



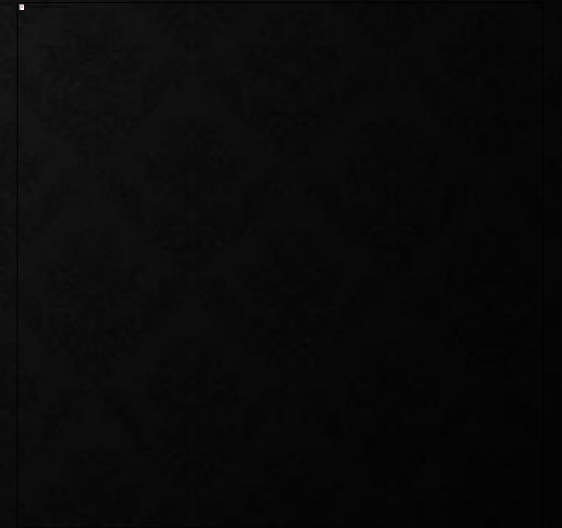
**In The Name Of GOD**

# **NON MASS FINDINGS AT BREAST ULTRASOUND**

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# DEFINITION

- A nonmass finding at US is a **discrete identifiable area of altered echotexture** compared with that of the surrounding breast tissue that does not conform to a mass shape
- The term nonmass finding is **not included** in the current Breast Imaging Reporting and Data System (BI-RADS) US lexicon
- The reported incidence of nonmass findings at **screening** whole-breast US is 1.0%–5.3%
- A wide range of **benign and malignant** pathologic conditions appear as nonmass findings on US images

**Table 4: Reported Benign and Malignant Entities of Nonmass Findings**

**Benign entities**

Abscess  
Apocrine metaplasia  
Atypical ductal hyperplasia  
Chronic granulomatous inflammation  
Diabetic mastopathy  
Duct ectasia  
Fat necrosis  
Fibroadenoma  
Fibrocystic changes  
Fibrosis  
Lobular carcinoma in situ  
Normal breast tissue  
Papillomatosis  
Plasma cell mastitis  
Radial scar  
Sclerosing adenosis

**Malignant entities**

Acute lymphatic leukemia  
DCIS  
IDC  
ILC  
Invasive mixed (ductal and lobular) carcinoma  
Invasive papillary carcinoma  
Metaplastic carcinoma  
Metastasis  
Mucinous carcinoma



# US FEATURES OF NONMASS FINDINGS

- Echogenicity:
  - Predominantly (>50%) hypoechoic
  - Predominantly hyperechoic
  - Mixed hyperechoic and hypoechoic
  - Predominantly anechoic
- Distribution:
  - Focal
  - Linear-segmental
  - Regional

- Associated features:
  - Calcifications
  - Tubular and/or ductal architecture
  - Posterior shadowing
  - Architectural distortion
  - High elasticity
  - Hypervascularity

**CORRELATIONS WITH HISTOPATHOLOGIC  
FINDINGS AND BENIGN AND MALIGNANT  
HISTOLOGIC FINDINGS**

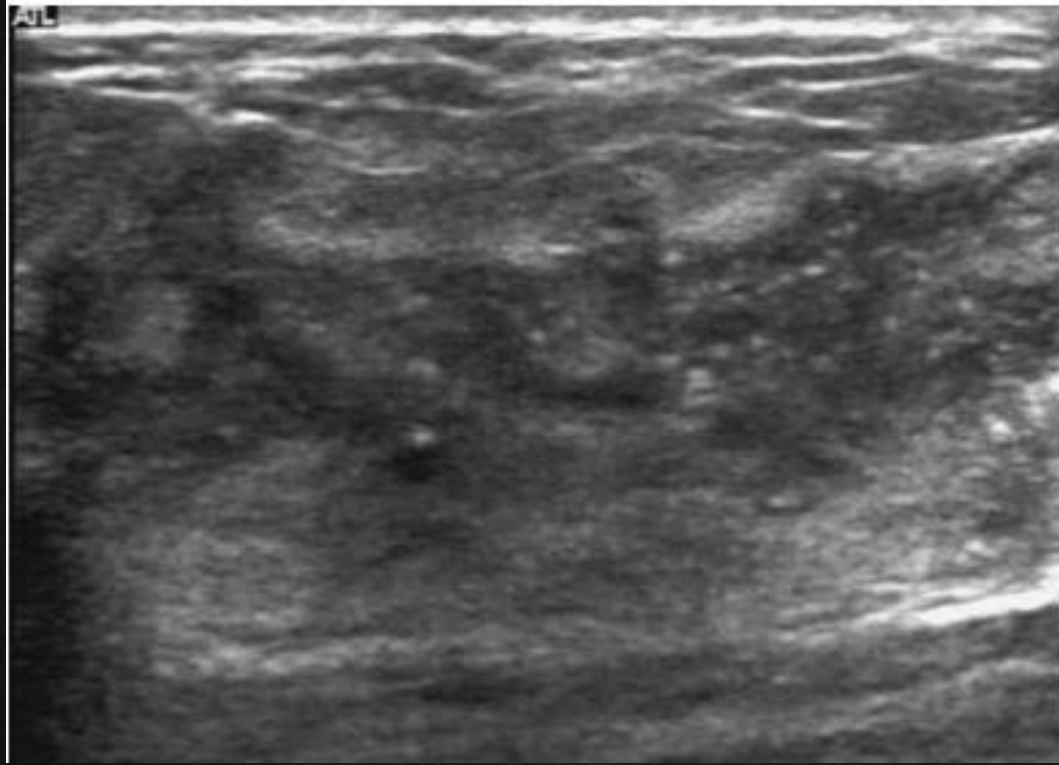
# Calcifications

- Choi et al demonstrated that calcifications were present in **51% of malignant** nonmass findings compared with **2% of benign** nonmass findings.
- Associated calcifications may be visualized in:
  - IDC
  - DCIS
  - Atypical ductal hyperplasia
  - Lobular carcinoma in situ
  - Fibroadenoma
  - Radial scar
  - Tubular adenoma



# Calcifications

- **The morphology of calcifications cannot be fully interpreted with US compared with mammography**
- **Patients with calcified NMLs detected by B-mode US have to undergo mammography for further evaluation and then the higher BIRADS category found of the two imaging modalities can be used to decide how to manage these lesions.**

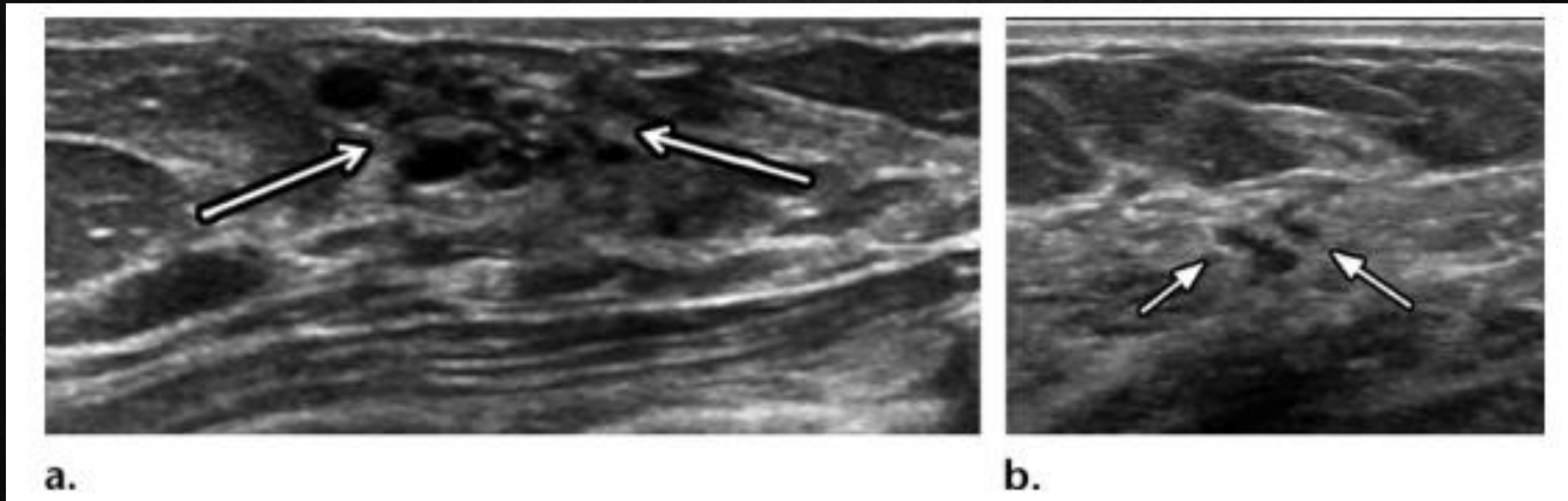


**A hypoechoic area with scattered microcalcification**  
in the upper outer quadrant of the left breast.  
The lesion was demonstrated to be **high-grade ductal**  
**carcinoma in situ by surgery** .

# TUBULAR OR DUCTAL ARCHITECTURE

- IDC
- DCIS
- Intraductal papilloma
- Atypical ductal hyperplasia, Atypical lobular hyperplasia
- Fibrocystic changes
- Ductal ectasia

# TUBULAR OR DUCTAL ARCHITECTURE



(a) A 25-year-old woman with a **palpable** concern in the left breast. US guided core biopsy : **complex sclerosing and papillary lesion with intraductal hyperplasia and apocrine metaplasia**

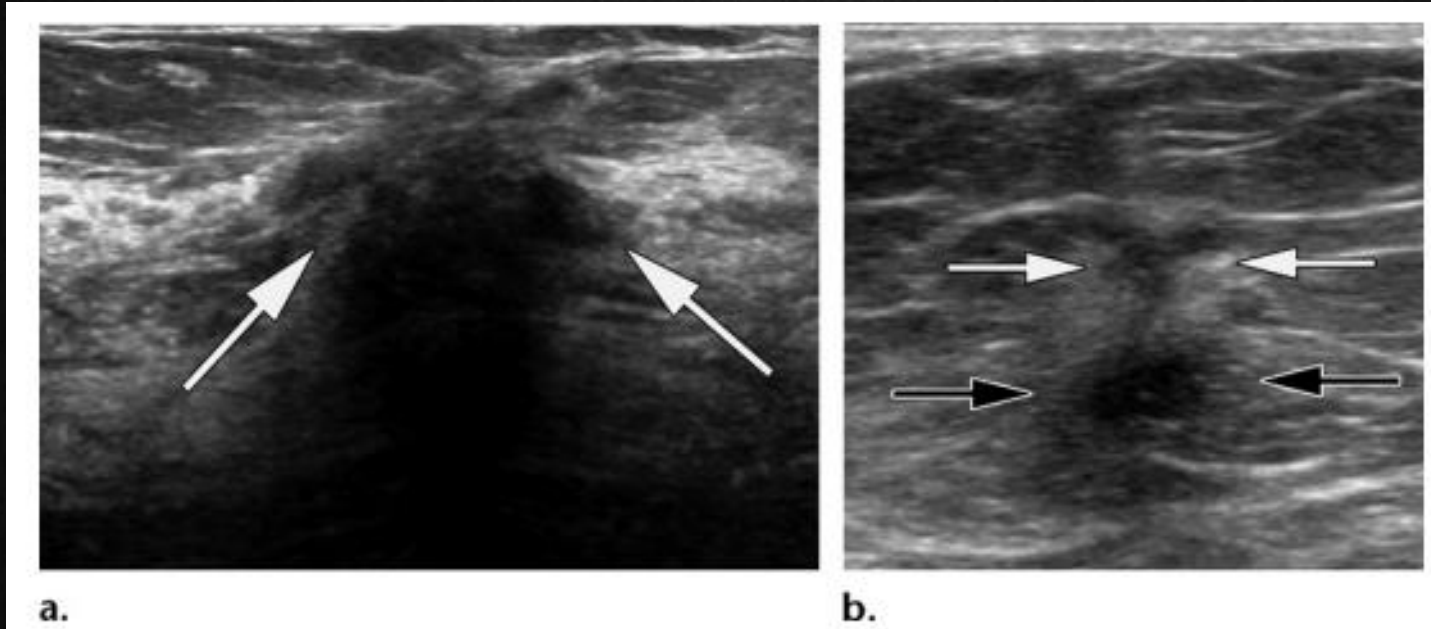
(b) A 72-year-old woman. US image shows a **focal nonmass finding** with tubular architectural distortion. US-guided core biopsy : **DCIS**

# POSTERIOR ACOUSTIC SHADOWING

- May indicate pathologic changes inciting **desmoplastic reaction** that can attenuate the ultrasound beam and are described in **both benign and malignant conditions**:
  - Invasive carcinoma
  - Postoperative scar
  - Complex sclerosing lesion
  - Fibrous or dense breast tissue



# POSTERIOR ACOUSTIC SHADOWING



(a) A 57-year-old woman. US image shows a hypoechoic nonmass finding with posterior acoustic shadowing (arrows), corresponding to **mammographic architectural distortion**. The results of a US-guided core biopsy and surgical excisional biopsy confirmed **dense fibrous tissue**.

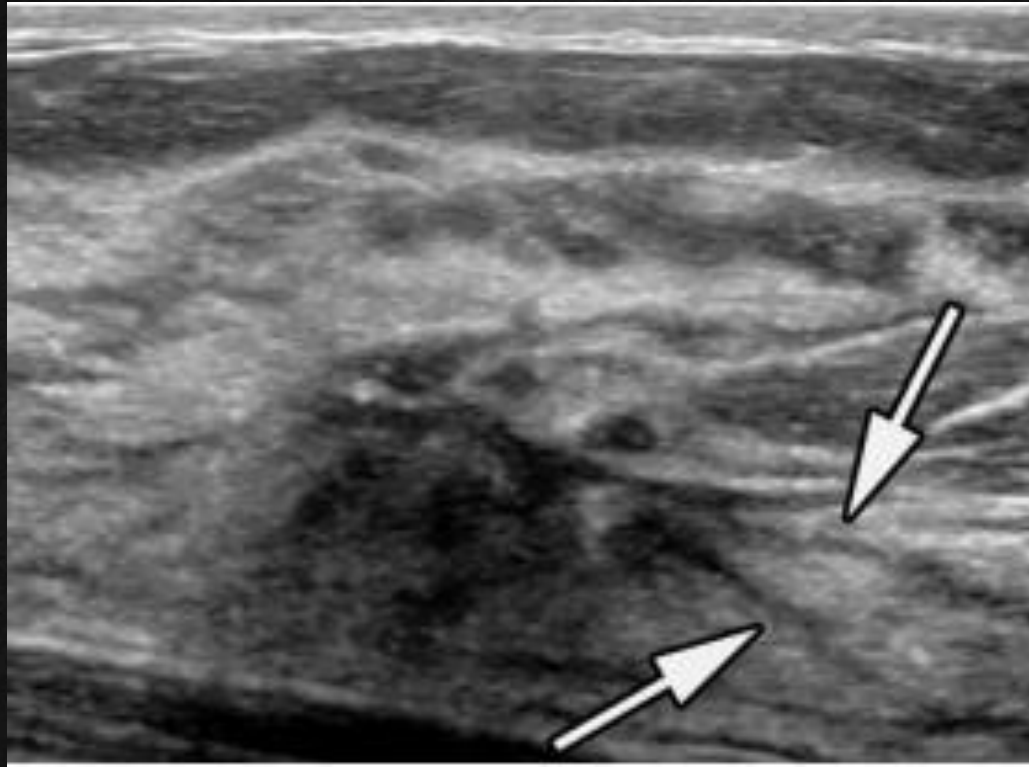
(b) A 74-year-old woman. US image shows a focal nonmass finding with mixed echogenicity (white arrows) with associated posterior acoustic shadowing (black arrows), corresponding to a **palpable concern** and mammographic **focal asymmetry**. The results of a US-guided core biopsy confirmed **invasive lobular carcinoma (ILC)**.

# ARCHITECTURAL DISTORTION

- Both **benign and malignant** lesions can cause architectural distortion.
- Can be attributed to pathologic changes **distorting ducts** within the adjacent fibroglandular tissue or **straightening nearby Cooper ligaments**
- Benign conditions:
  - Fibrosis
  - Sclerosing adenosis
  - Fat necrosis

# ARCHITECTURAL DISTORTION

- Architectural distortion is also depicted in cases of **malignancy** and can be due to:
  - **Retraction of the tissue** around the tumor or the tumor itself
  - Tumor **extension** into the cooper ligament
  - Fibrosis caused by shrinkage of breast parenchyma following **chemotherapy**
- Architectural distortion is a more frequent associated feature of nonmass findings in **malignant** lesions than in benign lesions .



A 40-year-old woman

US image shows a hypoechoic nonmass finding with radiating lines, suggesting architectural distortion at the site of mammographic architectural distortion.

US-guided core biopsy : **benign breast** parenchyma with **dense fibrous stroma**, focal lymphocytic mastitis, and histiocytic reaction.

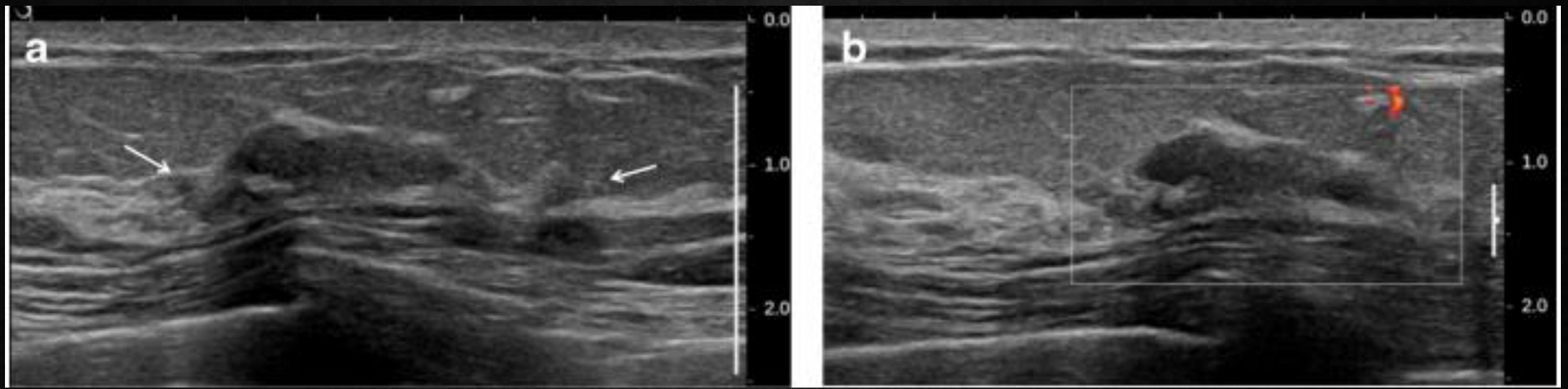
# HYPERVASCULARITY

- Color or power Doppler US is used to depict blood vessels in non-mass lesions.
- **Malignant** non-mass lesions feature significantly **higher vascularity** (more than two vessels) than benign non-mass lesions .
- Color Doppler US improves the specificity of breast US for characterizing nonmass lesions .
- Elasticity and vascularity results can help characterize non-mass lesions on breast US better than morphological features on B-mode US

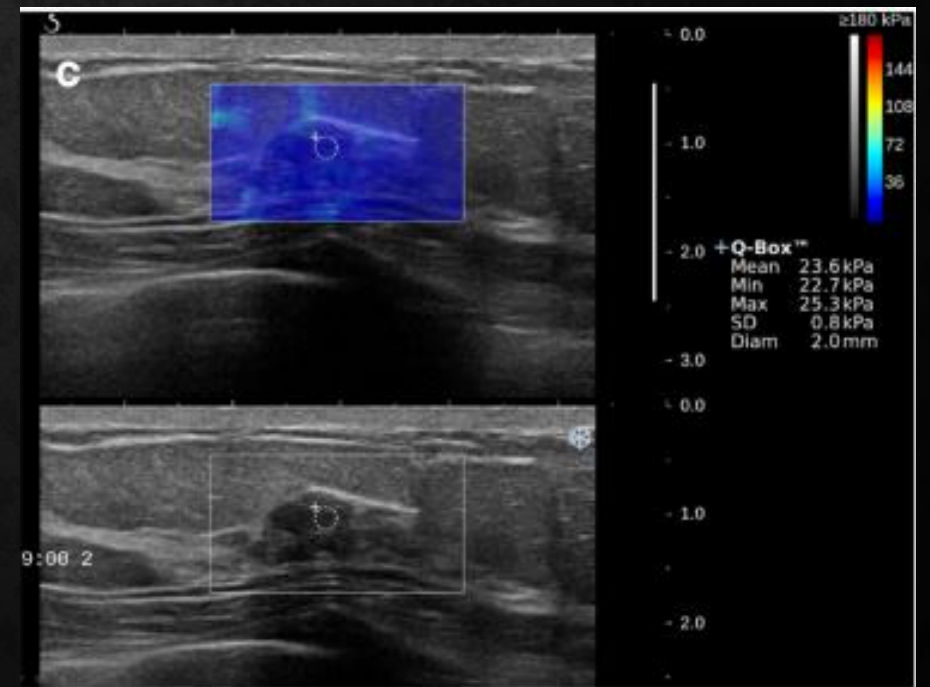


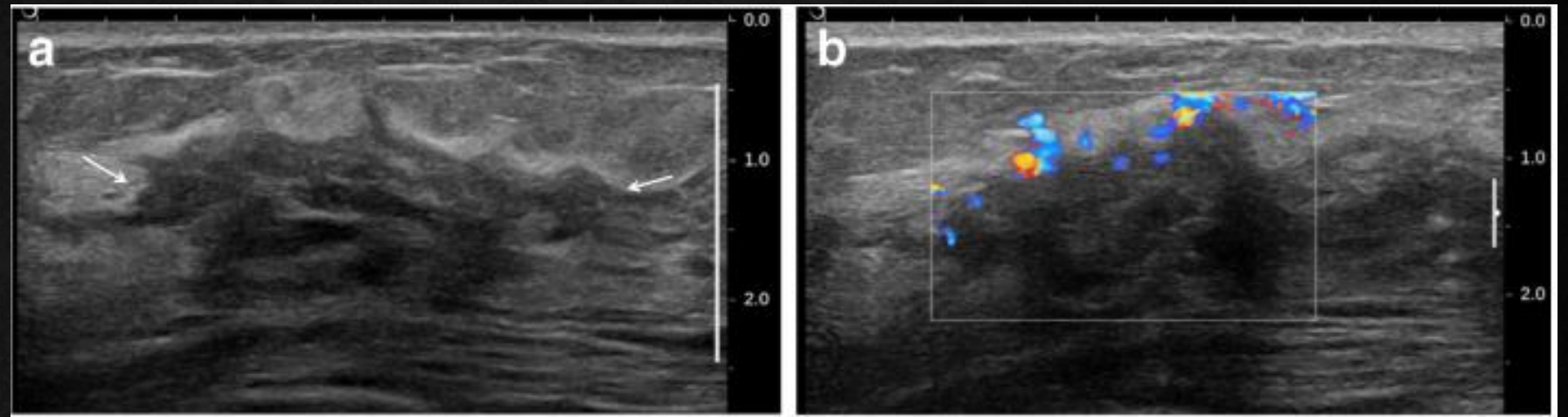
# HIGH ELASTICITY

- This method **improves the diagnostic specificity** of breast US for non-mass lesions .
- Diagnostic value of SWE and colour Doppler US may be higher when evaluating breast NMLs than breast masses, because B-mode US features associated with malignancy have not yet been established for breast NMLs while they have been for breast masses

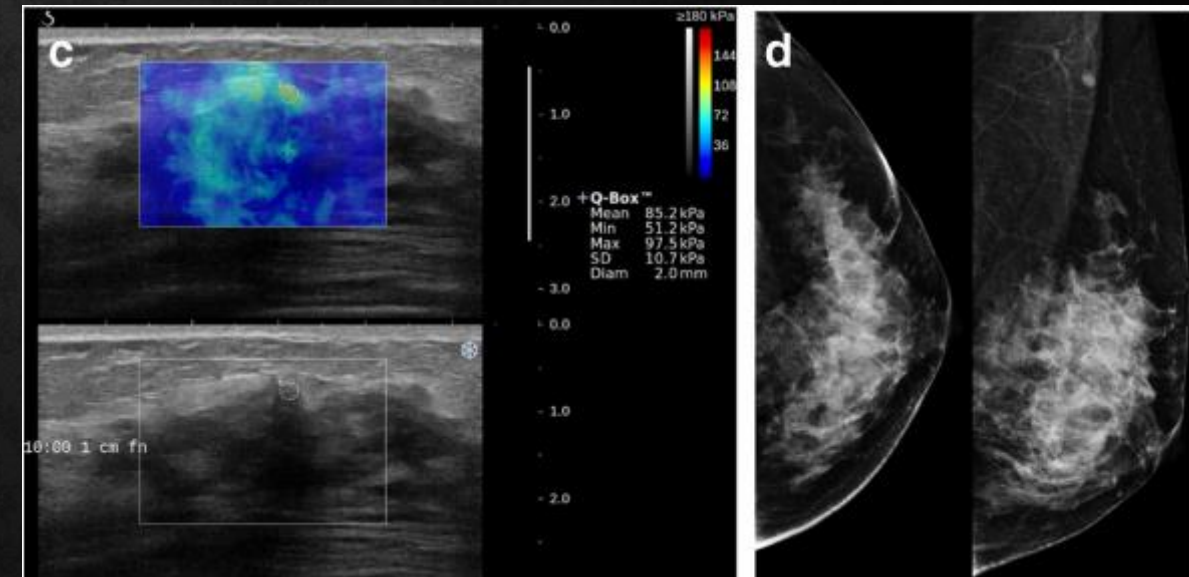


A 57-year-old woman diagnosed with **fibroadenomatoid mastopathy** by US-guided biopsy. a The B-mode US image shows a 2.8-cm non-mass lesion assessed as BI-RADS category 4a (arrows), b the colour Doppler US image shows low vascularity and c the SWE image shows Emean of 23.6 kPa, Emax of 25.3 kPa and dark blue colour on the maximum stiffness colour map





A 47-year-old woman diagnosed **with invasive ductal carcinoma** by US-guided biopsy and surgical excision. a The B-mode US image shows a 4.5-cm non-mass lesion assessed as BI-RADS **category 4b** (arrows) in the left upper inner breast, b the colour Doppler US image shows high vascularity, c the SWE image shows an Emean of 85.2 kPa, an **E<sub>max</sub> of 97.5 kPa** and yellow colour on the maximum stiffness colour map and d this lesion was not detected on the mammogram at the time of diagnosis



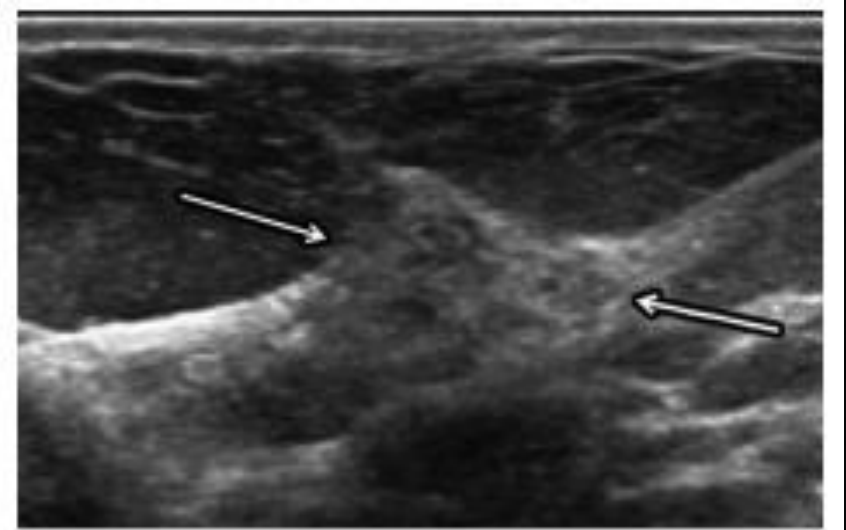


- Nonmass findings are benign in 46%– 90% of cases, with malignancy rates for nonmass findings reported in the literature as ranging from 10% to 54%.
- Kim et al reported that the most common benign histopathologic finding (75%) in a nonmass finding was **fibrocystic change**.
- Nonmass findings can manifest in both invasive and noninvasive breast cancer, as well as in nonprimary breast malignancies .

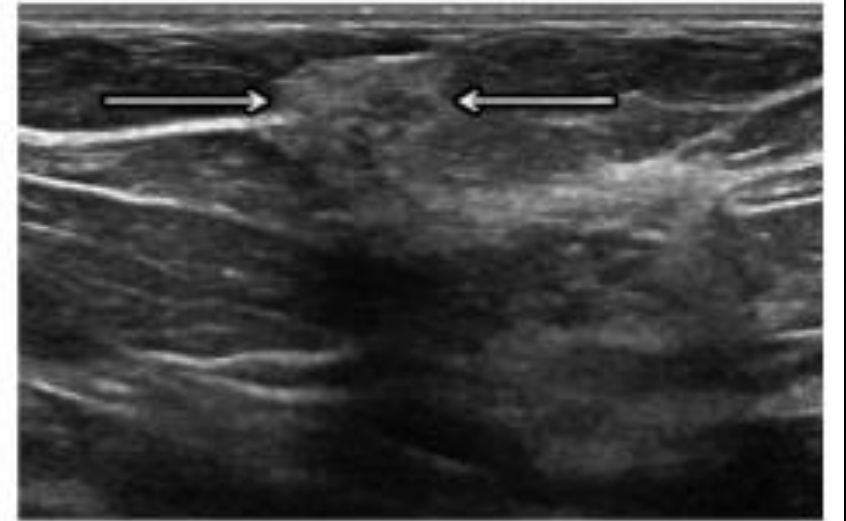
- The most common breast cancers identified as nonmass findings on US images were DCIS or ILC . It has been reported that 11%– 19% of DCIS cases manifest as nonmass findings
- ILC is another type of malignancy that tends to be depicted as a nonmass finding on US images, likely owing to its characteristic noncohesive and infiltrative growth pattern. Selinko et al reported nonmass findings in 13% of ILC cases.



DCIS manifesting as a nonmass finding at US. Two orthogonal US images of right breast in a **74- year old woman** show a **focal nonmass** finding with **mixed echogenicity** at the site of a mammographic developing asymmetry . The results of a US guided core biopsy confirmed DCIS.



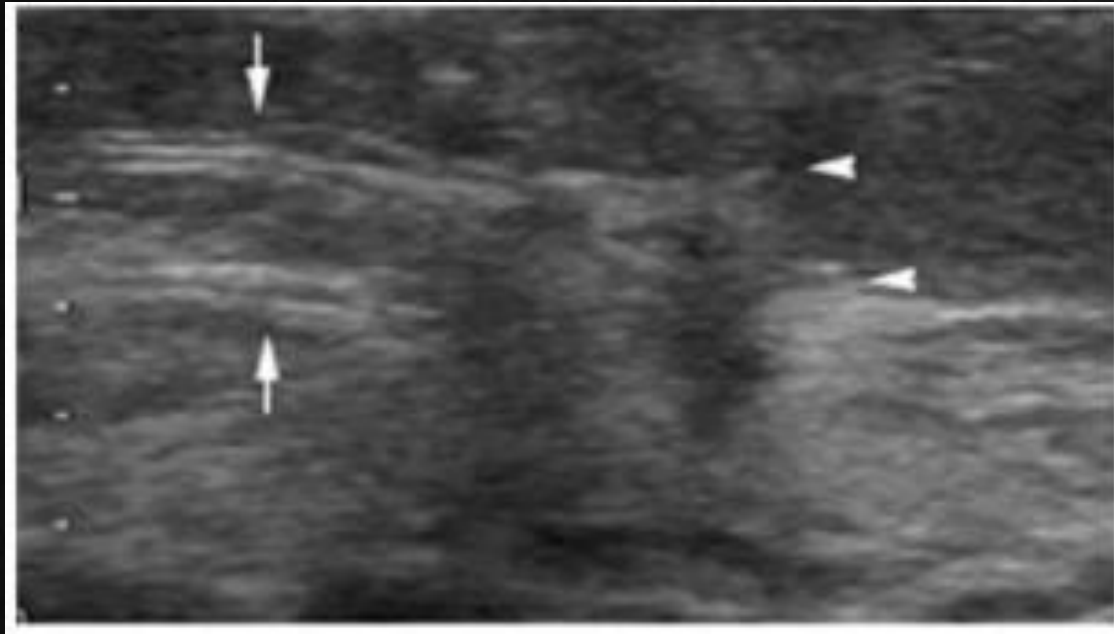
a.



b.

# CORRELATION BETWEEN BREAST US AND MAMMOGRAPHIC FINDINGS

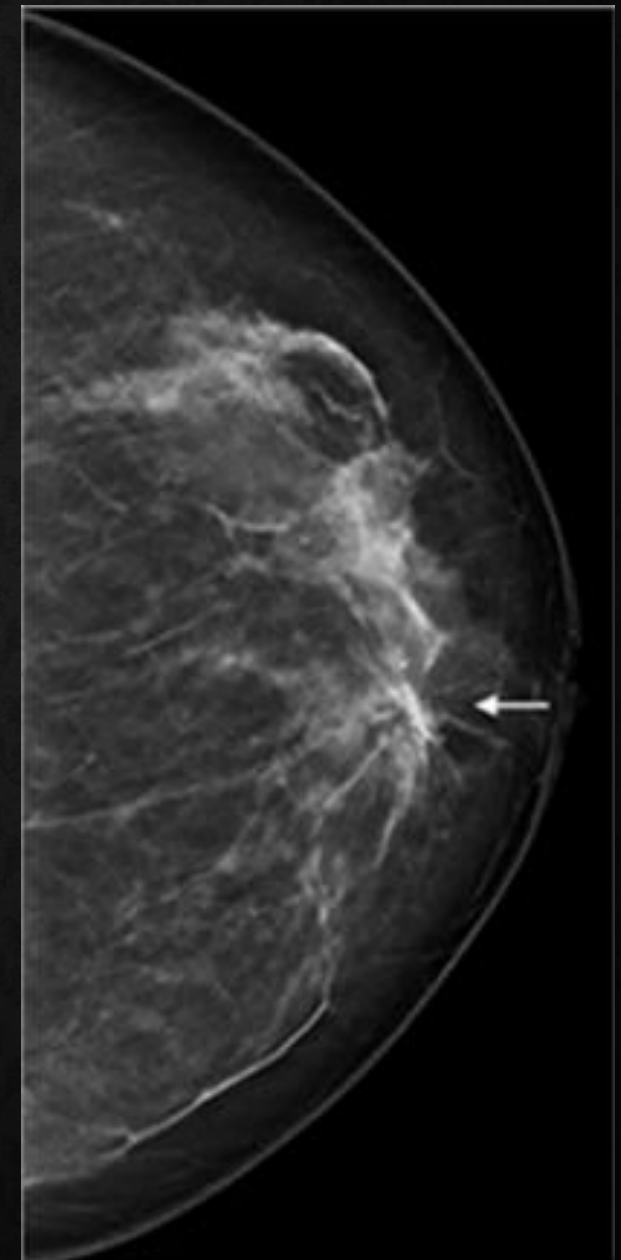
- Mammographic lesions that most often appear as nonmass findings on US images include:
  - Calcifications
  - Focal or developing asymmetry
  - Architectural distortion
- 35% of focal asymmetry cases that had a US correlate depicted nonmass findings on US images, which are described as echogenic tissue in their study

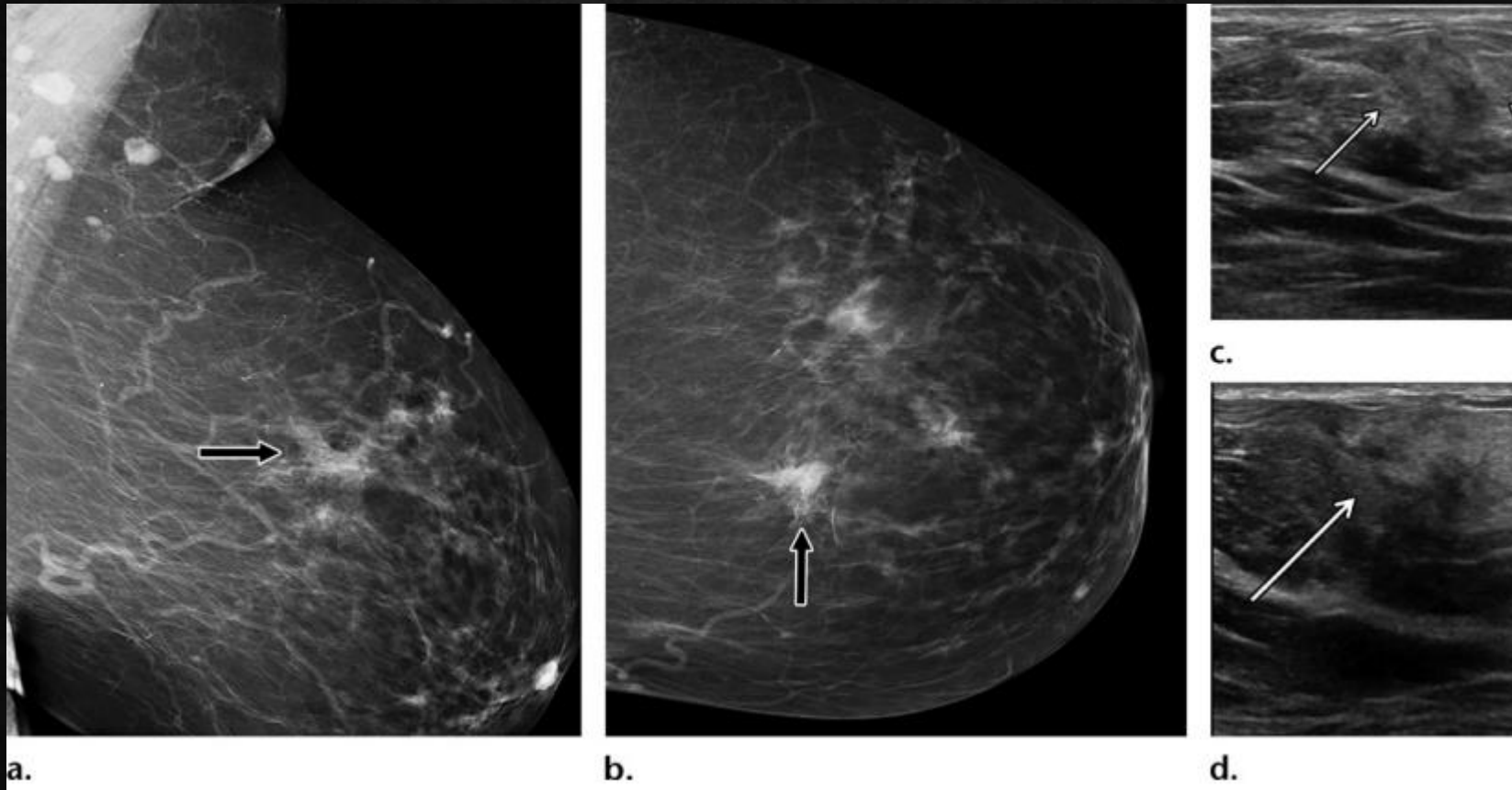


**Non-mass lesions with associated architectural distortion on breast US in a 70-year-old woman.**

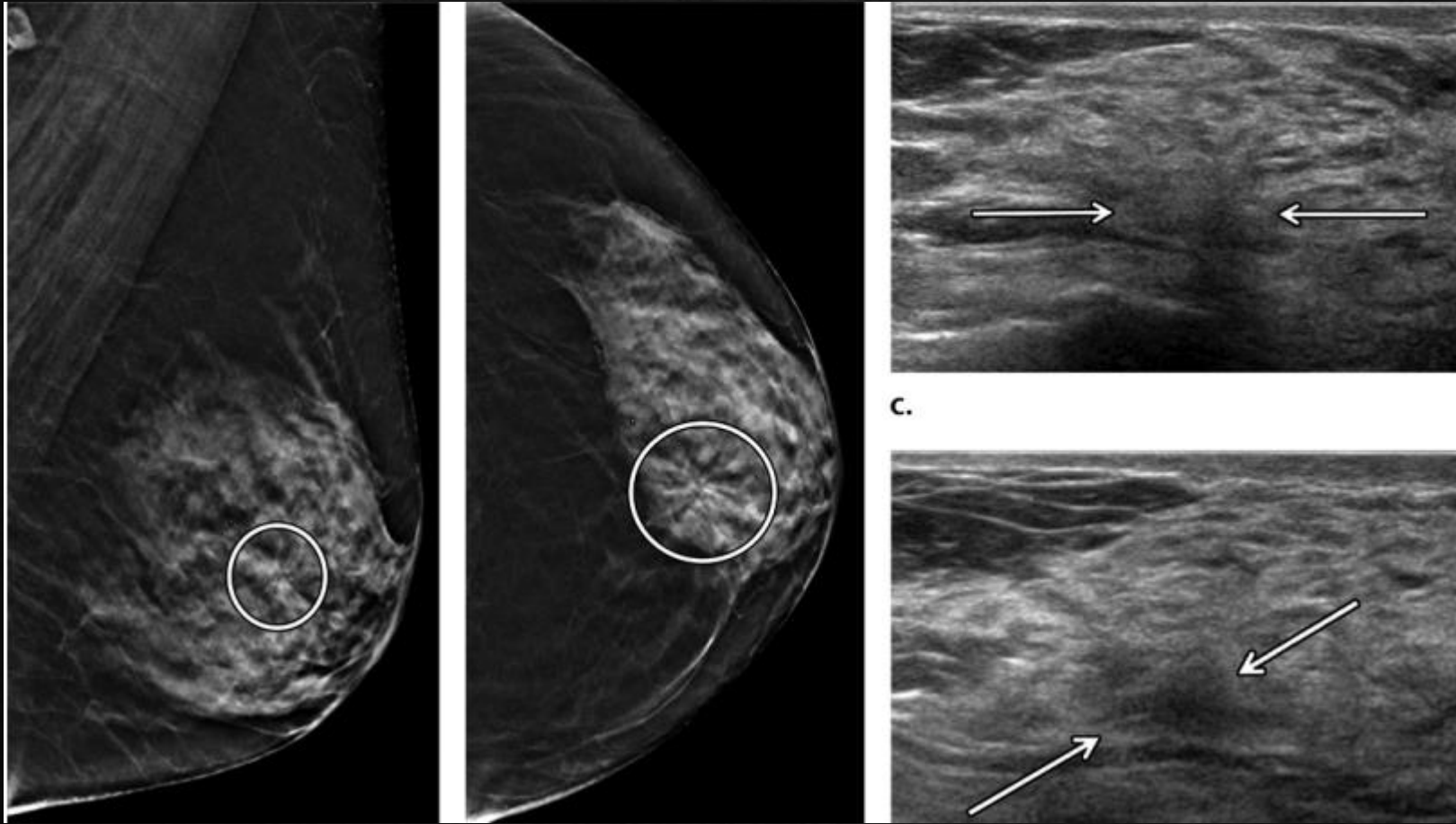
a The US image shows a nonmass lesion with thin straight lines (arrows) and radiating spiculations (arrowheads). b The breast tomosynthesis image shows spiculations (arrow).

A subsequent pathological examination confirmed **sclerosing adenosis**





Nonmass finding as a US correlate of mammographic focal asymmetry in a 67-year-old woman with a history of lupus. (a, b) Mediolateral oblique (a) and craniocaudal (b) screening mammograms show a focal asymmetry (arrow) in the upper inner left breast. (c, d) Orthogonal targeted US images shows a focal predominantly hyperechoic nonmass finding (arrows) at the site of mammographic focal asymmetry. The results of a US-guided core biopsy confirmed atypical lymphoid infiltrate, compatible with lupus mastitis.



Nonmass finding as a US correlate of mammographic architectural distortion in a **69-year-old woman**. (a, b) Mediolateral oblique (a) and craniocaudal (b) mammograms with tomosynthesis of the left breast show architectural distortion (circle). (c, d) Orthogonal targeted US images show a corresponding **focal hypoechoic nonmass finding** (arrows). The results of an excisional biopsy confirmed **invasive carcinoma with ductal and lobular features and DCIS**



- Park et al reported that malignant nonmass findings at US are more often associated with mammographic abnormalities than are benign nonmass findings, as 84% of malignant nonmass findings had corresponding mammographic abnormalities, compared with 40% in benign nonmass findings in their study.
- US-guided biopsy is generally preferred because it is less expensive and better tolerated by patients.
- Given the subtle nature of nonmass findings, performing stereotactic core biopsy may be preferable when there is sonographic uncertainty

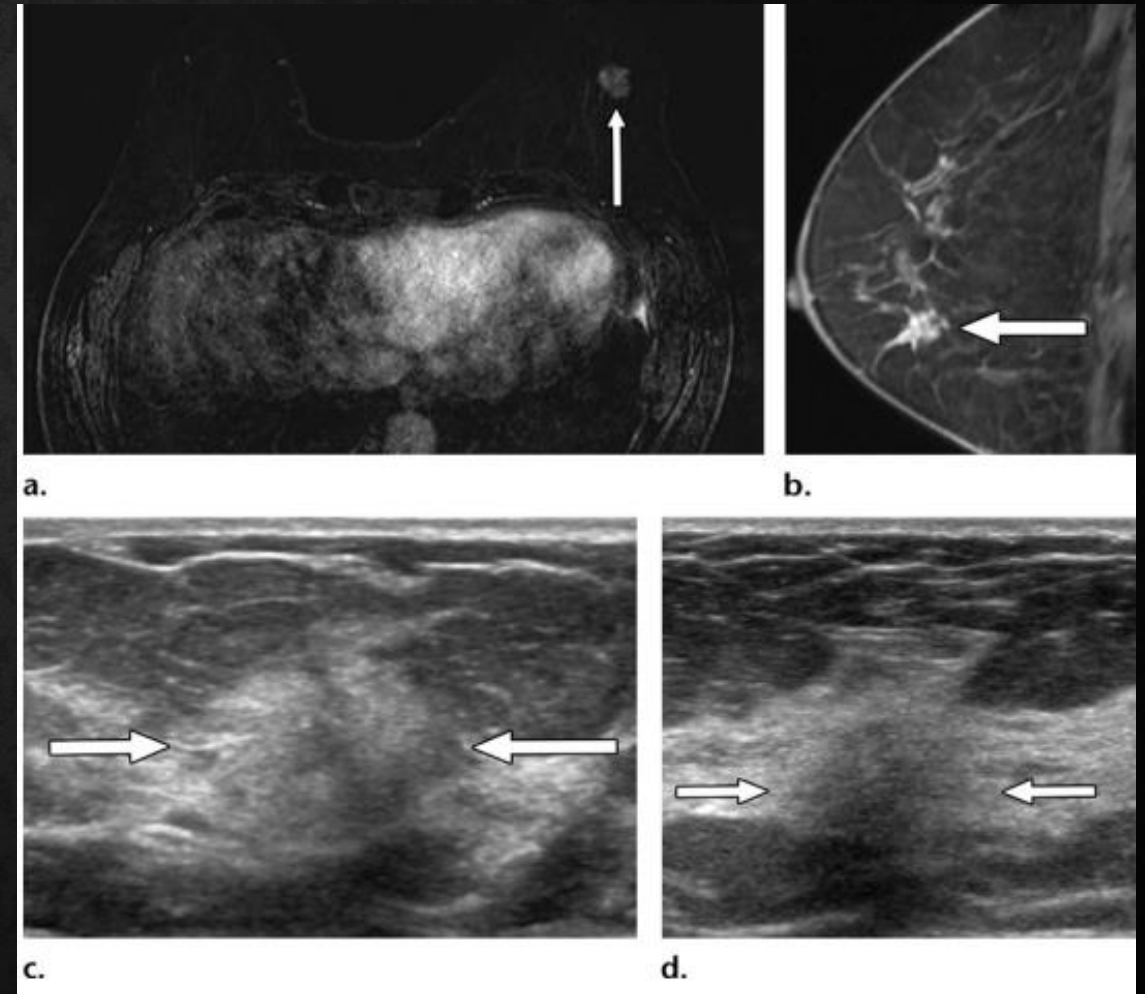
# CORRELATION BETWEEN BREAST US AND MRI FINDINGS

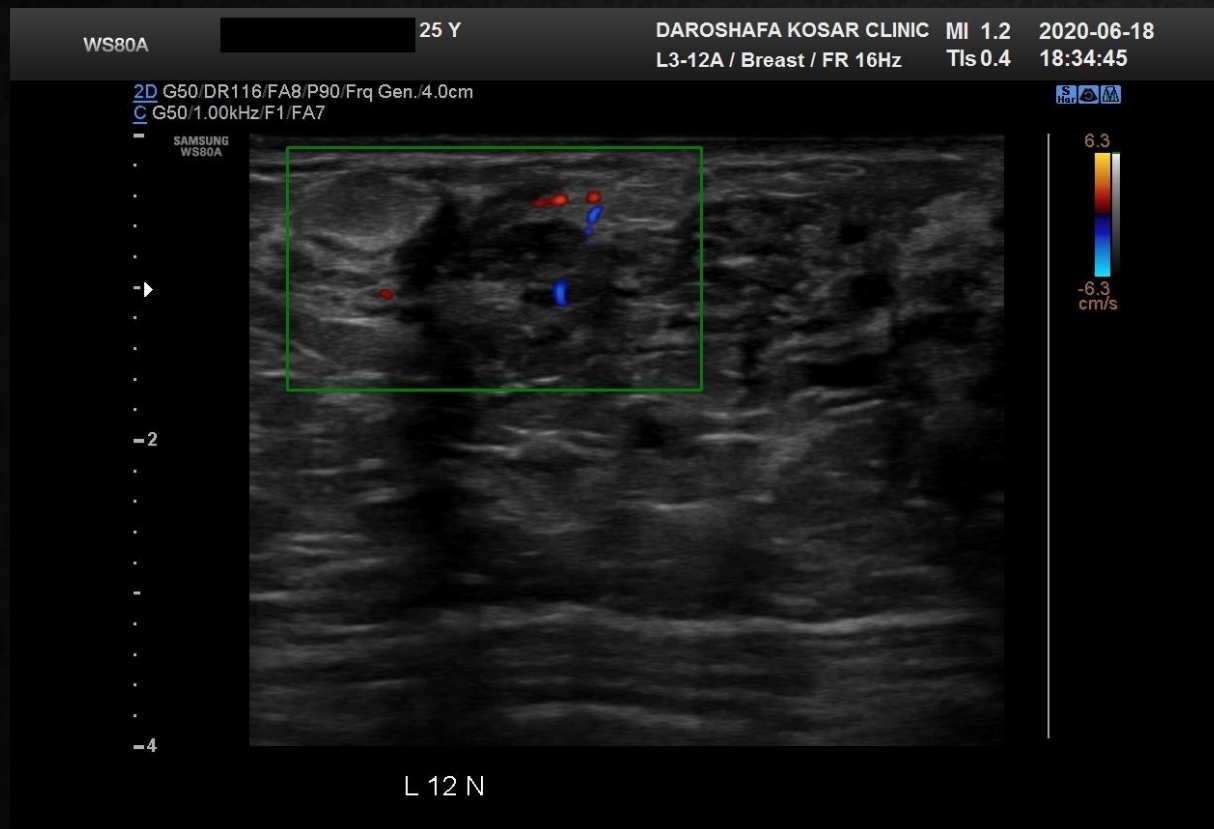
- Wang et al reported that US correlates for DCIS, which appear as nonmass enhancement at MRI, included “vague areas of decreased echogenicity or altered echotexture,” or nonmass findings.
- Similarly, nonmass findings at US tend to appear as nonmass enhancement at MRI as well.
- Sotome et al found that 40% of nonmass findings at US have corresponding enhancing lesions at MRI, and of these findings, 97% were nonmass enhancement at MRI.
- In the same study, 95% of malignant nonmass findings at US showed nonmass enhancement at MR

Nonmass finding as a US correlate of MRI nonmass enhancement in a 69-year-old woman with a history of BRCA2 mutation. (a, b) Axial subtraction (a) and sagittal contrast-enhanced (b) MR images show a **focal nonmass enhancement** (arrow) in the left breast.

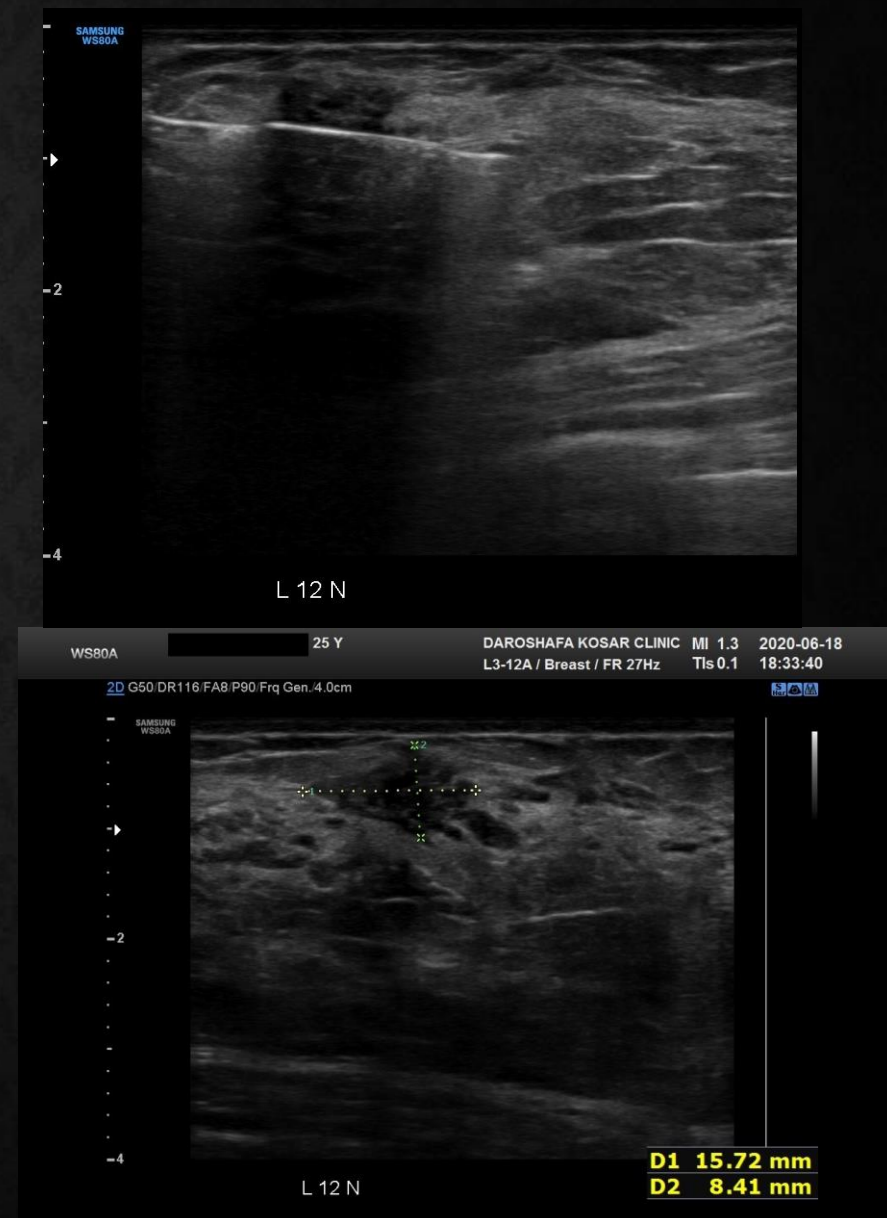
(c, d) Orthogonal focused US images show a corresponding **focal nonmass finding** (arrows) with **mixed echogenicity**.

The results of an MRI-guided core biopsy confirmed ILC

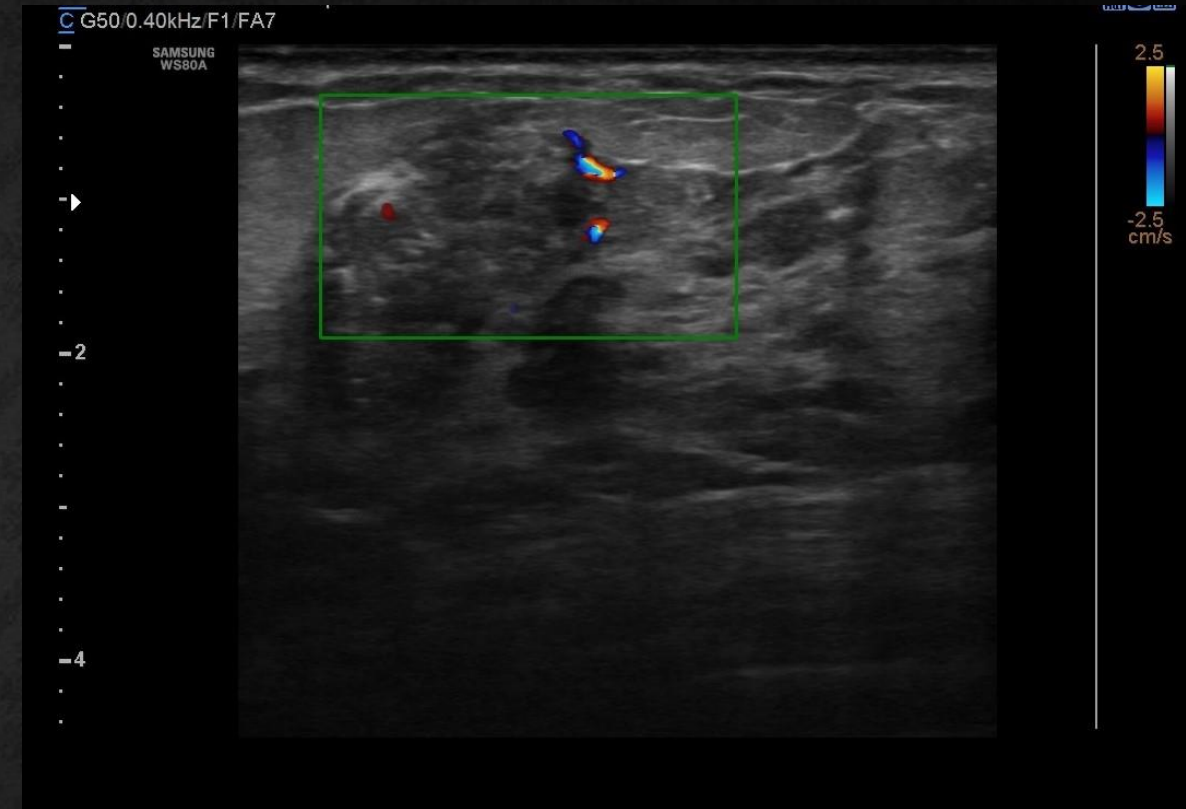
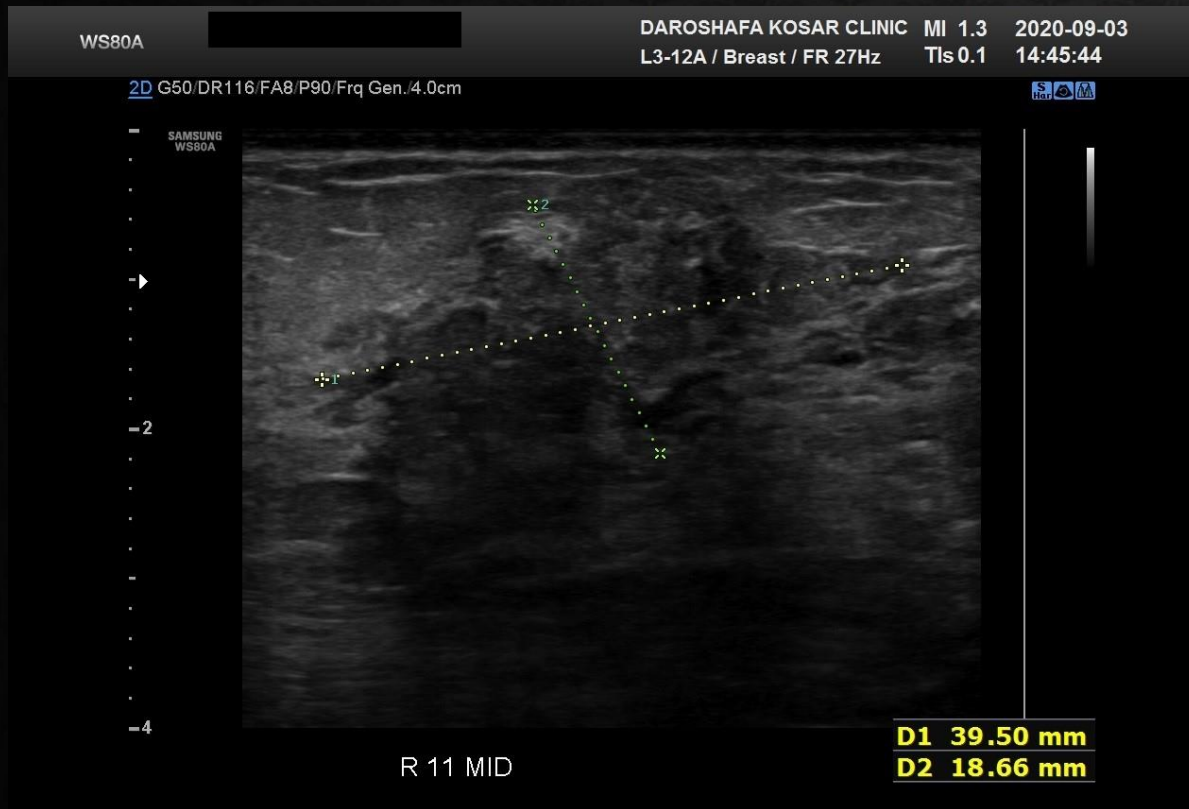




Mass sensation in a 25 y/o woman: A hypoechic non mass finding .  
Pathology report: Invasive ductal carcinoma







A 44 y/o woman with focal pain  
A non mass finding with mixed echogenicity  
Pathology report: High grade DCIS





# TAKE HOME NOTES



- Radiologists may encounter nonmass findings at screening and diagnostic US.
- Nonmass findings are significant because they may indicate malignancy, especially if associated with **calcifications** depicted on US images, and may be imaging **correlates for mammographic and MRI findings**.
- We suggest evaluating nonmass findings on US images by assessing internal **echotexture, distribution, and associated findings**.
- Further studies are needed to validate these categories with histopathologic correlation.





**Thanks for your attention**