

Male Breast Imaging with Radiologic-Pathologic Correlation

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We will discuss...

- Male breast imaging
- Normal male mammogram
- Classic features of gynecomastia
- Lesions that require a biopsy
- Male breast cancer
- Benign, non-neoplastic breast conditions

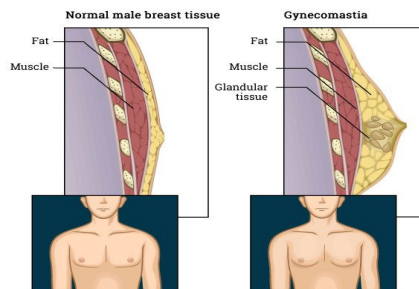


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Normal Male Breast

- Rudimentary organ
- Nipple & subareolar ducts



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Source: Gynecomastia.org.uk

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Gynecomastia

- Gynecomastia is the most common abnormality in the male breast
- At clinical examination - Manifests as an easily compressible, mobile, soft subareolar mass
 - Every word in this sentence is critical: *compressible, mobile, soft, subareolar*
- It is tender in the acute phase, but not in the chronic phase



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Gynecomastia

- Gynecomastia must be subareolar! Any mass that is *not* subareolar is not gynecomastia.
 - Masses due to cancer are usually eccentric to the nipple-areolar complex
 - Pseudogynecomastia: uni or bilateral breast enlargement rather than a discrete mass
- May be symmetric, asymmetric, unilateral or bilateral



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Gynecomastia

- Is simultaneous proliferation of ducts & stroma *without* encapsulation, so it *must* blend into the surrounding fat tissue
- There is no proliferation of lobuli, like there is in women
- You will not see tumors that start in the lobules, i.e., adenomas (lactating) fibroadenomas, phyllodes tumors



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Gynecomastia

- Because of the lack of lobular structures, invasive lobular carcinomas are extremely rare
- By definition gynecomastia is 2 cm or more of subareolar tissue in a non-obese male
- It is a common “normal” finding, that is seen in 55% of men at autopsy



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Gynecomastia

- The peak incidence is 60 - 69 years
- It is significant if it is *new* or *symptomatic*
- In elderly males, gynecomastia makes up 65% of all breast lesions



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Gynecomastia



Source: C. Salt, MD

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Imaging Technique

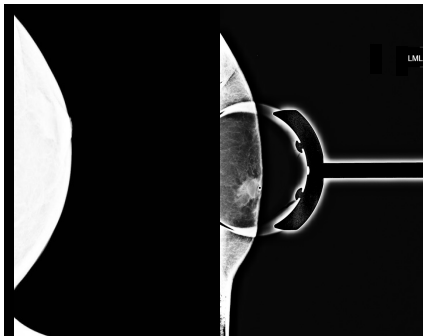
- Bilateral CC & MLO
- Narrow paddle helpful
- BB on palpable mass
- Really important to try & keep nipple in profile
- Additional views as indicated



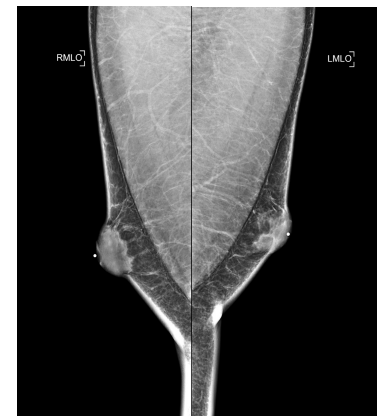
Source: NIMCSD

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Imaging Technique



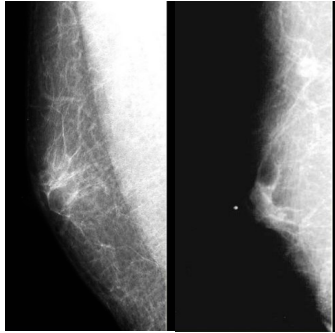
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Source: NIMCSD

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Normal Male Mammogram



Source: Glassman 2009

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Gynecomastia

- Neonatal gynecomastia:
 - Exposure to placental estrogens
 - Duration: weeks
- Adolescent gynecomastia:
 - 60-70% of pubertal boys
 - Duration: 1-2 years
- Senescent gynecomastia: >50 years old



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Gynecomastia

- Pathologic
- Physiologic



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Gynecomastia

- **Pathologic**
- Physiologic



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Tumors Causing Gynecomastia

- Leydig or Sertoli cell tumor
- Testicular tumors
- Lung
- Liver
- Adrenal



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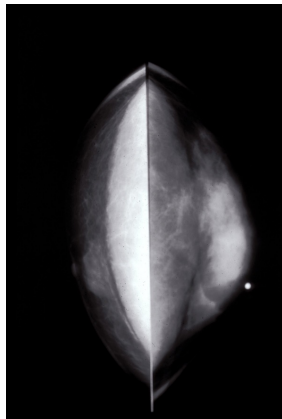
Leydig Cell Tumor

- 2-3% of all testicular neoplasms
- 2-82 years old
- Estrogen secretion in 25%
- 10% exhibit malignant behavior (adults)



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Source: Linda Olson, MD

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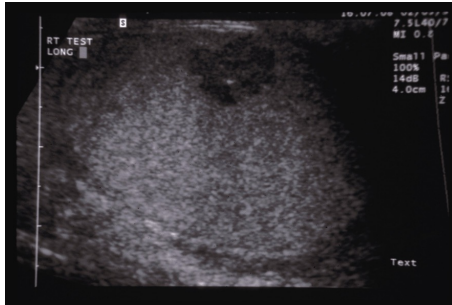


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Source: Linda Olson, MD

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Testicular Echo



Source: Linda Olson, MD

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Gynecomastia

- Pathologic
- **Physiologic**



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Gynecomastia-Physiologic

- Primary or secondary testicular failure
- Chronic liver or renal failure
- Hyperthyroidism
- Malnutrition, upon re-feeding



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Gynecomastia-Physiologic

- Cardiac agents
- Alkylating agents
- Anti-ulcer agents-cimetidine
- Tricyclic antidepressants
- Some body building supplements/steroids
- Hormones/Lupron
- Marijuana
- Heroin



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Klinefelter's Syndrome

- XXY genotype
- Gynecomastia common
- Small testes
- Increase FSH
- Breast cancer risk:
 - 20x for all men
 - 1/5 for all women
 - 3% risk (lifetime)



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Klinefelter's Syndrome

Recommendation:

- Patient education
- Routine clinical exam
- Mammography for any abnormal physical exam



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Gynecomastia - Imaging Patterns

- There are three imaging patterns:
 - Nodular glandular (acute florid phase, > 1 yr.)
 - Dendritic (chronic fibrotic phase)
 - Diffuse glandular pattern



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Gynecomastia - Nodular pattern

- Nodular or triangular density radiating from the nipple
- It may be more prominent in the upper outer quadrant & well-defined
- More importantly, it blends into the surrounding fat



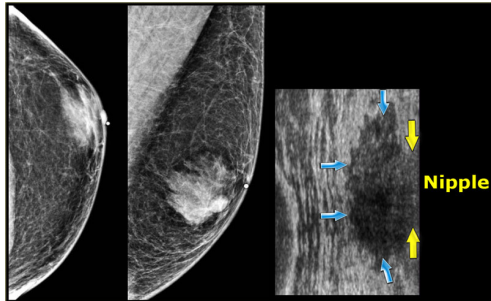
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In a man, an indistinct border is a sign of gynecomastia

Nodular Pattern

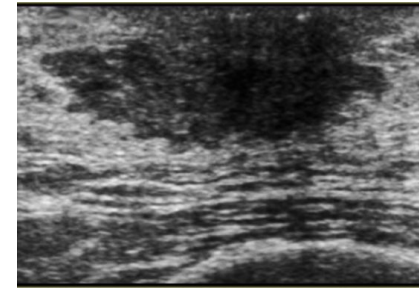


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Source: Glassman 2009

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Ultrasound



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Source: Glassman 2009

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Gynecomastia – Nodular pattern

- The nodular pattern of gynecomastia is seen in the florid early phase
- It begins as an increased number of ducts and epithelial proliferation with edema & cellular fibroblastic stroma
- This phase is reversible
- Remove causative agent



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Gynecomastia – Dendritic pattern

- The dendritic pattern is seen in the fibrotic or late phase
- There are dilated ducts, moderate epithelial proliferation and fibrosis
- Not reversible



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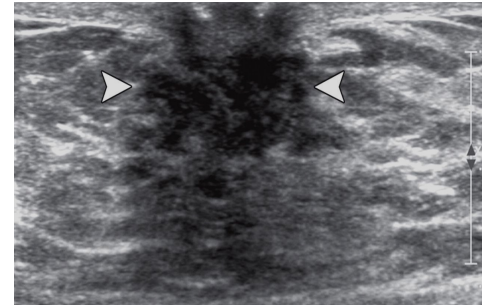
Dendritic Pattern – Patient 75 years



Source: Nguyen 2023

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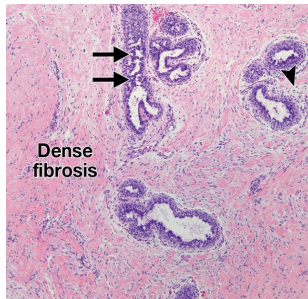
Dendritic Pattern - Ultrasound



Source: Nguyen 2023

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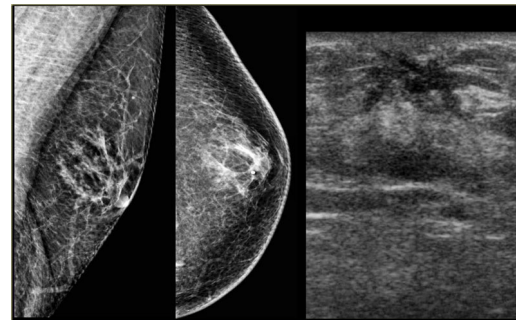
Dendritic Pattern - Photomicrograph



Source: Nguyen 2023

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Classic Benign, Chronic Gynecomastia



Source: Glassman 2009

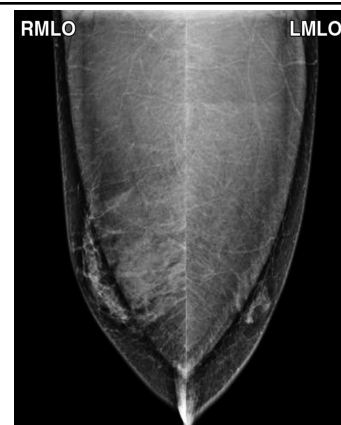
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35 year-old Weight-lifter with Bilateral Lumps and Pain



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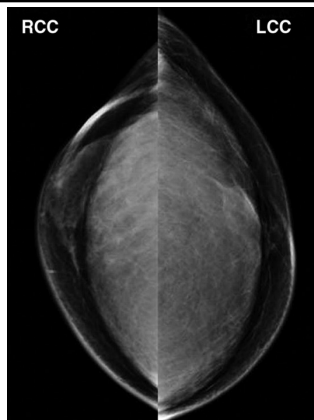
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Source: Iuanow et al 2011

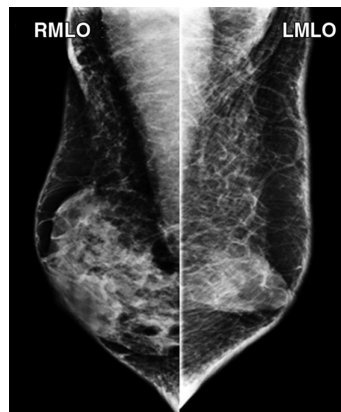
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Source: Iuanow et al 2011

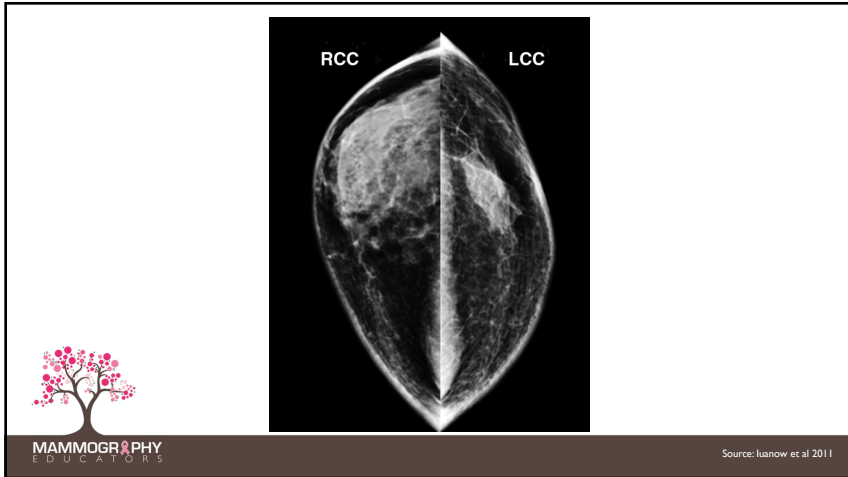
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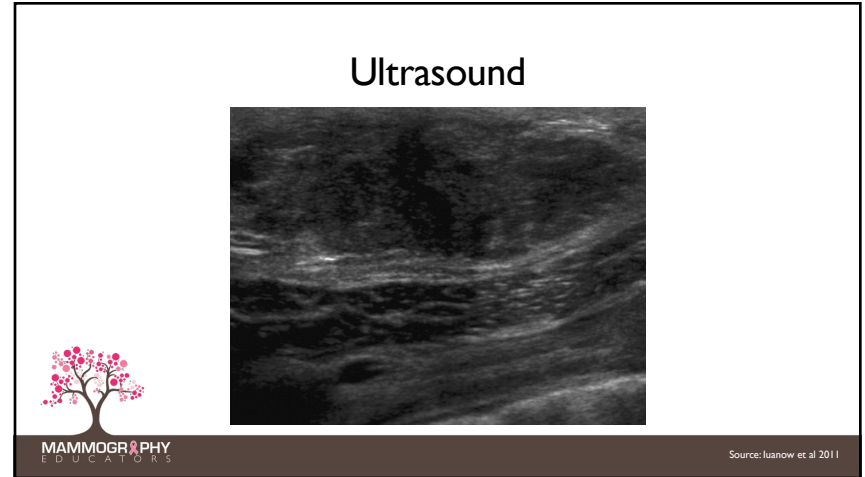
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Source: Iuanow et al 2011

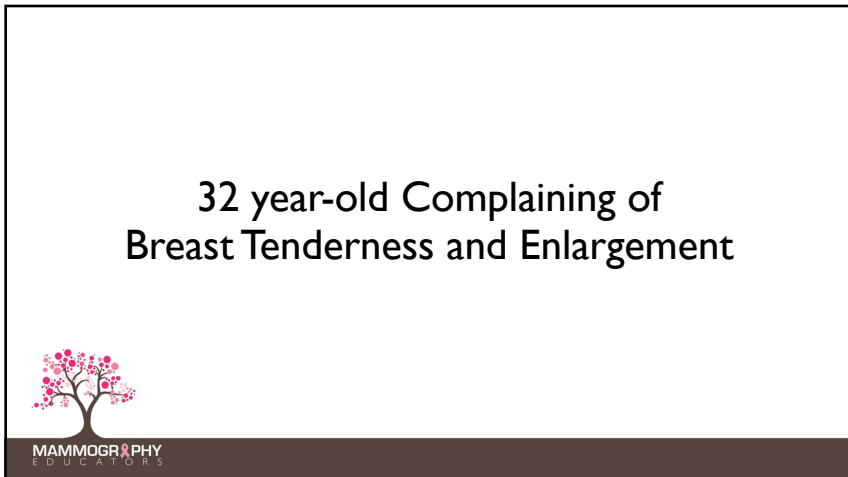
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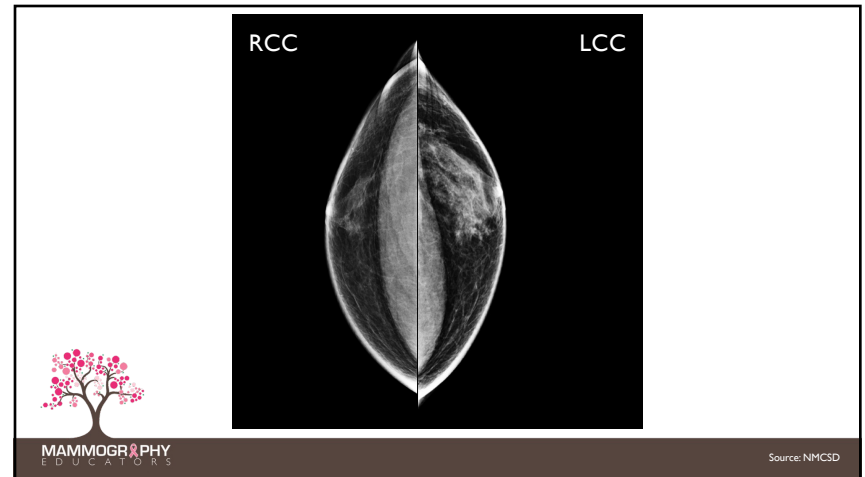
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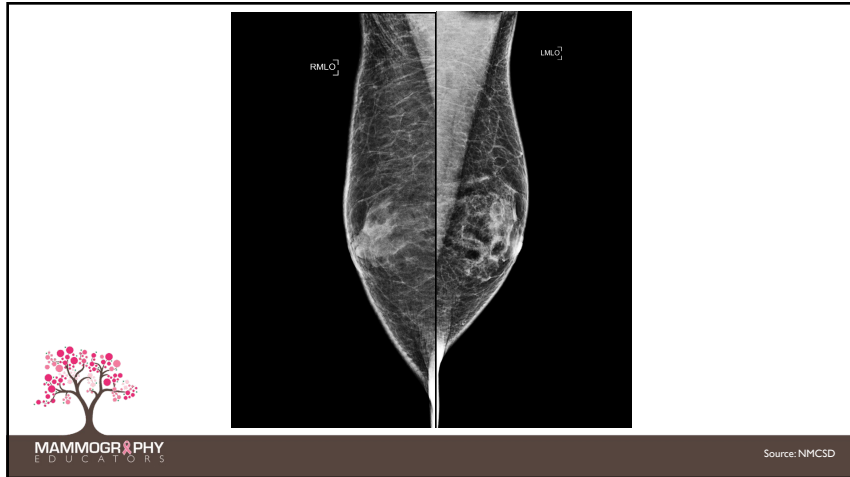
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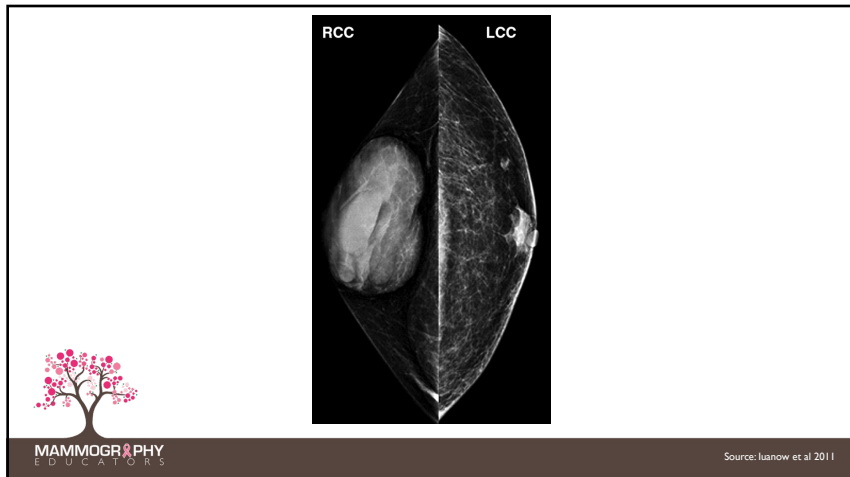
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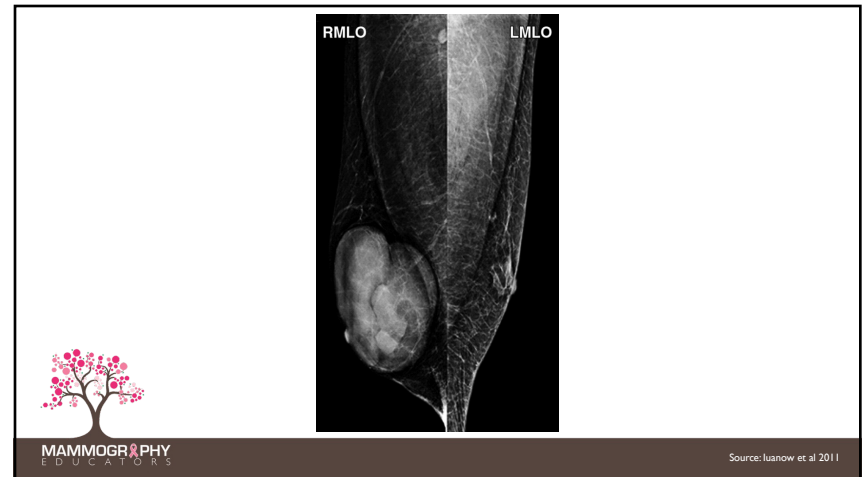
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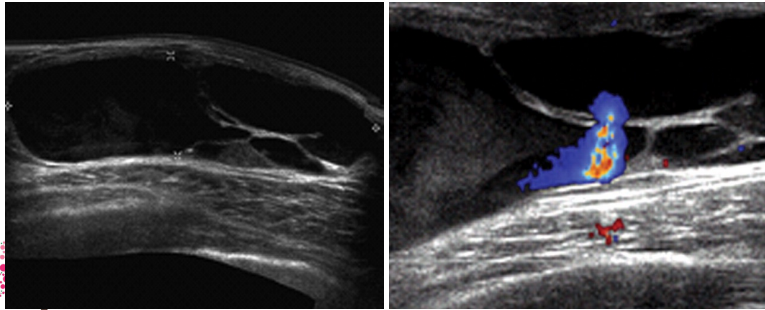


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Ultrasound

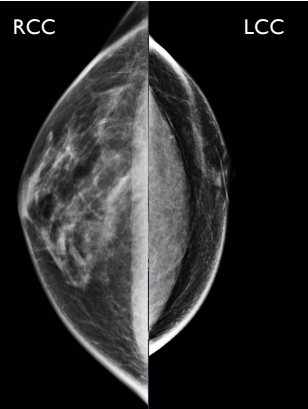


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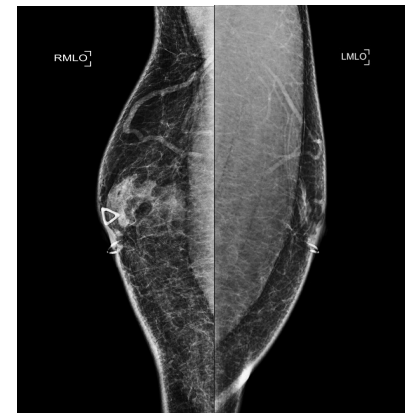
30 year-old with Progressive Right Breast Enlargement



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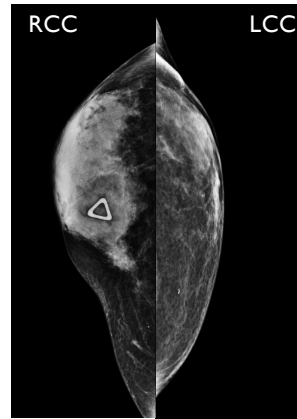
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72 year-old male

- Hx CAD with CABG
- Hx Below the knee amputation for ischemia
- THC cream for analgesic to stump
- 2012 breast reduction
- Medications include: ASA, Crestor, Lisinopril, Metoprolol, Omeprazole
- 2-4 drinks daily
- CBD/THC cookie for insomnia



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Source: NMCSD

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Source: NMCSD

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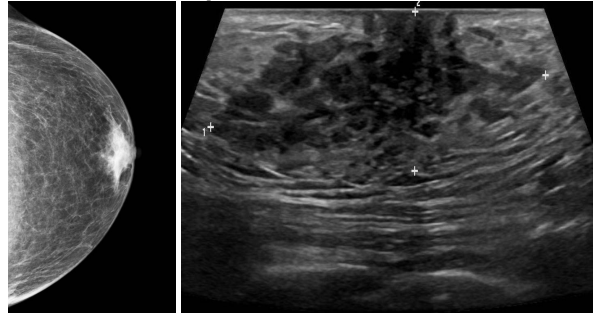
Ultrasound



Source: NMCSD

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70 year-old with 7-month HX of Palpable Concern



Source: NMCSD

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63 year-old Male

- Self-discovered finding of 3/8 inch firm, nontender breast lump superior to right nipple
- Family Hx of Mother diagnosed with breast cancer in her 30's, treated with bilateral mastectomy
- Medications include: Lisinopril, Lipitor, Xarelto, Aspirin

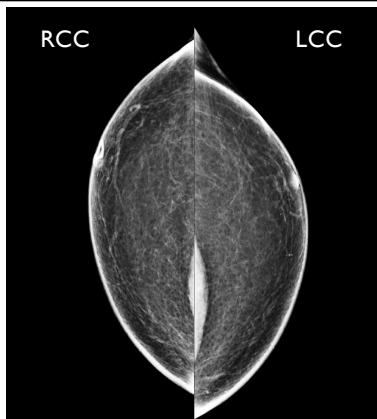


Source: NMCSD

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RCC

LCC



Source: NMCSD

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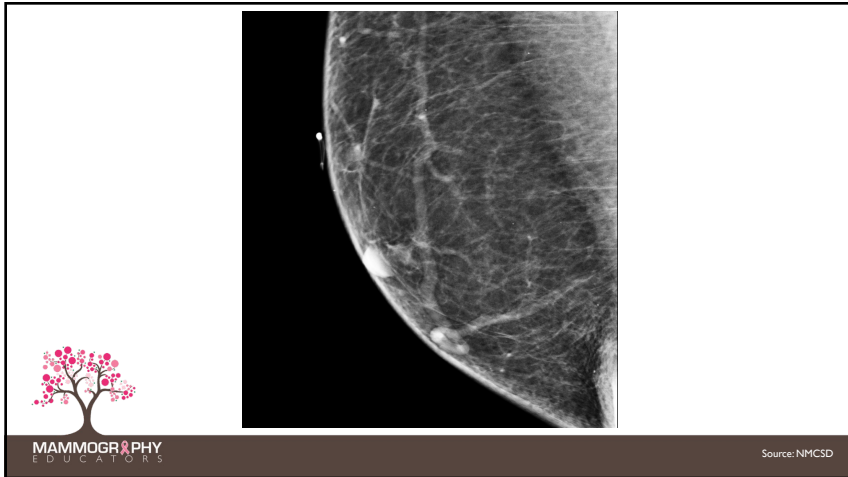
RMLO

LMLO



Source: NMCSD

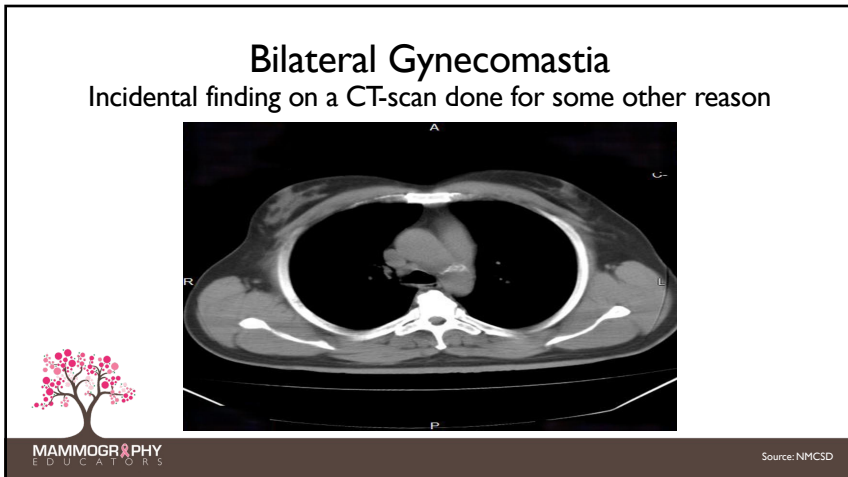
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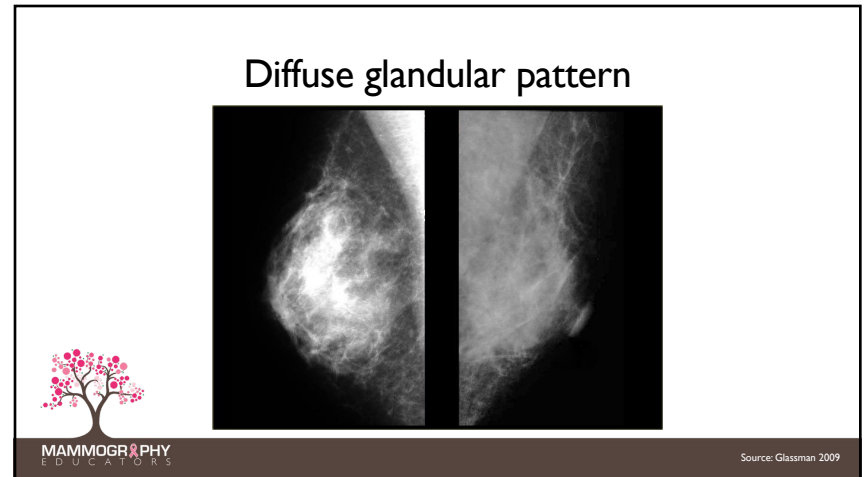
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Pseudogynecomastia

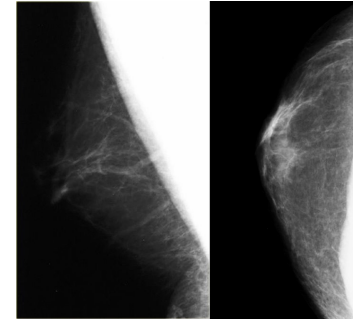
- This is usually bilateral and there is no palpable mass
- Remember that gynecomastia presents clinically as a soft, mobile, tender, subareolar mass
- Pseudogynecomastia results from excessive fat deposition in the breast area
- It is seen as a normal variant, in obesity and in neurofibromatosis



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Pseudo- vs true Gynecomastia

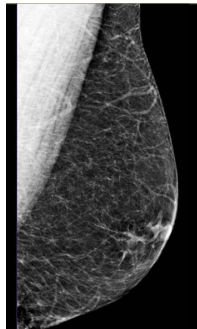


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Source: NMCSD

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Pseudogynecomastia



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Source: NMCSD

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Pseudogynecomastia



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Pseudogynecomastia



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Pseudogynecomastia



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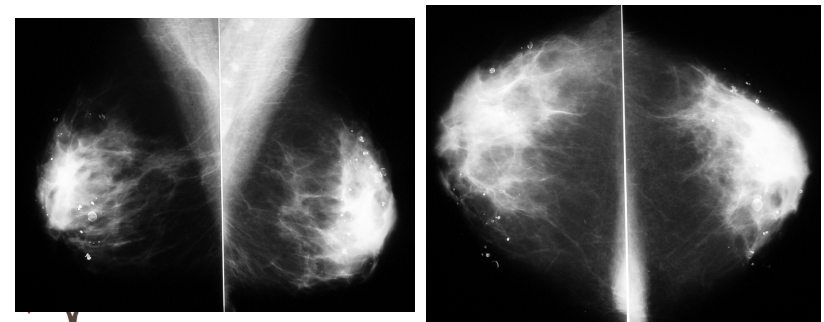
Gynecomastia

- Remove causative agent when possible
 - Tamoxifen
- Surgical therapy
 - Liposuction
 - Reduction
- Prophylaxis
 - Low dose radiotherapy prior to estrogen administration for prostate cancer (85 pts.- 11% exhibited gynecomastia)



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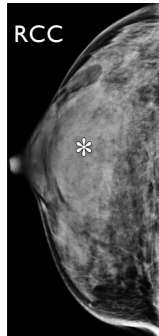
Transgender Male on Hormone Replacement for 22 years



Source: NMCSD

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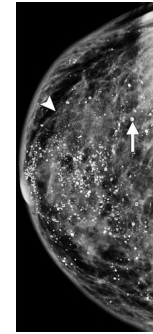
Transgender female



Source: Nguyen 2023

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Transgender Male Patient



Source: Nguyen 2023

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Male Breast Cancer

- Malignant disease in men looks just like malignant disease in women
- In the USA there are about 2,600 new male cases each year, which is 1% of all breast cancer diagnosed



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Male Breast Cancer

- There is a higher incidence in people from China & Africa due to hyperestrogenism secondary to parasitic liver disease
- These cancers present as a unilateral painless subareolar mass
- This subareolar location is just like in gynecomastia, but usually it is eccentric to the nipple



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Male Breast Cancer

- It sometimes presents with unilateral, spontaneous bloody nipple discharge, which is unlike gynecomastia
- Usually it is invasive ductal cancer
- As stated previously invasive lobular cancer is extremely rare



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Male Breast Cancer

- DCIS is rare to find, because there is no screening program for men, so they will present when there is a palpable mass
- Male breast cancer presents as a round, oval or irregular mass
- Calcifications are rare, but when they occur, they are coarser than in women



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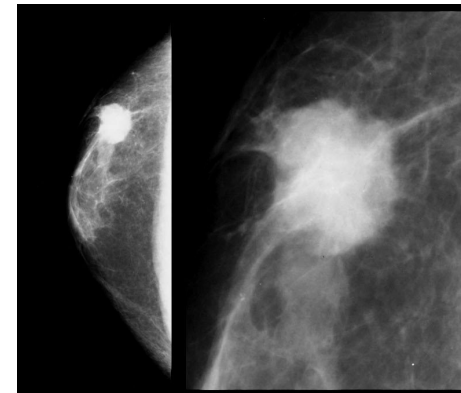
76 year-old Male

- Right palpable concern
- Firm, hard
- Painless
- NO contributing medical or pharmaceutical history



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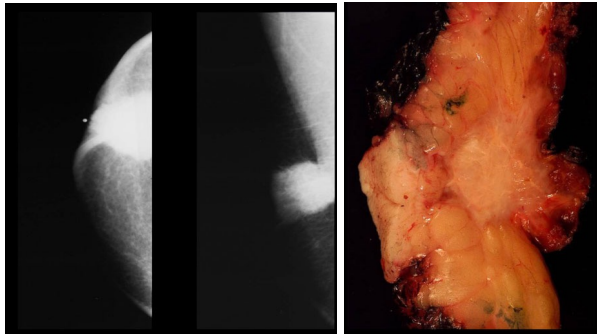


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Source: Glassman 2009

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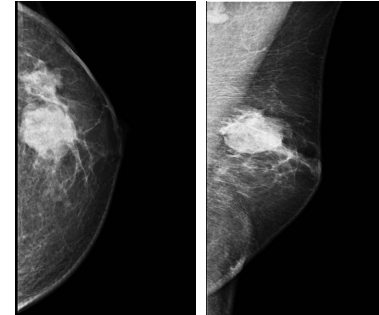
IDCA with skin retraction



Source: Glassman 2009

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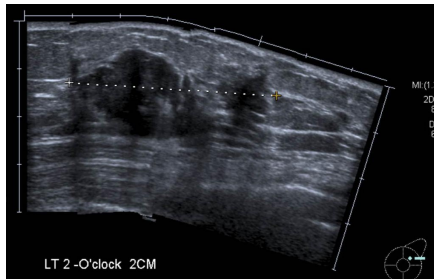
76 year-old
10-month HX of enlarging, painless mass



Source: NMCSD

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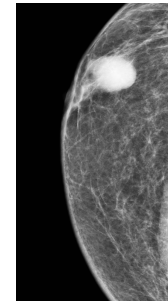
76 year-old
10-month HX of enlarging, painless mass



Source: NMCSD

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65 year-old
9-month HX of hard, painless mass



Eccentric to the nipple



Source: NMCSD

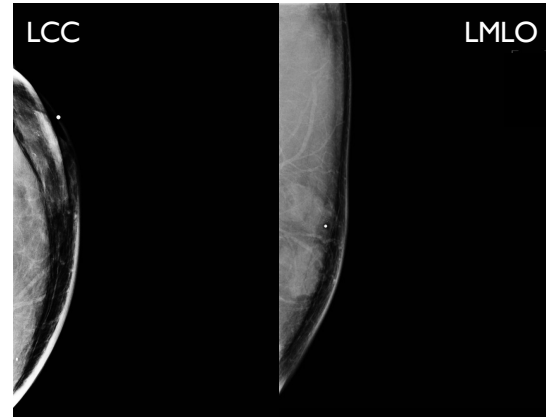
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37 year-old
Presents with palpable concern



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Source: Linda Olson, MD

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Source: Linda Olson, MD

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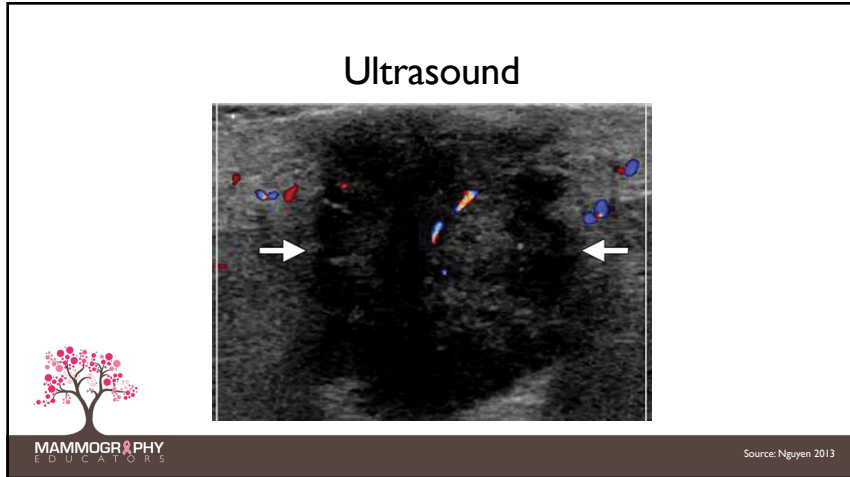
76 year-old Male
1-month HX of palpable mass



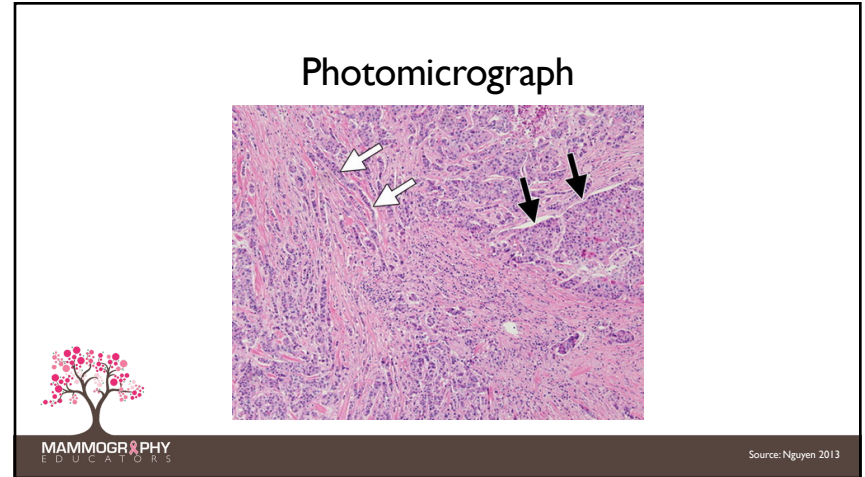
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Source: Nguyen 2013

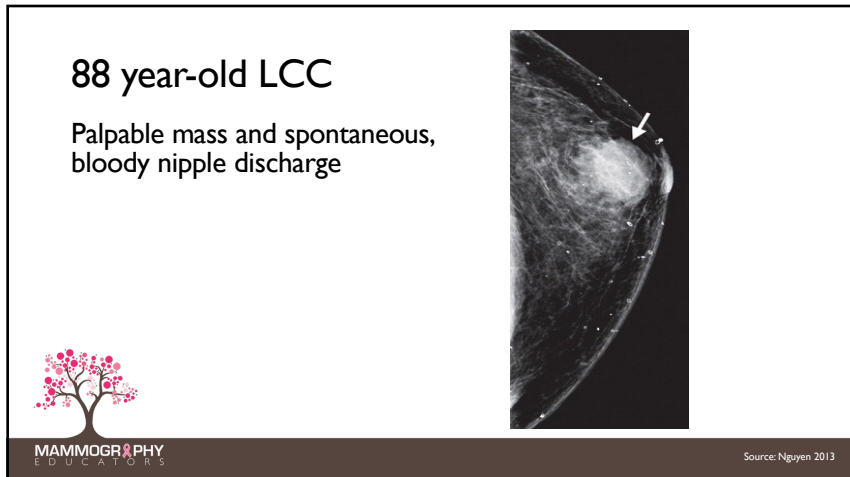
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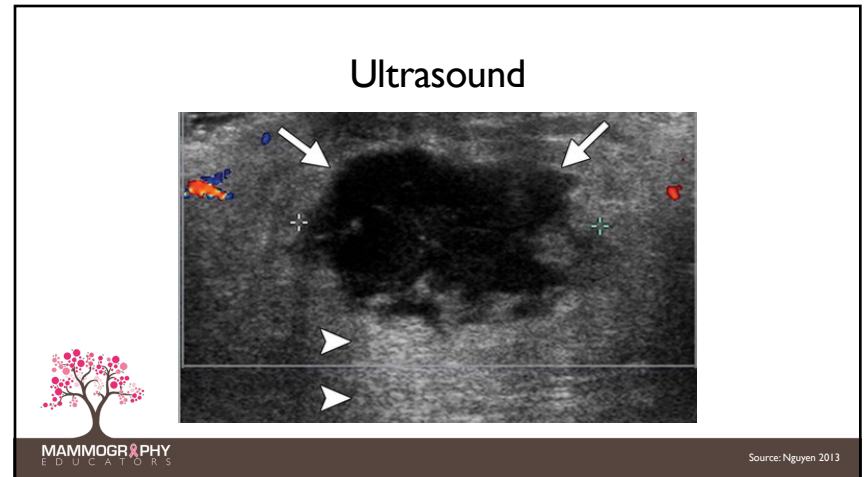
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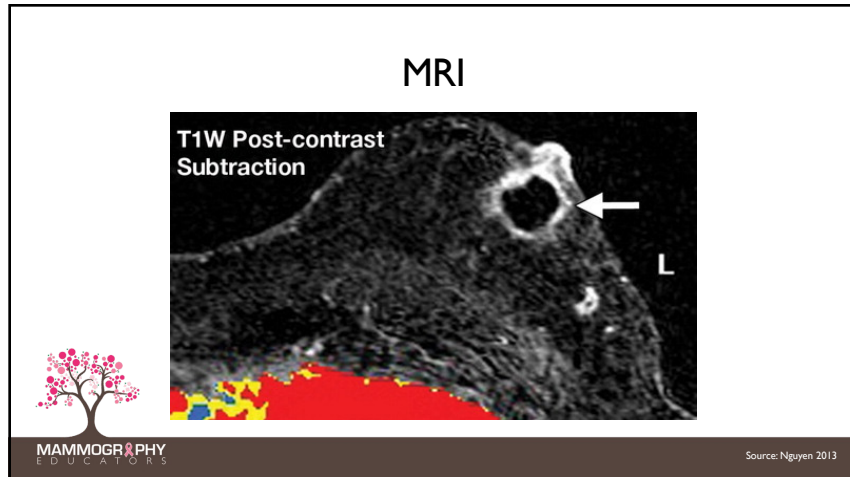
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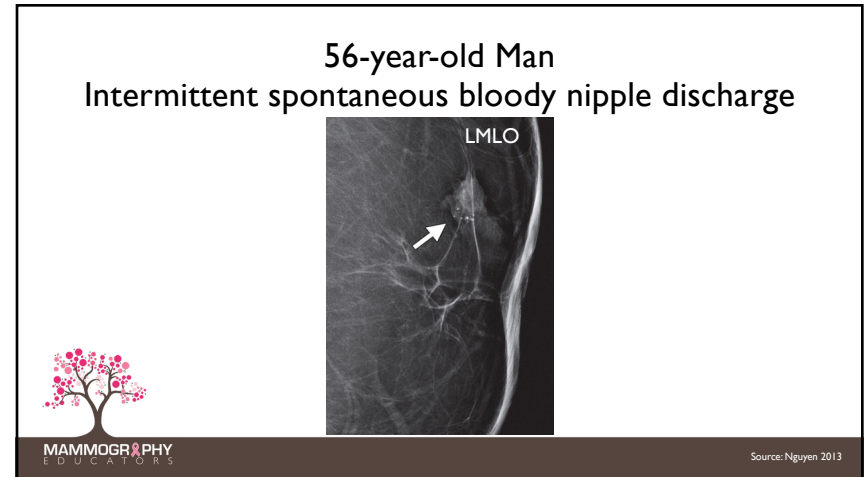
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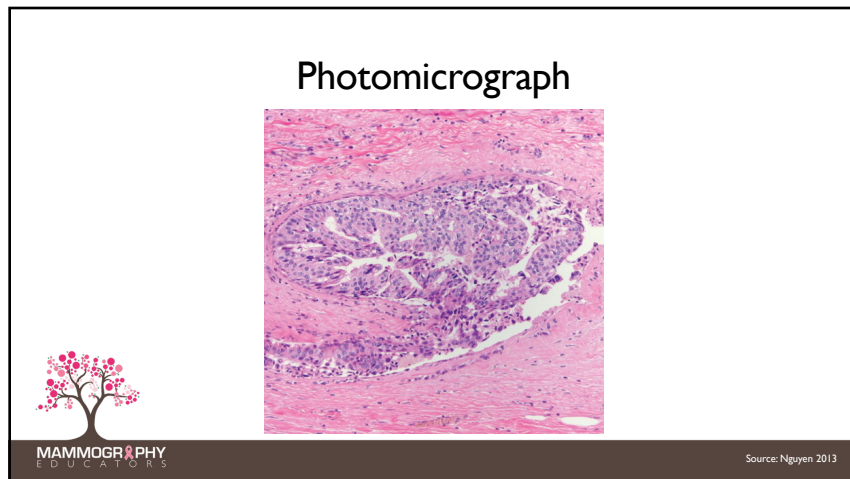
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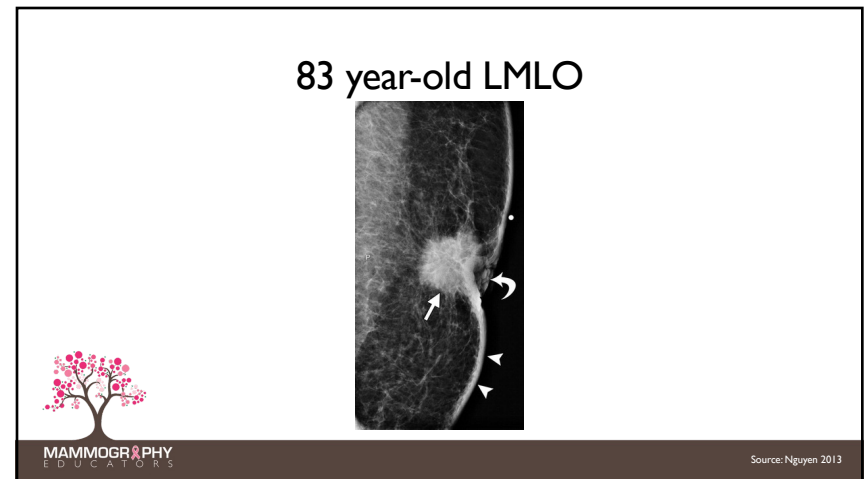
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Male Breast Cancer

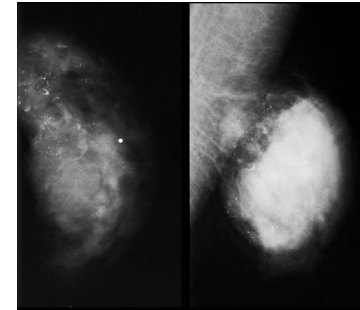
- Most commonly manifests as a painless palpable mass
- Other signs & symptoms include nipple ulceration or retraction, spontaneous unilateral nipple discharge, skin thickening & palpable axillary lymph nodes
- Mammography is the initial modality for imaging



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Huge IDCA with Some Coarse Benign Looking Calcifications



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Source: Glassman, 2009

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Cancer Risk Factors

- Advanced age
- Family history
- Jewish heritage (Ashkenazi)
- BRCA1 & BRCA2 gene mutations
- BRCA 2 is seen in 4-16% of male breast cancer patients (40% in Iceland)
- Chest wall irradiation (10 years post-treatment for Hodgkins)



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Cancer Risk Factors

- Hyperestrogenism
- Exposure to hepatotoxins
- NOT gynecomastia
- Occupational exposure to high heat (steel industry)
- Undescended testes
- Orchiectomy and orchitis
- Klinefelter's syndrome (47, XXY - 6% of all male breast cancer is in Klinefelter - 3% lifetime risk)



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Screening for Males?

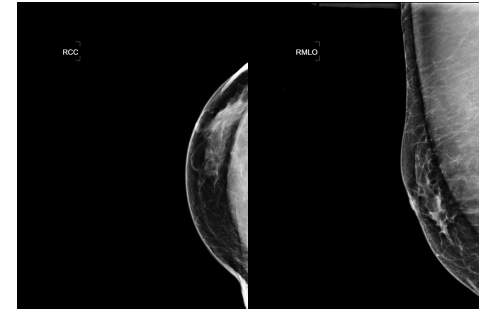
- Typically, male mammograms are only diagnostic exams
- We do screen for prior breast cancer patients (contralateral breast)
- BRCA mutations?
- Klinefelter's or other high-risk patients?



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Screening Post-Mastectomy



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Source: NMCSD

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Male Breast Malignancies

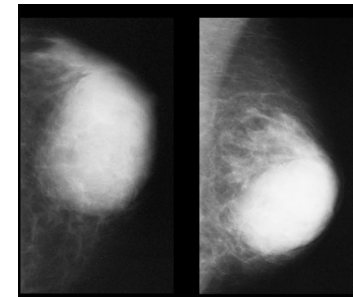
- Infiltrating ductal carcinoma including special types:
 - 93.7% invasive ductal (usually NOS)
 - 2.6% papillary
 - 1.5% lobular
- Non- breast origin malignancies:
 - Liposarcoma
 - Metastases (to the breast)



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Liposarcoma

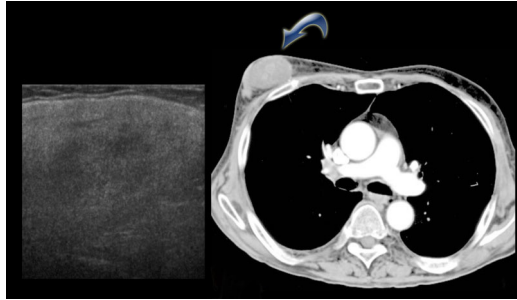


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Source: Glassman, 2009

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Liposarcoma



Source: Glassman, 2009

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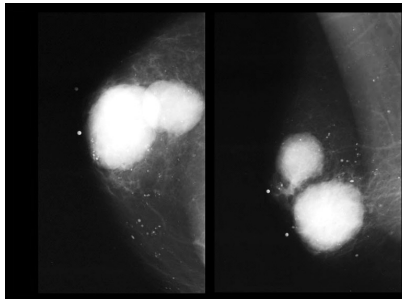
Liposarcoma

- A rare sarcoma
- Presents as a slowly enlarging painful mass
- Usually of water-density
- Not typically fatty



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Mets from Small Cell Lung Cancer



Source: Glassman, 2009

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Lesions Men Do NOT Get

- No lactating adenomas
- No lobules w/o progesterone
- Rare lobular carcinomas
- Fibroadenoma
- Rare fibroepithelial lesi
- Phyllodes tumor
- No pregnancy
- Carcinosarcoma



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Lesions That DO Occur in Men

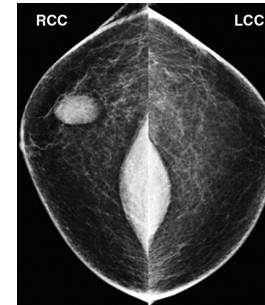
- Gynecomastia
- Pseudogynecomastia
- Papilloma
- Adenoma
- Myofibroblastoma
- Fibrocystic change
- Granular cell tumor
- Diabetic mastopathy
- Epithelial inclusion cyst
- Angiolipoma
- Schwannoma
- Leiomyoma
- Lipoma



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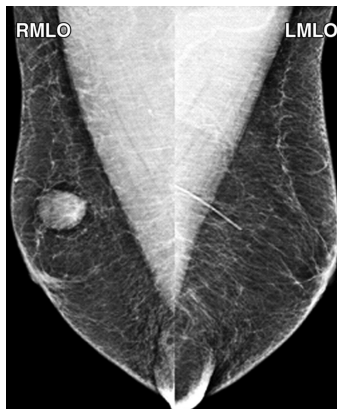
76 year-old with Right Breast Mass Found Incidentally on Chest CT



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Source: Iuanow et al, 2011

110

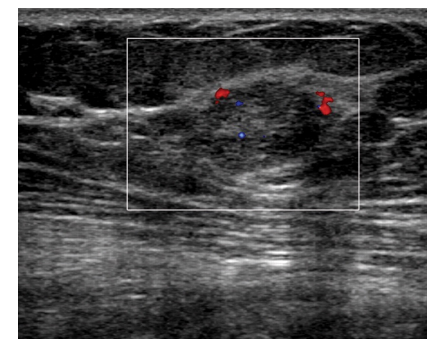


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Source: Iuanow et al, 2011

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Ultrasound



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Source: Iuanow et al, 2011

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Myofibroblastoma

- Myofibroblastoma is an interesting lesion because it is the only lesion that is more common in men than in women
- It presents as a freely moveable, solitary, palpable, firm mass
- There are no calcifications
- The mean age is in the late 50's



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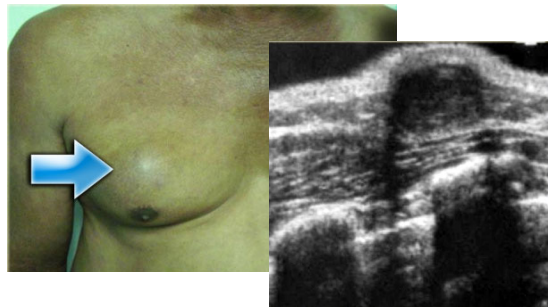
Epidermal Inclusion Cyst

- Epidermal inclusion cyst is a skin lesion
- It presents as a round well circumscribed dense mass
- Must be in dermal plane on U/S
- Can often see a punctum or communication with the skin
- “Light touch”, lots of gel or stand-off pad



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Epidermal Inclusion Cyst



Source: Glassman, 2009

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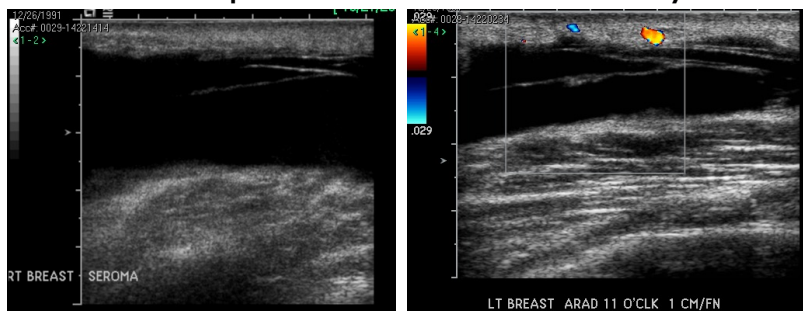
Patient Returns to Clinic After Bilateral Liposuction Procedure for Gynecomastia

- Complaining of chest fullness and pain
- Post-op drains removed subjectively early (still having greater than 30 ml output/day)
- Patient non-compliant in wearing post-op compressive vest



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Patient Returns to Clinic with Complaint of Post-op Pain and Fullness Bilaterally



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Source: NMCSD

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Aspirated Cavity Refills; Patient Returns to Clinic



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Source: NMCSD

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28 year-old Male

- Slowly growing, 5cm painless mass in the left breast
- Physical exam: elastic, soft, smooth & mobile lump close to the nipple of the left breast
- Mammo: circumscribed, round & equal density nodule without ca++
- No history of von Recklinghausen's disease (NF2)



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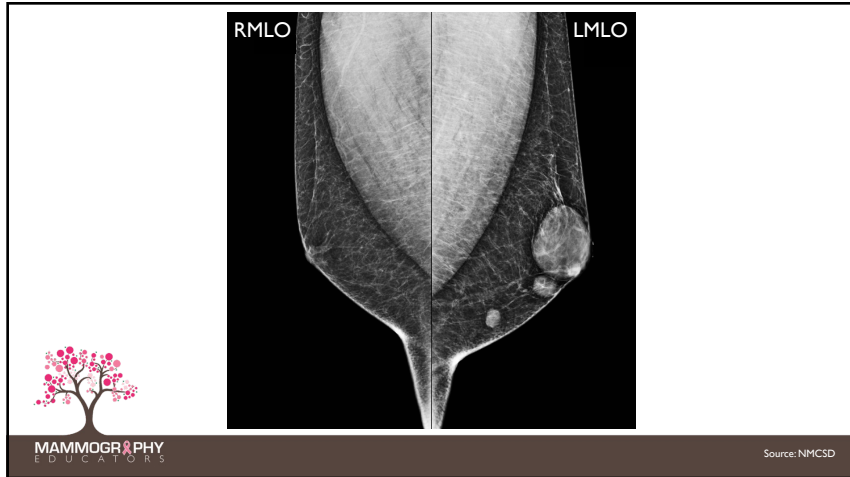
119



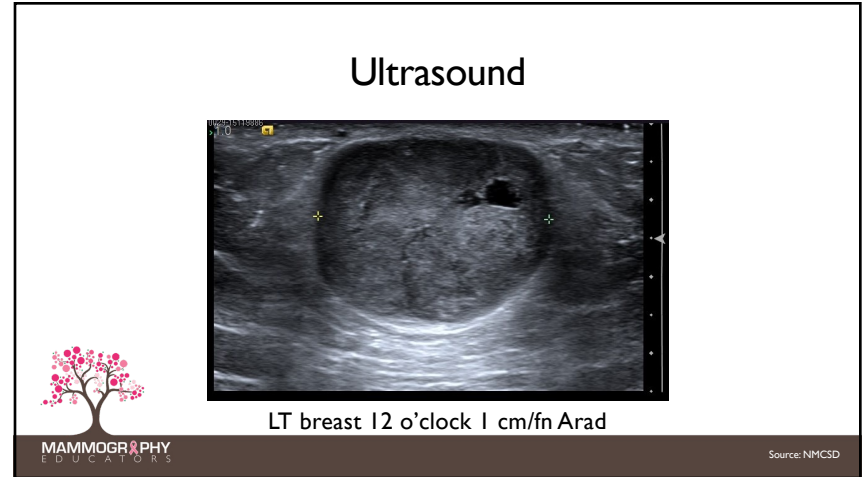
MAMMOGRAPHY
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Source: NMCSD

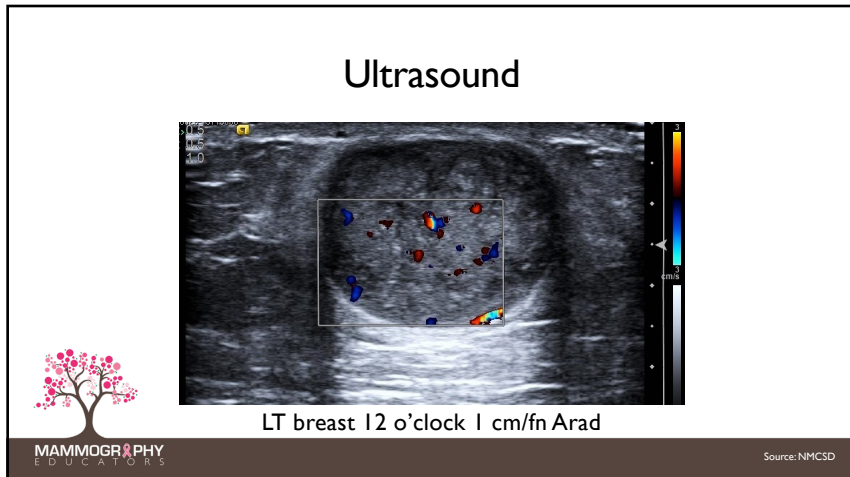
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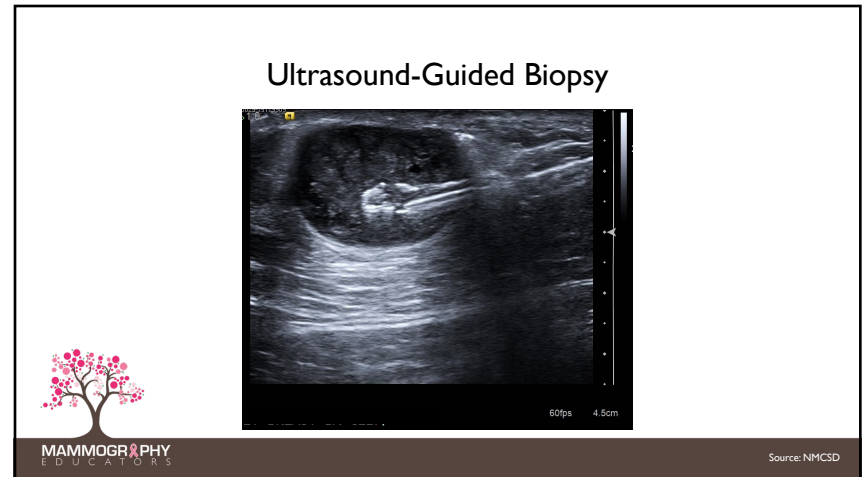
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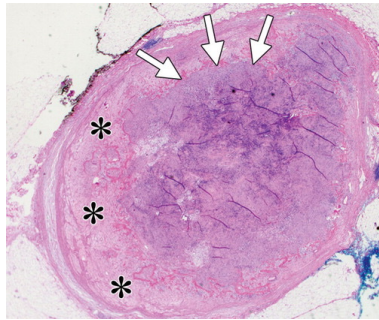


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Photomicrograph



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Source: Nguyen, 2013

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Pathology Results

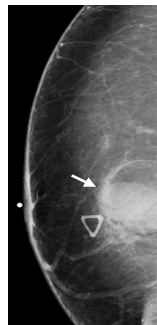
- Neurilemmoma/Schwannoma
 - Benign nerve sheath tumor
 - Homogeneous tumors
 - Are mostly benign & > 1% become malignant degenerating into a form of cancer known as neurofibrosarcoma
 - Can arise from a genetic disorder called neurofibromatosis (NF2)



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40 year-old Man with a 3-month hx of Breast Mass

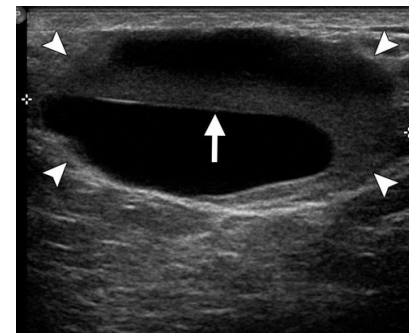


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Source: Nguyen, 2013

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Ultrasound



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Source: Nguyen, 2013

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Hematomas & Fat Necrosis

- Benign processes usually related to breast trauma or breast surgery
- Patients may report a discrete event that has caused either condition
- Incidental trauma can cause clinical symptoms & imaging abnormalities if patient is undergoing anticoagulation therapy



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Teaching Point

- Whenever a fluid-debris level is detected: make liberal use of decubitus views and other changes in the patient's position to confirm the mobility of the internal contents and ensure that there is no underlying adherent solid tissue (or mural nodule)
- Detection of internal flow at color Doppler imaging suggests an underlying neoplasm



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Gynecomastia vs Carcinoma

- Gynecomastia and carcinoma can usually be differentiated, but biopsy is sometimes necessary to distinguish between the two
- All lesions eccentric to the nipple need biopsy unless they are characteristically benign (i.e., contain fat or are a typical lymph node)



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Gynecomastia

- Age 60s
- Soft
- Mobile
- Tender
- Subareolar, central
- Nodular/triangular/fan
- Dendritic/fibrotic
- Diffuse glandular
- Subareolar density with extension into fat

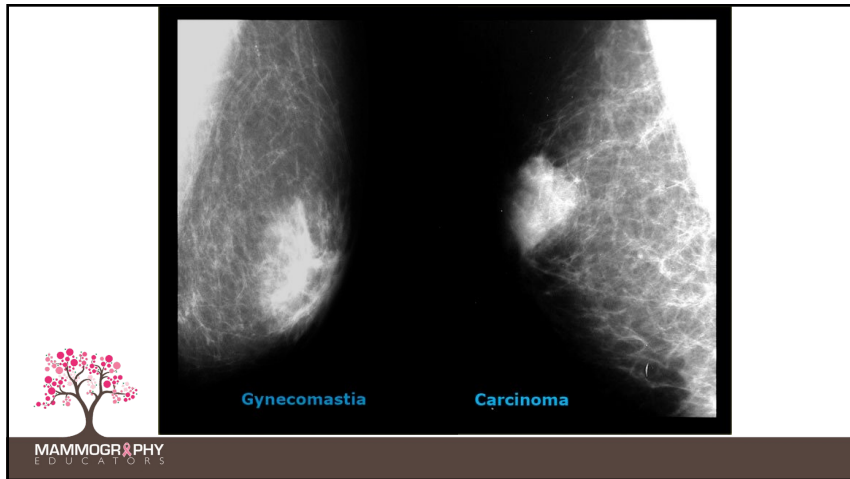
Carcinoma

- Age 60s
- Soft or hard
- Mobile or fixed
- Usually painless
- Subareolar, usually eccentric
- Mass, large or small
- Large: lobulated borders
- Small: spiculations

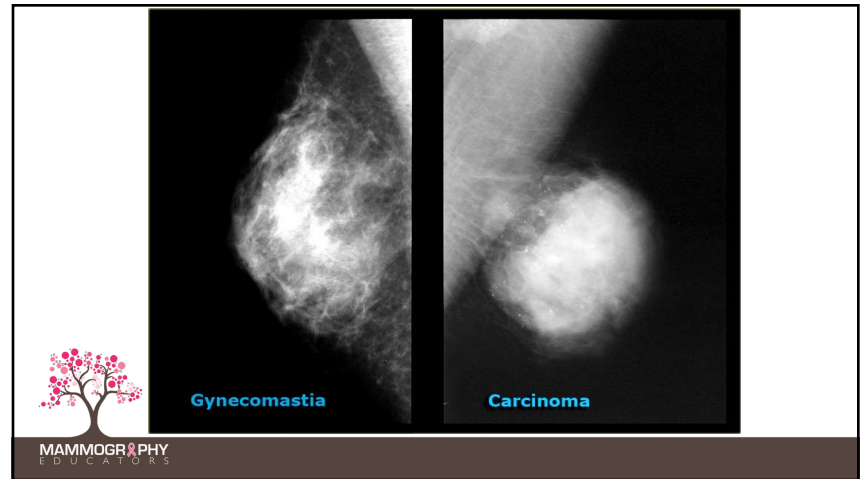


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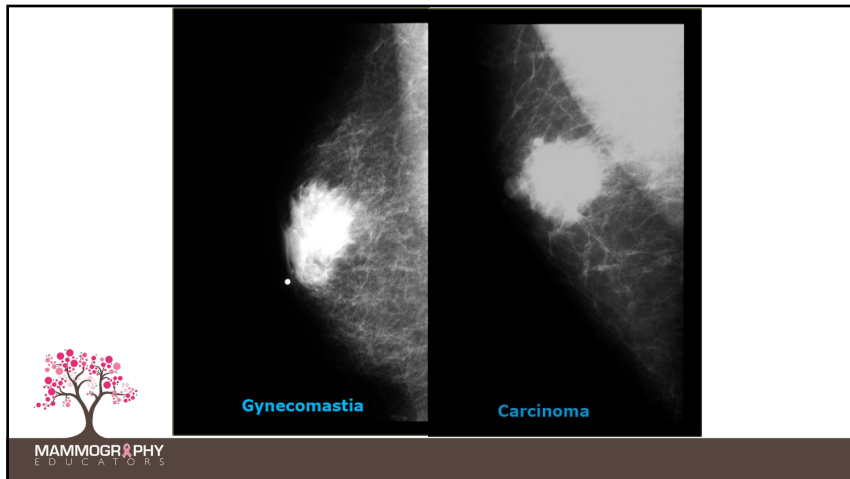
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Gynecomastia vs Carcinoma

- Male breast disease either presents as mass, pain or nipple discharge
- Gynecomastia and invasive ductal cancer are the most common lesions in the male breast, but there are other rare benign & malignant lesion can be seen at imaging



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Conclusion

- Most breast conditions in men are benign conditions
- Many have imaging features that allow differentiation from malignancy
- Appropriate use of mammography, U/S, and when indicated, MR imaging in workup of male breast lesions will enable the radiologist to confidently identify the small subset of patients who require biopsy to confirm or exclude malignancy



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Conclusion Good imaging technique is crucial!

- Gynecomastia
- Physiologic
- Pathologic
- Male breast cancer
- Mets
- Other malignancies



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Food for Thought : Future Burden of Cancer

- Breast cancer mortality rates were at their highest in 1986 and have decreased by 44% since then
- As a result of increased & better screening technologies
- Prevalence is highest in patients over 50
- Must develop more effective strategies for prevention, treatment and early detection of all breast cancers, whether male or female



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Ivanow E, Kettler M & Slanetz P. *Spectrum of Disease in the Male Breast*. AJR Vol 196, No 3, Mar 2011.

Nguyen C, Kettler M, Swirsky M, Miller V, Scott C, Krause R, Hadro J. *Male Breast Disease: Pictorial Review with Radiologic-Pathologic Correlation*. Radiographics Vol 33, No 3, May 2013.

Images courtesy: Linda Olson M.D., UCSD & Naval Medical Center San Diego colleagues



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