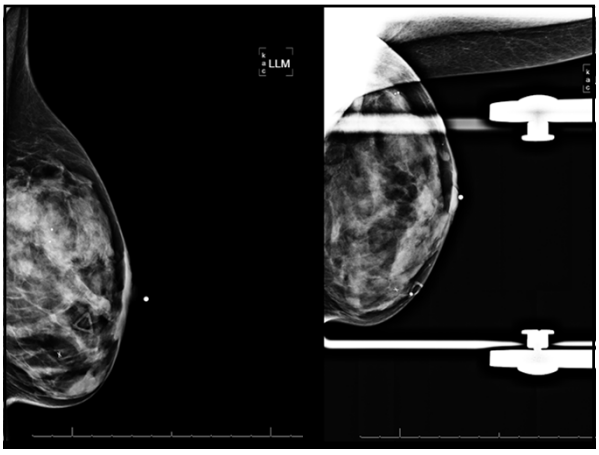












Diagnostic Mammography

- To further characterize an abnormality
- To determine if an abnormality is real
  - Is the finding due to overlap of normal structures?

The Green Light

- Enable technologists to select the appropriate views
  - Encourage ownership of the case
  - Saves time
- Avoids initial "What views would you like me to obtain?"

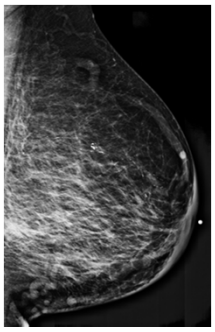
Diagnostic Mammography

- No single best way
- Many valid approaches
- Aim for accuracy and efficiency
- Aim to cover all/nearly all the breast tissue to the best of your ability.

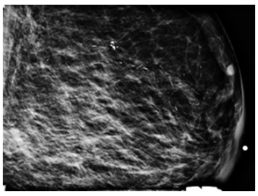
Diagnostic Mammography

- Select the appropriate views
- Calcifications→ magnification views
- Real masses → magnification views
- ? Real masses → spot compression views

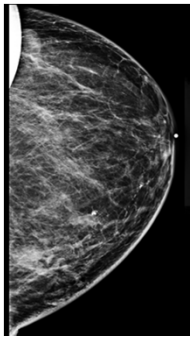
Spot Compression Views



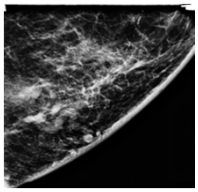
Does it persist on spot compression ?



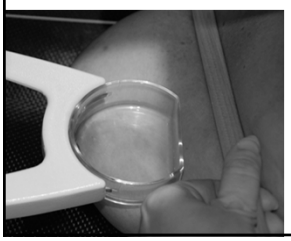
Spot Compression

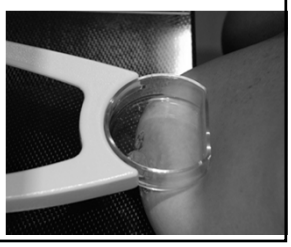


Does it persist on spot compression?



Tip for superficial spot compression
"Counter the force"





Magnification Views

- Characterize calcifications
- Characterize margins of masses

MAGNIFICATION VIEWS

Magnification views are obtained by moving the breast away from the image receptor (i.e., increasing the object-to-image distance and decreasing the source-to-object distance), thereby creating an air gap. A grid is not needed because scatter radiation is eliminated in the air gap. As the object-to-image distance increases, the amount of magnification increases (e.g., 1.5× and 1.8× common); however, this is associated with a loss of resolution from an increasing penumbra effect. The use of a small focal spot (0.1 mm) helps overcome the loss of resolution. With the small focal spot, however, exposure time is increased, leading potentially to motion. In an effort to obtain acceptable exposure times, the kilovoltage used to obtain magnification views can be increased by at least 2 from that used for routine views

Magnification Views

- Magnification = improved spatial resolution
- Magnification = 1.5 X
- Standard = 1 X
- Magnification → improved visualization of calcifications

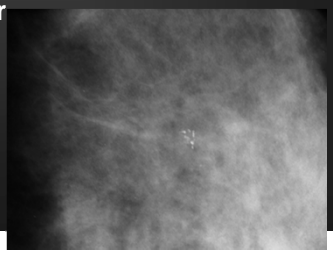
– Sickles. Radiology 1980;137:9-14

MAGNIFICATION

When you complete a mag film for a mass or density do they look fuzzy or blurry?

Do you know why?

To characterize microcalcifications (size, shape, form) they must be sharp and clear



Magnification

Magnification Facts:

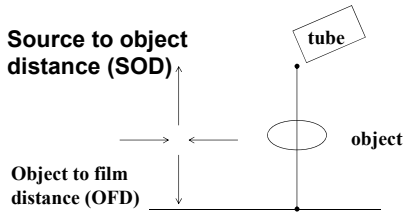
1. We use two factors to determine the magnification factor appropriate when doing magnification.
   They are:

   A. The focal film distance
   B. Size of the calcifications
   C. What position we are using
   D. The object film distance
   E. Compression paddle

Magnification Facts:

1. We use two factors to determine the magnification factor appropriate when doing magnification.
They are:

A. The focal film distance
B. Size of the calcifications
C. What position we are using
D. The object film distance
E. Compression paddle



The closer the object gets to the source or the focal spot the greater the increase in penumbra.

Reduce the effect of a widening penumbra:

- Small focal spot (micro focal spot, .1mm or smaller)
- Increased mag factor requires small FS

General rule: sharpness deteriorates with magnification unless a small focal spot is used.

Compression is Essential

2. Contrast increases by approximately __ for each cm of compression:

A. 2%
B. 7%
C. 10%
D. 0%

Compression is Essential

3. Dose decreases approximately __ for each cm of compression:

A. 12%
B. 20%
C. 14%
D. 7%

4. What magnification factor do you normally use?

A. 1.6
B. 2.0
C. 1.5
D. 1.8
E. Don't know
F. Only have one mag stand and factor is fixed

Rules of Magnification

5. The higher the mag factor the:

A. Thinner the object must be.
B. Thicker the object must be.
C. Higher the kVp must be.
D. The more cooperative the patient must be.

Rules of Magnification

5.

The higher the mag factor the:

A. Thinner the object must be.
B. Thicker the object must be.
C. Higher the kVp must be.
D. The more cooperative the patient must be.

Rules of Magnification

6. The greater the mag factor the closer the _____ must be to the magnification platform.

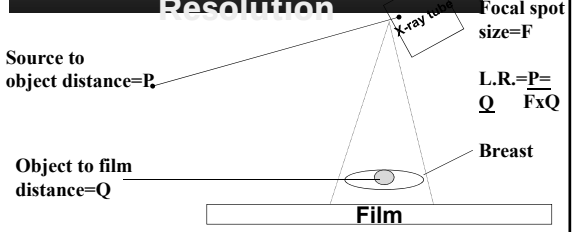
A. Patient
B. Area of interest
C. Nipple
D. Film

Rules of Magnification

6. The greater the mag factor the closer the _____ must be to the magnification platform.

A. Patient
B. Area of interest
C. Nipple
D. Film

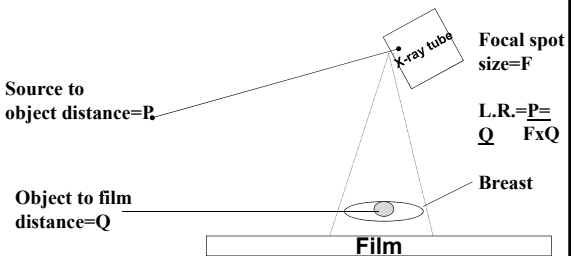
Absolute Imaging Resolution



P+Q=SID= 760 mm
FS= 0.345 mm

Example 1: P+Q 760mm = 760 =110/LP/mm
FxQ (.345)x(20) 6.90

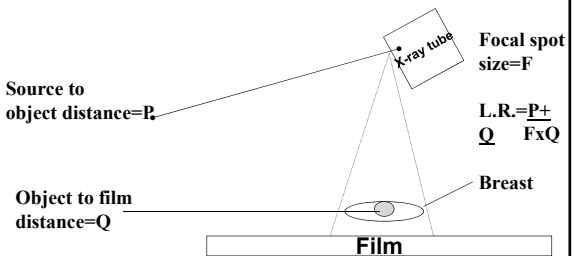
20 mm=measurement from film to top of image receptor-this is a constant for non-magnification images



P+Q=SID= 660 mm
FS= 0.3 mm

Example 2: P+Q 660mm = 660 =110/LP/mm
FxQ (.3)x(20) 6

20 mm=measurement from film to top of image receptor



P+Q=SID= 550 mm
FS= .25 mm

Example 2: P+Q 550mm = 550 =110/LP/mm
FxQ (.25)x(20) 5

Q=20 mm=measurement from film to top of image receptor

Example with small FS size:

P=Source to object distance
L.R.=P+Q
Q=Object to film distance
FxQ
F=Focal spot
Q is no longer 20 it will depend on the magnification factor being used
Example:
P=660mm mag=1.8 Q=293.33 F= .1mm

660 = 660 = 22.5 Lp/mm
(.1) x (293.33)= 29.33

Focal spot size is directly related to the SID
0.1mm FS ≅ narrow range of magnification that will result in improvement in resolution

As we change the SID we also change the FS size because they are interrelated.

P=Source to object distance L.R.=P+Q
Q=Object to film distance FxQ
F=Focal spot
Q is no longer 20 it will depend on the magnification factor being used-in this instance it is a 1.8 mag factor
Example:
P= 660mm mag=1.8 Q=293.33 F= .3mm

660 = 660 = 7.5 Lp/mm = loss of
(.3) x (293.33)= 87.99 resolution

7. The heart of image quality is the size of the:

A. Bucky
B. Focal spot
C. mA
D. Grid ratio

7. The heart of image quality is the size of the:

A. Bucky
B. Focal spot
C. mA
D. Grid ratio

8. When performing a 90°lateral magnification view of a mass or calcifications the orientation of the lateral view (ML or LM) depends on:

A. It does not matter which orientation it is done in.
B. The location of the area of interest on the CC view.
C. The orientation the patient prefers.
D. The way you feel that day.

8. When performing a 90°lateral magnification view of a mass or calcifications the orientation of the lateral view (ML or LM) depends on:

A. It does not matter which orientation it is done in.
B. The location of the area of interest on the CC view.
C. The orientation the patient prefers.
D. The way you feel that day.

9. **Choosing your Mag Factor**

You have a 6 cm breast with an area of interest superior to the nipple when viewed in the MLO projection. What magnification factor would you use?

A. 2.0
B. 1.8
C. 1.5
D. 1.0

9. Choosing your Mag Factor

You have a 6 cm breast with an area of interest superior to the nipple when viewed in the MLO projection. What magnification factor would you use?

A. 2.0
B. 1.8
C. 1.5
D. 1.0

10. **Choosing your Mag Factor**

You have a 6 cm compressed breast and the area of interest is medial to the nipple when viewed in the CC projection. You would do the magnification view in an:

A. MLO
B. LM
C. ML
D. Tangential

10. Choosing your Mag Factor

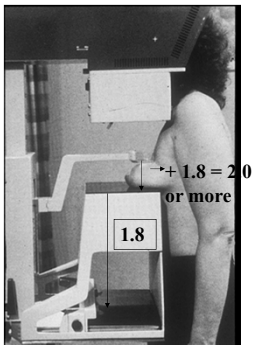
You have a 6 cm compressed breast and the area of interest is medial to the nipple when viewed in the CC projection. You would do the magnification view in an:

A. MLO
B. LM
C. ML
D. Tangential

Properly Identify the Area of Interest in the Breast to Select the Proper Mag Factor

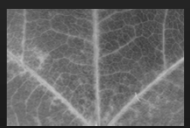
When the mag platform is set on 1.8x mag, the skin and the inferior portion of the breast is magnified 1.8x. When we move superior from the platform, the mag factor increases.

Draw an imaginary line from the target area to the approximate height of the platform, this will indicate over a 2 times mag factor in this particular instance.



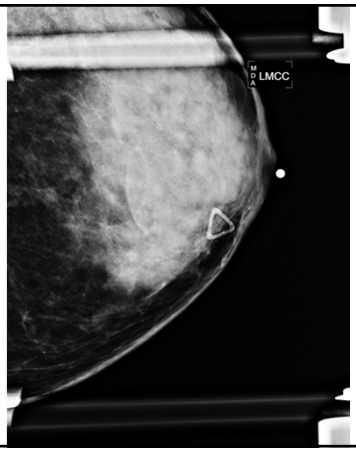
A mammogram can be anything from a blurry image to a detailed map of breast structures.

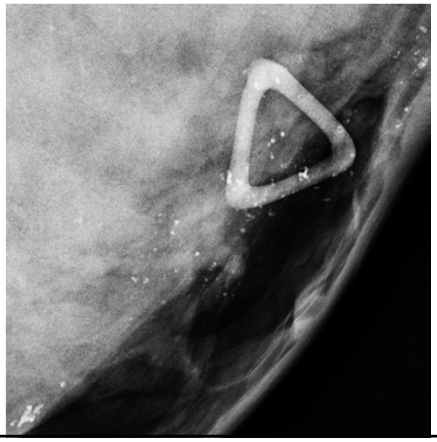
Use your skills and knowledge to provide a detailed map of breast structures in every image you take.



Palpable Abnormalities

- Marker to indicate the location of the palpable finding
-
- US

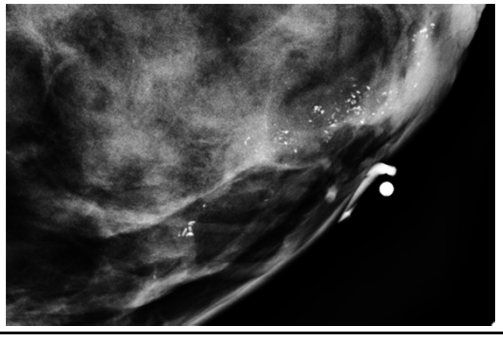


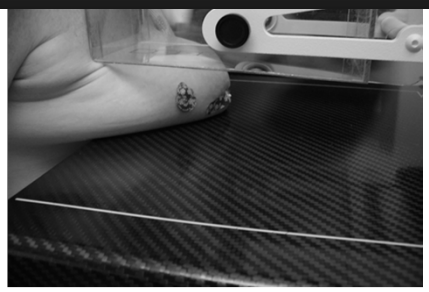


Tangential Views

- Imaging skin lesions
- Imaging palpable areas
  - With palpable marker
  - Followed by US

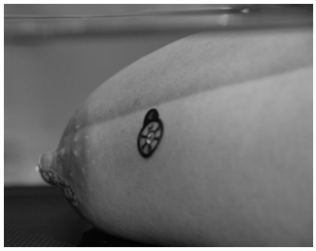
Tangential View



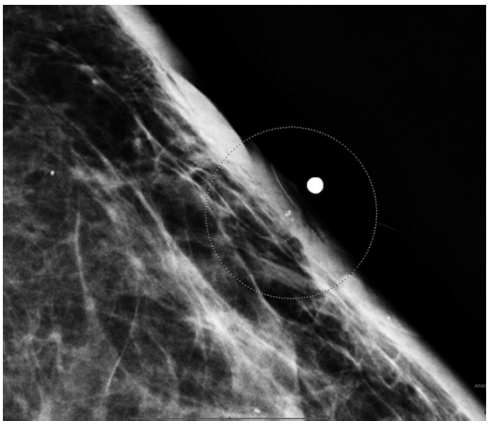


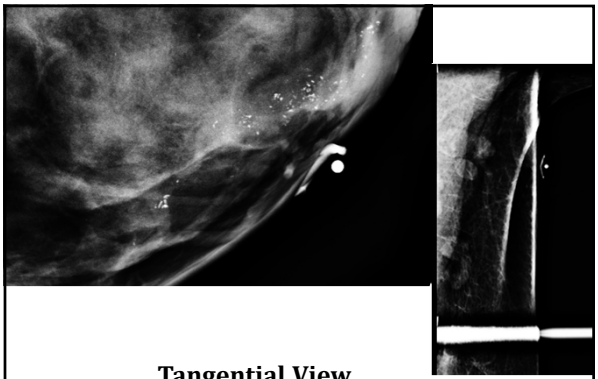
CC projection used if the palp is located in the 9:00 plane.

- Tangential View (TAN)
  - If the palp is in the 12:00/6:00 plane, you would perform the tangential view in a lateral position.
  - If the palp is in the 3:00/9:00 plane you would perform the tangential view in the cc position.
  - Any other o'clock and you can roll the breast or angle the machine until you get the palp tangential with the receptor plate.

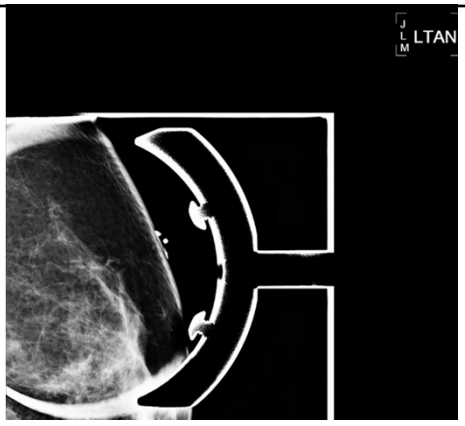


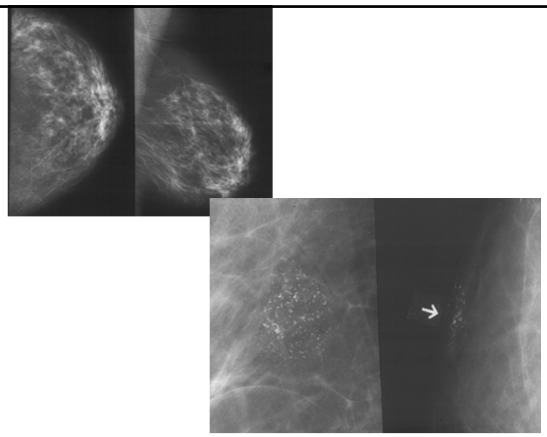
Tangential view.avi

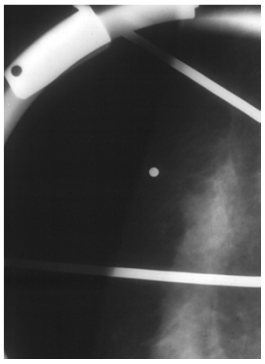


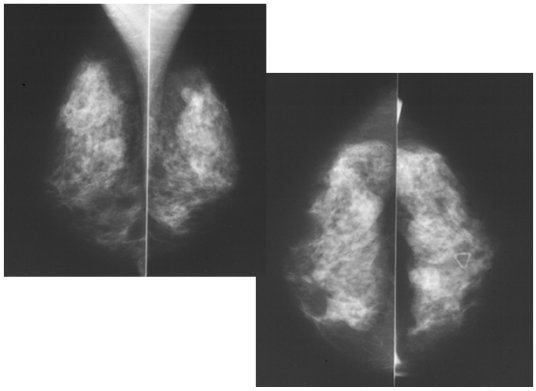


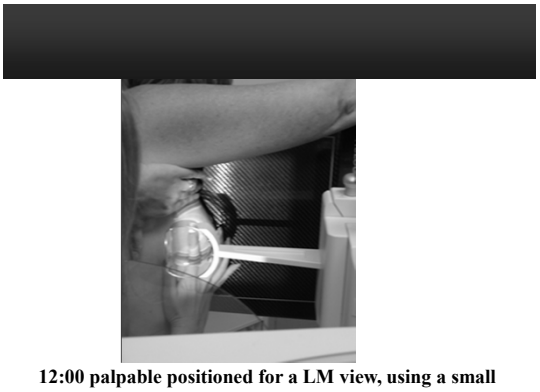
Tangential View











12:00 palpable positioned for a LM view, using a small compression paddle.

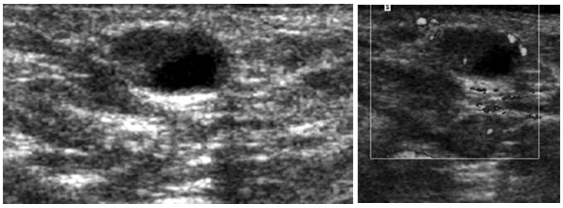
Marker is positioned at the edge of the compression paddle, to image the palpable lesion lying just beneath.

Palpable Abnormality

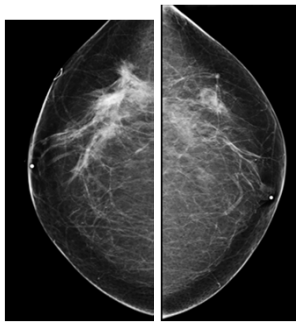
LM

AT

Results - Sebaceous Cyst

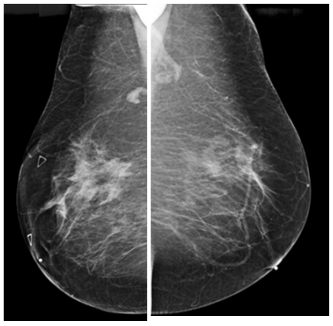


63 Year-Old Woman



Palpable abnormality in the right breast

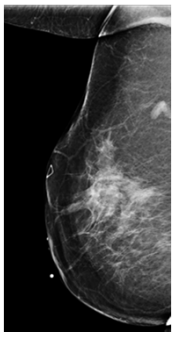
63 Year-Old Woman

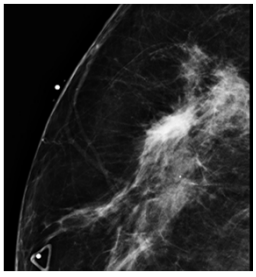


Palpable abnormality in the right breast

Additional Views

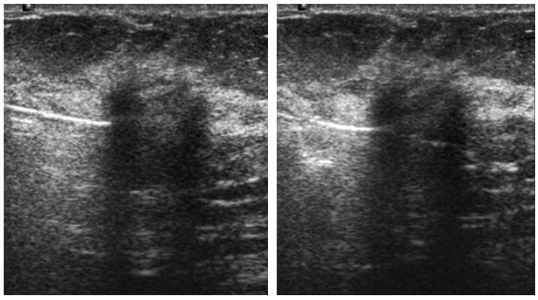
Right LM



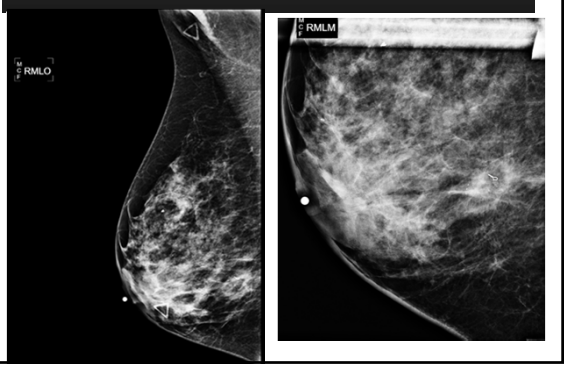


Right CC spot compression

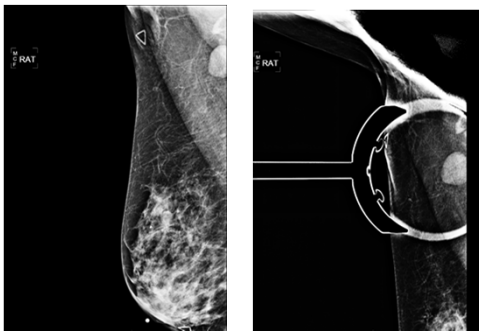
Invasive Lobular Carcinoma



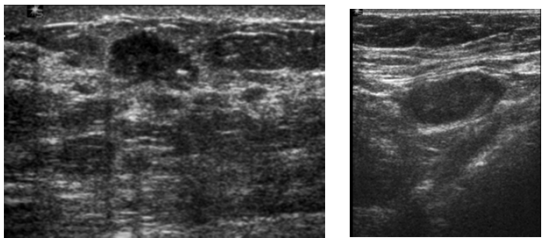
Palpable Abnormality



Axillary Tail View



Sonography



Invasive ductal carcinoma

Invasive ductal carcinoma

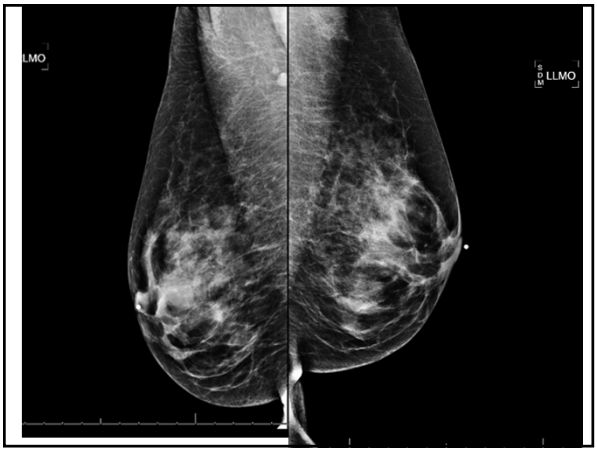
LMO Projection

- It is the exact opposite of the MLO view
- To image a mass in the deep inner quadrant not seen on mammography
- To image a mass deep in the medial aspect when seen on mammography
- Imaging kyphotic women

LMO

Patient leans into the machine much like a LM, with feet facing the machine.

To figure out the angle, take the degree of the angulation you would have used on an MLO, and subtract it from 180 degrees. (180-45 = 135)



Thank You