

Implants and More: Updated Imaging Techniques for the Surgically Altered Breast

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Surgically Altered Breast

Accurate interpretation of images of post-surgical breasts are dependent upon the technologist providing:

- High quality images for interpretation
- Pertinent medical and surgical history
- Many findings can be mistaken for cancer



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Post-surgical Breast

- Skin thickening and architectural distortion can be seen in **both** malignant and benign conditions
- Prior breast trauma and/or surgery (including breast conservation treatment or lumpectomy) can result in scarring and distortion seen on imaging studies



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Pathophysiology

The pathophysiology of post-surgical change, as seen on mammograms is associated with:

- Type of surgical intervention
- Time elapsed since surgical procedure
- Classified into two general categories:
 - Acute changes
 - Chronic changes



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Acute Post-surgical Change

- Refers to immediate post-operative period extending into the first few weeks and months
- Acute changes seen on mammogram or ultrasound include:
 - Hematoma
 - Seroma
 - Edema



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Chronic Post-surgical Change

- Refers to findings identified **after** the acute period, usually several months to years after surgery
- Chronic changes include:
 - Scar formation
 - Architectural distortion
 - Retraction
 - Development of dystrophic calcification(s) and/or fat necrosis
 - Tissue asymmetry from tissue removal



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Architectural Distortion

- Disturbance of normal-appearing, curved, crescent shaped planes of the breast
- Mammogram may demonstrate a pulling in of the Cooper's ligaments to form a spiculated appearance
- Architectural distortion may be the **only** mammographic indication of cancer



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Architectural Distortion

- Often seen post surgery and may be observed as the result of superimposition of normal structures
- Thorough mammographic evaluation is needed to evaluate any area of architectural distortion
- Technologist can assist radiologist to correlate the imaging finding with the clinical history of the patient



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Interventional Breast Procedures

- Four most common are:
- Percutaneous biopsy
 - Excisional biopsy
 - Lumpectomy (breast conservation therapy)
 - Breast reduction, augmentation or reconstruction



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Percutaneous Breast Biopsy

- Commonly performed on masses and microcalcifications
- Includes FNA (fine needle aspiration), core biopsy and cyst aspiration
- Procedure involves introduction of needle into suspicious lesion or calcifications under Stereotactic, Ultrasound or MRI guidance
- Sample of tissue is removed and analyzed by pathologist



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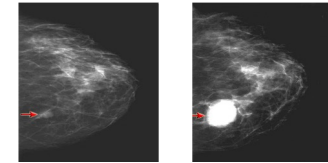
Imaging Findings with Percutaneous Biopsy

- Usually related to bleeding and the local anesthesia injected into the biopsy area
- Findings include:
 - Increased density in the biopsy area
 - Formation of a mass (hematoma)
 - Thickening of the connective tissue from edema (linear pattern)
 - Marker clip left to document location of sampled area



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Imaging Findings with Percutaneous Biopsy



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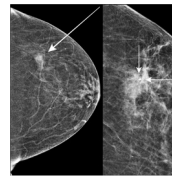
Imaging Findings with Percutaneous Biopsy

- In most women, the biopsy area heals with little or no residual evidence on the mammogram other than a reduction in size of the abnormality or number of calcifications
- Presence of marking clip: seen on follow-up mammogram if histology findings were benign (not removed)



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Imaging Findings with Percutaneous Biopsy



Immediate post-stereo mammo demonstrating marker clip.



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Excisional Biopsy

- Performed by surgeon in operating room, involving skin incision and removal of breast tissue
- Amount of tissue removed and degree of tissue interruption is variable
 - Dependent upon surgical technique
 - Subsequent treatment (radiation therapy)



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Acute Post-surgical Changes

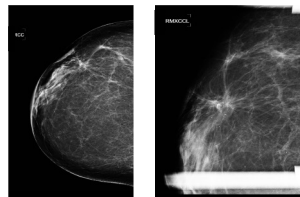
Imaging may demonstrate:

- An ill-defined mass
- Area of increased or increasing density
- Skin thickening and/or distortion
- Need for technologist to capture and report prior biopsy history is critical



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Post-surgical Change



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Post-surgical Imaging

What is the REASON for this breast imaging exam (please select one)?

This is a routine (screening) exam. I am not having any breast problems.

This is an additional exam requested from a recent study.

This is a short interval follow-up requested from my last exam (1-11 months ago).

I have breast implants, but I am not having any problems.

I am going to have breast reduction.

I am going to have radiation therapy.

This is an additional exam requested from my current screening exam.

I have a personal history of breast cancer with breast conservation therapy.

I am having the following PROBLEMS (Circle R for Right or L for Left)

R L A new lump that can be felt	R L Other lump or thickening
R L Bloody discharge	R L Nipple problem
R L Non-bloody discharge	R L Pain in the breast
R L Difficult physical examination	R L Cancer elsewhere
R L Implant problem	R L Large nodes under my arm
R L Skin thickening or retraction noted during my clinical breast examination	



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Technologist's capture and documentation of patient history is critical

Acute Post-surgical Changes

As healing occurs, the surgical site matures

- Fibrosis may occur, leading to scarring

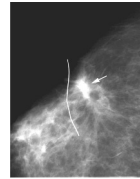
Mammo may show:

- Spiculated mass
- Area of architectural distortion
- Development of calcifications



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Post-surgical Imaging



Post lumpectomy and radiation therapy with architectural distortion



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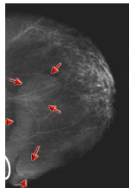
Acute Post-surgical Changes

- Rarely, extensive scarring can occur resulting in keloid formation
- Careful documentation on history form by the technologist and possible use of scar markers can help prevent misinterpretation of these images



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Post-surgical Imaging



CC view demonstrating Keloid formation



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Lumpectomy: Breast Conservation Treatment

- Involves removal of the breast cancer and a rim of non-cancerous tissue
- Patients may undergo a sentinel lymph node biopsy or full axillary dissection
- Most patients undergoing lumpectomy receive adjuvant radiation therapy to the breast to eradicate any residual cancer



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Acute Mammographic Changes

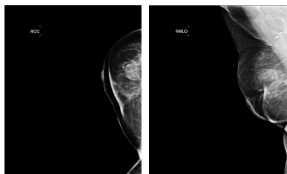
Imaging changes observed with lumpectomy are related to:

- Extent of surgery
- Time elapsed since surgery and radiation therapy



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Acute Mammographic Changes



Skin thickening, contour defect from scar, architectural distortion, surgical clips



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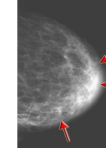
Chronic Mammographic Changes

- Radiation and surgical changes are most pronounced immediately after surgery
- Maximum radiation change is seen at 6-12 months
- Follow-up mammographic evaluation may involve a six-month series of exams to evaluate the treated breast (some institutions have different protocols)
- With subsequent imaging, distortion and edema should regress or remain stable



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Post-surgical Imaging



Post-lumpectomy and XRT with skin thickening and connective tissue changes, six months post surgery and two months post rad-therapy completion



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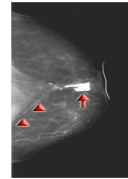
Post-surgical Change with Lumpectomy

- Development of calcifications with lumpectomy is problematic as 33-50% of irradiated breasts develop calcifications
- Most can be attributed to fat necrosis resulting from the surgery and/or radiation therapy



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Post-surgical Change with Lumpectomy

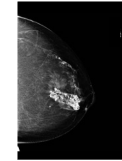


LCC demonstrating scarring and fat necrosis



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Post-surgical Change with Lumpectomy



CC view demonstrating extensive fat necrosis, dystrophic calcifications, scarring
Knowledge of clinical, surgical hx from tech essential to correlate image findings



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Breast Reduction, Augmentation or Reconstruction

- Mammographic changes after procedures are very common
- Variety of techniques utilized in breast reduction: most common is keyhole incision



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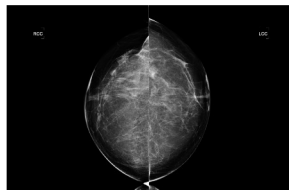
Breast Reduction

- Typical mammographic findings include:
- Alteration of parenchymal architecture
 - Cranial displacement of nipple
 - Patchy densities due to tissue removal and scarring
 - Development of fat necrosis



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Breast Reduction



CCs demonstrating disruption of normal pattern



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Breast Reduction



MLO views post reduction



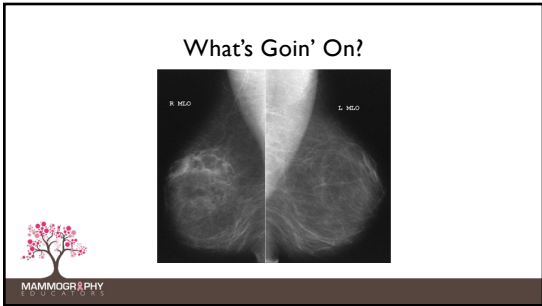
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Tip: 35 Degrees!

In order to include more pec muscle on the MLO, use a less steep degree of angulation.



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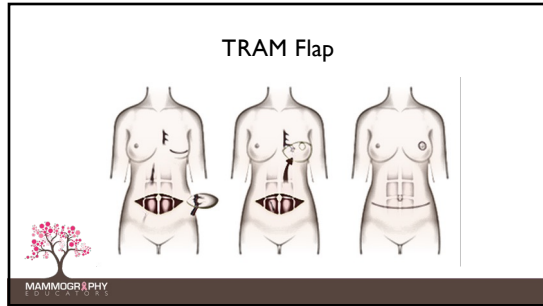


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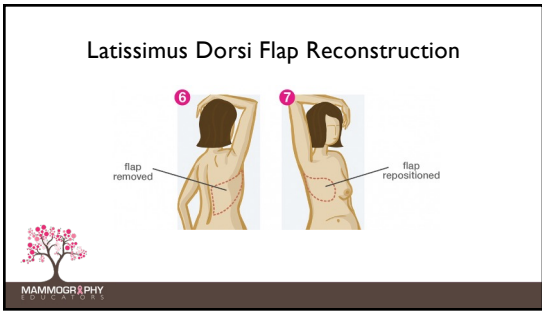
Breast Reconstruction

- Performed after mastectomy by means of reconstruction with autogenous tissue transfer and/or implants
- Most common location of donor tissue is a flap harvested from transverse rectus abdominus muscle (TRAM) flap or latissimus dorsi

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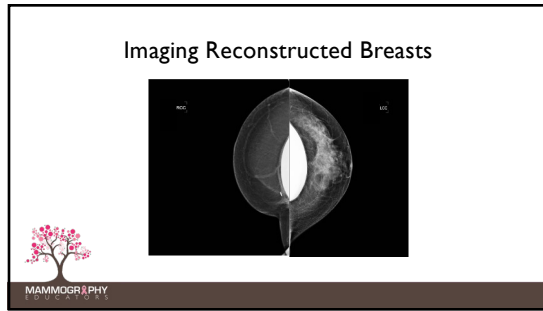


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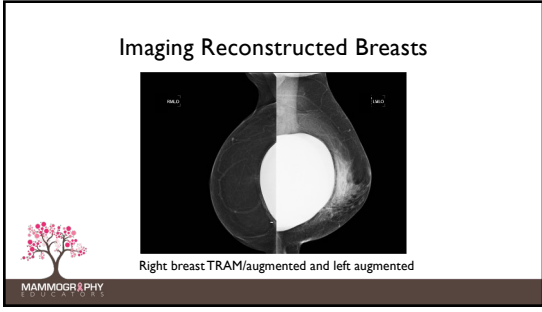
Imaging Recommendations

- Check your department policies and procedures
- Standard mammographic views performed along with additional views as needed (CC and MLOs)
- Most mammographic and clinical findings are related to development of dystrophic changes within donor tissue such as oil cysts and fat necrosis

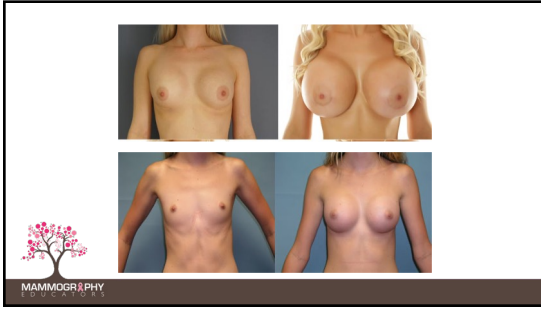
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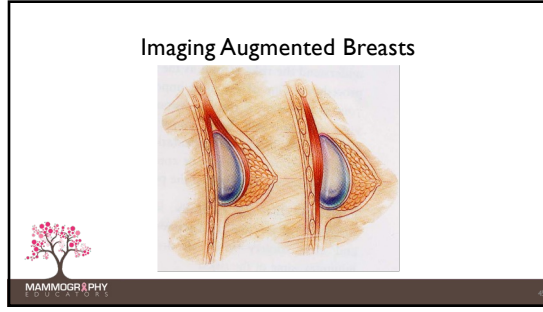
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Remember

- The decision to have breast augmentation is a personal decision
- Do not express any personal biases you may have
- You can explain the imaging process (double images)
- Explain how and why



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Imaging Augmented Breasts

As suggested by the ACR/CAR, four views of each breast should be performed to include:

- Standard and implant-displaced views
- Assessment of the implant includes:
 - Location: subglandular or subpectoral
 - Type: silicone, saline or mixed
 - Contour: evaluate for rupture, weakening, and possible complications such as rupture/capsular formation
 - AGE of implant



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Imaging Augmented Breasts

Recommended imaging sequence:

- Full implant CCs
- Full implant MLOs
- CCIDs
- MLOIDs



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Remember!!

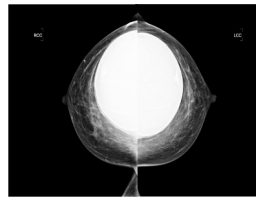
Full implant views are done for posterior breast tissue

- On the full CC shows deep posterior medial and lateral breast tissue (i.e. cleavage)
- The full MLO should visualize deep posterior breast (i.e. axilla and IMF)
- Compression should be applied just enough to immobilize the implant and present motion un-sharpness



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Imaging the Augmented Breast



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Imaging the Augmented Breast



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Remember!!

ID views are done for anterior breast tissue:

- The CCID is done to show deep anterior breast tissue
- The MLOID should visualize anterior breast
- Taut compression may be applied



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Suggestions for ID Views

- Sit the patient down for the ID views
- Stand behind the patient
- Pull forward rather than push back



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Implant Displacement for the CC View



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Implant Displacement for the MLO View

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Imaging the Augmented Breast

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Imaging the Augmented Breast

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Encapsulated Implants

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Encapsulated Implants

- Develop policy and procedure
- No nipplegrams!

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MRI is Used to Evaluate Implant Integrity

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Miscellaneous Findings

Post-implant removal with calcified capsule

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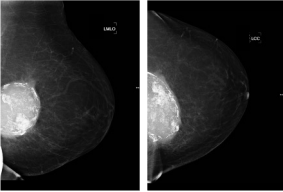
Miscellaneous Findings

Implant with free silicone


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Miscellaneous Findings



Post-implant removal with calcified capsule



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Was this Saline or Silicone?




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Summary


- Interpretation of images in a post-surgical breast can be very complex and difficult
- Post-surgical findings can mimic cancer and result in a confusing image
- A subtle developing cancer in an area of prior surgery may be overlooked initially
- Residual cancer in a breast treated with lumpectomy can be difficult to detect




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Summary

- The workup of post-surgical breast changes includes a thorough mammographic evaluation
- Correlation with clinical history and pathologic findings
- Scar markers may be helpful to document surgical approach (should be indicated on hx sheet)
- Additional projections as needed
- Technologist's contributions to the breast imaging team are invaluable




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