

*Putting the Pieces Together:
Multimodality Review of Benign
Palpable Breast Lumps*

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Objectives

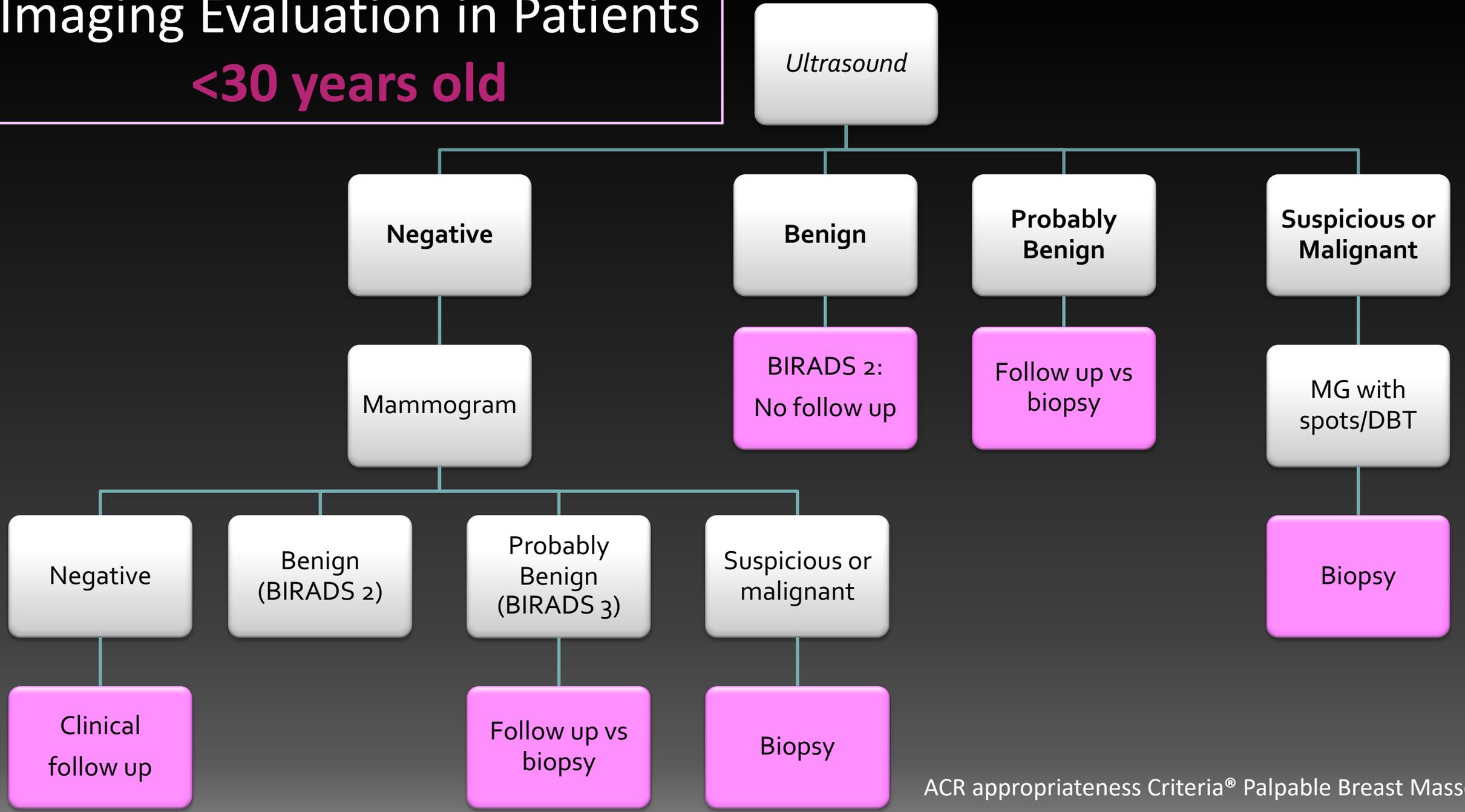
- Discuss the appropriate initial **diagnostic work up and management** for palpable breast lumps
- Recognize **common and rare causes** of palpable breast lumps that are encountered in daily practice
- Discuss and characterize the specific **imaging features** on multiple imaging modalities as well as their clinical implications
- Summarize the **follow up and management**

Format: Case based

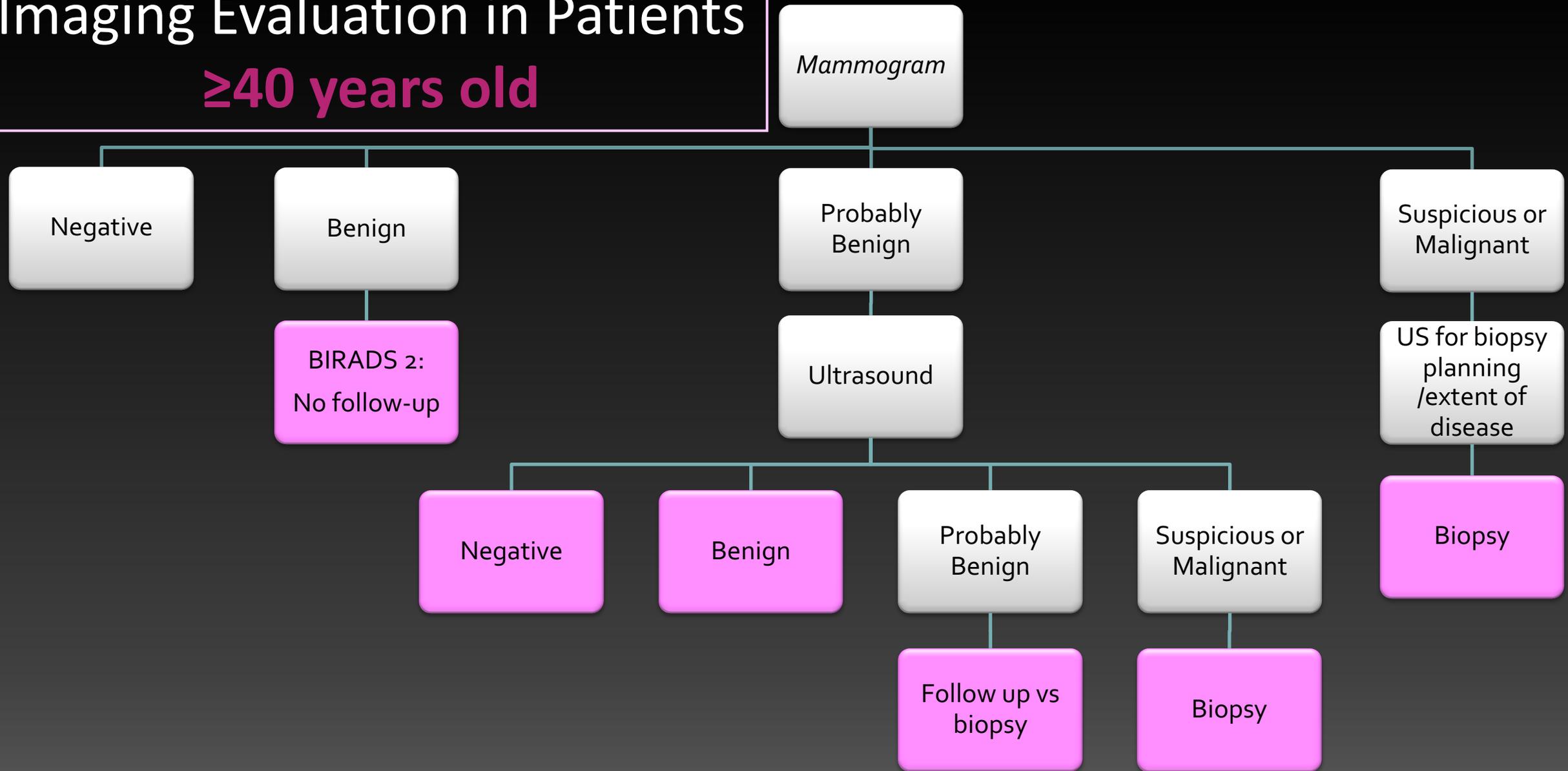
Background

- Palpable breast lumps are frequently encountered in the diagnostic setting
- Majority of palpable breast lumps are benign
- Most palpable breast masses cannot be clearly distinguished by clinical exam and imaging evaluation is necessary
- Workup typically involves mammography and/or targeted ultrasound based on patient's age
- *History can be critical for determining etiology:*
 - ❖ **Duration**
 - ❖ **Size**
 - ❖ **Pain**
 - ❖ **Redness/Erythema**
 - ❖ **Trauma**
 - ❖ **Surgery**

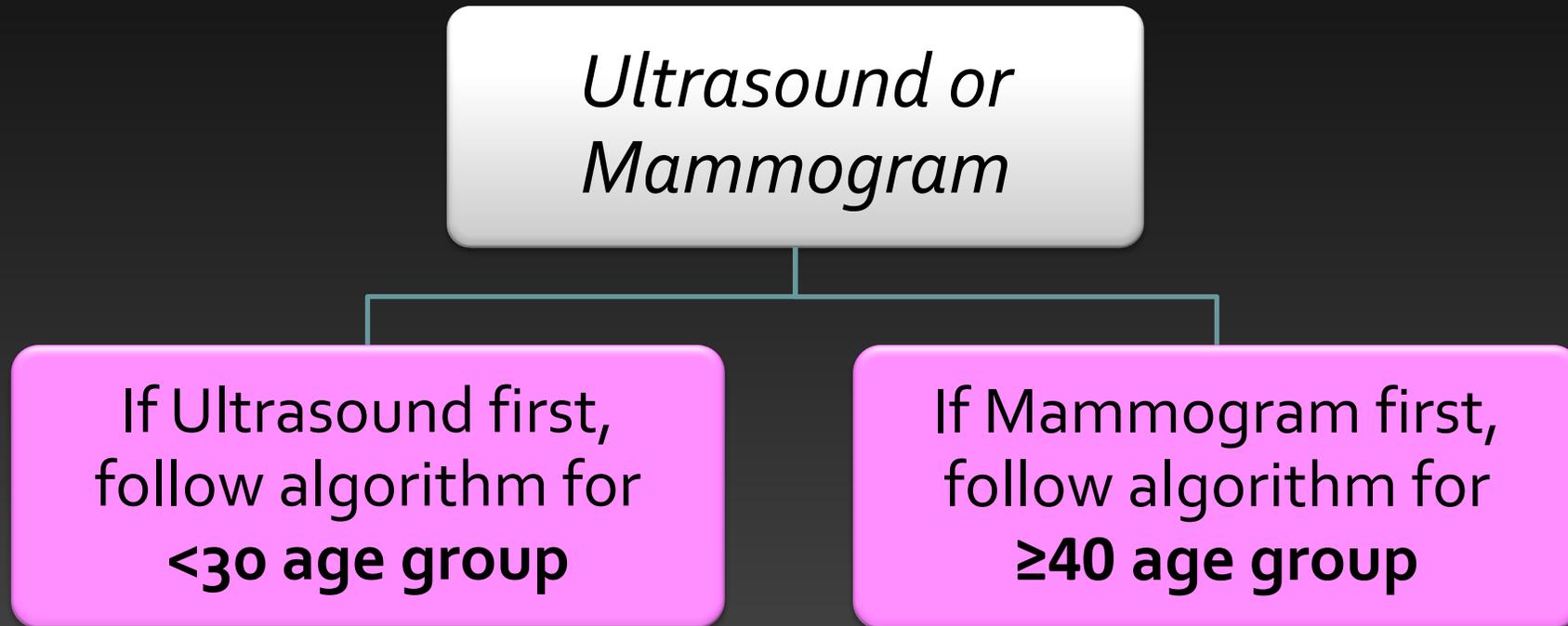
Imaging Evaluation in Patients <30 years old



Imaging Evaluation in Patients ≥40 years old

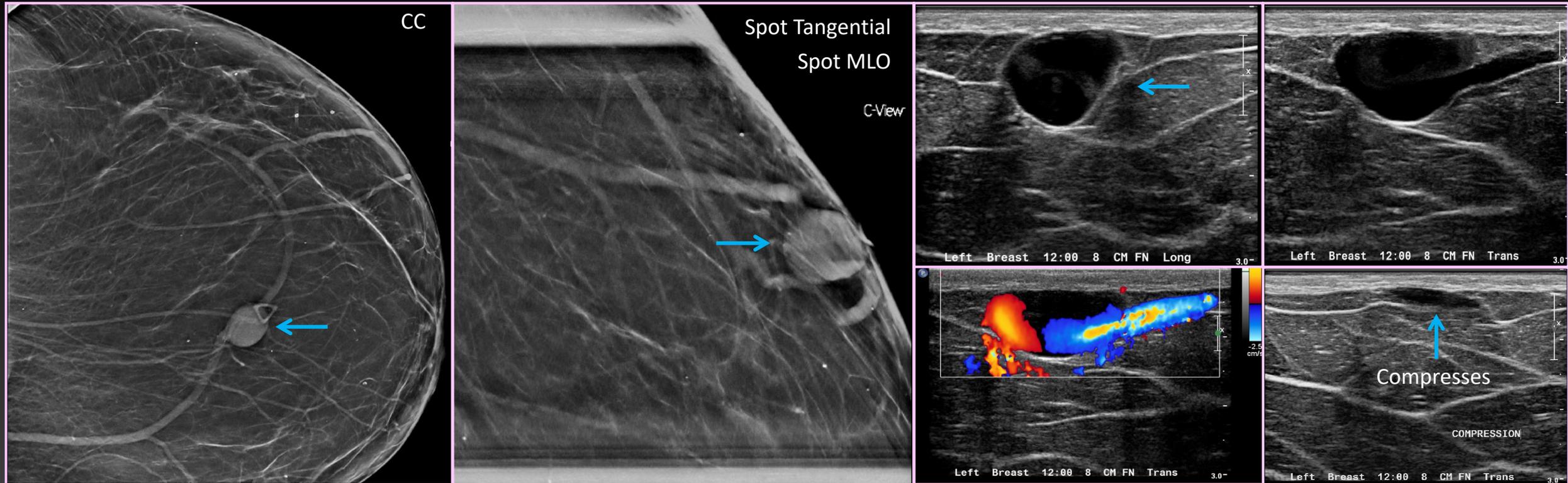


Imaging Evaluation in Patients 30-39 years old



True Aneurysm

44 year old F with superficial palpable breast lump in the left breast



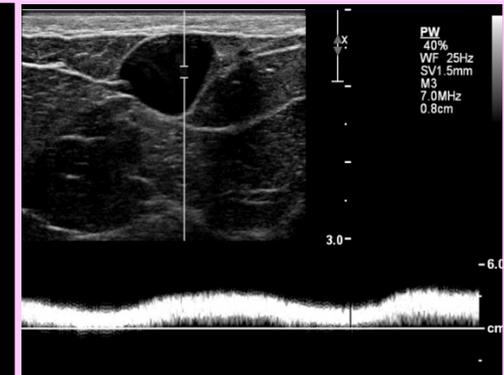
Thought to be related to prior trauma and often present as a **slowly enlarging pulsatile mass** with possible overlying skin bruising

- Important to **use color Doppler flow** during ultrasound evaluation
- **Compression** may be helpful to narrow differential
- **Treatment:** Direct compression, thrombin injection, surgical repair

Imaging Findings

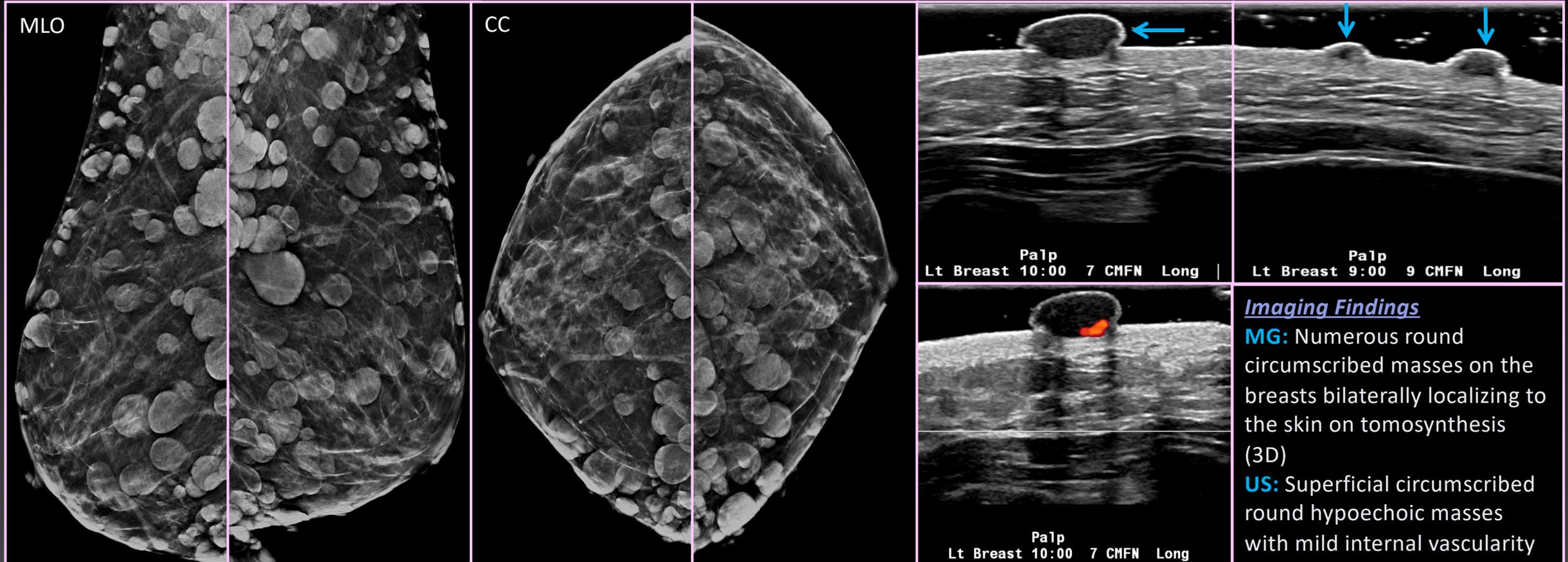
MG: Circumscribed round mass contiguous with a superficial vessel

US: Superficial **compressible** vein with focal aneurysmal dilatation. Spectral doppler confirms **→** venous nature of the aneurysm



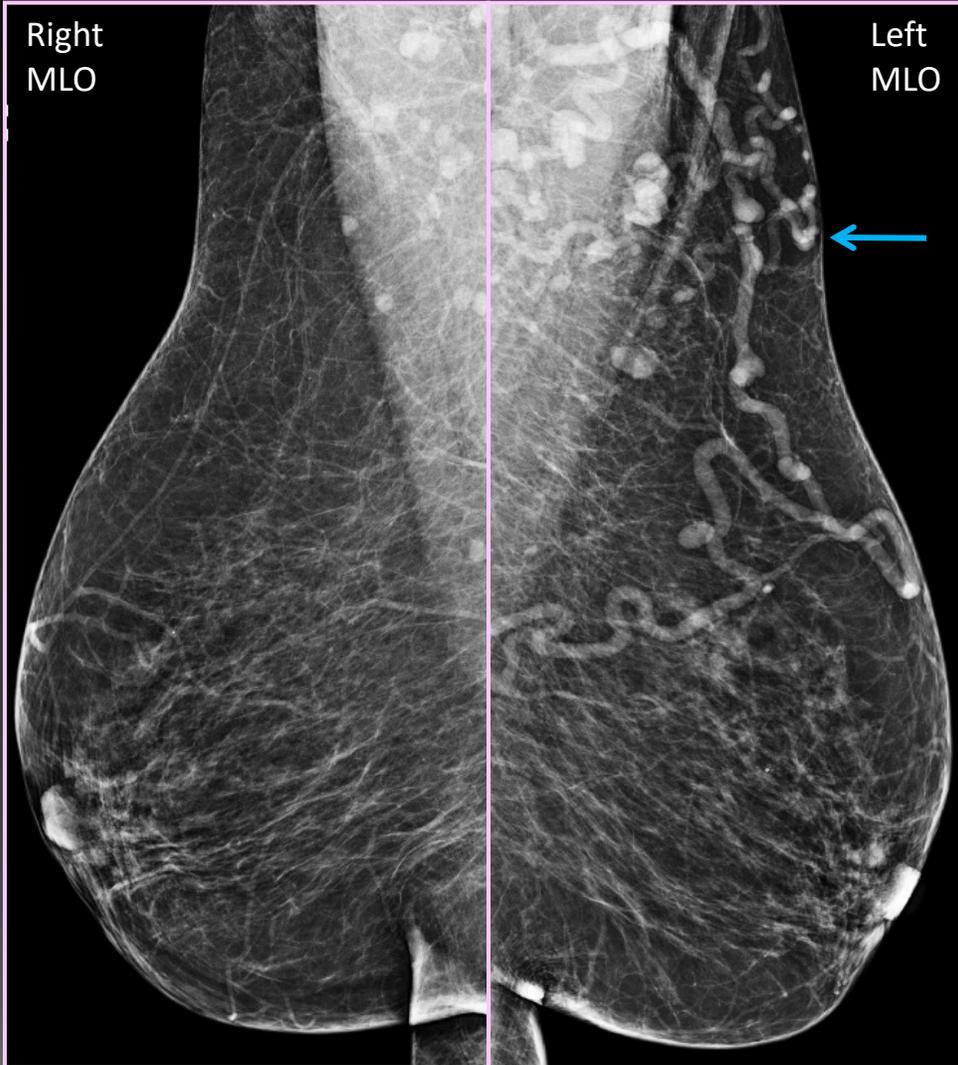
Neurofibromatosis 1

53 year old F with numerous superficial breast lumps



- Can be challenging to distinguish an underlying breast mass due to multiple skin neurofibromas
 - **3D/Tomosynthesis is beneficial** in cases with extensive disease
- **Higher prevalence (3.5 fold)** and possible earlier onset of breast cancer in NF1

Multiple Enlarged Superficial Vessels



Imaging Findings

MG: Enlarged and tortuous left internal mammary vein

VS.

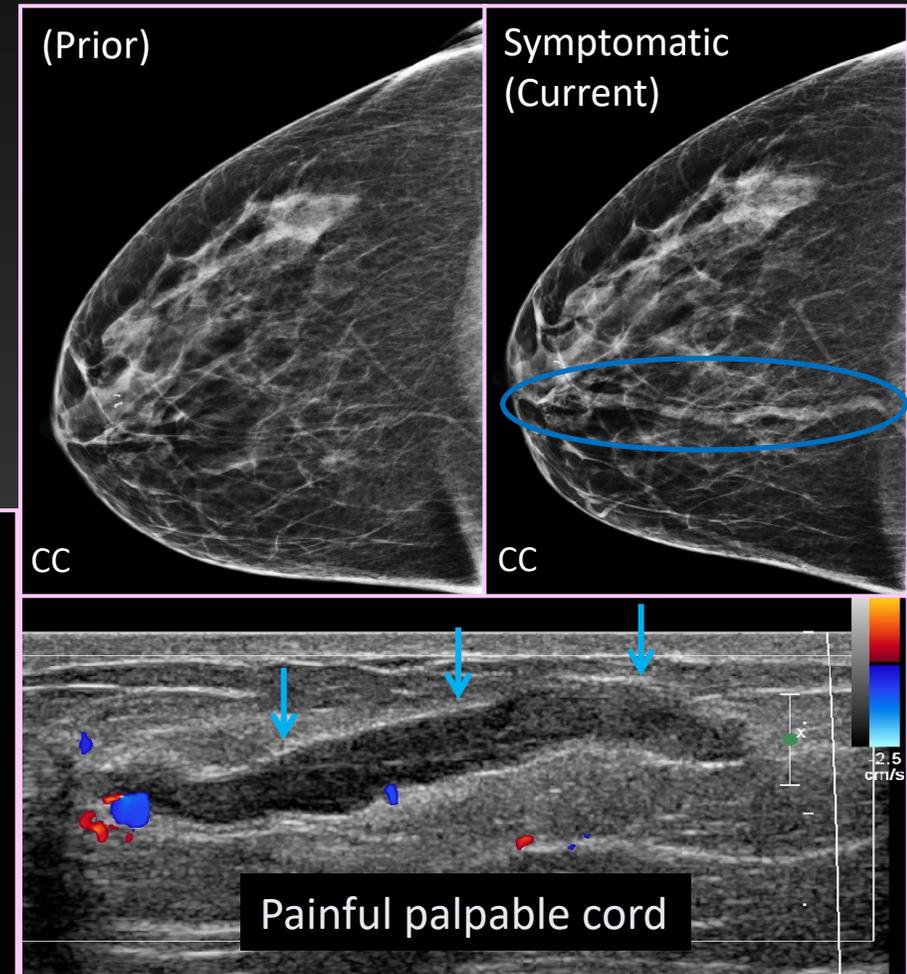
Imaging Findings

MG Prior: Dilated vessel coursing towards the nipple. Otherwise, no suspicious findings

MG Current: New enlarged vein
US: Distended vein with internal hypoechoogenicity and without vascular flow consistent with thrombosis

Mondor's Disease

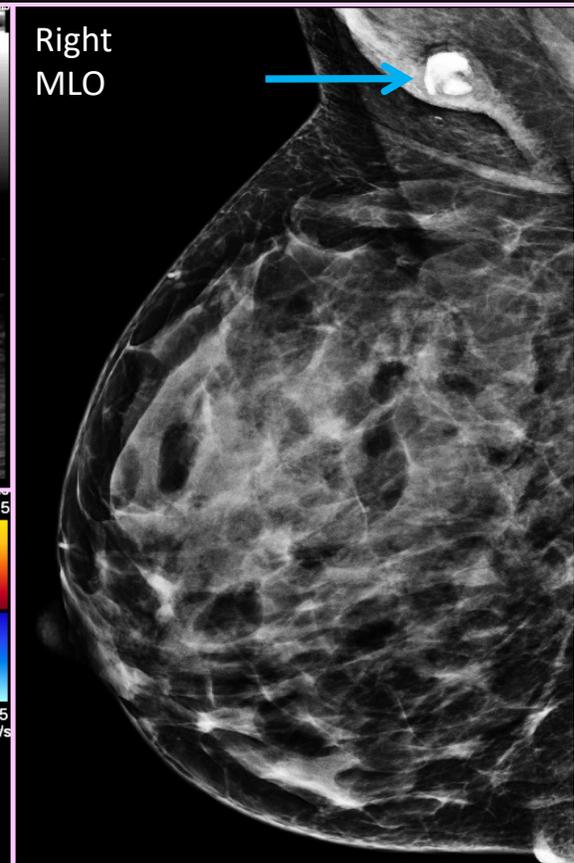
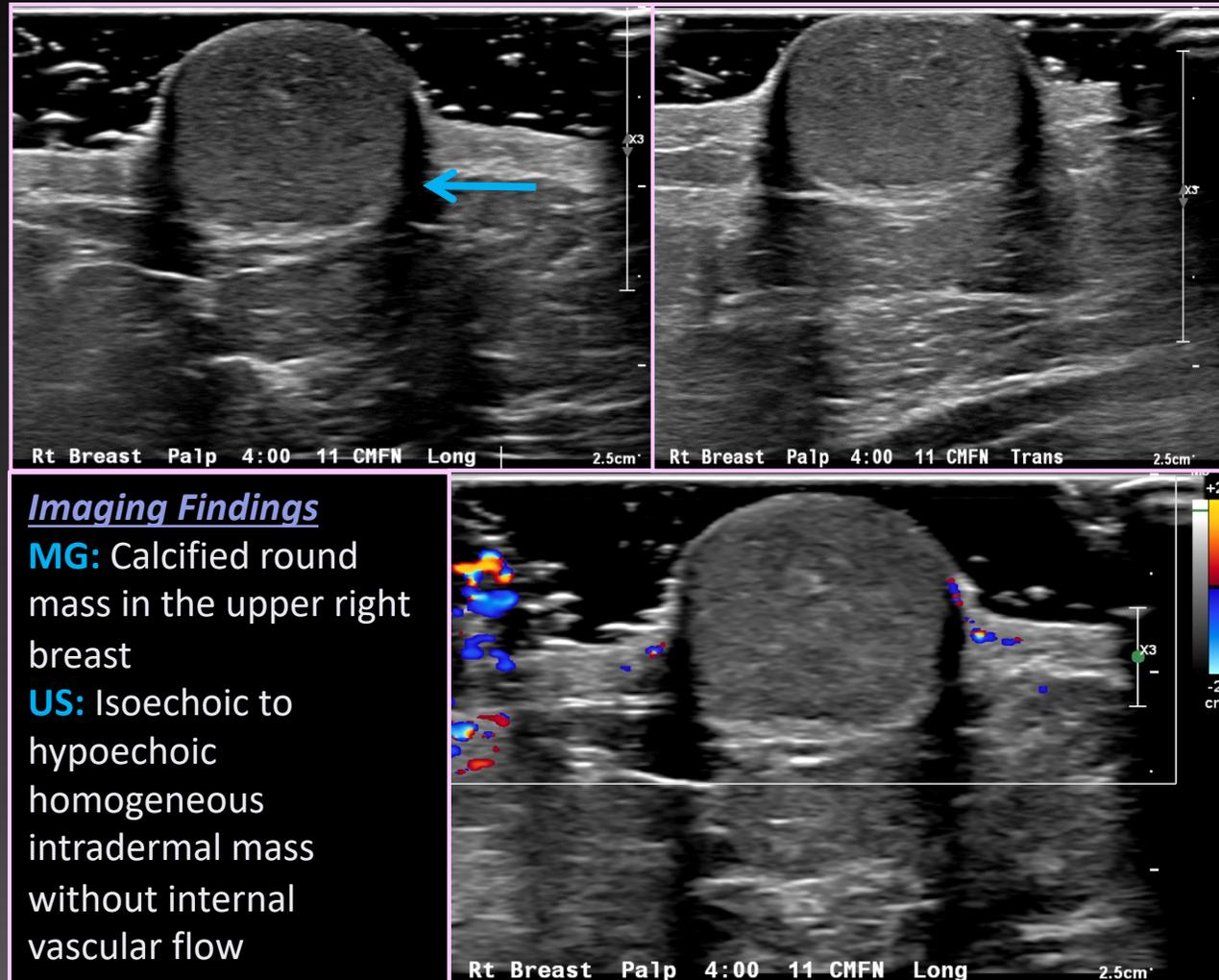
Thrombophlebitis of the superficial veins of the breast and anterior chest wall



Epidermal Inclusion Cyst

28 year old F with 3 month history of enlarging lump in the inner right breast

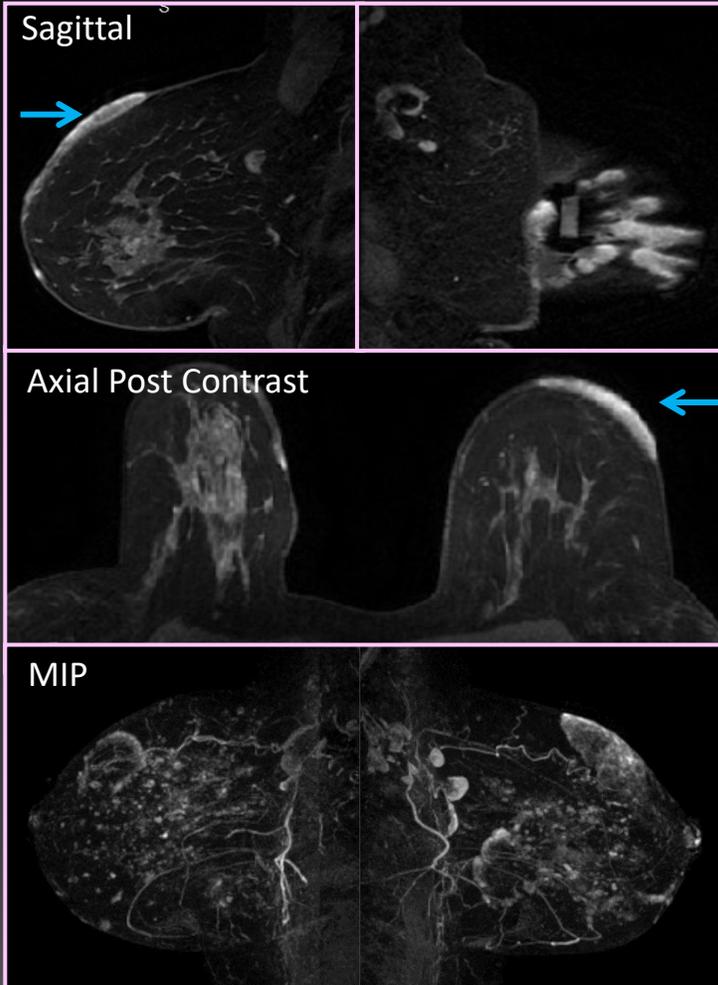
- Proliferation and implantation of epidermal elements within a circumscribed **place in the dermis**
- **Peripheral vascularity on US suggests inflammation**
- Possible **association with squamous cell carcinoma**
- *Studies have shown a correlation with tumor size and malignant transformation*



Calcifications can occur when chronic

Keloids

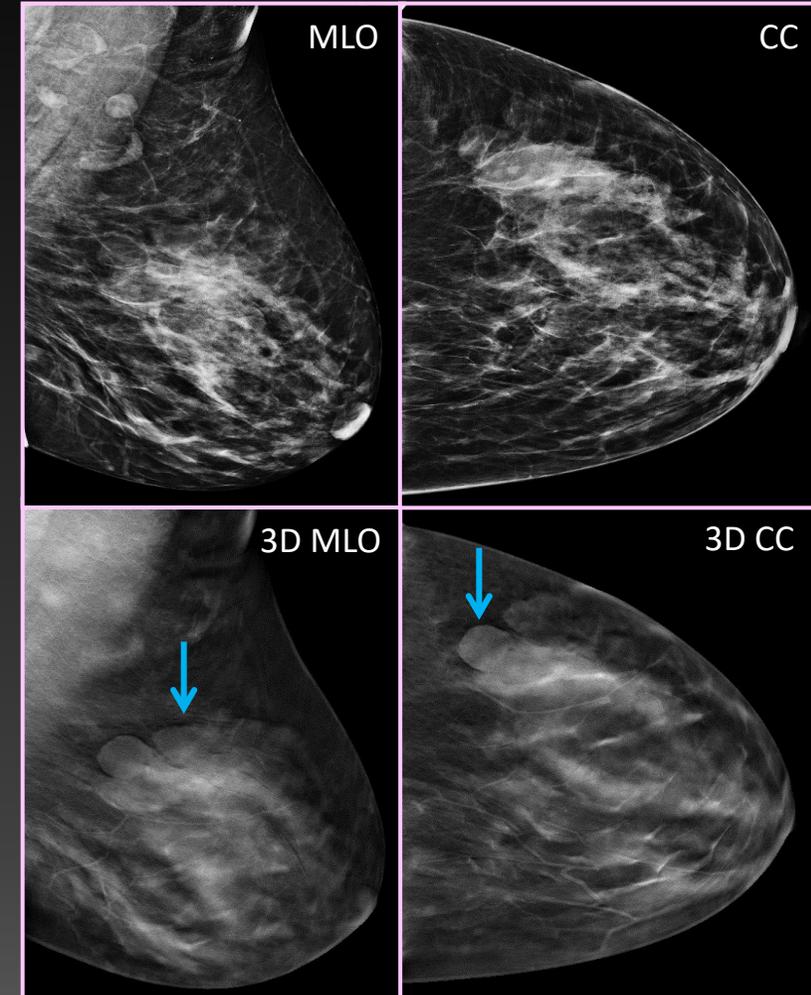
56 year old F with pain at area of prior abscess drainage in the left breast



Imaging Findings

MRI: Enhancing keloids bilaterally on postcontrast images

- Benign dermal fibroproliferative neoplasm that occurs at the site of skin injury
- **Aberrant wound recovery** causes excess accumulation of extracellular matrix thickened collagen bundles
- Keloid tissue has demonstrated **abnormal expression of growth factors**
- Recent study by Davis et. al. demonstrated **keloid positive African American patients were more likely to be younger at diagnosis of breast cancer**
 - Also a **larger percentage of late stage breast cancers**

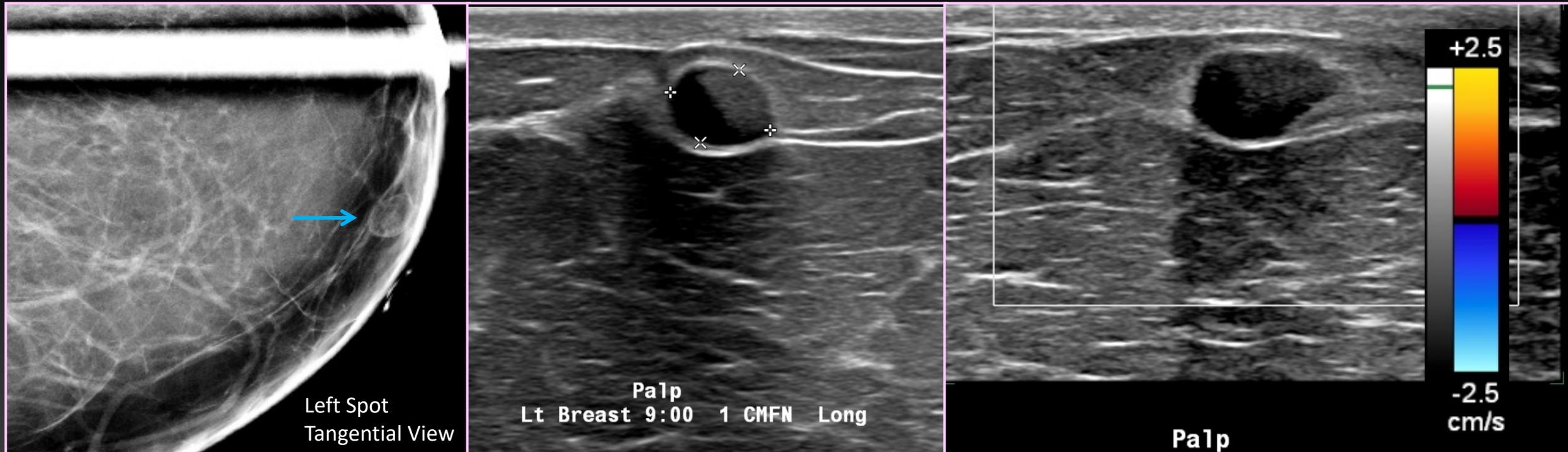


Imaging Findings

MG: Conglomerate round masses localized to the skin on 3D consistent with patient's keloids

Fat Necrosis

40 year old F with intermittent left breast pain and palpable area of concern



Imaging Findings

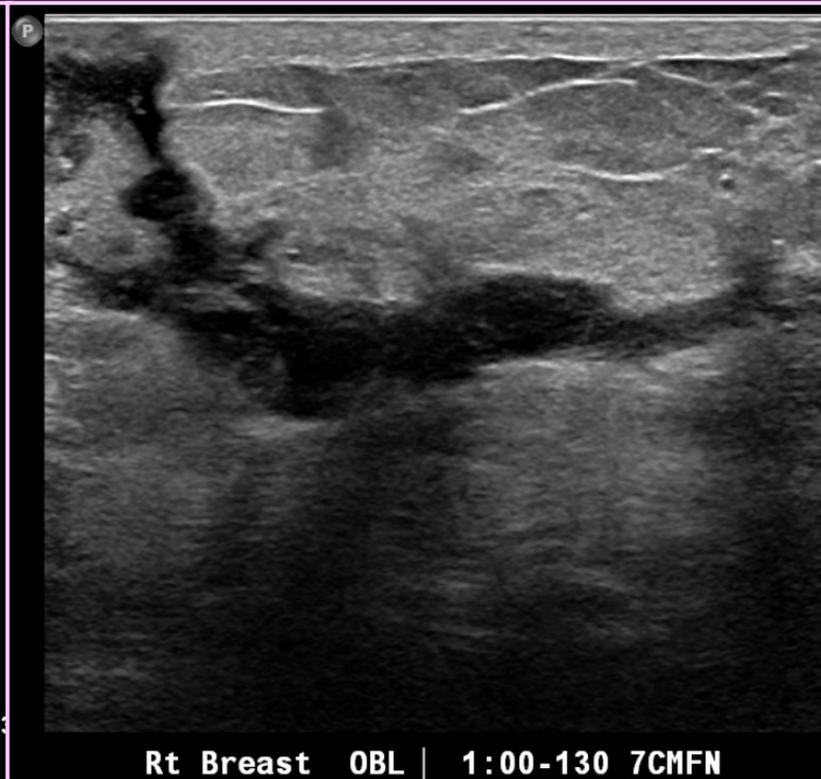
MG: Fat-containing oval mass with thin noncalcified rim

US: Circumscribed, oval, parallel, mixed anechoic and isoechoic mass with thin echogenic rim and mild posterior shadowing

- Saponification of local fat – benign inflammatory process
- Related to **direct trauma or surgery**
- Most at risk are middle-aged women with pendulous breasts
- Variable appearance on mammography and ultrasound
 - Evolves into an **oil cyst** (fine curvilinear calcification of the wall)
 - Ddx includes: intracystic carcinoma (papillary) – history is important

Granulomatous Mastitis

38 year old F with history of recurrent breast infections with new palpable areas of concern and drainage in the right breast



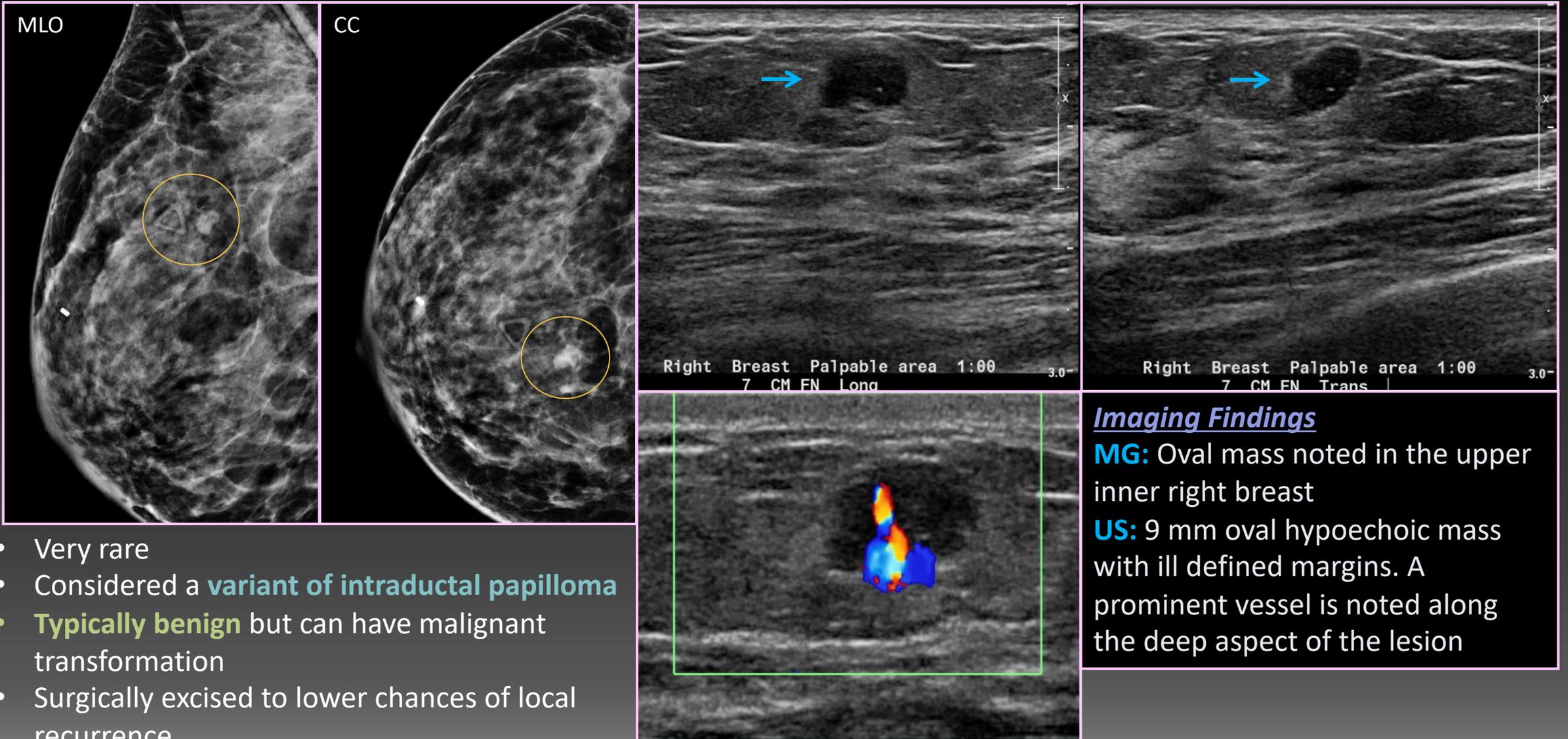
- **Younger patient population** – within 6 years of pregnancy
- Has been related to *Corynebacterium*
- Mammogram can show asymmetrically increased density
- Typically diagnosis of exclusion
- Tx: Steroids, methotrexate, surgery
- **HIGH recurrence rate!**

Imaging Findings

US: Irregular mixed echogenicity collections in the right breast with tracts (arrow) extending to the skin surface

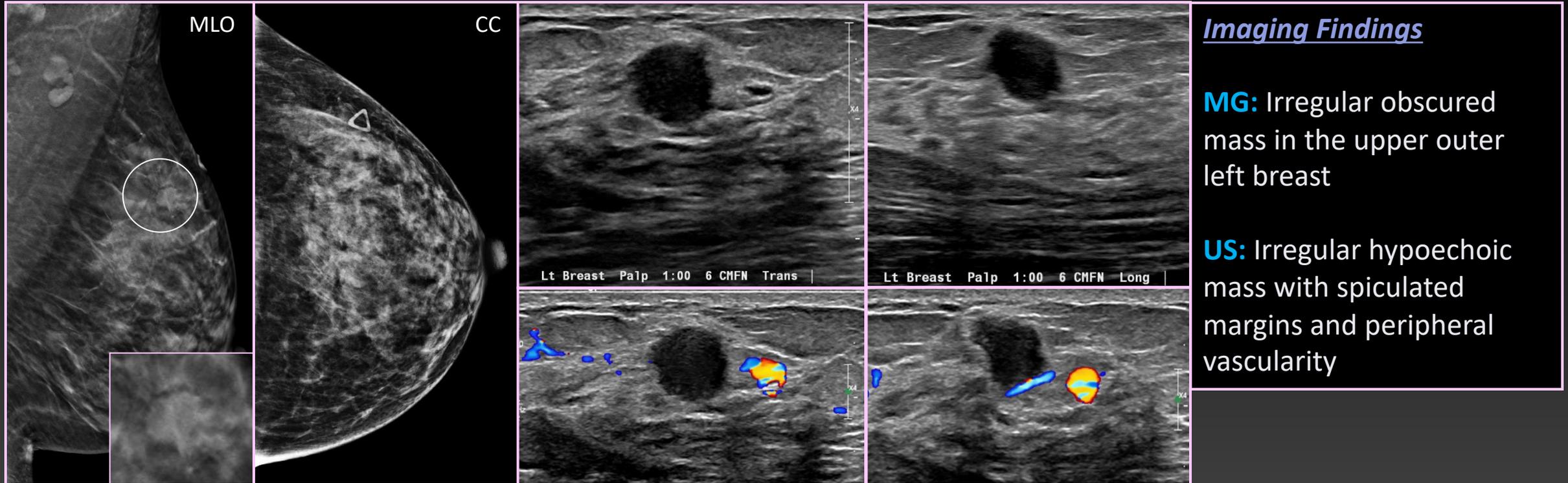
Adenomyoepithelioma

35 year old F with small palpable mass in the upper inner right breast



Granular Cell Tumor

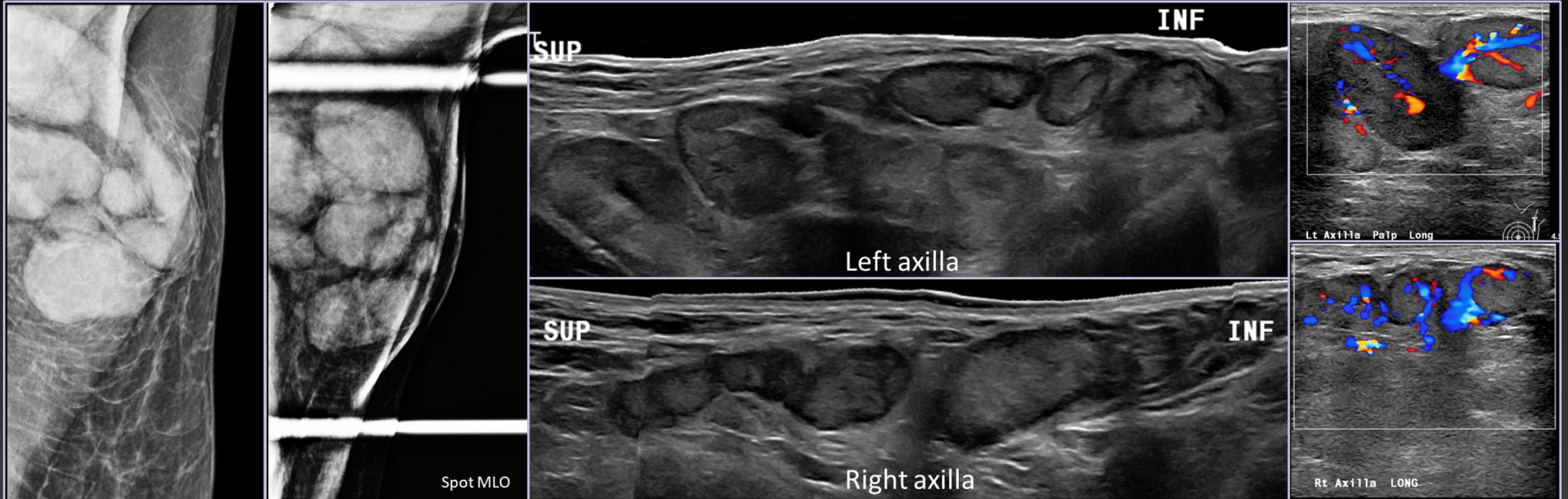
44 year old F with palpable abnormality in the left breast



- Originates in **Schwann cells of peripheral nerves** (40% in the tongue, 5-6% in the breast)
- Aka **Abrikossoff's tumor**
- Most are **benign**, 1% malignant
- Radiographic findings are often indistinguishable from breast cancer
- **Wide local excision** with adequate margins

Sarcoidosis

38 year old F with palpable masses in the bilateral axillary regions



Chronic multi-systemic immune disease characterized by the formation of inflammatory **non-caseating granulomas**

- Can mimic different rheumatologic diseases including connective tissue diseases
- Most common laboratory test: **ACE (angiotensin converting enzyme)**

Imaging Findings

MG: Multiple enlarged axillary lymph nodes

US: Multiple enlarged bilateral axillary lymph nodes which appear to maintain their characteristic reniform shape with central feeding vessel and fatty hilum

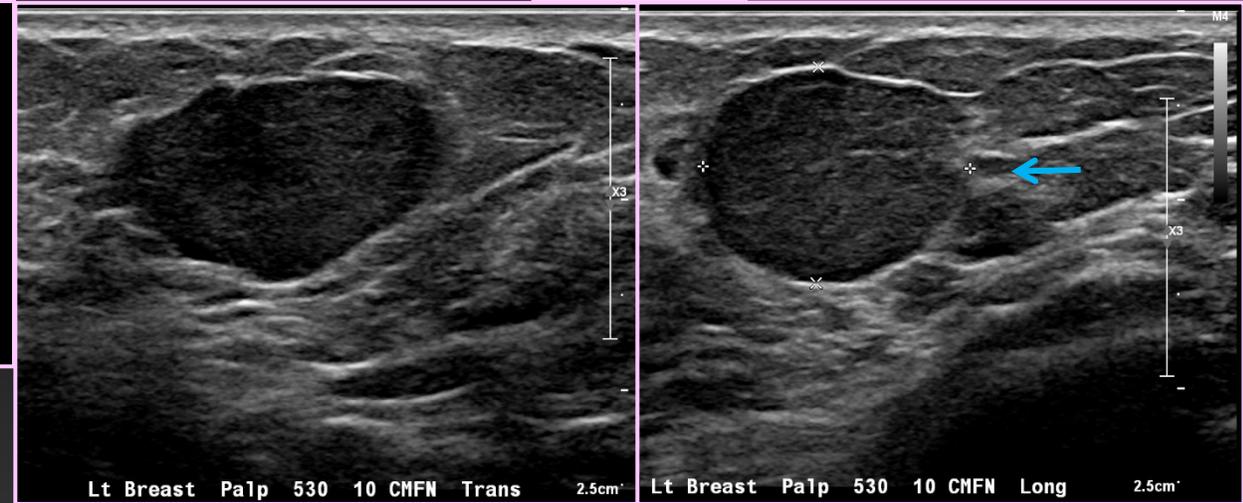
Lactating Adenoma

33 year old F pregnant patient in third trimester with palpable lump in left breast

- Typically occur in **peripartum period**
- Undergo **spontaneous regression** after pregnancy and lactation
- Imaging features:
 - Most have circumscribed margins
 - Homogeneous and hypo/isoechoic
 - May contain cystic areas of necrosis
- **Core biopsy is recommended** given resemblance to other pathologic entities

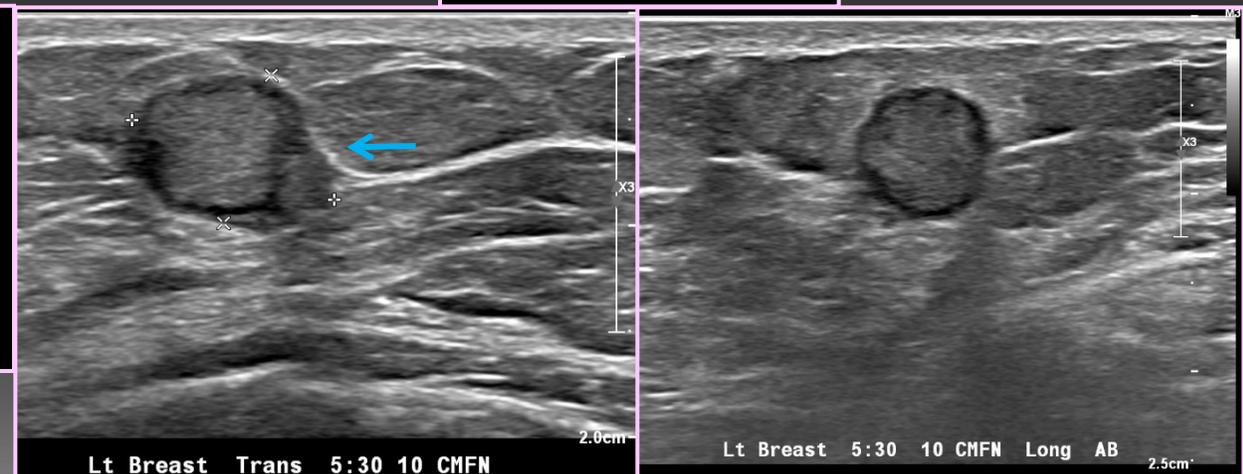
Imaging Findings

US: Circumscribed oval, parallel, hypoechoic mass in the left breast



Imaging Findings

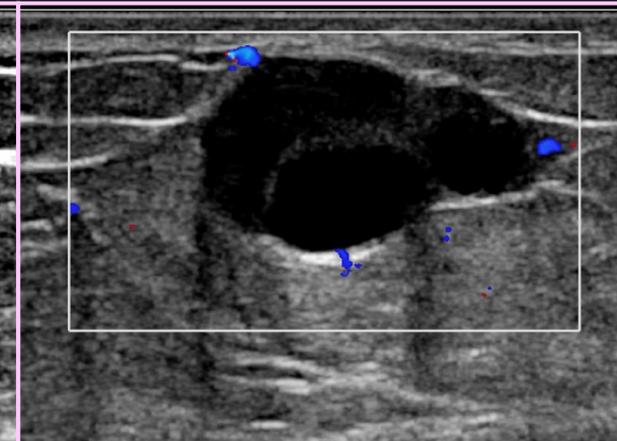
US: Decreased size and echogenicity of the lesion



Galactocele

33 year old F 7 weeks post-partum currently breastfeeding with palpable lump

Spot Tangential View



Imaging Findings

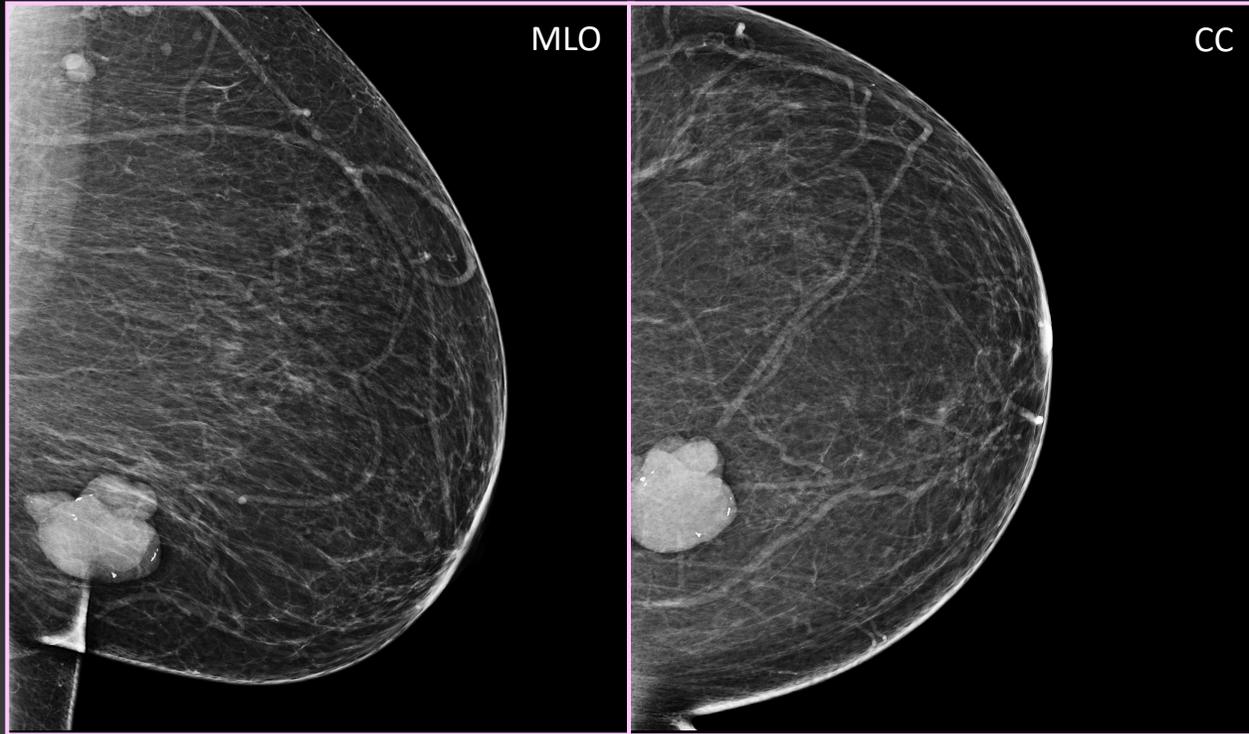
MG: Circumscribed low-density mass containing fat

US: Complex cystic mass with increased through transmission and some posterior shadowing

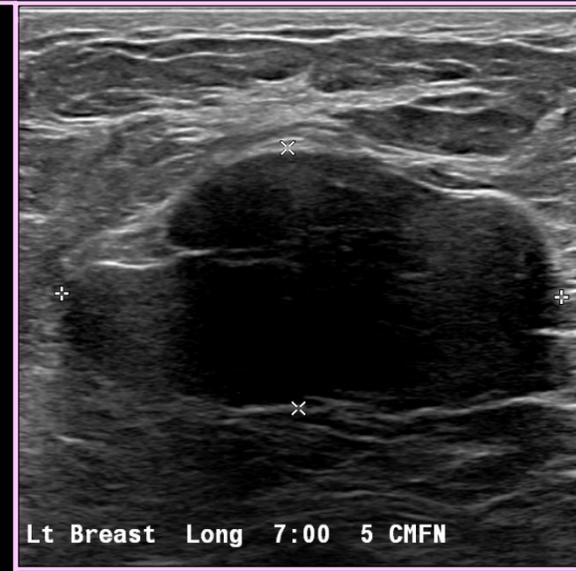
- Most common benign breast mass in lactating patient
- Typically presents after **cessation of breast-feeding** although can be seen during lactation
- Variable sonographic appearance which occasionally shows a **fat-fluid** level
- **Absent internal vascular flow**

Fibroadenoma

53 year old F with palpable abnormality in left breast



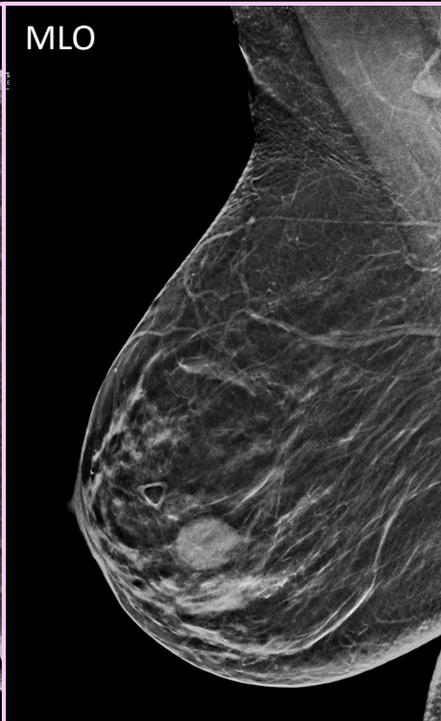
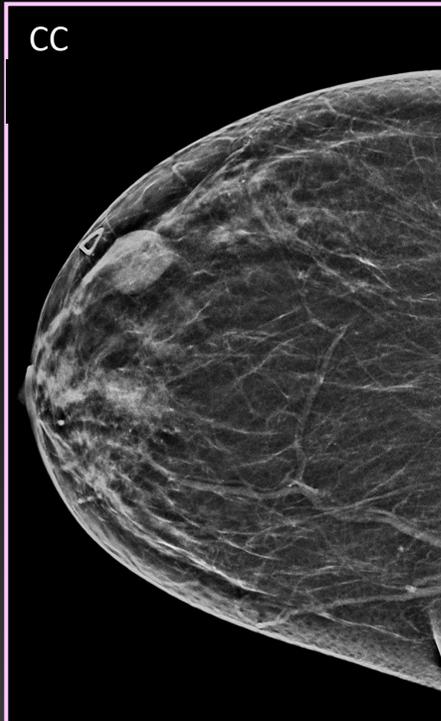
Imaging Findings
MG: High density circumscribed mass containing dystrophic calcifications in the lower inner left breast
US: Hypoechoic, parallel, oval mass with circumscribed margins



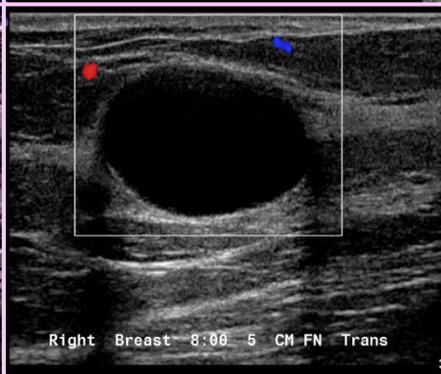
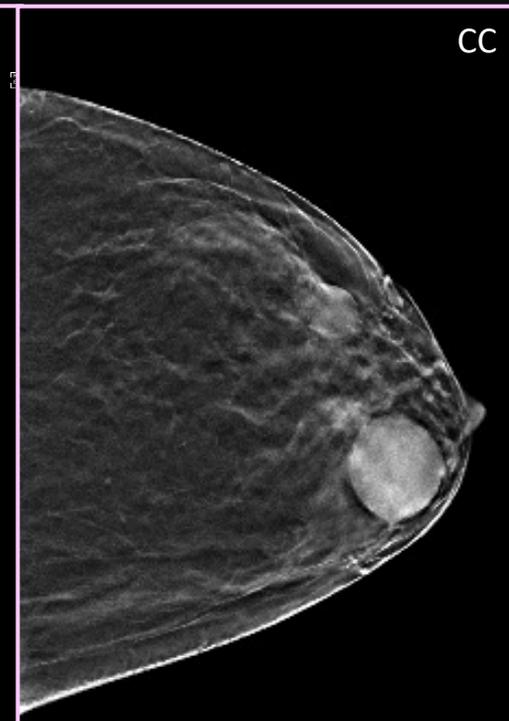
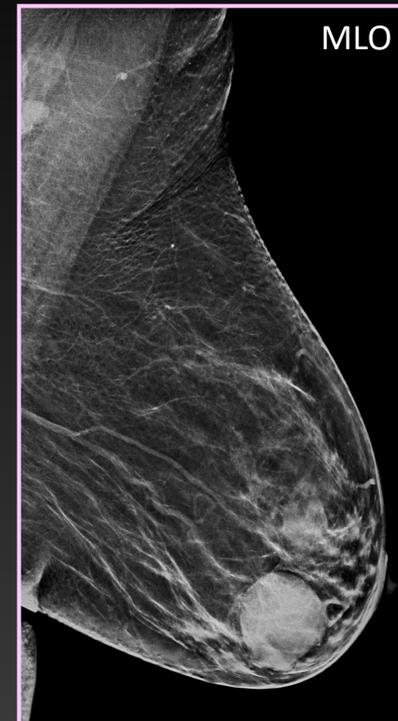
- Most common breast mass in **adolescent and young adult** population
- Typically present as **freely mobile** palpable mass detected during medical or self-examination
- Peak incidence between 25-40 years of age
- Can be **hormonally stimulated** by estrogen and progesterone

Cyst

52 yo F presents with bilateral palpable breast lumps felt by provider



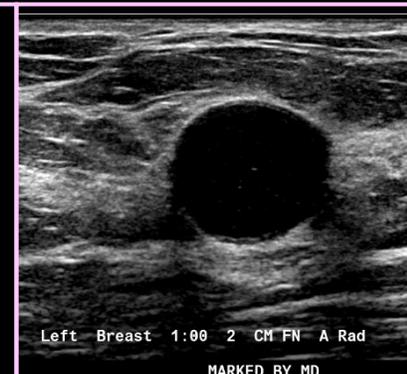
- Circumscribed, oval or round, anechoic mass with imperceptible wall and posterior acoustic enhancement
- May warrant aspiration if causing **pain or discomfort**
- **Size may fluctuate with menstrual cycle**



Imaging Findings

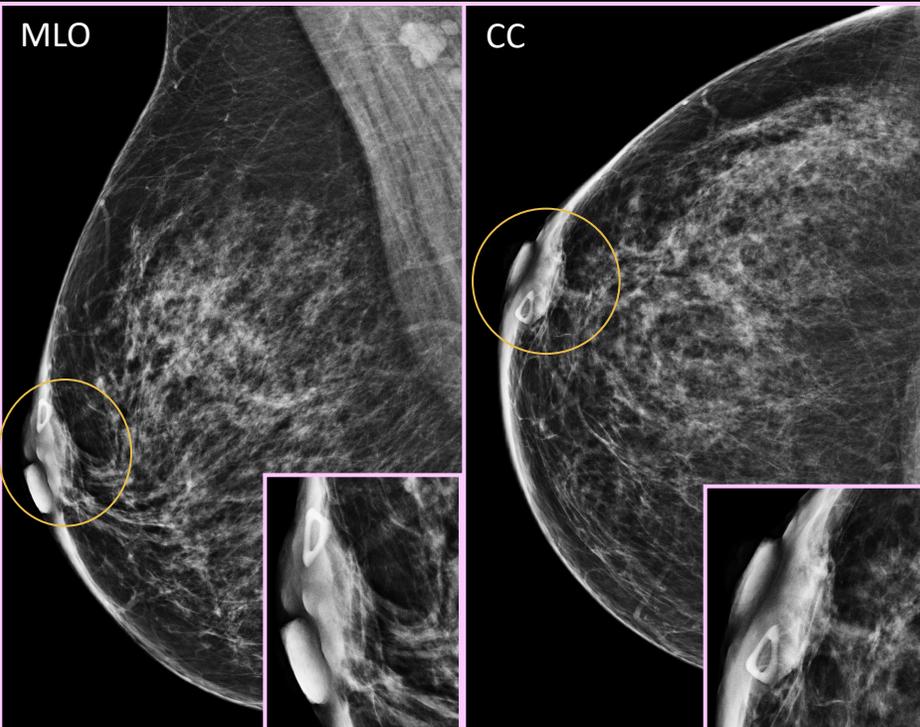
MG: Round circumscribed masses in anterior breasts (one on the right and two on the left)

US: Round/oval circumscribed anechoic masses with posterior acoustic enhancement



Abscess

48 yo F with grape sized lump under right nipple with pain and redness

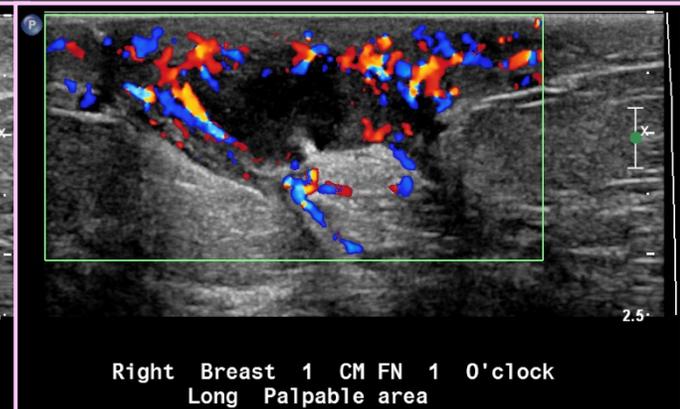
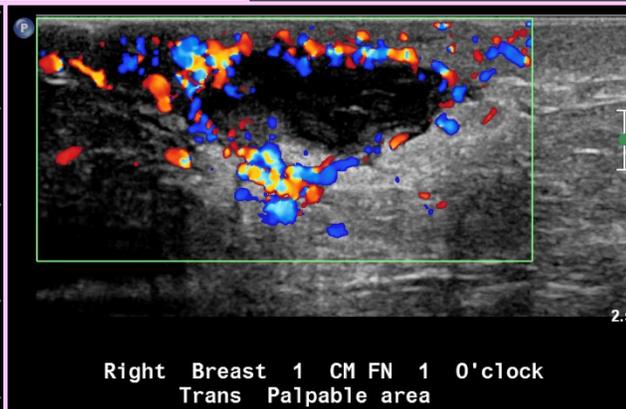
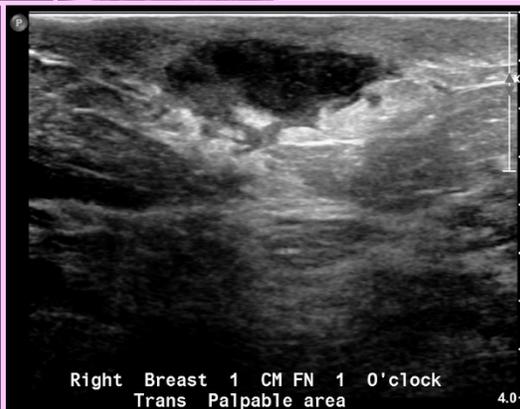


Imaging Findings

MG: Ill-defined mass with associated skin thickening in the subareolar region of the right breast

US: Oval hypoechoic mass with a thick rim and surrounding hypervascularity

- Rare complication of mastitis in 5-11% of cases
- Most commonly central/**subareolar**
- Typically seen in lactating women (additional risk factors – smoking, obesity, HIV, steroids)
- **Staph. aureus** is most common organism (>50% MRSA)
- US guided aspiration for diagnosis and treatment



Tubular adenoma

16 year old F presents with palpable lump in the right breast

- Rare: 0.13-1.7% of benign breast lesions
- Typically present as palpable lump in **women of reproductive age** (age <40)
- Imaging features similar to that of a fibroadenoma
- **NO malignant potential**

Initial presentation



Imaging Findings

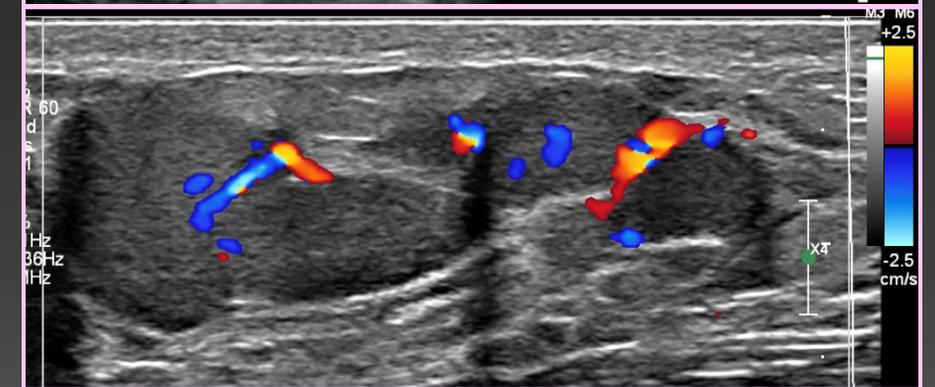
US: Circumscribed slightly hypoechoic mass with internal vascularity

6 month follow up



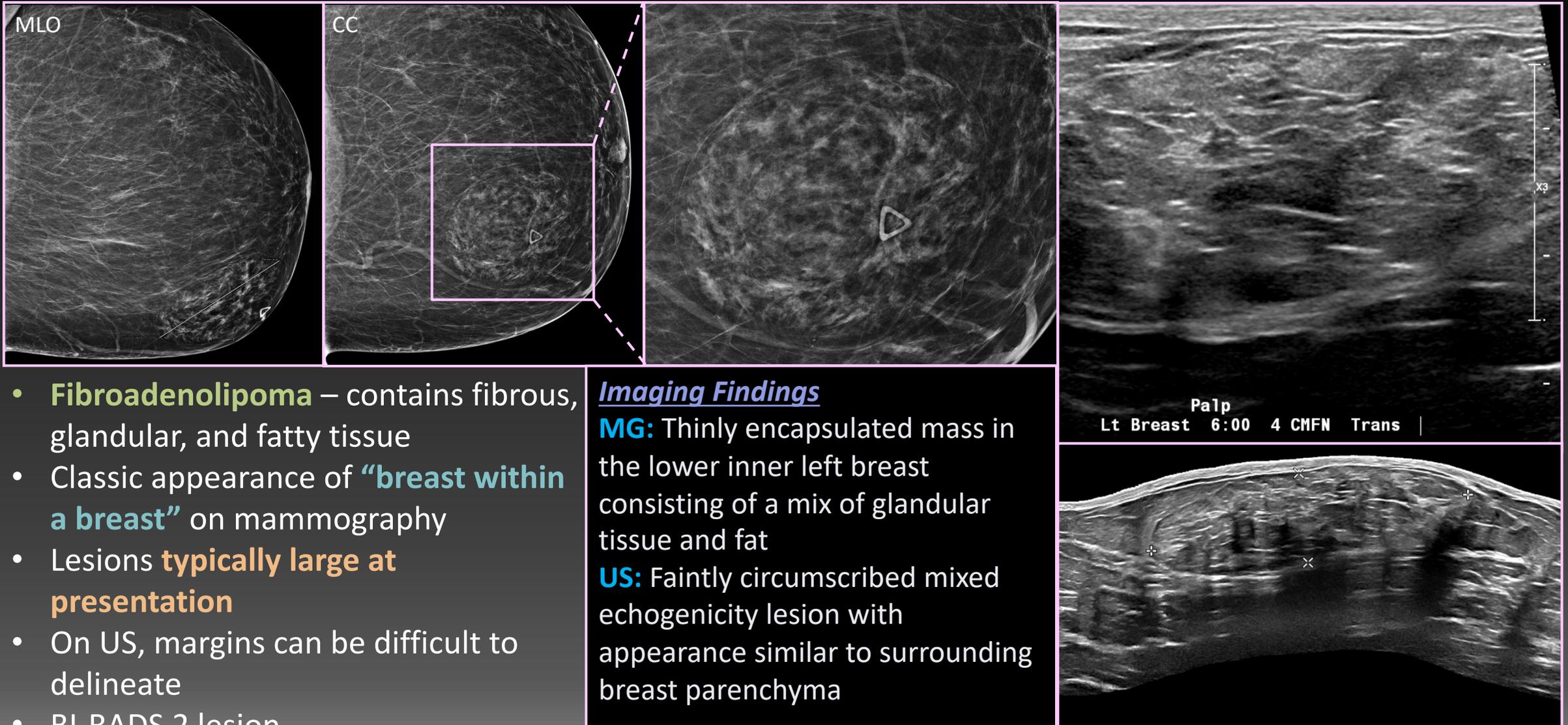
Imaging Findings

US: Interval increase in size of the mass, biopsy was recommended



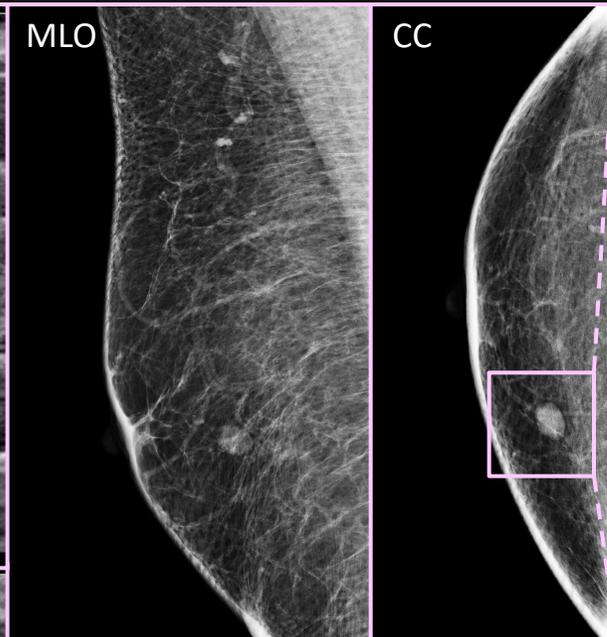
Hamartoma

44 year old F with enlarging lump in the inferior left breast



Myofibroblastoma

78 year old M with pain and lump in right breast



Imaging Findings

US: oval, antiparallel, hypoechoic mass with an echogenic rim and internal vascularity

MG: Oval circumscribed mass in the inner right breast



- Only breast tumor that **occurs more commonly in males** than females, particularly elderly males
- Similar imaging appearance to fibroadenoma
- **Complete resection is recommended** given high rate of recurrence if incomplete margins

Silicone Granulomas

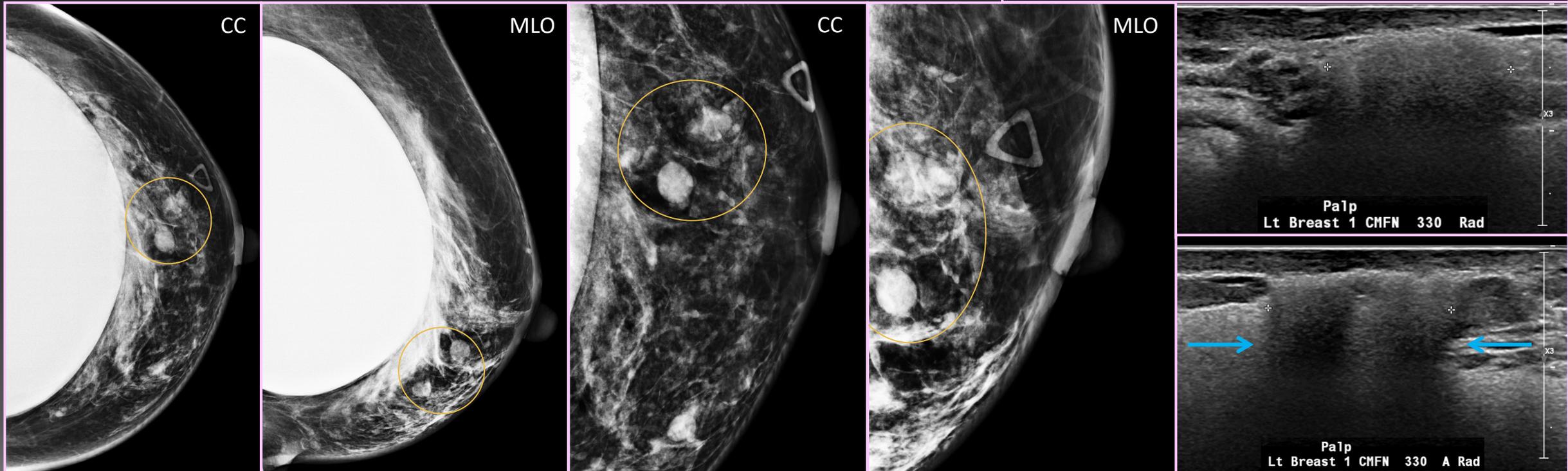
63 year old F with history of breast implant presents with palpable lump in left breast

- Result of **silicone implant extracapsular rupture**, gel bleed, or free injection
- Ultrasound demonstrates classic **snowstorm appearance** → the most sensitive and specific sign on US of extracapsular implant rupture
- Location: **typically at edge of implant or in axilla**
- No malignant potential

Imaging Findings

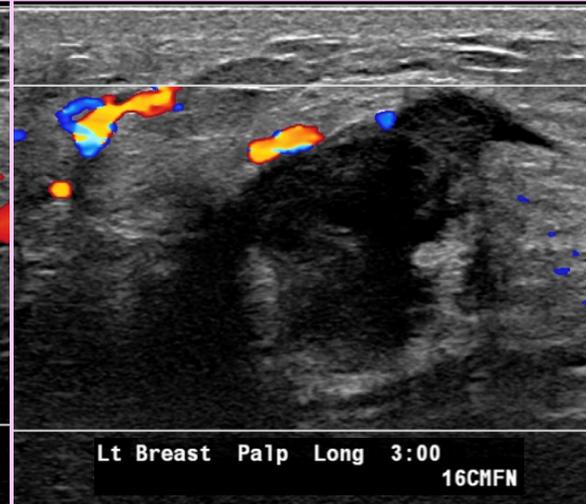
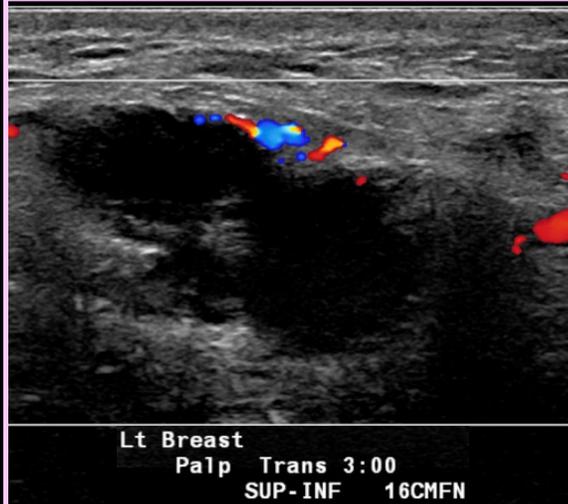
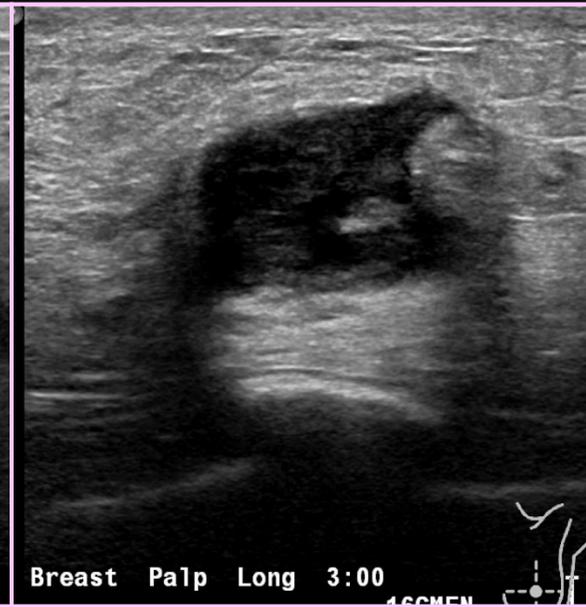
MG: Numerous circumscribed masses of varying sizes throughout the left breast

US: Multiple silicone granulomas with “snowstorm appearance” with a well-defined anterior margin and echogenic/dirty shadowing



Fibromatosis of Breast

42 year old F present with palpable abnormality in the left breast



Imaging Findings

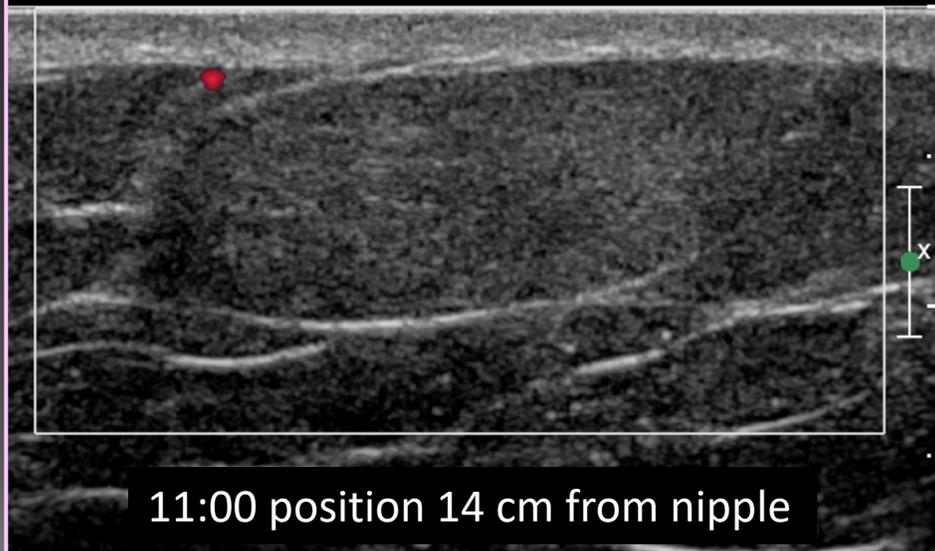
MG: Focal asymmetry in the left breast at posterior depth underlying the triangular marker on the MLO view

US: Irregular hypoechoic mass with angular margins, areas of posterior acoustic shadowing, and peripheral vascularity

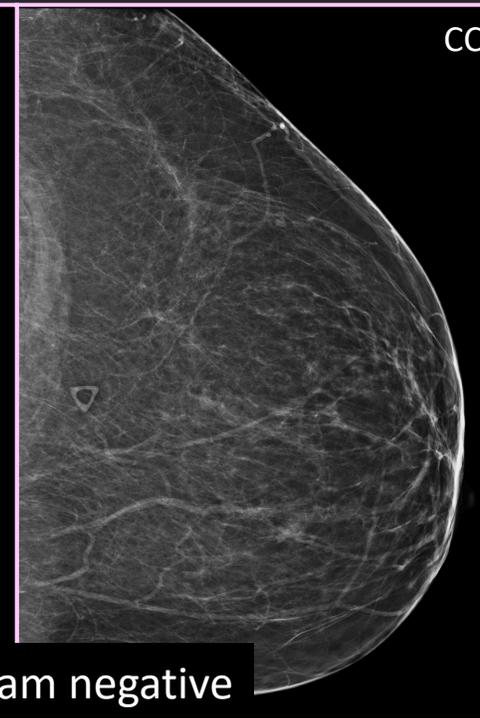
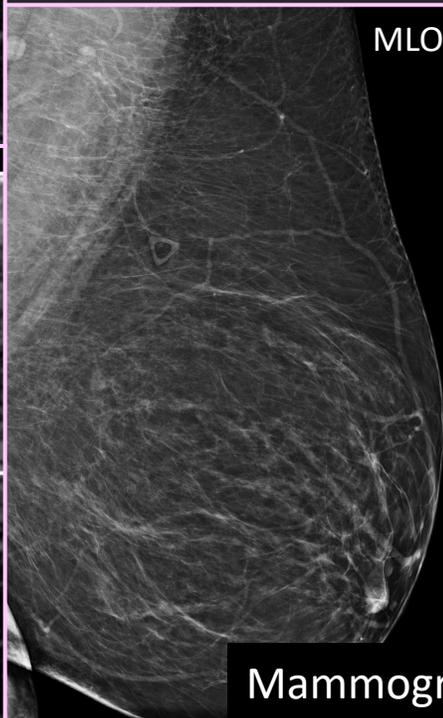
- Extra-abdominal desmoid tumor
- **Benign locally infiltrative spindle cell tumor** composed of fibroblasts and collagen
- **Locally aggressive, but NO metastatic potential**
- Treated with **complete local excision** with wide margins
- High recurrence rate ~25%

Breast Lipoma

43 year old F present with palpable lump in upper left breast



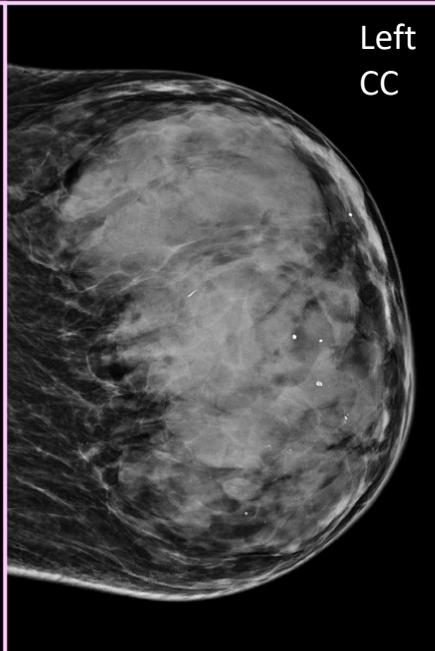
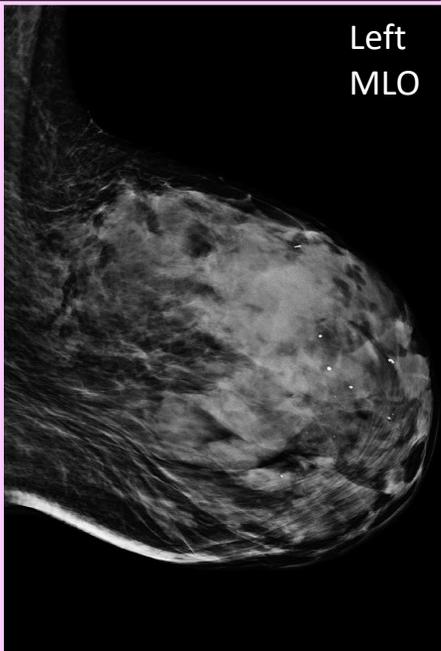
- Benign tumor of mature adipose cells
- BIRADS 2 lesion – however, **enlargement of a lipoma is an indication for biopsy**
- Important to differentiate from angiomyolipoma, which will be more hyperechoic and vascular on ultrasound



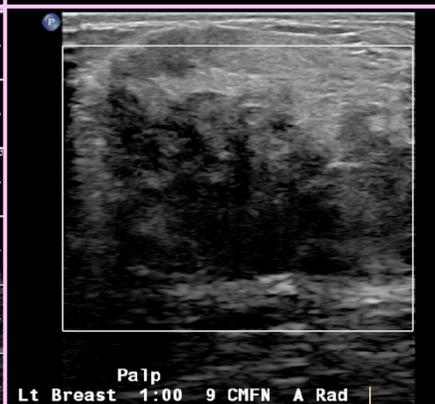
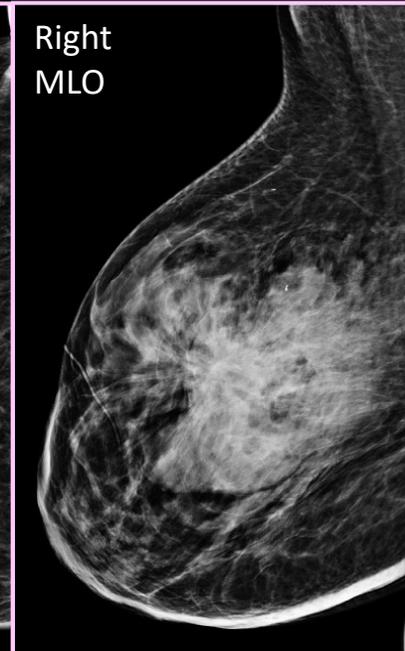
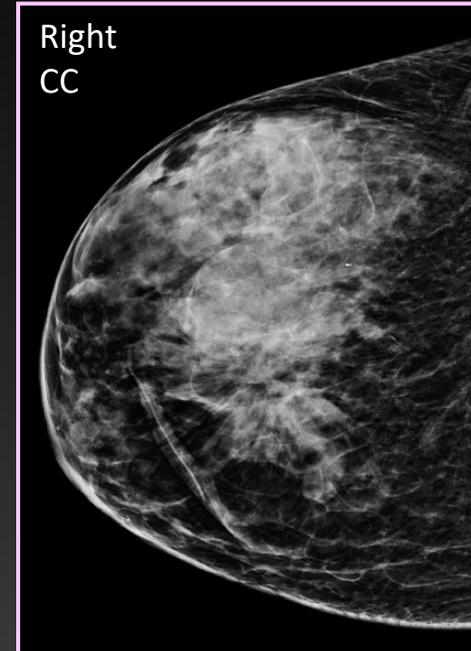
Imaging Findings
MG: Scattered areas of fibroglandular density with no suspicious abnormality underlying the triangular marker
US: Isoechoic, oval, parallel mass with thin capsule

Diabetic Mastopathy

55 year old F with insulin-dependent diabetes for 9 years presents with bilateral palpable masses



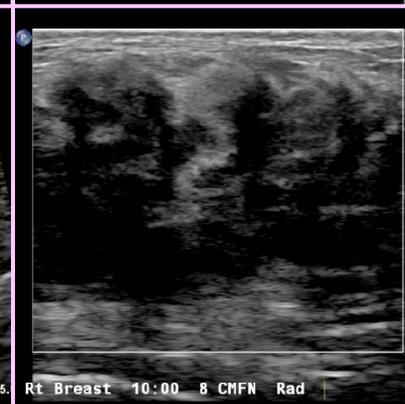
- Stromal/fibrous proliferation found in **females with diabetes** (usually type 1)
- Often presents as **firm to hard nontender breast mass**
- Mammogram may demonstrate dense asymmetry or irregular mass
- **Indistinct and hypoechoic on US** with posterior shadowing



Imaging Findings

MG: Extremely dense breasts bilaterally, especially on the left (architectural distortion in the right breast is from remote benign biopsy).

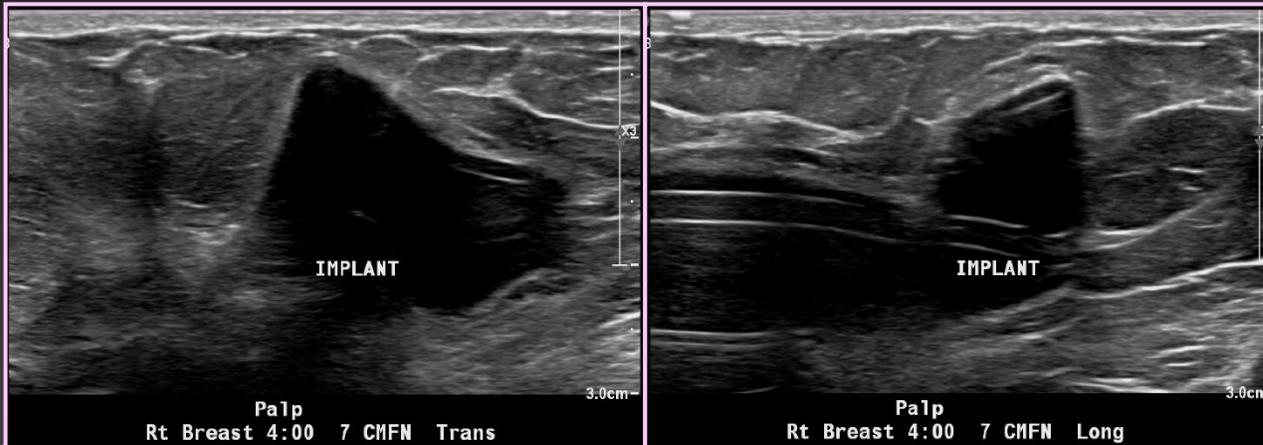
US: Indistinct, hypoechoic masses bilaterally with shadowing measuring up to 12 cm on the right and 5 cm on the left



Collapsed Implant

57 year old F with history of bilateral saline breast implants with right breast palpable abnormality

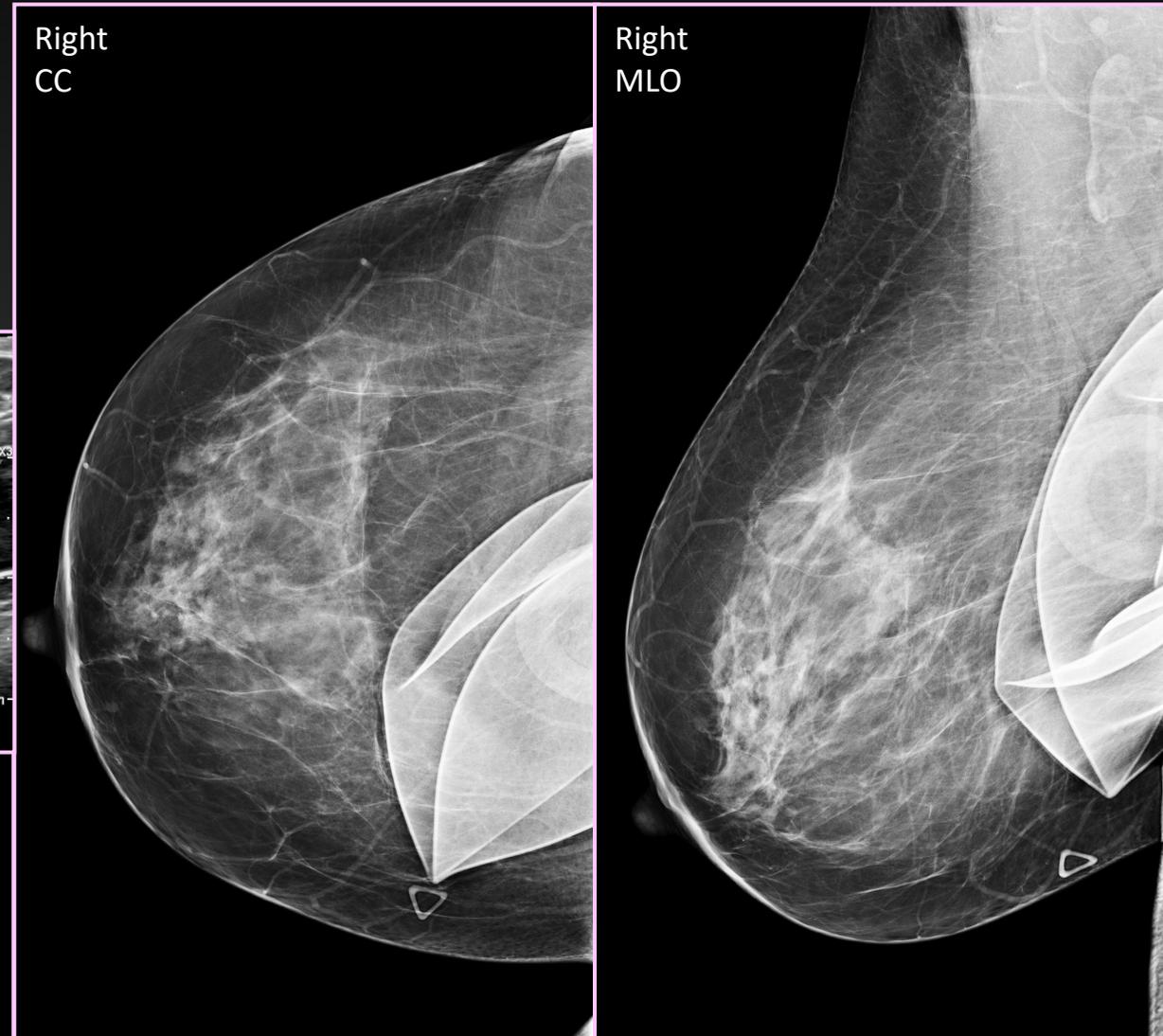
- Rupture of saline implant is **typically a clinical diagnosis** although may be equivocal and present with a palpable breast mass
- Treatment: Surgical removal



Imaging findings

MG: Saline implant is collapsed and folded on itself underlying the triangular marker. No suspicious mammographic masses.

US: Irregular contour of the saline implant with collapsed layers of the implant shell and “stepladder sign”



Summary/Learning Points

- Because palpable masses are such a frequently encountered diagnostic dilemma for radiologists, it is important to understand the appropriate initial imaging algorithm for different patient populations:
 - Age <30 → begin with US
 - Age 30-39 → begin with US or MG
 - Age ≥40 → begin with MG
- Although the majority of palpable breast lumps are benign, many have imaging features which may raise suspicion requiring biopsy
- Correlation between history and specific imaging features of the benign cases discussed in this exhibit will aid in diagnostic accuracy and ensure appropriate management.

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