Mammography Positioning

BASIC AND ADVANCED

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Rethinking Mammography

Principles:

What works and why
Mammography Positioning is SCIENCE not anecdote!

• Anatomy
• Physiology
• Physics
How we learned positioning in general radiology was vastly different from the way we learned mammographic positioning

- Limited understanding of correlation anatomy
- No clarity regarding cause and affect
- How-to approach was not sufficient to problem solve
The Importance of Consistency and Reproducibility in General Radiology

• Every tech performs the exam it the same way, in the same sequence
• Reduces repeats/rejects
• Increases proficiency
• Increases efficiency
• Reduces confusion when training students
• Is ergonomically sound and reduces positioning related OJT injuries
• Facilitates easier comparison
• Identifies difficult to position patients
The Importance of Consistency and Reproducibility in Mammography

• Is consistent with general radiology principles
• Reduces repeats/rejects
• Increases proficiency
• Increases efficiency
• Reduces confusion when training students
• Reduces positioning related OJT injuries
• Provides easier comparison from year to year
The principles of mammography positioning should be consistent with the principles of general radiology principles.

- Methodology - How we position
- Sequencing – Which view, when
Natural anatomical position
Something to think about

• In general radiology everyone positions every body part in the same way?

• In general radiology everyone does the in the same sequence?

Yet in Mammography these principles don’t seem to apply
• Unfortunately there is very little current information and educational material regarding standardized positioning for FFDM and DBT

• Both require improved positioning techniques due to increased size of both the IR and Face Shields.
In general radiology there are only so many options for error

• Equipment
• Patient
• The body part
• The way you position the body part
In mammography there are only so many options for error

- Equipment
- Patient
- The body part
- The way you position the body part
What about the technique you use to control the equipment, the patient and the breast?

IT SHOULD BE CONSISTENT AND REPRODUCIBLE WITH THE GOAL OF MAINTAINING AND IMPROVING QUALITY
BACK TO THE BASICS

Going back to the basics strengthens your foundation.

An Act of Truth.
ANATOMY – PHYSIOLOGY - PHYSICS
You lucked out......
ANATOMY AND PHYSIOLOGY AS THEY RELATE TO MAMMOGRAPHY POSITIONING USING GENERAL RADIOLOGY PRINCIPLES
Goals for Mammography Positioning

• Bring the breast back to its true anatomical position
• Use palpable and visible anatomical landmarks for positioning and clinical image evaluation
• Use consistent and reproducible methods
The goal for mammography positioning should be to bring the breast back to its natural anatomical position (with the nipple perpendicular to the chest wall) on both screening views to maximize visualization of breast tissue and to avoid superimposition of structures.
Anatomy of the Breast
Normal or natural position of the breast is when the nipple perpendicular to the chest wall
When positioning for mammography we need to bring the breast back to its ‘normal’ position.
In order to accomplish this and include the maximum amount of will breast tissue we must consider the anatomical landmarks that will be used for positioning and clinical image analysis.
• Perimeter
• Pectoralis muscle
• PNL
Perimeter of the breast

The perimeter of the breast.

A) Lateral  D) Superior
B) Inferior  E) Extension of superior
C) Medial       border
Perimeter used for positioning and clinical image analysis
Pectoralis major muscle
Pectoralis used for positioning and clinical image analysis
PNL used for positioning:
Elevate the breast so that the PNL is as close as possible to perpendicular to the chest wall
PNL used for clinical image analysis: PNL measurement of CC should be within 1cm of the PNL measurement on the MLO
THE MLO

* Inclusion of all breast tissue within perimeter
* Pectoral muscle fully visualized
* Tissue well separated
* Tissue visualized back to retromammary fat space
* IMF
MLO:
Visualization of the pectoral muscle

- The pectoralis muscle is really not part of the breast.....however it serves as an important anatomical landmark for positioning and film evaluation
* Visualized down to the PNL

* Wide margin at the axilla

* Convex/straight

* Radiolucent
The absence or presence of these characteristics will tell you exactly what you did right...or did wrong when positioning and therefore.....whether you included or excluded breast tissue!!
LENGTH OF THE MUSCLE

Should be visualized down to the level of the PNL
EQUIPMENT: Length of the Muscle is related to the degree of angulation

The average degree of angulation will be 50 degrees, but most importantly the angle should be chosen on the basis of anatomy. The wrong degree of angulation could exclude breast tissue.
PATIENT: Length of muscle is related to the position of the patient.

The patient must be turned into the machine with both feet, hips and shoulders as far forward as possible as not to impede progress of the compression paddle.
Angle for the MLO

• Angle to the free margin of the pectoralis muscle.
• Keep angulation consistent
• Steeper angle for patients with longer thoraxes and small breast
• Lesser angles for shorter thoraxes and larger breasts
Recommended Angulation for MLO

• Depends on body habitus
• Maintain consistency from year to year
• Vary in 10 degree segments
• Recommend 40, 50 or 60.
Proper degree of angulation

Angle too steep
Proper degree of angulation

Angle too steep
Is it the angle or the patient?
WIDTH OF THE MUSCLE

There should be a wide margin of the pectoralis muscle at the top of the image (in the axilla).
EQUIPMENT: Width of the Muscle is related to placement of the IR in the axilla

The average degree of angulation will be 50 degrees, but most importantly the angle should be chosen on the basis of anatomy. The wrong degree of angulation could exclude breast tissue.
PATIENT: Width of the muscle is related to the position of the patient.

The patient must be turned into the machine with both feet, hips and shoulders as far forward as possible as not to impede progress of the compression paddle.
Is it the placement of the IR in the axilla or the patient?
SHAPE AND OPACITY OF THE MUSCLE

The muscle should be convex or straight
EQUIPMENT: The shape and opacity of the muscle is related to the height of the IR

The top of the IR should be positioned at height of the sternoclavicular joint, or half way between the top of the shoulder and the axilla crease.
PATIENT: The shape and opacity of the muscle is related to relaxation of the pectoralis muscle

Patient’s shoulder, arm and hand muscle

Be relaxed.
Is it the height of the IR or the patient?
Problems with the MLO

- No visualization of the IMF
- Folds in the IMF
- Breast drooping
VISUALIZATION OF THE IMF

Equipment challenges:
Change of the angle will not compensate for the increased length and the width of IR for FFDM and DBT (compared to the bucky)
Change should be made in the patient position
No IMF

IMF
The position of the patient related to the bottom, front corner of the IR is critical

• Patient must be facing forward with both feet
• Lower front corner of the IR should be directly below the patient’s nipple or half between her ASIS and umbilicus
• This requires the patient taking a “side step” towards you.
Improper
Edge of IR in front of IMF

Proper
Edge of IR behind IMF

Top edge of IR indicated by vertical dotted line
Folds in the IMF

1. Horizontal fold is in the medial breast
2. Vertical fold is in the lateral breast
Breast sagging
POSITION OF THE BREAST

• Breast held in up and out position to bring the breast back to it’s ‘normal’ position (nipple perpendicular to the chest wall)

• Maintained by adequate compression
THE CC

- Include maximum amount of breast tissue in the axial/transvers plane
- Visualization of medial breast tissue (cleavage) if possible
- Visualization of pectoralis muscle on approximately 30% of all CCs
Due to lack of anatomical landmarks, positioning techniques are extremely important!!
Standardized method

• Stand of the medial side of the breast to be imaged
• Elevate the breast so that the PNL is perpendicular to the chest wall
• Adjust the height of the IR to elevated IMF
• Pull the breasts on with both hands
• Anchor the breast
• Lift the contralateral breast
• Guide patient’s head forward and around
• Pull on lateral breast tissue
Standardized method

Stand of the medial side of the breast to be imaged

- Facilitates exam
- Better enables you to life other breast onto IR
- Helps you use your arm to keep patient forward
- Facilitates better eye contact
*Elevate* the breast so the PNL is perpendicular to the chest wall and *pull* the breast on with both hands.
1 handed “plop”          2 handed pull

12.5 CM                               14.8 CM
Lateral, mobile border of the breast pulled forward
Failure to pull on lateral posterior breast tissue
NIPPLE IN PROFILE
NIPPLE CENTERED
Nipple centered

• Nipple should be centered on the CC view, if possible, and without sacrificing breast tissue.

• Nipple may not be centered due to prominent medial or lateral fullness of the breast, which should be noted on the hx sheet.
Patient with Prominent Medial Fullness
• Breast tissue should never be sacrificed in order to center the nipple or show the nipple in profile.
• An additional view should be added and labeled appropriately.
• Notation should be made on hx sheet.
Positioning criteria as described will only be visualized in approximately ____% of all mammographic studies.

Last study published in 1993 and there is no current data available on FFFDM or DBT
Before

12.5 CM

After

14.8 CM
Before 12.5 CM  

After 14.8 CM
OR......

• To show an area of concern in better detail
• To counteract superimposition of structures
• To triangulate a lesion
Most commonly used additional views are done to show a specific component of the anatomy not seen on standard views.
Ask and Answer

• Which part of the breast do I want to visualize?
• In which projection?
• Which view will accomplish this?
Before

12.5 CM

After

14.8 CM
ADDITIONAL VIEWS FOR PROBLEM SOLVING

THE WHY AND THE HOW
Most Commonly Used Additional Views

- XCCL  Exaggerated CC lateral
- CV    Cleavage
- LM    90 degree lateromedial
- ML    90 degree mediolateral
- TAN   Tangential
Just a review….but why do we do additional views?

• To show a specific component of the anatomy not seen on standard views

• To provide localization of an area of concern medial/lateral or superior/inferior to the nipple
XCCL

- Done to visualize lateral breast tissue in a CC projection.
- XCCLs should not be performed as standard screening views except on baseline exams when all lateral posterior breast tissue is excluded on the CC image*

*On subsequent exams, if glandular breast tissue is fully visualized back to the retromammary fat space on the MLO, an XCCL is not necessary
CV

Visualization of the medial breast in CC projection
Verify pectoral insertion
Mosiac/tile large breasts
Superior or inferior orientation to the nipple:

LM or ML
The use of the Lateral

- Shows effects of gravity on air fluid levels
- Used as a “tie breaker” view
- Can be used to triangulate lesions
- Provides visualization of the 12:00 and 6:00 areas of the breast for encapsulated implants
ML - Mediolateral

LM - Lateromedial
Why do the LM?

• When you did the MLO you showed the lateral breast in better detail. The LM shows the medial breast in better detail.

• The LM takes advantage of the lateral mobile border of the breast and thus facilitates positioning
Why do the LM?

• The hardest part of the breast to image (and the area most often missed on the MLO) is the posterior medial breast. If done properly (off-setting the IR into the contralateral breast) you will be able to get deeper against the chest wall.

• There is no issue of the contralateral breast impeding the path of the compression paddle
**Improperly** positioned LM with breasts separated so middle of the IR is centered on midsternal line thus excluding deep medial breast tissue on the side you are imaging.
Properly positioned LM with breasts separated so top edge of the IR is centered on midsternal line and the width of the IR pressing against the contralateral breast.
TANGENTIAL VIEWS

• To prove the existence of dermal calcifications

• Enhanced visualization of palpable masses that may otherwise be superimposed on glandular breast tissue
Tangential views made easy

• Place a BB on the palpable mass or on the area identified by localizing skin calcifications
• Draw an imaginary line between the breast and the BB
• Position the breast so the BB is in tangent to the beam by angling the tube, the patient or the breast.
• OR position the BB like you were doing a nipple in profile view.
Tangential Views
You can teach old dogs new tricks!

They've started us off with the basics -- sit, stay, come -- but I hope by the end we'll be doing some web design.