MAMMOGRAPHY CLINICAL IMAGE EVALUATION

Pam Fulmer, BA RT (R)(M)(QM)

MAMMOGRAPHY QUALITY STANDARDS ACT

- 1987-American College of Radiology provided image evaluation-Volunteer basis
- 1987-91-Only 70% of mammography units passed on first attempt.
- MQSA-Enacted October 27, 1992
- MQSA-Mandatory October 1, 1994
- Site inspections started January 1995

CERTIFYING AGENCIES

- FDA approved certifying states
- States can only certify facilities within their state borders
- Illinois
- Iowa
- South Carolina
- Texas

ACCREDITATION BODIES

- These states have their own accrediting bodies
  - Arkansas
  - Iowa
  - Texas

MQSA

- All mammography units must be:
  - Accredited
  - Certified
  - Inspected

QUALITY STANDARDS ACT

- Regular quality control testing
- Mandatory initial qualifications for personnel
- Continuing education qualifications for personnel
- Facility inspections
**DIGITAL IMAGE EVALUATION**
- Positioning
- Compression
- Exposure
- Contrast
- Sharpness
- Noise
- Labeling
- Artifacts

**ACR REQUIREMENTS**
- Facility’s best work-Each case includes 2 MLOs and 2 CCs
- Reviewed and approved by supervising radiologist
- Must be “Negative” images
  - BI-RADS 1
  - BI-RADS 2 (benign) with prior approval and report
- Must not be from models or volunteers
- Entire breast must be imaged in a single exposure on each projection

**IMAGE REVIEW CATEGORIES**
- Artifacts
- Exposure
- Contrast
- Labeling
- Compression
- Noise
- Positioning
- Sharpness

**DEFICIENCIES IN POSITIONING**
- 1. Inadequate pectoralis muscle
- 2. Sagging of breast on MLO
- 3. Lack of posterior tissue on the MLO
- 4. Skin folds overly breast tissue
- 5. Lack of posterior tissue on CC
- 6. PNL now within 1 cm of MLO
- 7. Excessive lateral or medial exaggeration on CC

**NUMBER 1 REASON FOR ACR FAILURE**

**POSITIONING**
MUST KNOW BREAST ANATOMY

HINTS FOR POSITIONING

- Moveable borders
  - Fixed
    - Superior and Medial
  - Moveable
    - Lateral and inferior
- Angle of pectoralis muscle
- Compression

Inadequate Compression

- Poor Separation of glandular tissue
- Unequal exposures of tissues
- Motion?

Optimal Compression

- Breast looks uniform in thickness
  - Reduces dose
  - Reduces unsharpness
  - Subtle density differences seen in the breast more likely due to breast tissue attenuation differences rather than uneven breast thickness

SHARPNESS

Inadequate Compression

- Breast appears non-uniform in thickness

Optimal Compression

- Breast appears uniform in thickness

http://radiopaedia.org/articles/breast-density
Motion Unsharpness

SHARPNESS on the CC View
- Edges of vessels, calcifications and cooper’s ligaments
- Near the nipple
- From medial to lateral (posterior tissues closest to the ribs)

SHARPNESS on the MLO View
- Edges of vessels, calcifications and cooper’s ligaments
- Anterior edge of pectoralis muscle
- Near the nipple
- At the IMF

Noise
- Decreases the ability to differentiate tiny structures on the mammogram, i.e., calcifications
- Loss of the ability to see low-contrast Structures
- Noise is more common in digital imaging
MOST COMMON DEFICIENCIES
CC VIEW

- Poor visualization of posterior tissue
- PNL on CC view not within 1 cm of PNL on MLO
- Excessive lateral or medial exaggeration (nipple not in middle of image)
- Skin folds overlying breast tissue
CRANIAL CAUDAL TIPS

- Image receptor placed at elevated inframammary crease
- Both hands pull breast onto receptor
- Patient leans into unit
- Nipple centered and straight on image
- Absence of skin folds
- PNL within 1 cm of PNL on MLO

CHECK LIST FOR CC

- Breast centered on image receptor
- Nipple centered and in profile (without sacrificing breast tissue)
- Tissue well separated
- Visualization of breast tissue back to retromammary fat space
- Pec muscle visualized at least 30% of the time
- Visualization of cleavage or contralateral breast
- PNL must be within 1 cm of PNL measurement on MLO
Nipples Centered and Straight ??

Skin Folds on the CC View

RCC LCC

MEDIOLATERAL OBLIQUE
MLO

Most common deficiencies on MLO

- 1. Inadequate pectoralis muscle
- 2. Sagging breast
- 3. Poor visualization of posterior muscle
- 4. Skin folds overlying breast tissue
- 5. Portion of breast cut off
MLO POSITIONING TIPS

- Hips in front of image receptor
- Convex pectoralis muscle to the nipple line
- Breast lifted up and out
- All posterior tissue seen
- IMF open
- Absence of skin folds
CHECK LIST FOR MLO

- All the breast tissue included within the perimeter
- Visualization of the breast tissue back to the retro mammary fat space
- Nipple elevated and in profile (if possible)
- Tissue well separated
- Pectoralis muscle visualized down to PNL
- Pectoralis muscle with wide margin at the axilla
- Pectoralis muscle convex (vs concave) or at least
- Pectoralis muscle radiolucent
- Visualization for IMF

INADEQUATE PECTORAL MUSCLE?

- Shape: Concave, Triangular Shaped
- Length: Inadequate
- IMF excluded

http://www.koningcorporation.com/Case_coverage.aspx

Sagging/Drooping Breast

BREAST DENSITY FOR ACR
LABELING

- MQSA Requirements
  - Patient name and identifying number
  - Date of examination
  - View and laterality
  - Facility name, city, state and zip code
  - Technologist’s identification
  - Cassette screen number-CR
  - Mammography unit number, if more than one

- Recommended by MQSA
  - Date
  - Technical factors
    - Target filter
    - kVp and mAs
    - Compression force
    - Compressed breast thickness
    - Degree of obliquity

ADDITIONAL VIEWS
LATERAL VIEW:
90 DEGREES TO CC

- Medial lesion evaluation - If there is any question of medial tissue exclusion on the MLO view
- Triangulate lesion
  - If seen on CC view, determine upper or lower quadrant
  - If seen only on MLO, determine location medial or lateral
- Milk of calcium
- Benign calcifications

MEDIAL LATERAL
TANGENTIAL

CASE STUDY
EXAGGERATED CRANIAL CAUDAL

For postero-lateral tissue
Tube angled up to 5°
Used for localization of lesions in far lateral breast
Compression of anterior tissue is not optimized
Implants displaced on same patient (Eklund Technique)

THE AUGMENTED BREAST
- Makes mammography a challenge

ANNA NICOLE SMITH’S BOOBS EXPLODE
PROBLEMS WITH IMPLANTS

Mammography
Radiopaque
Obscures tissue
Hides cancer
Hides leaks
Manual exposure
Difficult to localize

IMAGING BREAST TISSUE
Factors Influencing Success

Position of implant
Sub glandular
Sub muscular
Size of implant
Amount of breast tissue
Presence of contracture
Patient Compliance

POSITIONING THE AUGMENTED BREAST
IMPLANTS IN RELATIONSHIP TO MUSCLE
GOOD POSITIONING IS CREATIVITY. IF YOU DON’T PLACE THE TISSUE ON THE DETECTOR, THE RADIOLOGIST WILL NEVER SEE THE CANCER.