

Positioning From A-Z: Getting it Right the First Time

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MAMMOGRAPHY

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BACK TO THE BASICS


*Going
back to the
basics
strengthens
your
foundation.*



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ANATOMY - PHYSIOLOGY - PHYSICS



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You lucked out.....no
physics....well sorta




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Common Positioning Problems

- **Caused by lack of understanding of physics**
- Caused by the lack of the use of standardized positioning techniques
- Too much “futzin’” around




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Because

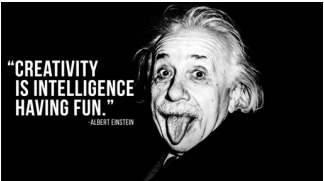
- For every action there is a reaction
- What goes up, must **come down**




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Mammography Physics




"CREATIVITY IS INTELLIGENCE HAVING FUN."
-ALBERT EINSTEIN




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Newton's Laws

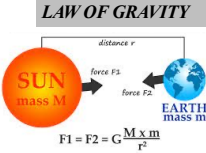
* Law of Gravity
* For every action there is a reaction





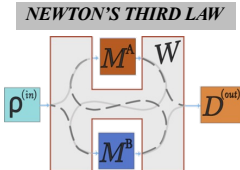
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LAW OF GRAVITY



$F_1 = F_2 = G \frac{M \times m}{r^2}$

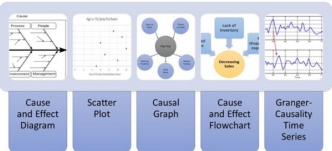
NEWTON'S THIRD LAW






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Cause and Effect





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CAUSE AND EFFECT

The pig ran out of the barn as fast as he could, when he saw a snake near his trough.

1. What is the cause and the effect?

CAUSE AND EFFECT

When the dog saw the post worker, he started barking loudly.

2. What is the cause and the effect?

CAUSE AND EFFECT

The bunny was able to find lots of carrots in the garden, as a result of the good weather.

3. What is the cause and the effect?

CAUSE AND EFFECT

Since the day was warm, the proks delivered out from under the rock and into the sunshine.

4. What is the cause and the effect?




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In Mammography

It's the way you "set up" the machine

- Angle
- Height
- Paddle size
- The way you "set up" the patient
- Facing forward
- Step towards you on the MLO



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In Mammography

It's the way you "set up" the patient

- Facing forward (CXR position)
- Feet, hips and shoulder forward
- Arms down by her side



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KEEP
CALM
AND
NO MORE
PHYSICS



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ANATOMY AND PHYSIOLOGY
AS THEY RELATE TO MAMMOGRAPHY
POSITIONING USING
GENERAL RADIOLOGY PRINCIPLES



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Goals for Mammography Positioning

- Bring the breast back to it's true anatomical position
- Use palpable and visible anatomical landmarks for positioning and clinical image evaluation
- Use consistent and reproducible methods



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The goal for **ALL** body part positioning should be to bring that part back to it's natural anatomical position and perform orthogonal views. This maximizes visualization of that body part and avoids superimposition of structures.



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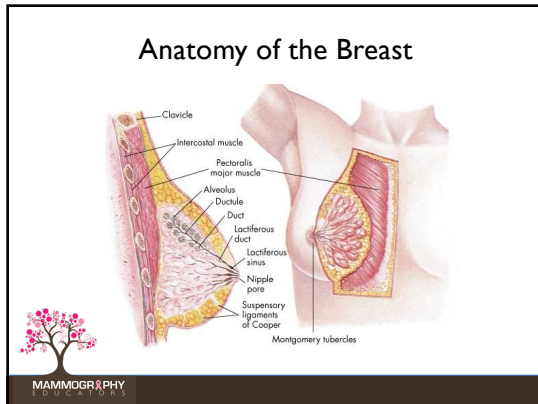
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The goal for **mammography** positioning should be to bring the breast back to it's natural anatomical position (with the nipple perpendicular to the chest wall) on both screening views to maximize visualization of breast tissue and to avoid superimposition of structures.

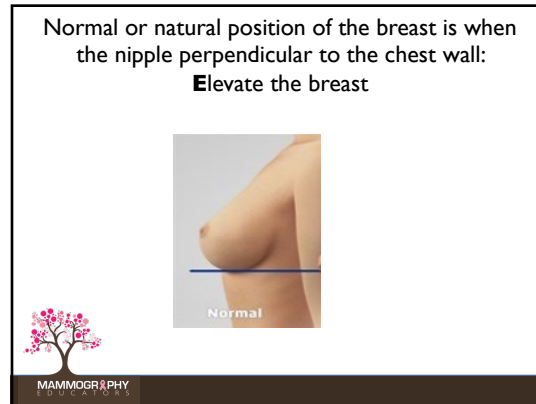


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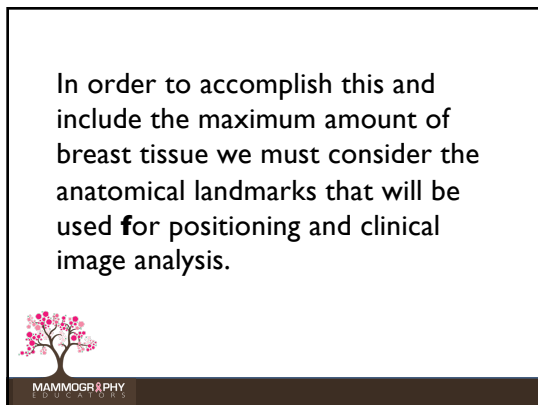
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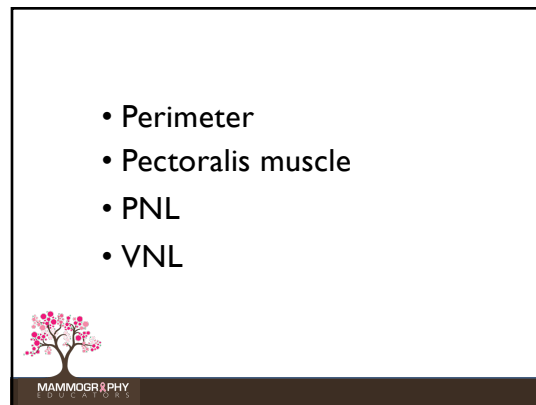
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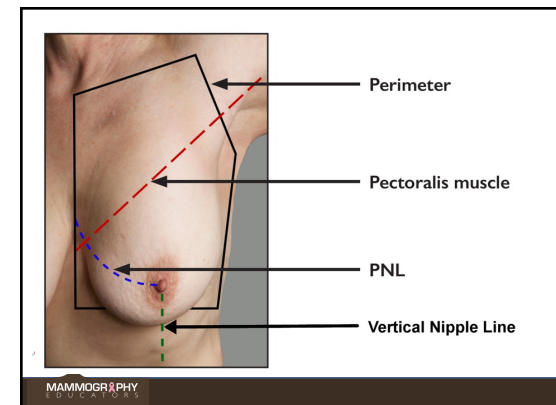
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Perimeter of the breast

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Perimeter used for positioning and clinical image analysis

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Pectoralis major muscle

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Pectoralis used for positioning and clinical image analysis

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PNL used for positioning:

Goal: Elevate the breast so that the PNL is as close as possible to perpendicular to the chest wall

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PNL used for clinical image analysis:

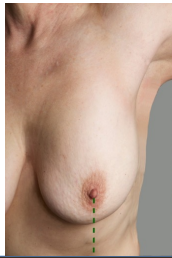

PNL measurement of CC should be within 1cm of the PNL measurement on the MLO

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Vertical Nipple Line



Used for postioning the MLO

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THE MLO

- * Inclusion of all breast tissue within perimeter
- * Pectoral muscle fully visualized
- * Tissue well separated
- * Tissue visualized back to retromammary fat space
- * IMF





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MLO:

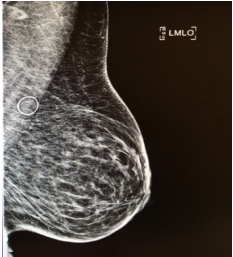

Visualization of the pectoral muscle

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

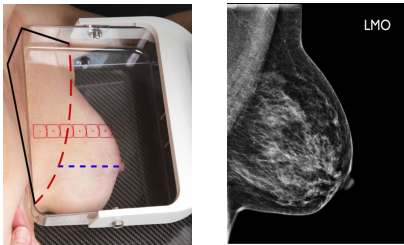



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- * **Visualized down to the PNL**
- * **Wide margin at the axilla**
- * **Convex/straight**
- * **Radiolucent**





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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!!



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LENGTH OF THE MUSCLE

Should be visualized down to the level of the PNL





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EQUIPMENT: Length of the Muscle is related to the degree of angulation

The average degree of angulation will be 40-50 degrees, but most importantly, the angle should be chosen on the basis of anatomy.


The wrong degree of angulation could exclude breast tissue.



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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.



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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



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Recommended Angulation for MLO

- Depends on body habitus
- Maintain consistency from year to year



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I am going to say something that is shocking!! **NO JOKE!**




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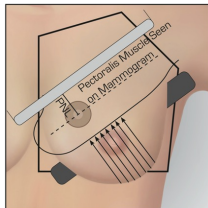
Keep angles consistent

- 40 for shorter, heavier patients with large breasts
- 45 for average patients
- 50 for tall, thinner patients with smaller breasts



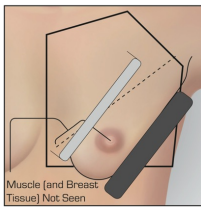
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Proper degree of angulation




Pectoralis Muscle Seen
on Mammogram

Angle too steep




Muscle (and Breast Tissue) Not Seen

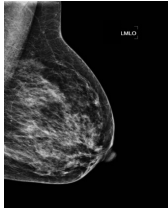



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Proper degree of angulation



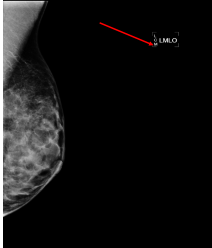

Angle too steep





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Is it the angle or the patient?

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WIDTH OF THE MUSCLE


There should be a wide margin of the pectoralis muscle at the top of the image (in the axilla).

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EQUIPMENT: Width of the Muscle is related to placement of the IR in the axilla

The back corner of the IR should be placed just anterior to the latissimus dorsi



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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 shoulder as far forward as possible, with the shoulder down, relaxed and pulled forward



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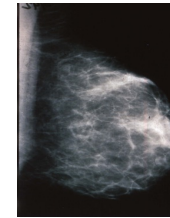
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Narrow muscle:
Is it the placement of the IR in the axilla **or** the **p**atient?



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SHAPE AND OPACITY OF THE MUSCLE

The muscle should be convex or straight



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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 axillary crease.



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PATIENT: The shape and opacity of the muscle is related to relaxation of the pectoralis muscle

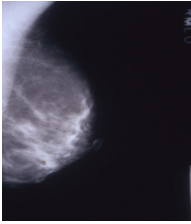

*Patient's shoulder, arm and hand muscle
Be relaxed.*



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Question:
Is it the height of the IR or the patient?





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Problems with the MLO

- No visualization of the IMF
- Folds in the IMF
- Breast drooping




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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)

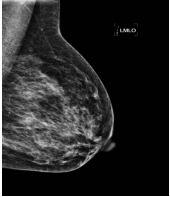


Change should be made in the patient position



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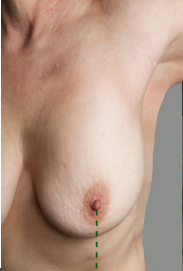

No IMF IMF

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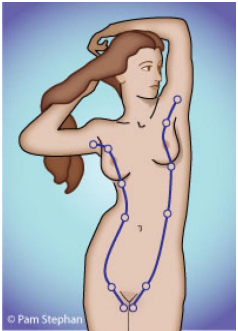
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Vertical Nipple Line





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

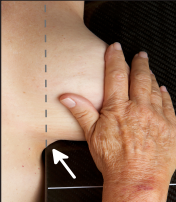
- Patient must be facing forward with both feet
- Lower front corner of the IR should be directly below the patient's nipple (VNL) or half between her ASIS and umbilicus
- This requires the patient taking a "side step" towards you.



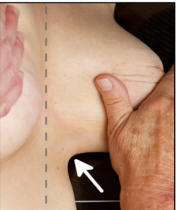
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Improper
Edge of IR in front of IMF



Proper
Edge of IR behind IMF



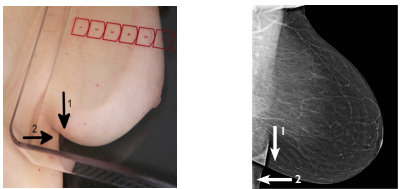
Top edge of IR indicated by vertical dotted line




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Folds in the IMF



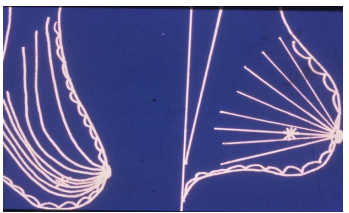
1. Horizontal fold is in the medial breast
2. Vertical fold is in the lateral breast




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Breast sagging



Courtesy Stephen Feig, MD

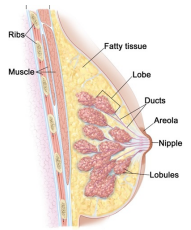


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Glandular Breast Tissue

Ducts, lobes, lobules

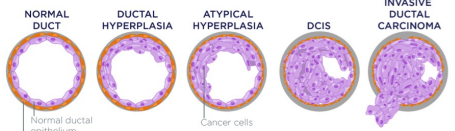


Labels: Ribs, Muscle, Fatty tissue, Lobe, Ducts, Areola, Nipple, Lobules




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NORMAL DUCT: Normal ductal epithelium, Myoepithelium
DUCTAL HYPERPLASIA
ATYPICAL HYPERPLASIA: Cancer cells
DCIS
INVASIVE DUCTAL CARCINOMA



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POSITION OF THE BREAST

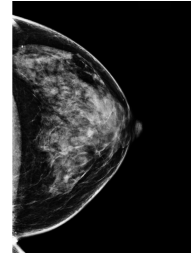
- Breast held in **up** and out position to bring the breast back to its 'normal' position (nipple perpendicular to the chest wall)
- Maintained by adequate compression



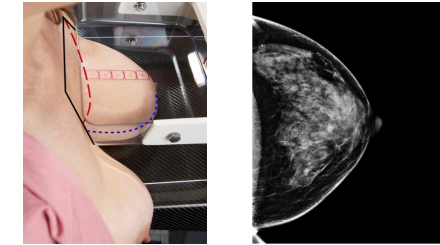
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THE CC

- 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



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Due to lack of anatomical landmarks, positioning techniques are extremely important!!



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Standardized method

- Stand on 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



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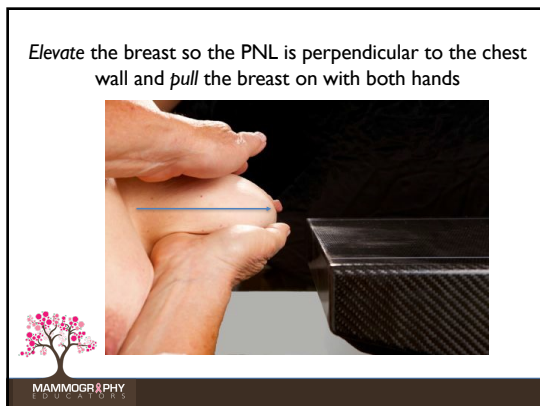
Standardized method

Stand on the medial side of the breast to be imaged

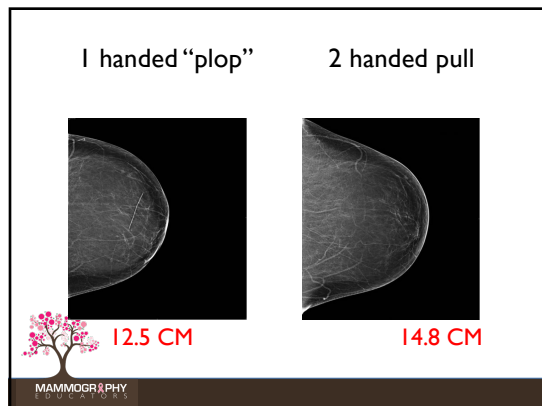
- Facilitates exam
- Better enables you to lift other breast onto IR
- Helps you use your arm to keep patient forward
- Facilitates better eye contact with the patient



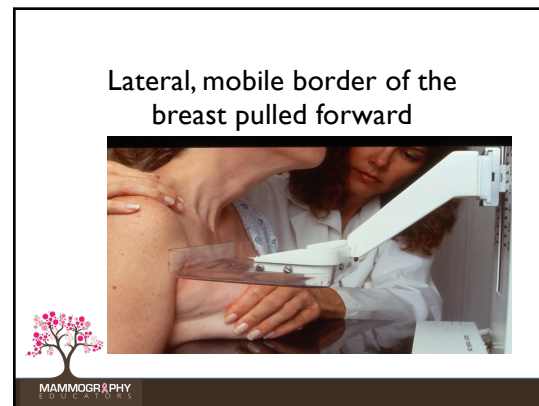
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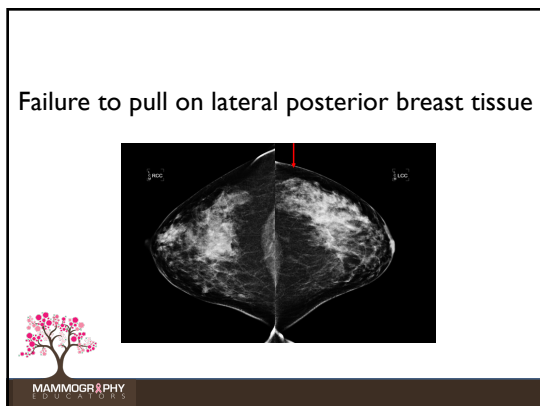
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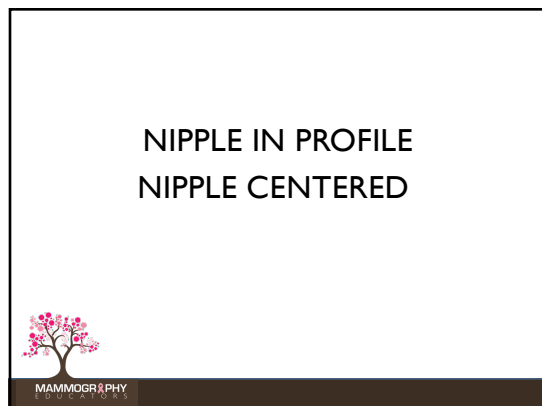
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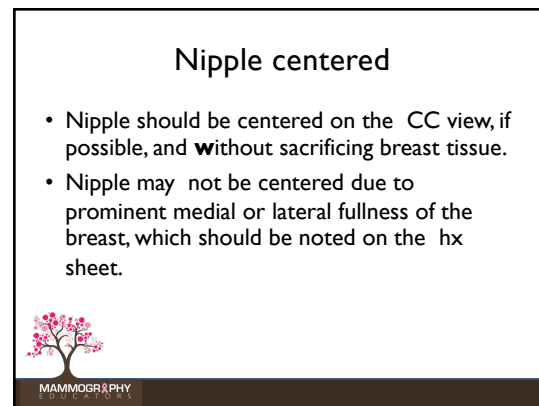
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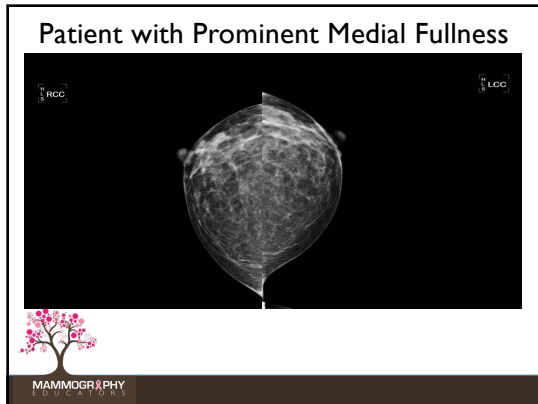
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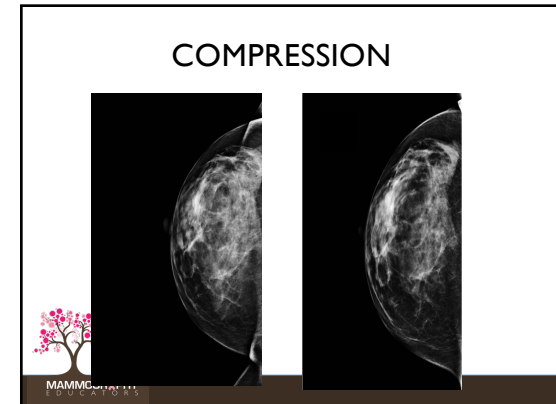
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- Breast tissue should never be sacrificed in order to center the nipple or show the nipple in profile.
 - An additional view should be added and labeled appropriately.
 - Notation should be made on hx sheet
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- Solutions – Compression
- Criteria:** Breast should be compressed until taut or less than painful. Glandular tissue should be well separated
- Technologist must compress the breast until “taut” or less than painful
 - Technologist must work with the patient to achieve adequate compression.
- X** ray quality does not improve with over compression!
- MAMMOGRAPHY

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Mammography Saves Lives!

But it is up to you.....

Even the best radiologist, in the best breast center cannot diagnose a cancer that is not included on the image.

Do your work with commitment and **ZEAL!**

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Questions or Comments?

louise@mammographyeducators.com

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