

# Update on Ultrasound BI-RADS

Jocelyn Rapelyea MD, FSBI  
Professor and Vice Chair of Diversity, Equity and Inclusion  
Associate Director, Breast Imaging

The George Washington University  
Breast Imaging and Interventional Center, Department of Radiology  
2300 M st, NW  
Washington, DC, 20037

# BI-RADS Ultrasound Subcommittee



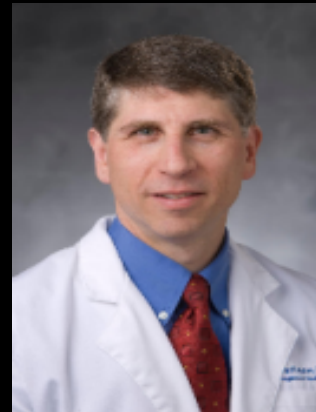
Jessica Leung, MD



Vilert Loving, MD



Regina Hooley, MD



Jay Baker, MD



Jocelyn Rapelyea, MD

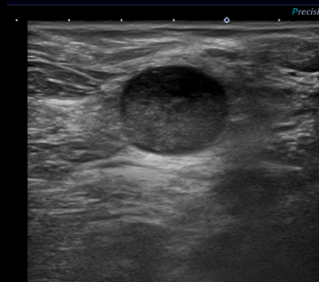
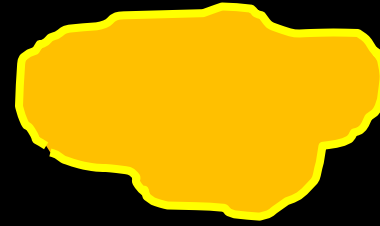
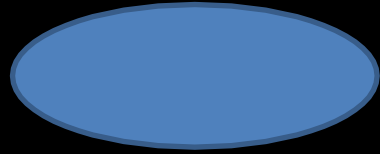
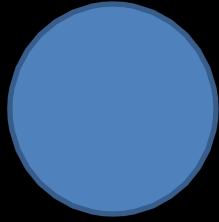
# ACR Lexicon

-Similar to current Lexicon, changes in the sixth edition were made to improve consistency across all imaging modalities.

# ACR Ultrasound LEXICON

- Masses
  - Shape:

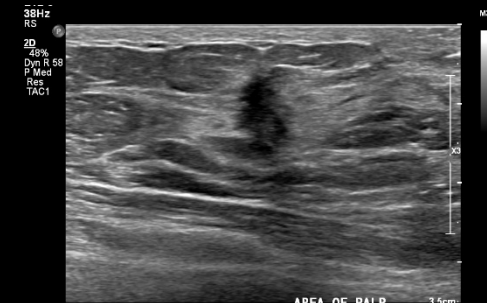
# Mass Shape:



RT BREAST 10:00



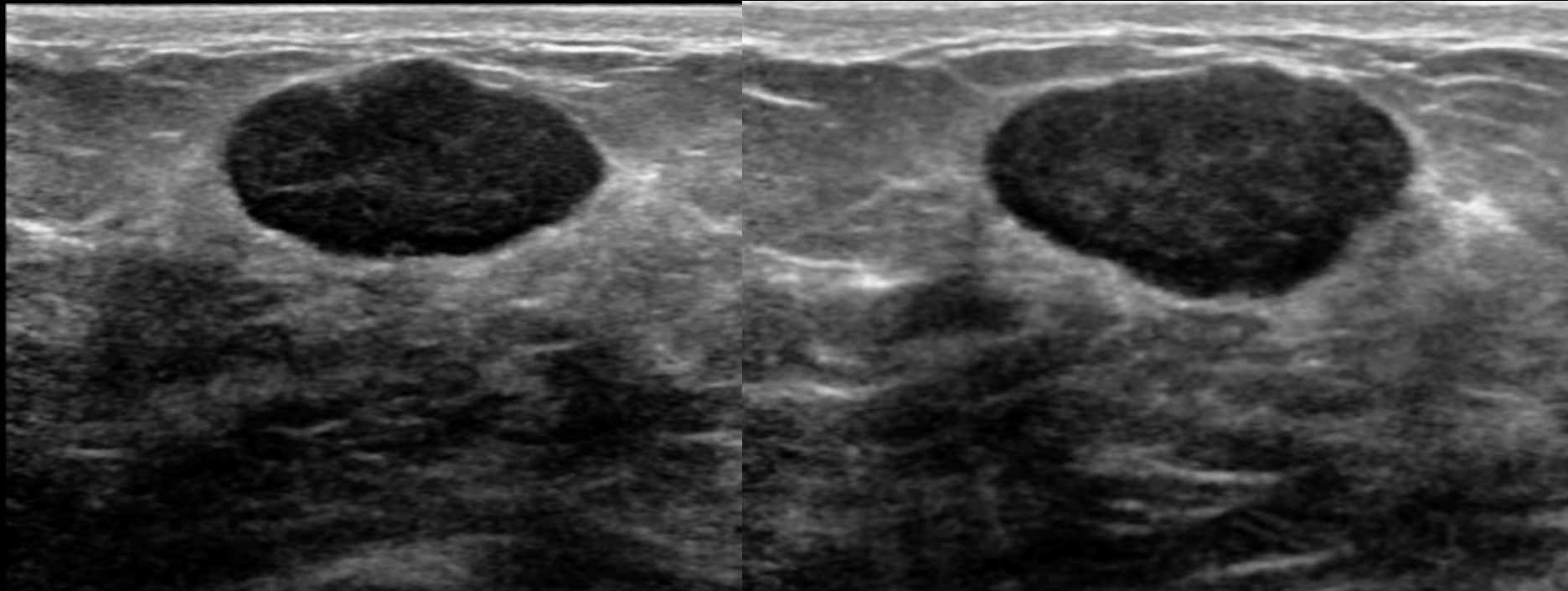
Right Breast A Rad 2:00 3 CM/FN



Left Breast Rad 8:00 1 CM FN

Lobular in shape

# 24 year old with new palpable mass

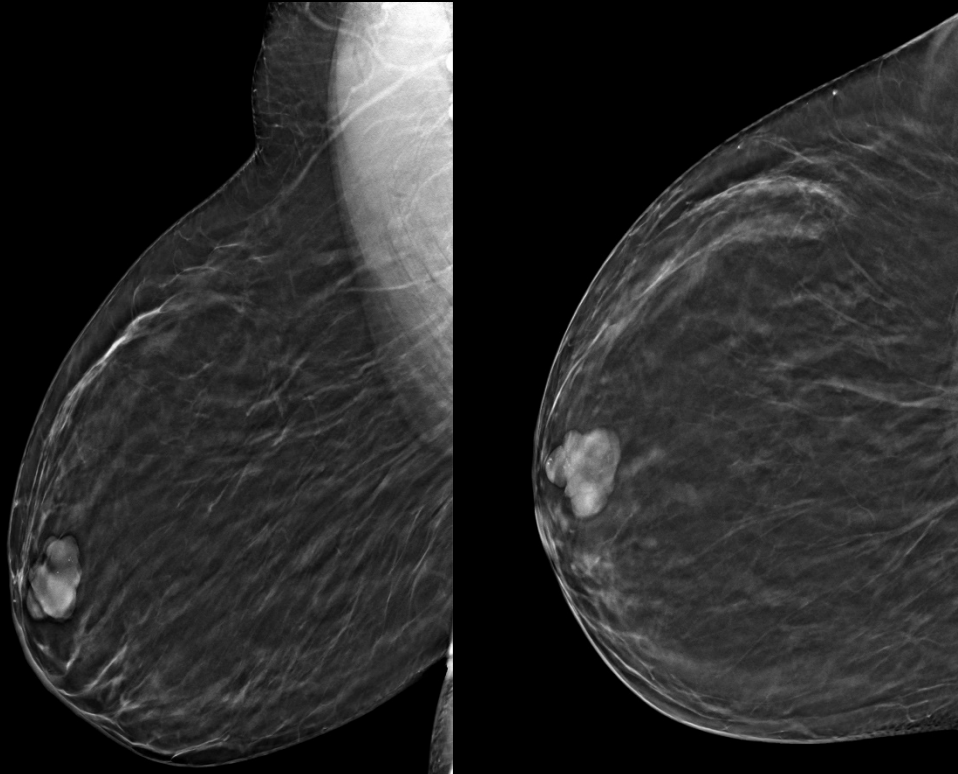


Anti-radial

Radial

Fibroadenoma

Abnormal Screening ultrasound 52 year old female.



2D  
84%  
C 50  
P Med  
Res

Dist 2.79 cm  
Dist 1.05 cm



Right Breast A Rad 11:00 2 CM/FN

2D  
84%  
C 50  
P Med  
Res



Right Breast A Rad 11:00 2 CM/FN

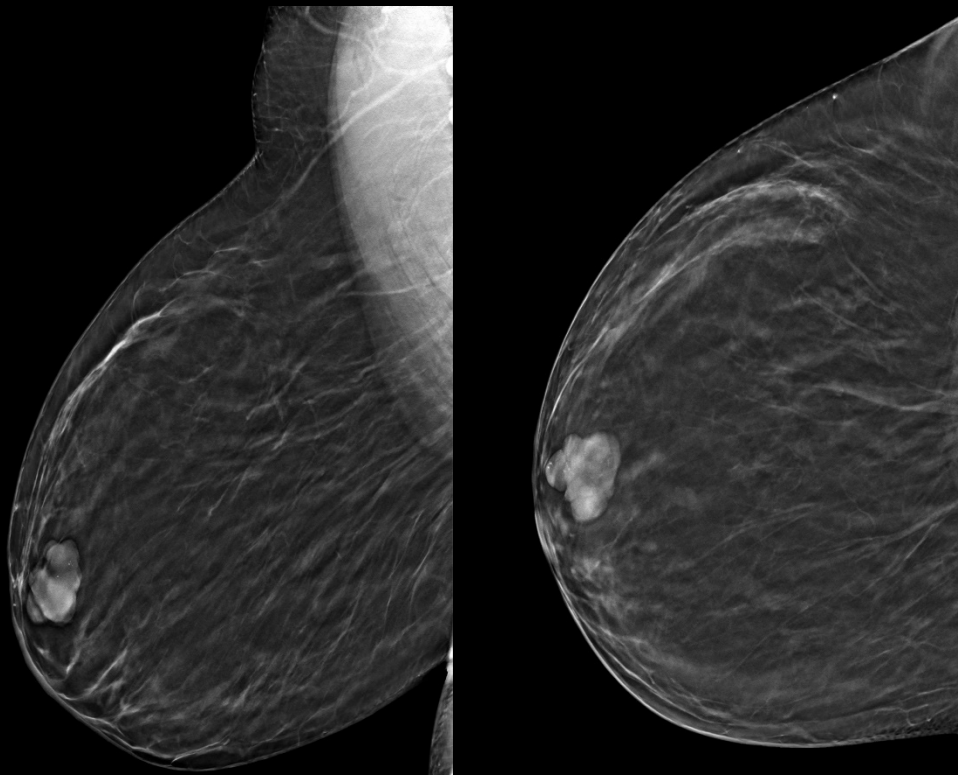
2D  
80%  
C 50  
P Med  
Res



Right Breast Rad 11:00 2 CM/FN

2D  
80%  
C 50  
P Med  
Res

# Lobular mass



2D  
84%  
C 50  
P Med  
Res

Dist 2.79 cm  
Dist 1.05 cm



2D  
84%  
C 50  
P Med  
Res

Dist 2.79 cm  
Dist 1.05 cm



2D  
80%  
C 50  
P Med  
Res

Dist 2.79 cm  
Dist 1.05 cm

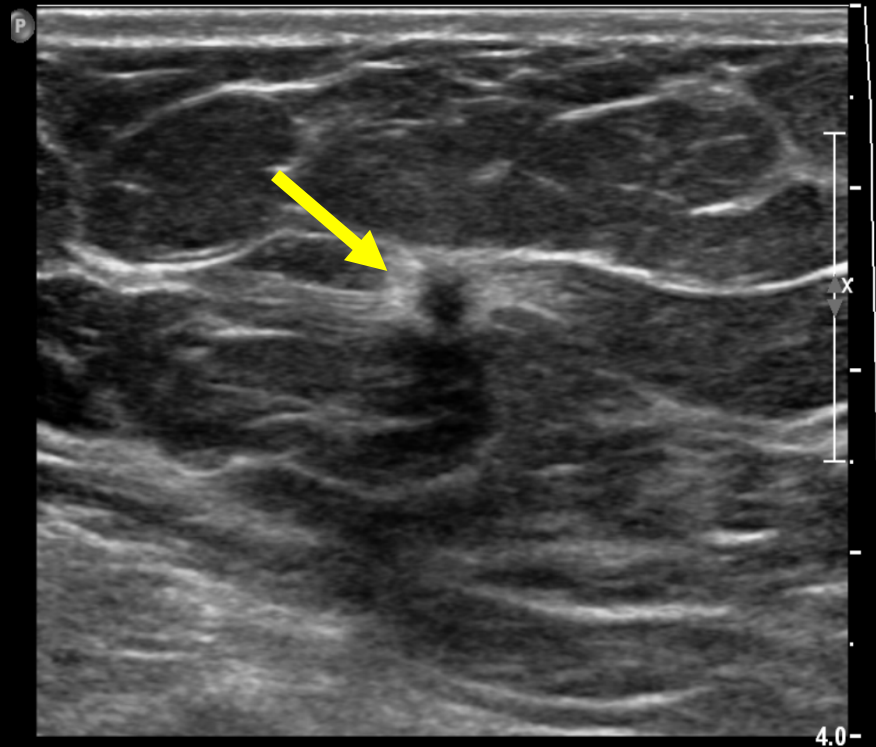




# Echogenic Rind

- Introduced *echogenic rind* as an associated mass feature
- Appears as a thick echogenic band surrounding all or part of a breast mass
- Should not to be confused with pseudocapsule which has a thin, uniform and discrete surrounding band

# Associated echogenic feature



RT BR 3:00 5CM/FN BX

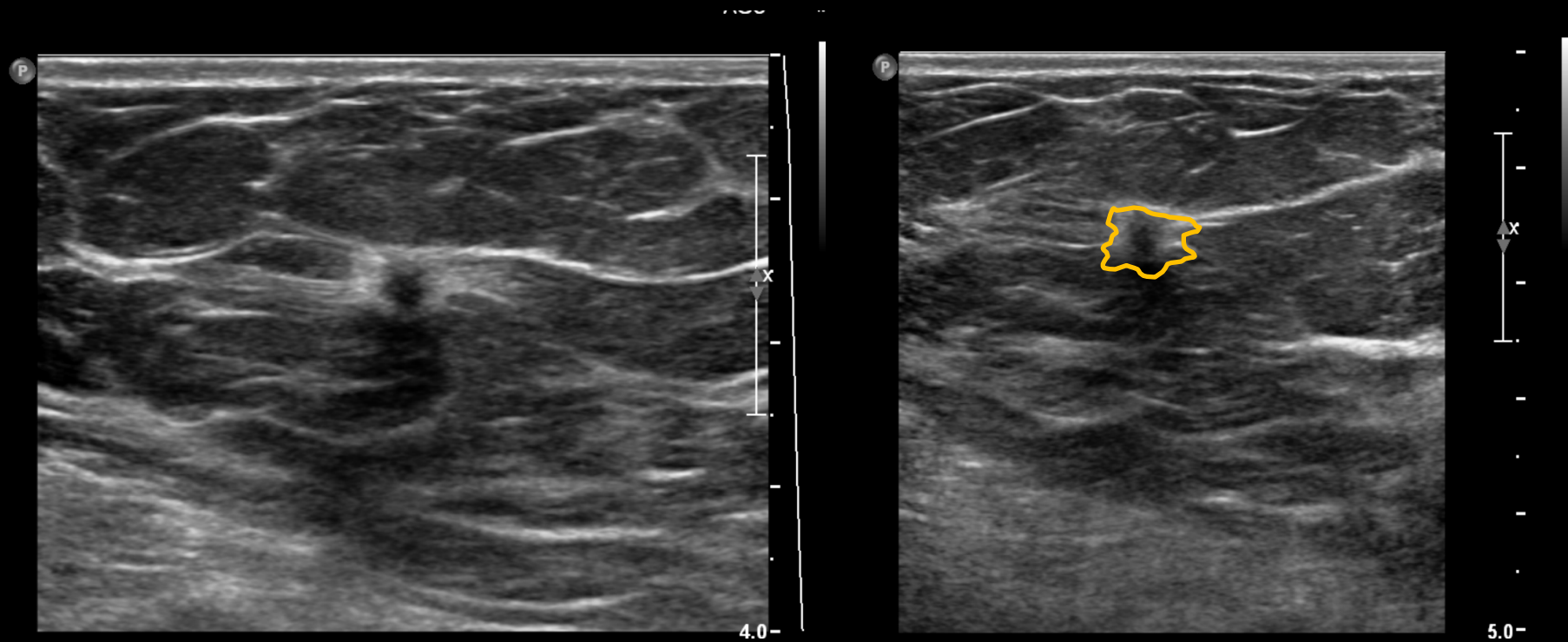
Echogenic Rind



Right Breast A Rad 2:00 3 CM/FN

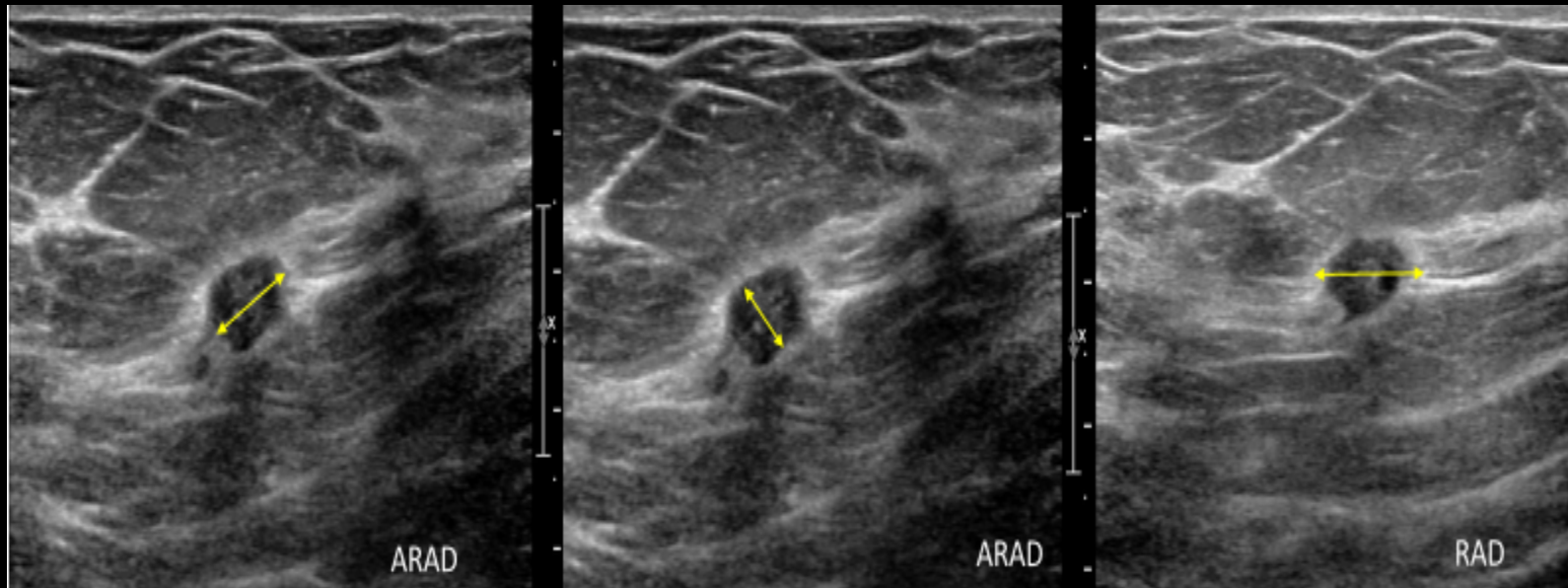
Pseudocapsule

# Echogenic Rind



\*Echogenic rind is more variable in thickness

# Echogenic Rind



## ACR BI-RADS

Inclusion of the echogenic rind in mass measurement is more predictive of the size at pathologic evaluation.

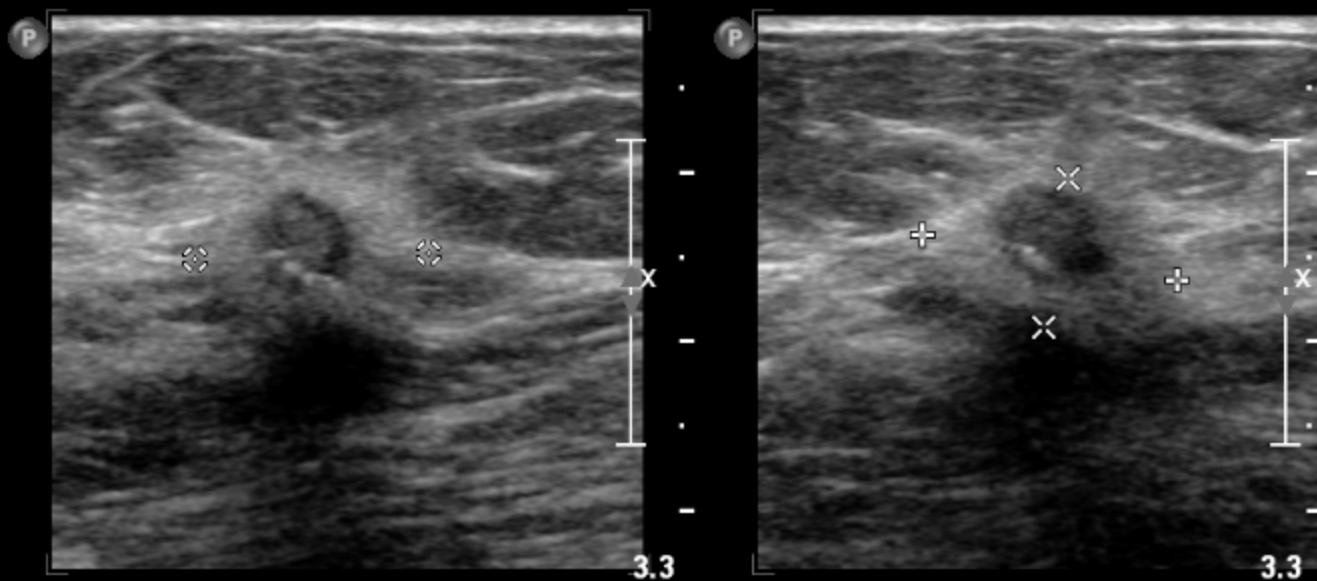
\*Joekel J, et al. Breast Cancer Res Treat 2016; 156:311-317

\*Meier-Meitlinger M, et al. Eur Radiol 2011; 21:1180-1187

# Echogenic rind inclusion in the measurement of the tumor size

- 196 preoperative ultrasounds of patients with invasive cancers were evaluated.
- Measurements of tumor size with and without echogenic halo and mammographic size were compared to the pathology.
- The us measurement with the echogenic halo was closest to the pathological measurement. *The match was highest for tumors < 2cm.*

# Echogenic Rind correlation

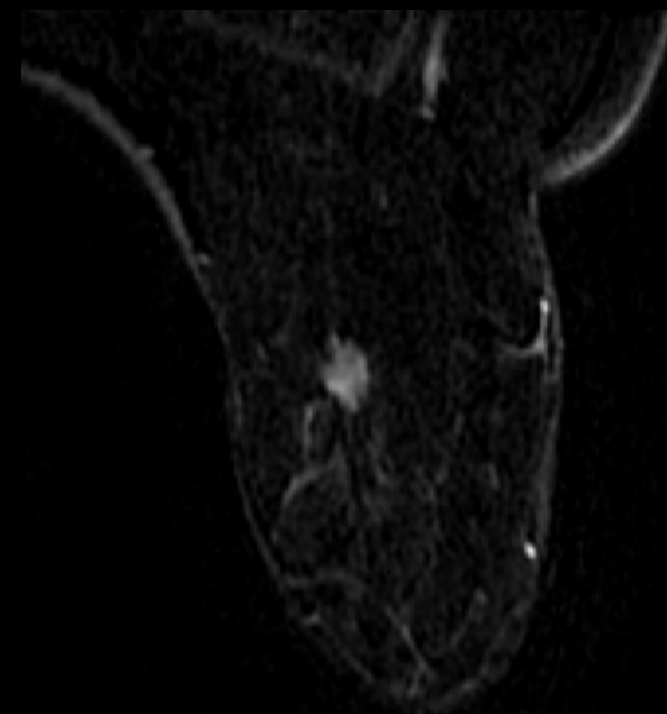


1.53 cm  
0.888 cm  
MPLETE #2  
1.38 cm

6CM FN

A RAD

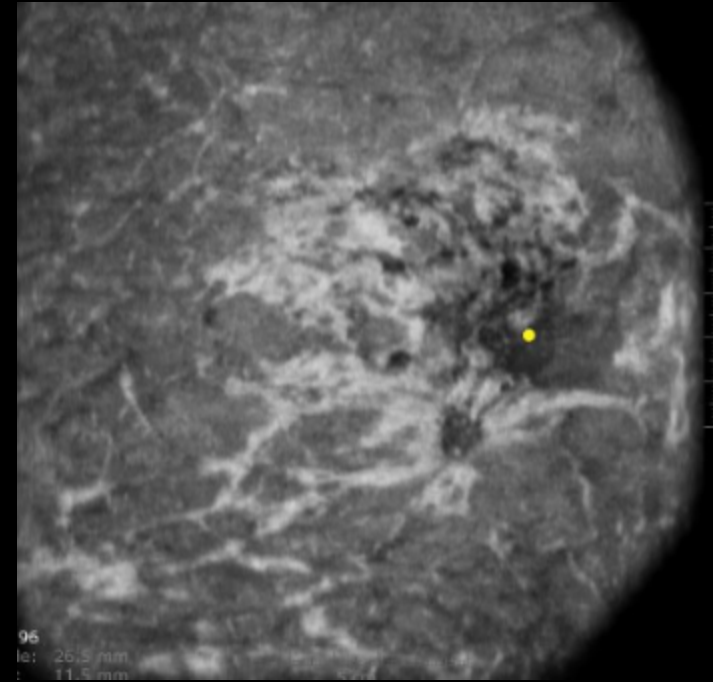
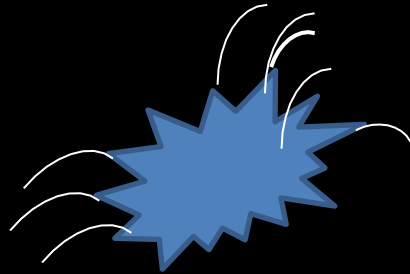
Right Breast Rad. 1.00



T1 axial post Gad

# Update breast ultrasound

- Retraction phenomenon



Due to the desmoplastic reaction of breast malignancy with disruption of the normal tissue planes

# Retraction Phenomenon

- Reconstructed coronal planes can provide a unique descriptor that is not detected on conventional US
- High specificity for malignancy with a range of 98-100% in published literature

(Chen, 2013); (Wang, 2012); (Zheng, 2015)

\* Chen et al. Comparative study of automated breast 3-D ultrasound and handheld B-mode ultrasound for differentiation of benign and malignant breast masses, *Ultrasound Med. Biol.* 39 (10)(2013) 1735-1742

\* Wang et al. Comparison of automated breast volume scanning to hand-held ultrasound and mammography. *Radiol. Med.* 117 (8) (2012) 1287-1293.

\*F.-Y. Zheng et al. Comparison of retraction phenomenon and BI-RADS-US descriptors in differentiating benign and malignant breast masses using an automated breast volume scanner, *European Journal of Radiology* 84 (2015) 2123–2129



# Update breast ultrasound

- **Non-mass lesion**

- Introduction of this descriptor which correlates with other modalities such as MRI and CEM
- Discrete finding that is unique from the adjacent normal tissue, seen in orthogonal views but lacks discrete margination of a mass and cannot be assigned a specific shape.

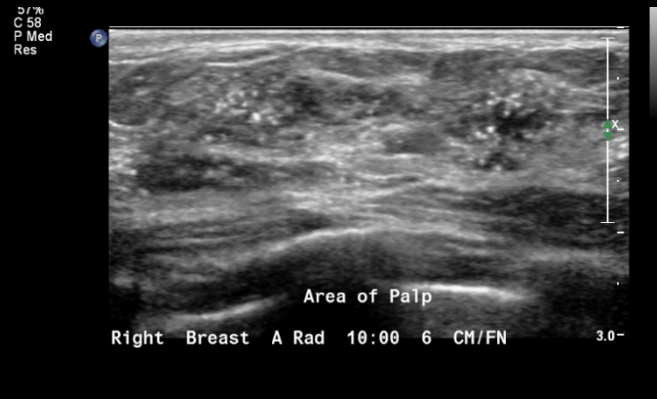
# Non-mass Lesion

- Lacks a definitive shape
- Often a subtle finding and may appear different in two different planes
- Finding can appear segmental or linear in appearance.
- Non-mass lesion may demonstrate associated architectural distortion

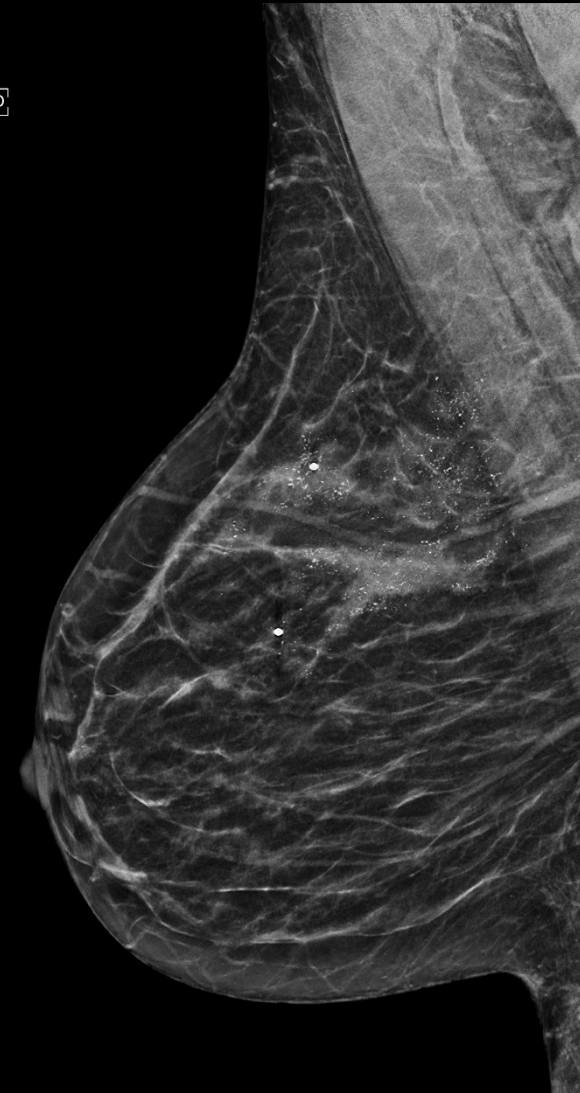
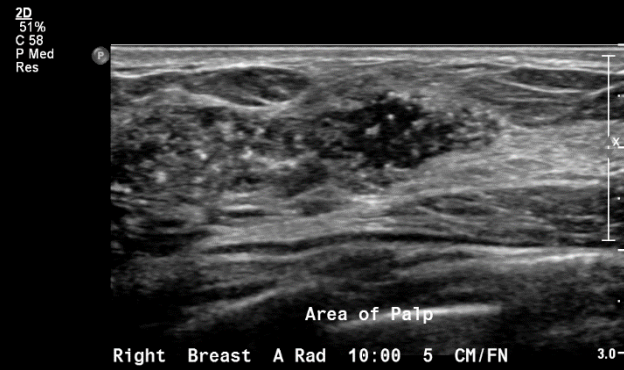


Non-mass lesion is a unique finding and should not be confused with heterogenous breast tissue – must correlate with other imaging.

# Non-mass Lesion



C-View



Importance of Imaging Correlation

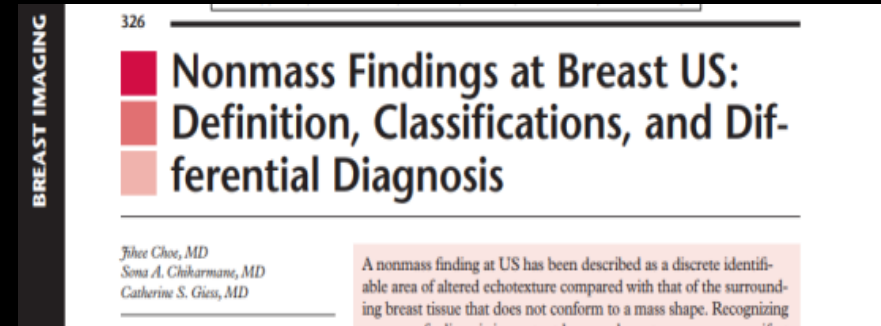
# Non-mass Lesion

- Distribution
  - Regional, focal, linear, segmental
- Echo pattern
  - Hyperechoic, heterogenous, hypoechoic
- Posterior Features
  - No posterior features, enhancement, shadowing
- Shape/Margin
  - Not applicable as shape/margin not characterizable

# Non-mass lesion ultrasound

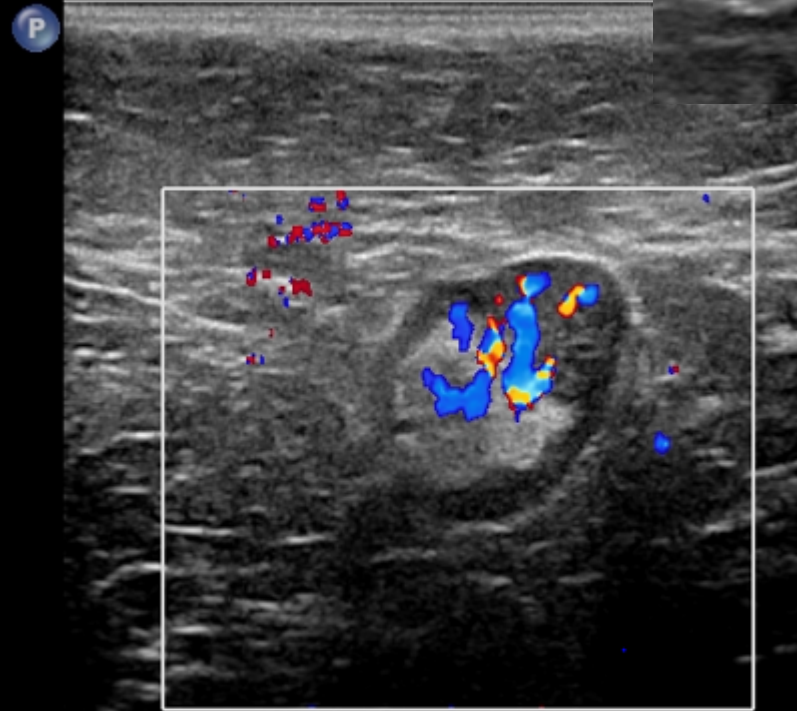


- A non-mass finding has been described with benign and malignant lesions.
- Nonmass findings are benign in 46%–90% of cases, with malignancy rates reported in the literature ranging from 10% to 54%.



# Lymph Nodes

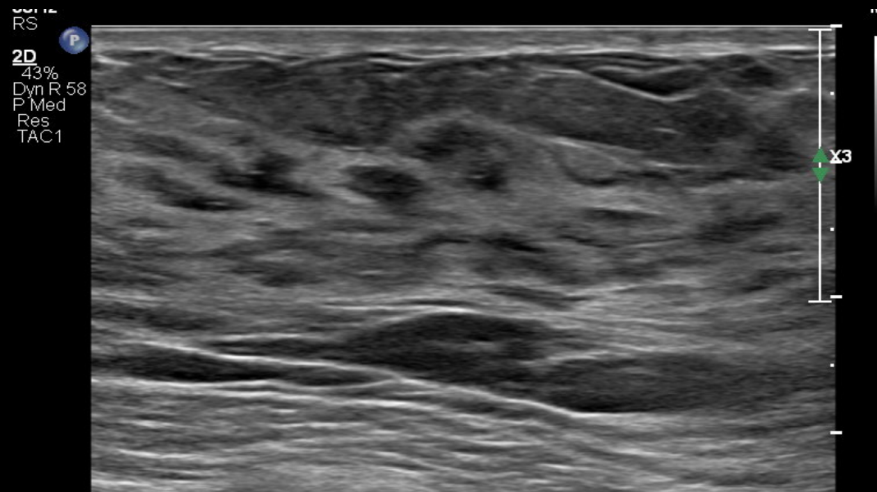
- Expanded section of lymph node location
- Location
  - Intramammary node
  - Axillary node (levels I,II,III)
  - Internal mammary node
  - Supraclavicular node
- Morphology
  - Cortical-hilar relationship



Axillary node with compressed hilum

# Glandular Tissue Component

- In mammography, density comprises fibrous tissue and glandular tissue. Ultrasound can distinguish glandular tissue from fibrous tissue.
- The sonographic echopattern of the breast depends on the distinct composition of the breast elements within the fibroglandular zone





# Glandular Tissue Component

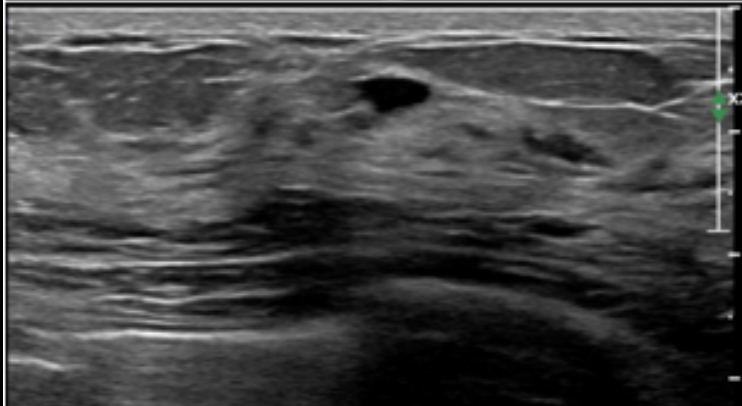
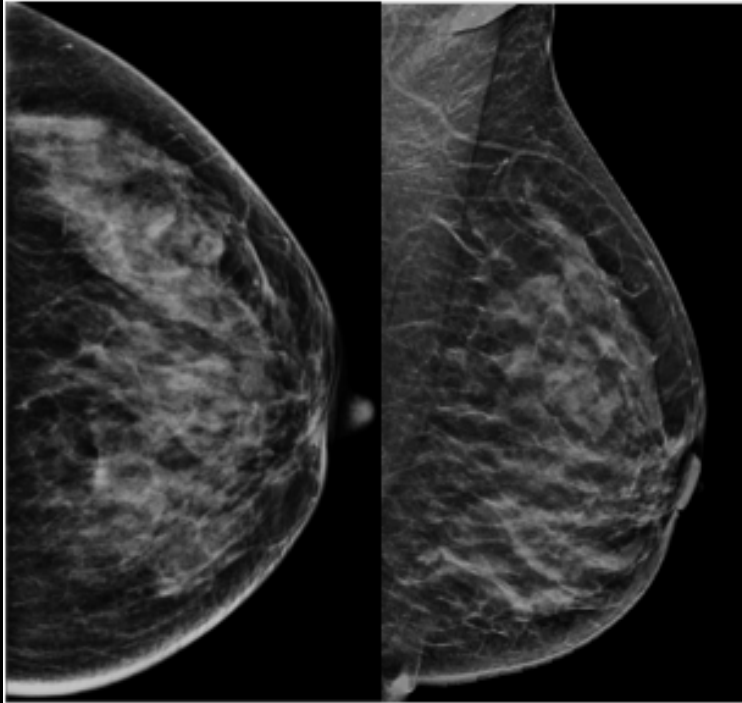
- In mammography, density comprises fibrous tissue and glandular tissue. Ultrasound can distinguish glandular tissue from fibrous tissue.
- The sonographic echopattern of the breast depends on the distinct composition of the breast elements within the fibroglandular zone



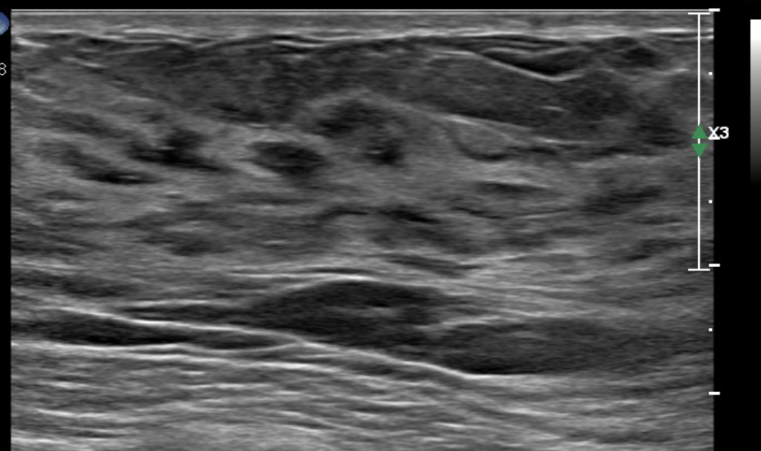
# Glandular tissue component

- Introduction of “glandular tissue component” on ultrasound.
- comparable to breast MRI BPE where glandular tissue component is stratified by amount of glandular tissue
  - a) minimal b) mild c) moderate and d) marked.
- In mammography, density comprises fibrous tissue and glandular tissue. Ultrasound can distinguish glandular tissue from fibrous tissue.

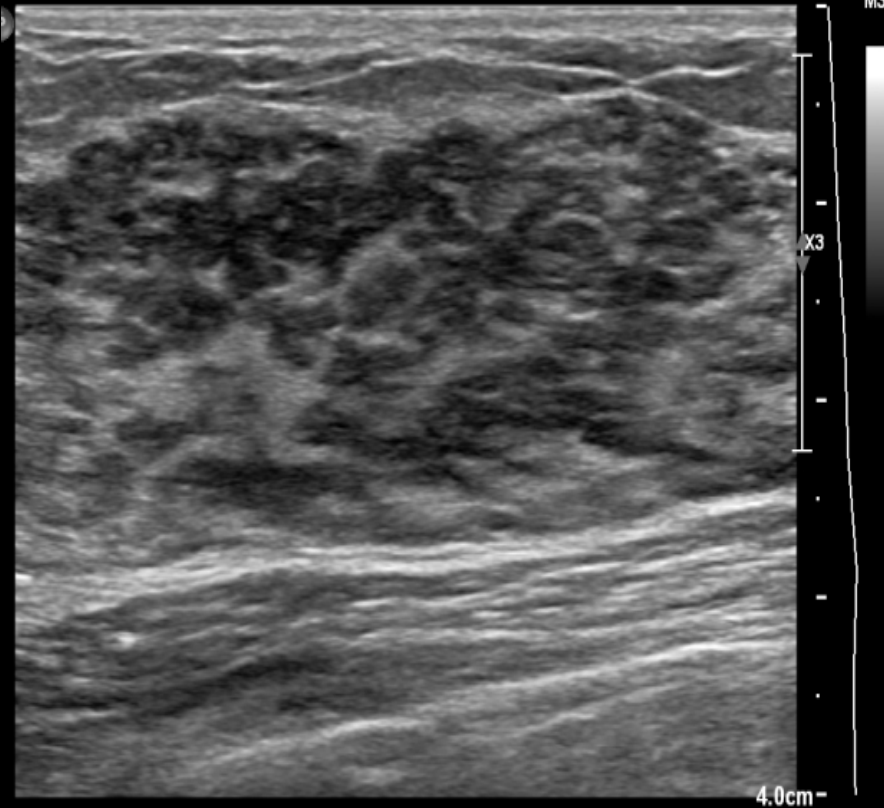
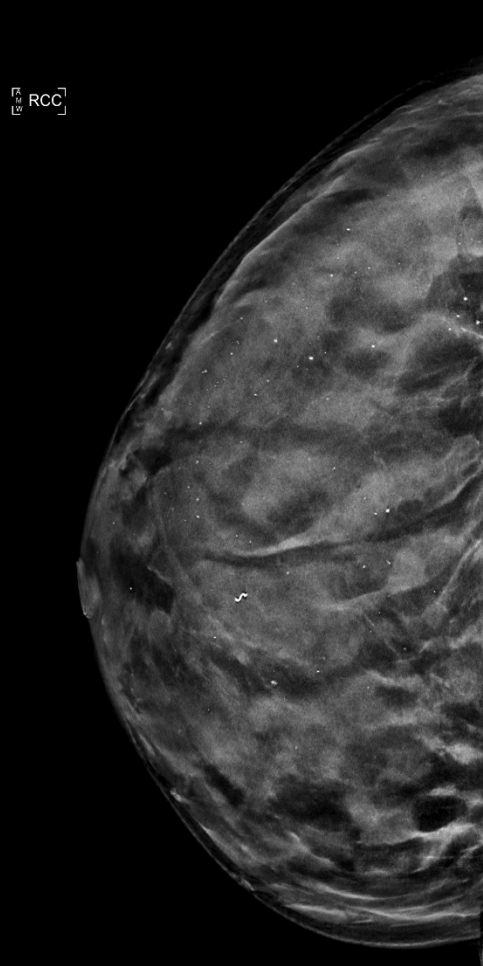
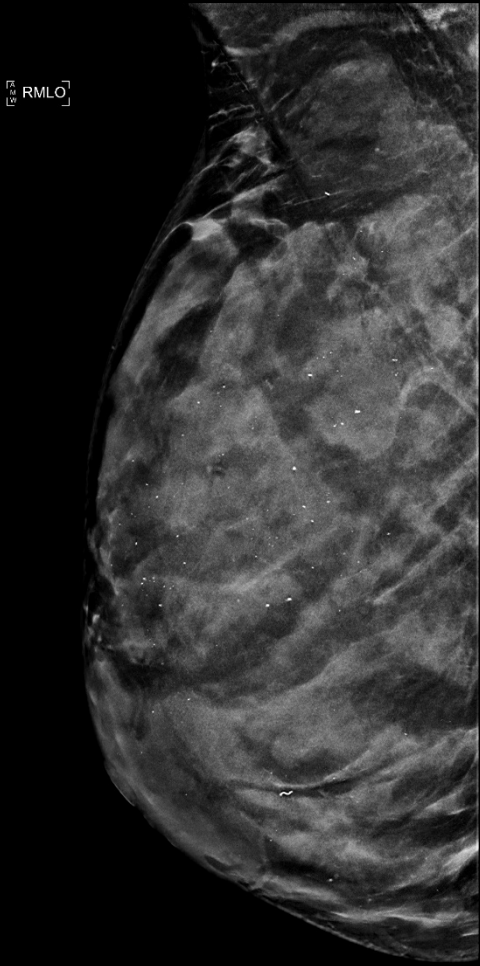
# Glandular Tissue Component



RS  
2D  
43%  
Dyn R 58  
P Med  
Res  
TAC1



Mild GTC

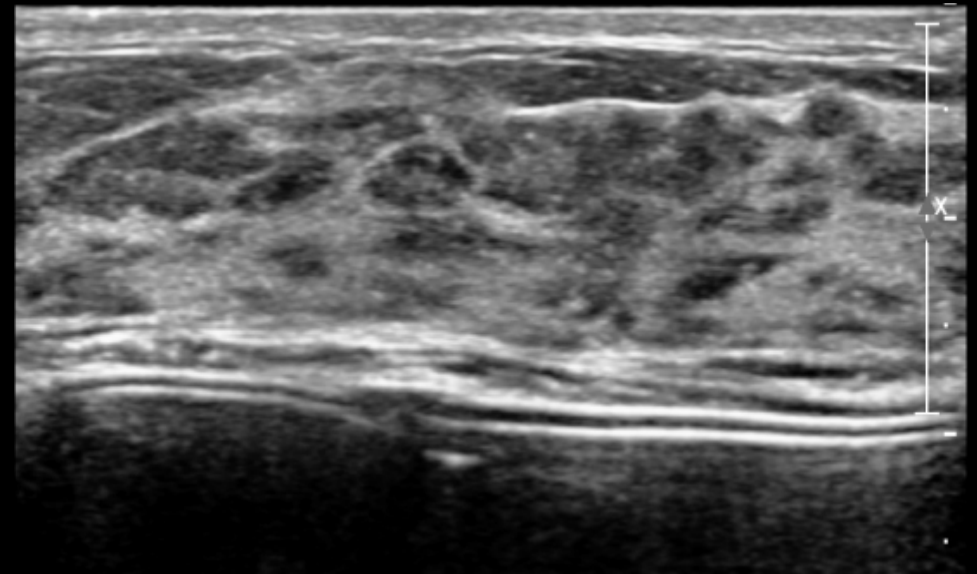


Right Breast A Rad 12:00 |

Glandular Tissue Component: Marked.

# Glandular Tissue Component (GTC)

- 14,767 screening breast ultrasound performed in 8,483 women were stratified based on qualitative percent of tdlus
- The ductal lobular units within the mammary zone was correlated with cancer development over an 8 year period.
- Moderate or Marked GTC had a higher risk of breast cancer compared to minimal amount of GTC



# In Summary:

- Mass Shape: **Lobular**
- Associated Features:
  - **Echogenic Rind**
  - **Retraction Phenomenon** (coronal view only)
- Non-mass Lesion
  - **Distribution**: Regional, focal, linear, segmental
  - **Echo pattern**: Hyperechoic, heterogenous, hypoechoic
  - **Posterior Features**: No posterior features, enhancement, shadowing
- Expanded section of lymph node location
- Glandular Tissue Component
  - a) **minimal** b) **mild** c) **moderate** and d) **marked**.

- Thank You!