Introduction

- Accurate interpretation of the postsurgical breast depends on:
  - High quality images
  - Applicable medical & surgical history

Indicators of malignancy can be seen in both benign & malignant conditions:
- Skin thickening
- Architectural distortion
- Retraction
- Dystrophic calcifications (deposits of calcium occurring in response to tissue damage)

Scarring & Distortion

- Prior breast surgery
- Trauma
- BCT - breast conservation treatment
- Lumpectomy

Postsurgical Changes

- Two general categories:
  - Acute changes
    - Immediate
    - First several weeks or months
  - Chronic changes
    - Months to years

Percutaneous Breast Biopsy

- Commonly performed on masses & calcifications & include:
  - Fine-needle aspiration
  - Core-needle biopsy
  - Cyst aspiration[^1]
Percutaneous Breast Biopsy

- Acute mammographic findings:
  - Usually related to bleeding & the local anesthesia injected into the biopsy area

Percutaneous Breast Biopsy

- Findings include:
  - ↑ density in the area
  - Formation of a mass (hematoma)
  - Trabecular thickening from edema

Excisional Breast Biopsy

- Usually performed by a surgeon
- Involves
  - Skin incision
  - Removal of breast tissue
  - Tissue interruption

Excisional Breast Biopsy

- Acute changes are related to:
  - Hematoma
  - Edema
  - Tissue disruption

Excisional Breast Biopsy

- Mammographic images may show:
  - An ill-defined mass
  - Area of ↑ density
  - Skin thickening
  - Distortion

Breast Conservation Treatment - BCT

- Removal of the breast cancer with a surrounding rim of noncancerous tissue
- Sentinel lymph node biopsy or complete lymph node dissection
- Adjuvant radiation therapy to the breast to eradicate any possible residual occult cancer
Breast Conservation Treatment - BCT

• Acute mammographic changes
• Usually related to the:
  — Extent of surgery
  — Time elapsed since radiation therapy

Breast Conservation Treatment - BCT

• Mammograms performed during the acute surgical period usually demonstrate findings related to the surgery such as:
  — Skin &/or trabecular edema
  — Seromas
  — Architectural distortion
  — Surgical clips in the tumor bed

BCT – Chronic Findings

• Related to the volume of tissue excised & radiation therapy
• Common findings identified after a lumpectomy
  — Architectural distortion
  — A spiculated or ill-defined mass
  — A change in an appearance of the breast

Breast Reduction

• Typical mammographic findings may include:
  — Alteration of the parenchymal architecture
  — Cranial displacement of the nipple
  — Patchy densities due to tissue removal & scarring
  — Development of fat necrosis
• New baseline @ 6 months

Breast Reconstruction

• The most frequent location of the donor tissue is from a flap harvested from the latissimus dorsi muscle or the transverse rectus abdominis muscle (TRAM) flap

Breast Reconstruction

• Evaluation of a clinically suspicious finding, ie. Palpable mass
• Standard views with any additional views &/or US
Breast Augmentation

- Postsurgical findings are related to:
  - The technical placement of the implant
  - The type of implant
- Standard & implant-displaced views

Breast Augmentation

- Assessment of the implants
  - Location - subglandular or subpectoral
  - Type - silicone, saline, mixed
  - Contour - evaluation for possible rupture or weakening
  - Evaluation for possible complications - rupture, capsular formation

Pregnancy Associated Breast Pathology

Mammographic Characteristics

PABC - pregnancy associated breast cancer

- Usually defined as a breast cancer diagnosed during pregnancy or one year following delivery
- Occurs in one out of every 1500 - 10,000 pregnancies

PABC - pregnancy associated breast cancer

- Represents up to 3% of all breast malignancies
- The incidence may be \( \uparrow \) due to many women delaying pregnancy

PABC - pregnancy associated breast cancer

- Ultrasound is a usual initial imaging modality in evaluating the breast in a pregnant or lactating patient
- Despite dense breast associated with pregnancy, PABC are often detectable on mammography
PABC - pregnancy associated breast cancer

- PABC is often advanced at diagnosis & associated with poor prognosis.

PABC Definition - Dr Yuranga Weerakkody & Radiwiki et al.
http://radiopaedia.org/articles/pregnancy-associated-breast-cancer

Breast Pathologies & Their Mammographic Appearances

Benign, High Risk & Malignant

Cyst

- Caused by blockage of the terminal acini with resultant dilatation of ducts
- Cysts may be unilateral, although they tend to be bilateral & multifocal
- Large solitary cysts appear as isolated masses

Hydatid Cysts in Breast

Case report: N Tutur, B Gökş, Z Erkek, N C Tekcan, A E Nirvan

Figure 25C. Pregnancy-related Burkitt lymphoma of the breast in a 29-year-old woman who presented with painful & rapid diffuse enlargement of both breasts 2 months after delivery.

- Burkitt lymphoma is a very fast growing form of non-Hodgkin’s lymphoma
Fibroadenoma

• Results from excess proliferation of connective tissue
• Characteristically contain glandular & fibrous connective tissue
• Usually occur in women between the ages of 10 & 40
• Most common breast mass in the adolescent & young adult population

Fibroadenoma

• Calcification may also present as microcalcifications - makes differentiation from malignancy very difficult

Fibroadenoma

• The lesions are especially prone to calcification in the post menopausal woman - the process is part of involution of the breast as a function of age

Galactocele

• Typically occur in young women during lactation
• Sometimes referred to as a lactocele

Galactocele

• Patients typically present with a painless breast lump occurring over weeks to months
• The lesion can present as a single nodule or multiple nodules & can be unilateral or bilateral

Galactocele

• Essentially a retention cyst resulting from lactiferous duct occlusion
• Single or multiple nodular lesions with a density equal to or less than that of the fibroepithelial tissue of the breast
Hamartoma

- Occurs in postmenopausal women taking hormones
- Typically not cancerous
- Does not increase the chance of getting breast cancer in the future
- Also known as a fibroadenolipoma

Dr. Garth Kruger
http://radiopaedia.org/cases/hamartoma-left-breast

Hematoma

- Blood-filled swelling caused by trauma to the breast
- May lead to:
  - Inflammation
  - Fever
  - Skin discoloration
- May leave scar tissue that mimics the shape of a breast tumor
- Usually visible mammographically

Fat Necrosis

- Fat necrosis may be seen after surgery, radiation therapy, & trauma
- Pathologically, hemorrhage within fat evolves into cystic degeneration
  - Often has associated calcifications & eventually continues to fibrosis & scar formation
  - Patients are most often asymptomatic but occasionally may present with a palpable lump that is tender

Casting Calcifications - Benign

- Extensive casting calcifications in the ducts left breast
- Literally calcified casts of the ducts
- These all have more or less the same density
- Dr. Garth Kruger sees them most often in older ladies
Casting Calcifications - Benign
• The distribution may be segmental but
  the nature of the casts is typically benign
• The left margin of the image shows
  subtle vascular calcifications in a typical
  "tramline" distribution of the arterial wall

Atypical Ductal Hyperplasia - ADH
• If the cells look unusual in size or shape,
  as they do in the illustration, the
  hyperplasia is called atypical
• Despite this unusual appearance, the
  extra cells in ADH are still dividing in a
  controlled way

Atypical Ductal Hyperplasia - ADH
• ADH does not normally cause changes
  that can be felt
• In this sense it is an 'accidental' finding

Necrotic Neoplasm
—Phyllodes tumors - appear
mammographically as large
circumscribed masses and
sonographically as circumscribed
hypoechoic masses with internal cystic
areas
DCIS right breast
- DCIS makes up probably 30% of the cancers we find in a large screening series
- The same percentage that screening reduces the mortality of breast carcinoma by.... coincidence?

Inflammatory Carcinoma
- Signs & symptoms of inflammatory breast cancer include:
  - Rapid change in the appearance of one breast, over the course of several weeks

Inflammatory Carcinoma
- Thickness, heaviness or visible enlargement of one breast
- Discoloration, giving the breast a red, purple, pink or bruised appearance
- Unusual warmth of the affected breast

Inflammatory Carcinoma – Mayo Clinic
- Dimpling or ridges on the skin of the affected breast, similar to an orange peel (peau d’orange)
- Tenderness, pain or aching
- Enlarged lymph nodes under the arm, above the collarbone or below the collarbone

Inflammatory Carcinoma – Mayo Clinic
- Flattening or turning inward of the nipple
- Inflammatory breast cancer doesn't commonly form a lump

Phyllodes Tumor
- < 1% of most breasts tumors
- Greek “phylloides” or “leaflike”
- Tumor tissue develops in a leaflike pattern
Phyllodes Tumor
- Additional names: phylloides tumor & cystosarcoma phyllodes
- Usually develop rapidly
- Rarely spread outside of the breasts.
- Majority of phyllodes tumors benign but several are cancerous & a few tend to be borderline

Phyllodes Tumor
- All 3 types of phyllodes tumors often develop rapidly & need surgical treatment to decrease the chance of local recurrence
- May appear at all ages but usually develop in women in their 40s
- Phyllodes tumors are very uncommon in males
- phyllodes-tumor.org

Mammographic Signs of Systemic Disease

Breast Imaging:
Malan M. Cao,
Anne C. Hoyt,
& Lawrence W. Bassett
Mammographic Signs of Systemic Disease Radiographics July-August 2011 31:4 1085-1100; doi:10.1148/rg.314105205

Amyloidosis (am-uh-loi-DO-sis)
- A disease that occurs when substances called amyloid proteins build up in your organs
- Amyloid is an abnormal protein usually produced by cells in your bone marrow that can be deposited in any tissue or organ

Amyloidosis (am-uh-loi-DO-sis)
- Amyloidosis can affect different organs in different people, & there are different types of amyloid
- Amyloidosis frequently affects the heart, kidneys, liver, spleen, nervous system & GI tract

Amyloidosis (am-uh-loi-DO-sis)
- Amyloidosis is rare, & the exact cause is often unknown. Treatments are available to help manage symptoms of amyloidosis & limit the production of amyloid protein

http://www.mayoclinic.com/health/amyloidosis/DS00431
Case #48 - Steatocystoma Multiplex

• An uncommon, inherited disorder
• Characterized by multiple, asymptomatic, variably-sized dermal cysts

Steatocystoma Multiplex

• Transmitted in an autosomal dominant (only need to get the abnormal gene from one parent in order for you to inherit the disease) fashion, although there may be sporadic cases have been documented

Steatocystoma Multiplex

• Solitary lesions of steatocystoma simplex have no hereditary tendency

Steatocystoma Multiplex

• The condition begins in adolescence or young adulthood & affects both sexes equally

Steatocystoma Multiplex

• It usually is present on the trunk & proximal extremities, but lesions may occur on the scrotum, thighs, forearms, & back
• The lesions lack surface puncta but may exude a creamy or oily fluid when punctured.

Case #50 - Subcutaneous Filariasis

• *Loa loa* is a thread-like worm that lives under the skin in the subcutaneous fat causing loiasis (an infection caused by the parasitic worm, *Loa loa*)
Subcutaneous Filariasis

- There may be up to 13 million people with loiasis in affected areas of Central & West Africa
- Because it is often spotted migrating in the eye, it is known as the eye worm

Subcutaneous Filariasis

- Loiasis is endemic to 11 countries & 12 million Africans are infected

Subcutaneous Filariasis

- The disease is also known as:
  - Subcutaneous filariasis
  - Calabar swellings
  - African eye worm infection
  - *Loa loa* filariasis
  - Fugitive swelling
- Loiasis is carried by day-biting deer & mango flies