SCREENING MAMMOGRAM NEED TO KNOWs – (fairly) COMPREHENSIVE

NAS Milestones for Screening Mammogram:

- _ Observe a (screening/diagnostic) mammogram being performed.
- _ Learn breast cancer risk factors, and define who is at high risk appropriately.
- _ Evaluate abnormal screening mammographic results, review subsequent diagnostic images, decide if an actionable finding is present or not, and include the suggested next step or management plan such as views to localize a one-view finding.
- _ Interpret as many screening mammograms as possible. Obtain meaningful feedback and incorporate on a daily basis.

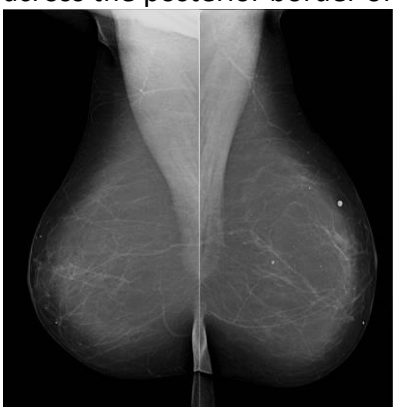
Screening Mammography Standard projections MLO and CC

Know:

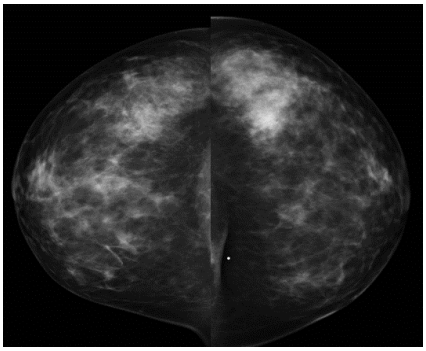
•If Baseline risk pt: Begin screening age 40 and annual thereafter
•High risk screening pt: test(s) determined by her specific risk parameters specifically mammo supplemented by high risk screening MR or US
•SEARCH! Screening mammogram hallmarks of malignancy: ***suspicious*** mass, calcifications, site of architectural distortion, asymmetry
•Screening mammograms may only be assigned BI-RADS® CATEGORY 1,2,0 no others
Abnormal screening mammogram *is assigned BI-RADS® CATEGORY 0 and is called back for a Diagnostic breast imaging workup*
•For mass/asymmetry: compression magnification views in MLO and CC possibly followed by targeted ultrasound
•For architectural distortion: compression magnification views in MLO and CC possibly followed by targeted ultrasound
•For calcifications: compression magnification views in TL 90 and CC

Standard Projections: MLO and CC

Mammograms are displayed in conventional manner paired (to permit bilateral comparison) MLO followed by CC with patient's right breast on the left side of the screen and left breast on the right side of the screen. There are two standard mammographic projections: a mediolateral oblique (MLO) view and a craniocaudal (CC) view. Correct positioning is crucial to avoid missing lesions situated at the margins of the breast. The MLO view is taken with the X-ray beam directed from superomedial to inferolateral, usually at an angle of 30–60°, with compression applied obliquely across the chest wall, perpendicular to the long axis of the pectoralis major muscle. The MLO projection is the only projection in which all the breast tissue can be demonstrated on a single image. A well-positioned MLO view should demonstrate the inframammary angle, the nipple in profile, and the nipple positioned at the level of the lower border of the pectoralis major, with the muscle across the posterior border of the film at an angle of 25°–30° to the vertical.


MLO view

For the CC view, the X-ray beam travels from superior to inferior. Positioning is achieved by pulling the breast up and forward away from the chest wall, with compression applied from above. A well-positioned CC view should demonstrate the nipple in profile. It should demonstrate virtually all of the medial tissue and most of the lateral tissue except the axillary tail of the breast. The pectoralis major is demonstrated at the center of a CC film in approximately 30% of individuals and the depth of breast tissue demonstrated should be within 1 cm of the distance from the nipple to the pectoralis major on the MLO projection.


CC view

Breast Compression

Compression of the breast is essential for good mammography, for the following reasons:
• It reduces geometric unsharpness by bringing the object closer to the film.
• It improves contrast by reducing scatter.
• It diminishes movement unsharpness by permitting shorter exposure times and immobilizing breast.
• It reduces radiation dose, as a lesser thickness of breast tissue needs to be penetrated, scatter is reduced.
• It achieves more uniform image density: a homogeneous breast thickness prevents overexposure of the thinner anterior breast tissues and underexposure of thicker posterior breast tissues.
• It provides more accurate assessment of the density of masses. As cysts and normal glandular tissue are more easily compressed, the more rigid carcinomas are highlighted.
• It separates superimposed breast tissues so that lesions are better seen.

For Diagnostic Additional Projections : XCCL, XCCM, Compression magnification, True Lateral / 90°, Ecklund

Supplementary views may be taken to solve specific diagnostic problems. For example, the CC view can be rotated to visualize either more of the lateral or medial aspect of the breast, compared to the standard CC projection. Localized compression views can be performed. This involves the application of more vigorous compression to a localized area using a compression paddle. These views are used to distinguish real lesions from superimposition of normal tissues and to define the margins of a mass. A true lateral view may be used to provide a third imaging plane in order to distinguish superimposition of normal structures from real lesions, to increase the accuracy of wire localizations of non-palpable lesions, or to ascertain the presence of layering in the case of milk of calcium or fat-containing oil cyst / galactocele. The true lateral view is performed with the mammography unit turned through 90° and a mediolateral or lateromedial X-ray beam. Magnification views are frequently performed to examine areas of microcalcifications within the breast, to characterize them and to establish their extent. These magnification views are typically performed in the craniocaudal and lateral projections. The magnified lateral view will demonstrate ‘teacups’ typical of benign microcalcifications, described later in the chapter. Mammographic technique may need to be modified in women with breast implants. Silicone and saline implants are radioopaque and may obscure much of the breast tissue. Consequently, mammography is of limited diagnostic

value in some women. The Eklund (Implant displaced) technique can be employed to displace the implant posteriorly, behind the compression plate, maximizing the volume of breast tissue that is compressed and imaged. Mammography-induced implant rupture is not a consideration.

SUGGESTED APPROACH TO INTERPRETATION

The first step is to **Determine if the study is technically adequate**.

• There should be *adequate tissue imaged on both the CC and MLO views. The posterior nipple line is a line drawn from the posterior nipple to the pectoralis muscle - or edge of the film on the CC view if the pectoralis is not visualized. The posterior nipple lines drawn on the CC and MLO views should be within 1 cm of each other. On the MLO view, the pectoral muscle should be visible at least to the level of the nipple.*

• The image must be *free from blur and artifacts*. The trabeculae should be sharp

• Each breast *nipple should be in profile* in at least one view.

Compare each side

• Each projection should be globally compared side-to-side to evaluate for symmetry.

Evaluate and magnify each image

• Each image should be carefully evaluated for signs of malignancy (mass, calcification, architectural distortion, and asymmetry).

Calcifications are best viewed at 1:1 or higher magnification, while architectural distortion is best seen when the whole breast is visualized.

• When viewing a digital mammogram, every portion of the image should be carefully evaluated at 1:1 zoom.

Compare to prior studies

• Even if a study appears unremarkable at first glance, comparison to prior exams can often reveal a subtle progressive change. At least *2 years previous compared*

REMEMBER ON SCREENING MAMMOGRAM SEARCH FOR: mass, calcifications, architectural distortion, asymmetry

1. **Mass -** new or increasing are of concern, particularly if irregular, high density, not circumscribed
2. **Calcifications -** assess stability, morphology, distribution. new or increasing are of concern when not typically benign morphology ie when fine linear, fine linear branching, fine pleomorphic, coarse heterogeneous, amorphous. Suspicious distribution includes segmental, linear, grouped, regional
3. **Architectural Distortion:**

•Normal breast architecture is distorted with no definite mass

•Thin straight lines of spiculations radiating from a point; focal retraction, distortion, straightening at the anterior or posterior edge of the parenchyma

•May also be seen in association with asymmetry or calcifications

•Determine if concordant history of trauma or surgery

•DDx for architectural distortion = Cancer, Radial scar, Posttraumatic/Surgical scar

4. **Asymmetry:** Unilateral deposits of fibroglandular tissue not conforming to the definition of a radiodense mass. Four types:

•1. **ASYMMETRY** - visible in only one mammographic projection. Typically summation artefact

•2. **GLOBAL ASYMMETRY** - large amount of fibroglandular-density tissue over a substantial portion of breast (at least a quadrant) compared to contralateral breast. Usually normal variant

•3. **FOCAL ASYMMETRY** - relatively small amount of fibroglandular-density tissue over a confined portion of breast (< a quadrant). Concave borders and interspersed fat distinguish from mass. DDx Superimposition of two normal structures, Mass

•4. **DEVELOPING ASYMMETRY -** focal asymmetry that is new, larger, or more conspicuous than previously. **15% are CA.** Therefore developing asymmetry can not be assigned BI-RADS® CATEGORY 3

ACR BI-RADS® 5th ed Desirable Medical Audit #s for interpreting radiologists

- *Cancer detection rate (per 1000 exams) >2%*
- *Abnormal interpretation (recall) rate 5-12%*
- *Sensitivity >75% see below*
- *Specificity 88%-95% see below*
- *PPV1 based on abnormal screening exam 3-8% see below*
- *PPV2 when biopsy (surgical, FNA, or core) recommended 20-40% see below*

ACR BI-RADS® 5th ed now includes auditing procedures for all three modalities Mammography Ultrasound MR

- *Positive exam defined as further imaging or short interval surveillance (BI-RADS® 0 and 3) on screening OR tissue diagnosis recommended (BI-RADS® 4 and 5) on diagnostic study*
- *Negative exam defined as tissue diagnosis not recommended (BI-RADS® 1 and 2 on screening OR BI-RADS® 1, 2 and 3 on diagnostic study)*
- *True positive TP defined as tissue diagnosis of cancer within 1 year of a positive exam*
- *True negative TN defined as no tissue diagnosis of cancer within 1 year of a negative exam*
- *False negative FN defined as tissue diagnosis of cancer within 1 year after the negative exam*
- *False positive FP has 3 separate definitions*

1. *FP1 = No known tissue diagnosis of cancer within 1 year of a positive screening examination*
2. *FP2 = No known tissue diagnosis of cancer within 1 year of a tissue diagnosis recommendation*
3. *FP3 = Concordant benign tissue diagnosis or discordant benign tissue diagnosis and no known diagnosis of cancer within 1 year of a tissue diagnosis recommendation*

TP + TN + FN + FP = total number of examinations

Sensitivity: The probability of detecting a cancer when a cancer exists or the number of cancers diagnosed after being identified at mammography in a population within 1 year of the imaging examination, divided by all cancers present in that population in the same time period.

Sensitivity = TP/(TP + FN)

Specificity: The probability of interpreting an examination as negative when cancer does not exist; or the number of true-negative mammograms in a population divided by all actual negative cases (those for which there is no tissue diagnosis of cancer within 1 year of the mammogram) in the population.

Specificity = TN/(TN + FP Sensitivity = TP/(TP + FN)

PPV2 = TP/(TP + FP2)

PPV1 = TP/number of abnormal screening exams, or TP/(TP + FP1)