Update in BIRADS - ULTRASOUND

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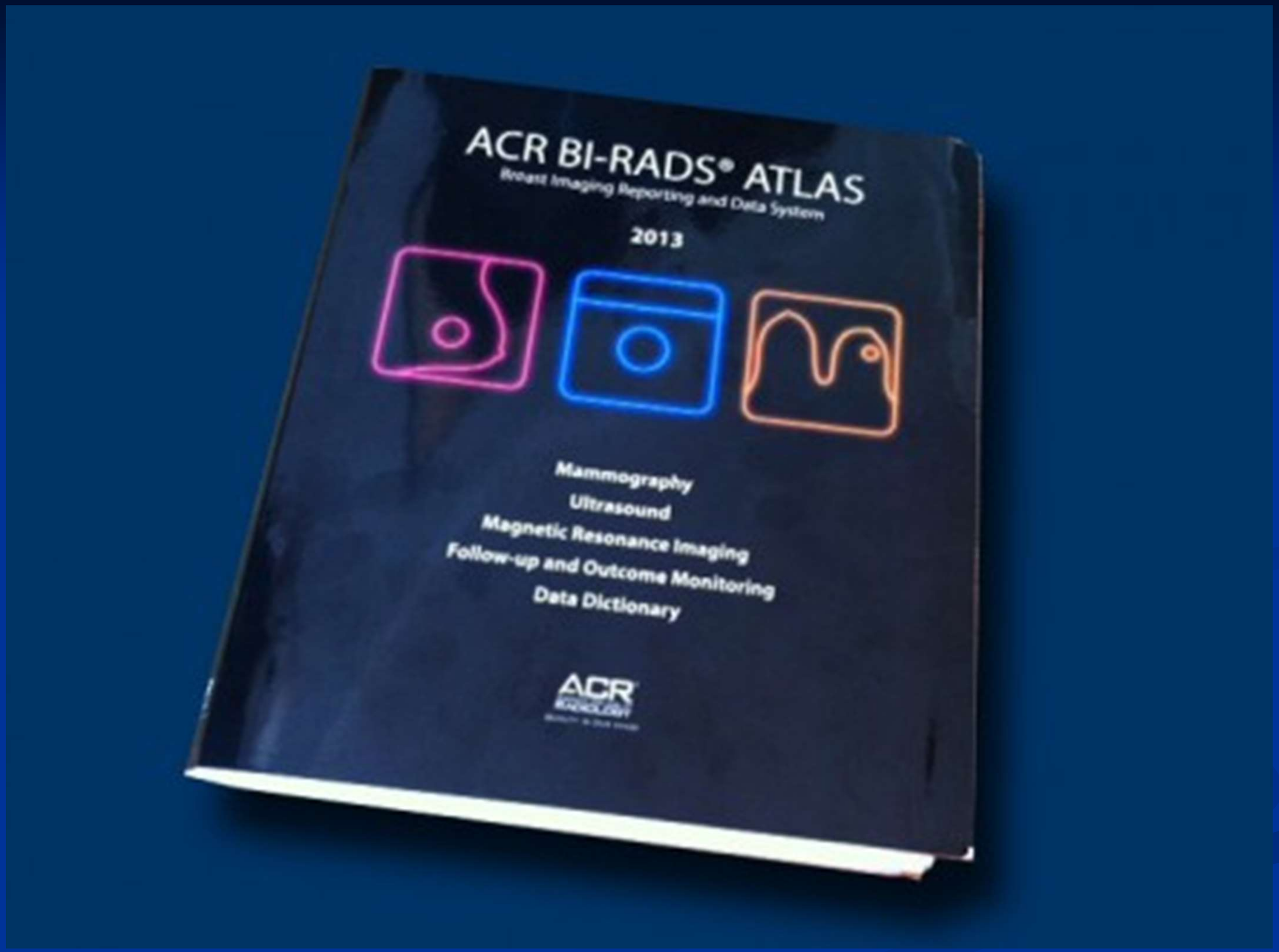

ACR BI-RADS® ATLAS
Breast Imaging Reporting and Data System
2013
Mammography
Ultrasound
Magnetic Resonance Imaging
Follow-up and Outcome Monitoring
Data Dictionary
ACR
RADIOLOGY

Ultrasound - Breast

Imaging Lexicon

Ultrasound Lexicon		
Breast composition	a. homogeneous - fat b. homogeneous - fibroglandular c. heterogeneous	
Mass	**shape**	oval - round - irregular
	margin	Circumscribed **or** Not-circumscribed: indistinct, angular, microlobulated, spiculated
	orientation	parallel - not parallel
	echo pattern	anechoic - hyperechoic - complex cystic/solid hypoechoic - isoechoic - heterogeneous
	posterior features	no features - enhancement - shadowing - combined pattern
Calcifications	in mass - outside mass - intraductal	
Associated features	architectural distortion - duct changes - skin thickening - skin retraction - edema - vascularity (absent, internal, rim) - elasticity	
Special cases *(cases with a unique diagnosis)*	simple cyst - clustered microcysts - complicated cyst - mass in or on skin - foreign body (including implants) - intramammary lymph node - AVM - Mondor disease - postsurgical fluid collection - fat necrosis	

Masses

- **ACR BIRADS Definition** :Three-dimensional and occupying space; should be seen in 2 different planes.

MASSES

- ***Shape*** ***(oval , round , irregular).***
- ***Margin*** ***(Circumscribed, Not Circumscribed)***
- ***Orientation (Parallel "wider-than-tall" ,Not parallel).***
- ***Echopattern*** ***(Anechoic, Hyperechoic, Complex Cystic and Solid, Hypoechoic, Isoechoic, Heterogeneous).***
- ***Posterior features*** ***(No Posterior Features, Enhancement, Shadowing, Combined Pattern).***

1.Shape

Fibroadenoma

Lactating adenoma or lobular hyperplasia of pregnancy

Intraductal papilloma

Complex sclerosing lesion

Invasive ductal CA

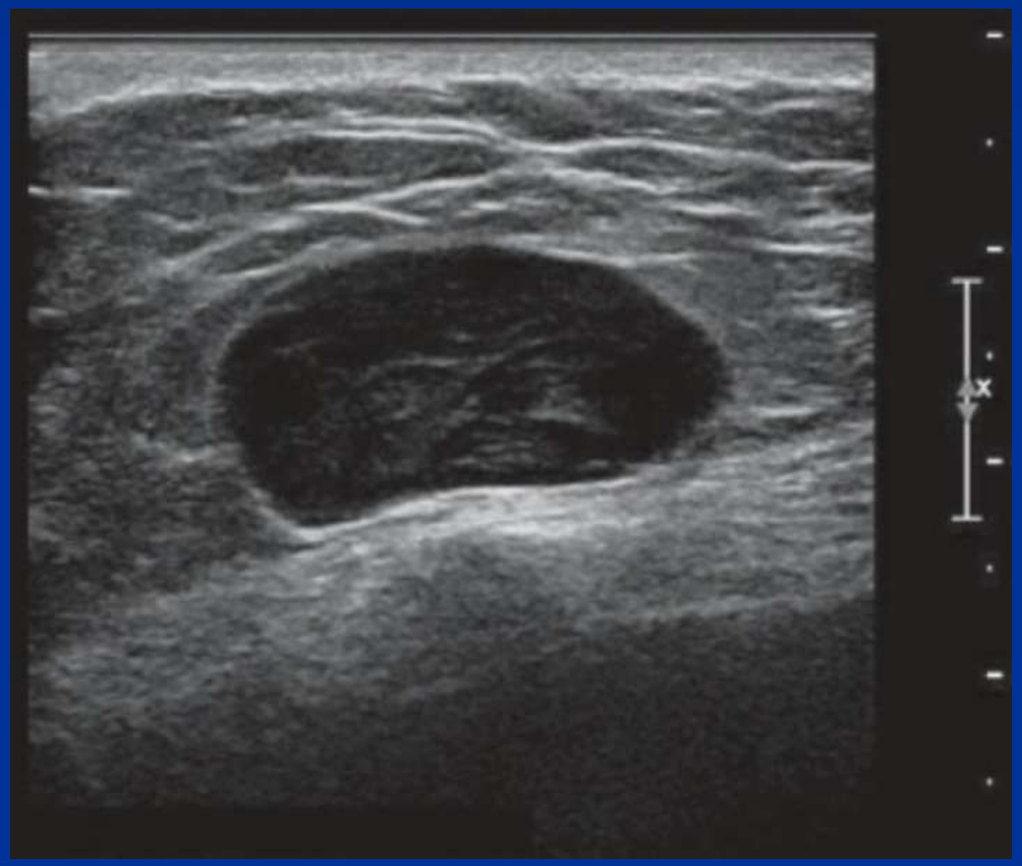
Diabetic mastopathy

Invasive ductal CA

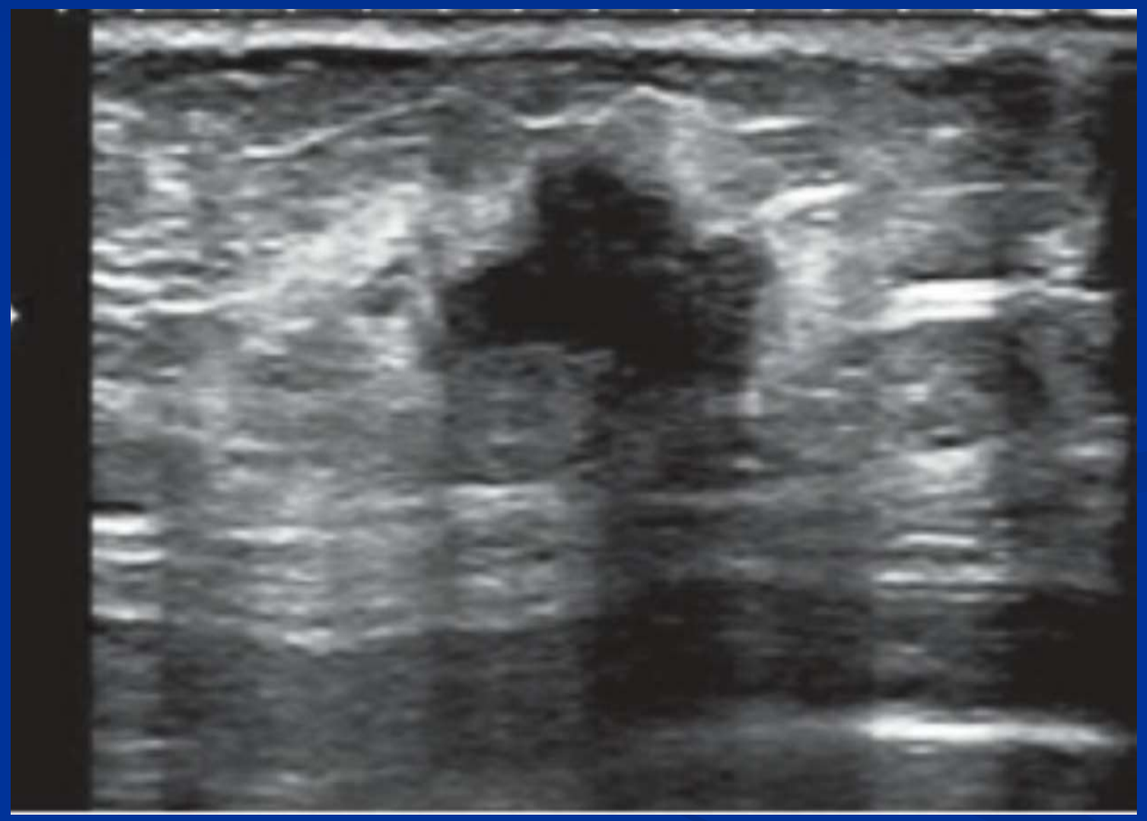
Invasive ductal CA

2.Margin

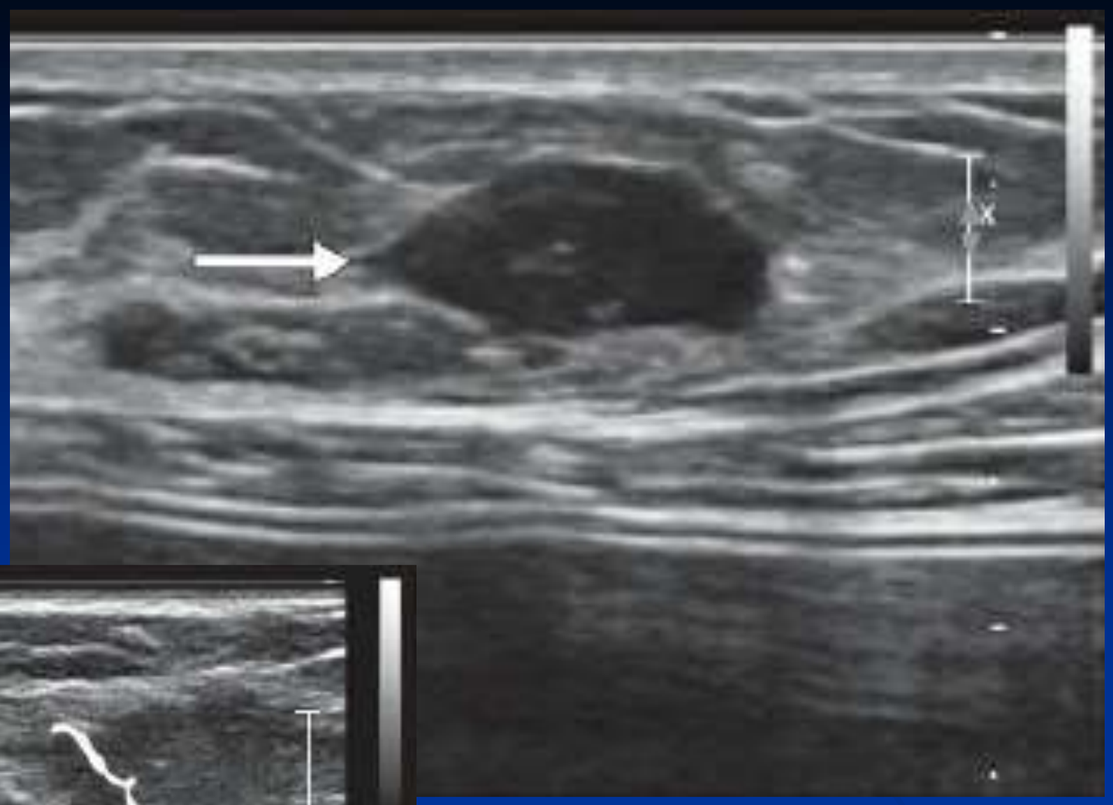
Circumscribed



Non Circumscribed



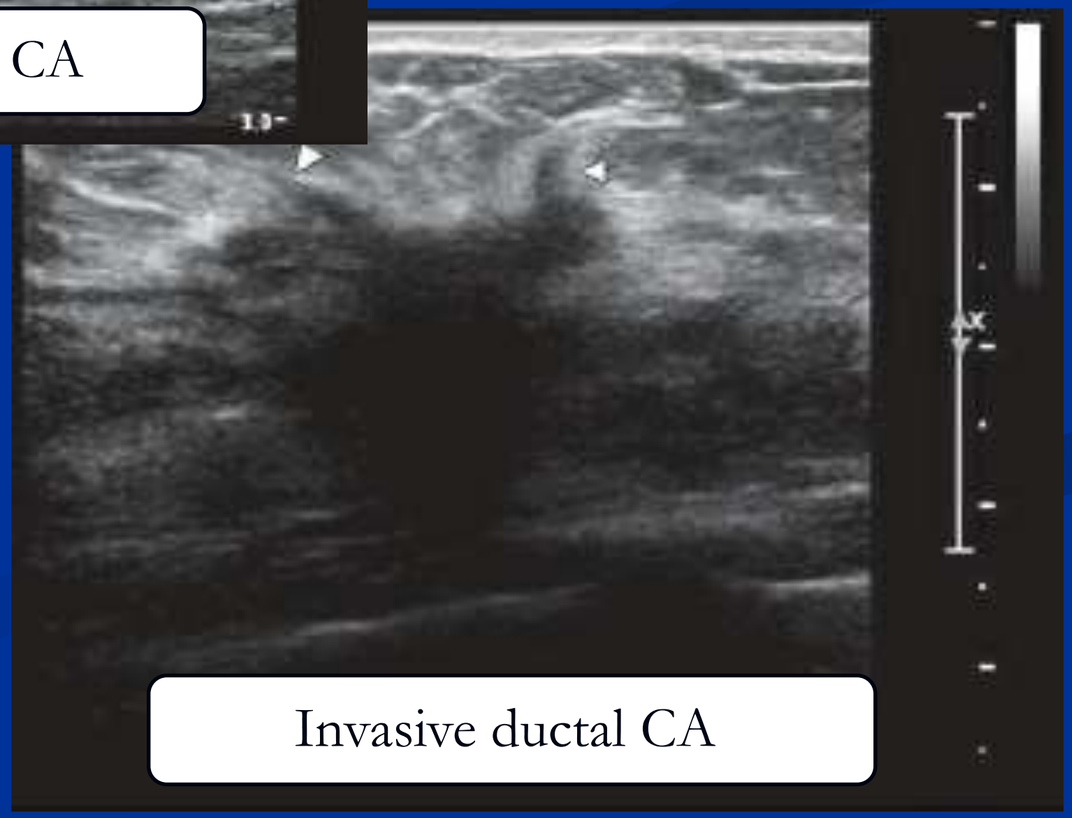
Invasive ductal CA



Invasive ductal CA

Invasive lobular CA

Invasive ductal CA



Invasive ductal CA

3.Orientation

Parallel

BIRADS 4
Histopathology :nodular sclerosing adenosis

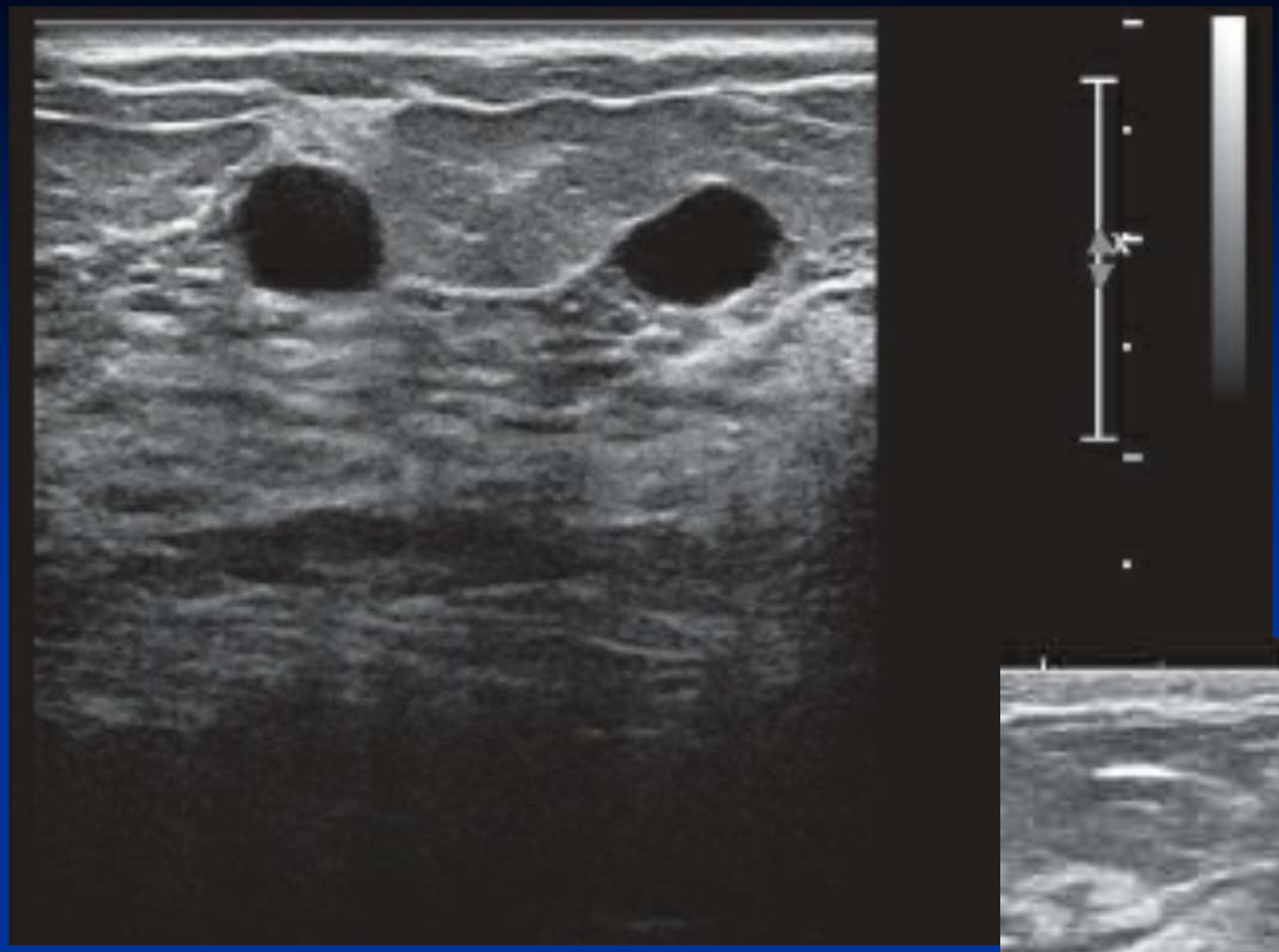
Non parallel

Invasive ductal CA

4.Echo pattern

- **Compared with mammary fat.**

(Anechoic, Hyperechoic, Complex Cystic and Solid, Hypoechoic, Isoechoic, Heterogeneous)



Anechoic

BIRADS 2 (simple cysts)

Hypoechoic

Fibroadenoma

BIRADS 4B

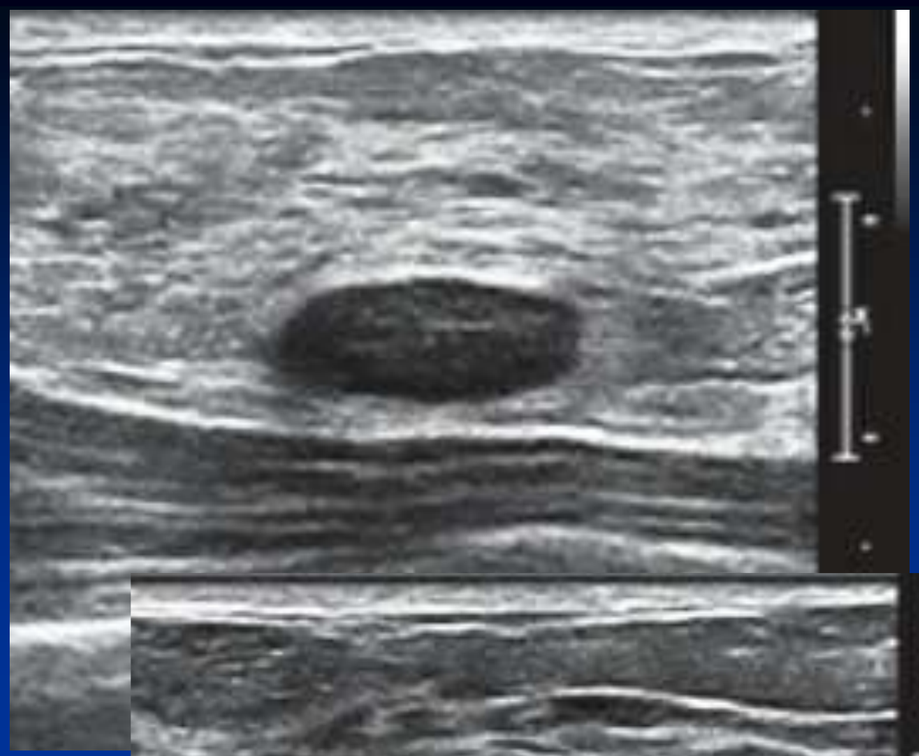
DX:intracystic papillary CA

Complex fibroadenoma

BIRADS II :Lipoma

5.Posterior Features

(No Posterior Features, enhancement , shadowing, Combined pattered)




LW
Lt Bret 3:00 8cm Rad

Combined pattered

Invasive ductal CA

Fibroepithelial lesion

ASSOCIATED FEATURES

1. ARCHITECTURAL *DISTORTION*

(compression of the tissue around the mass, obliteration of the tissue planes by an infiltrating lesion, straightening or thickening of Cooper ligaments, and an echogenic rim.

2.DUCT CHANGES.

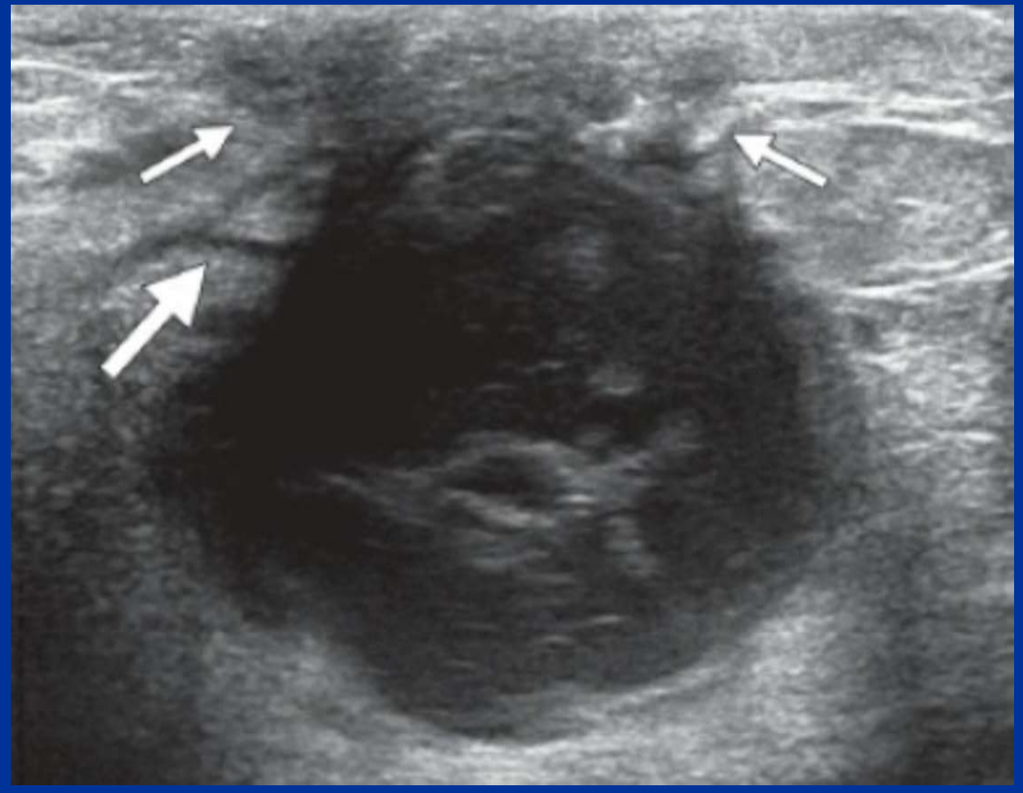
3.SKIN CHANGES(Skin Thickening, Skin Retraction)

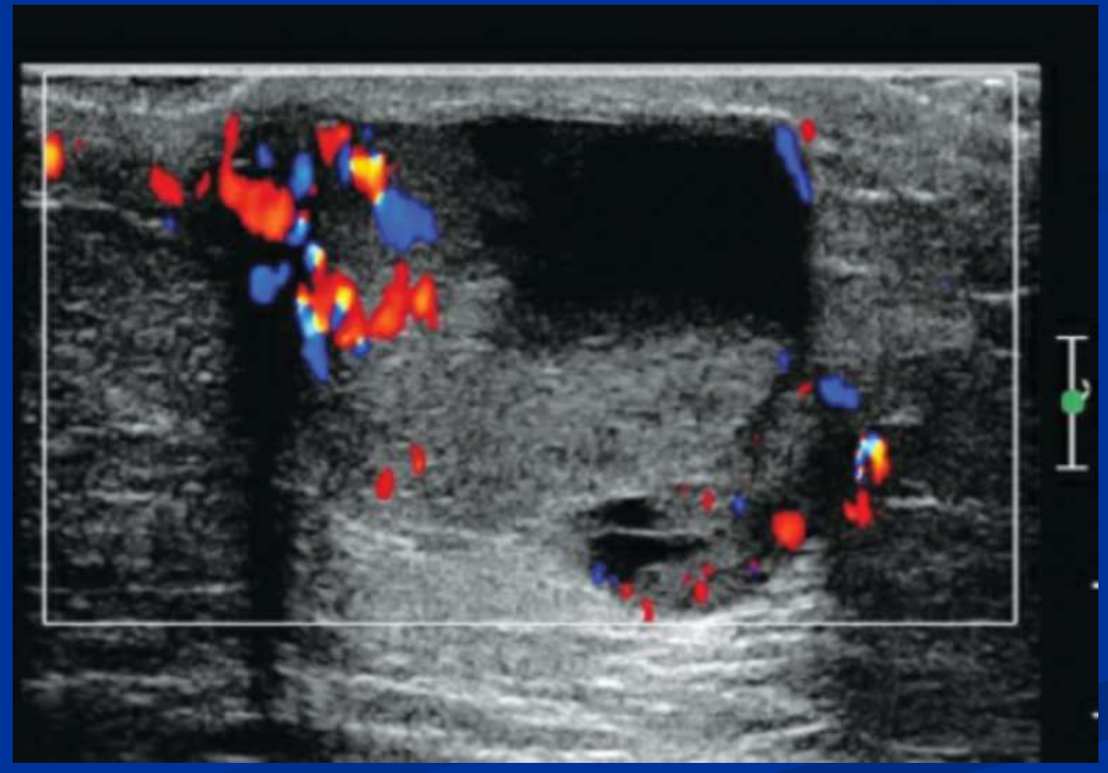
4.EDEMA.

5.VASCULARITY(Absent, Internal Vascularity ,Vessels in Rim)

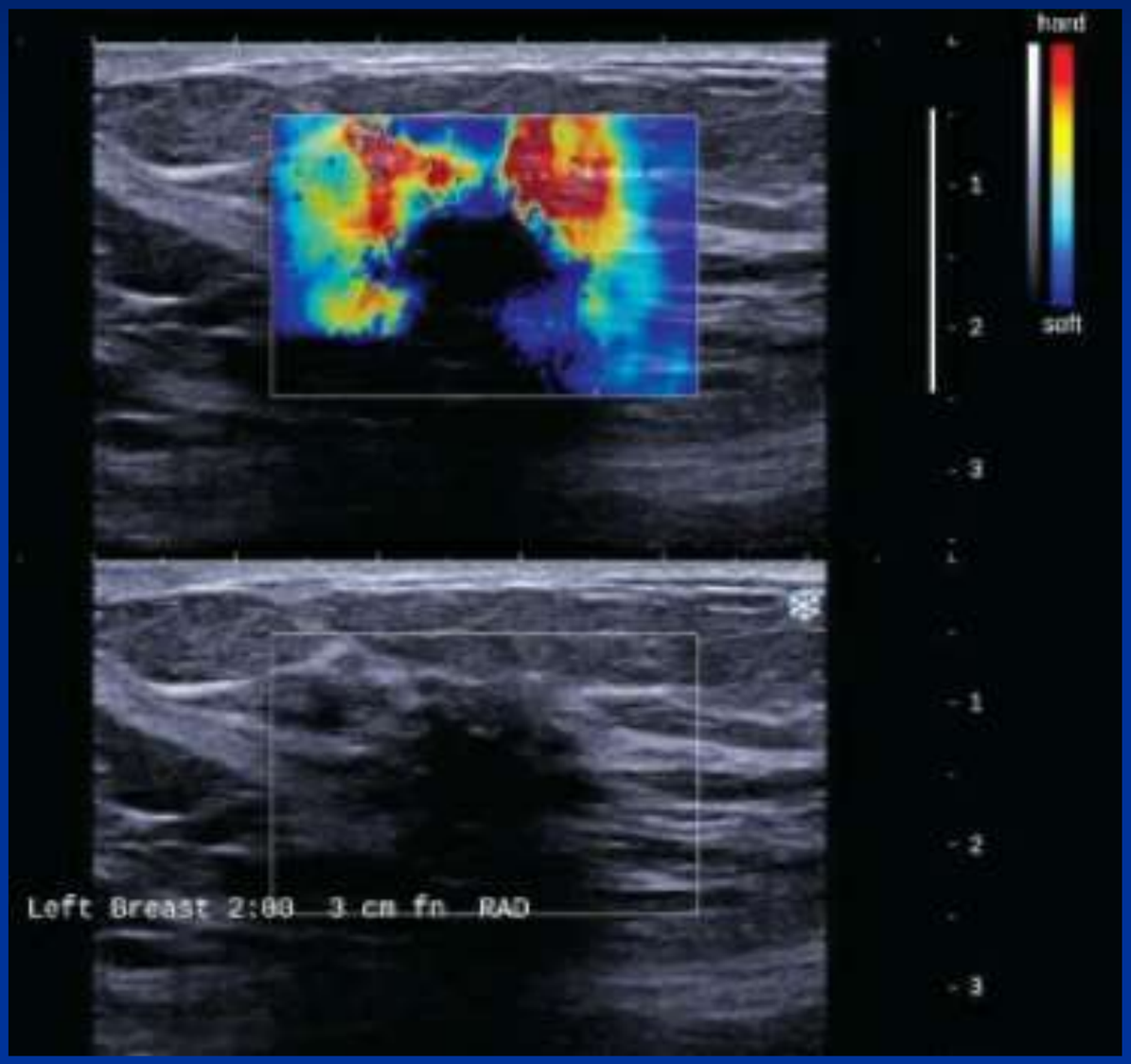
6.ELASTICITY ASSESSMENT (Soft, Intermediate ,Hard)

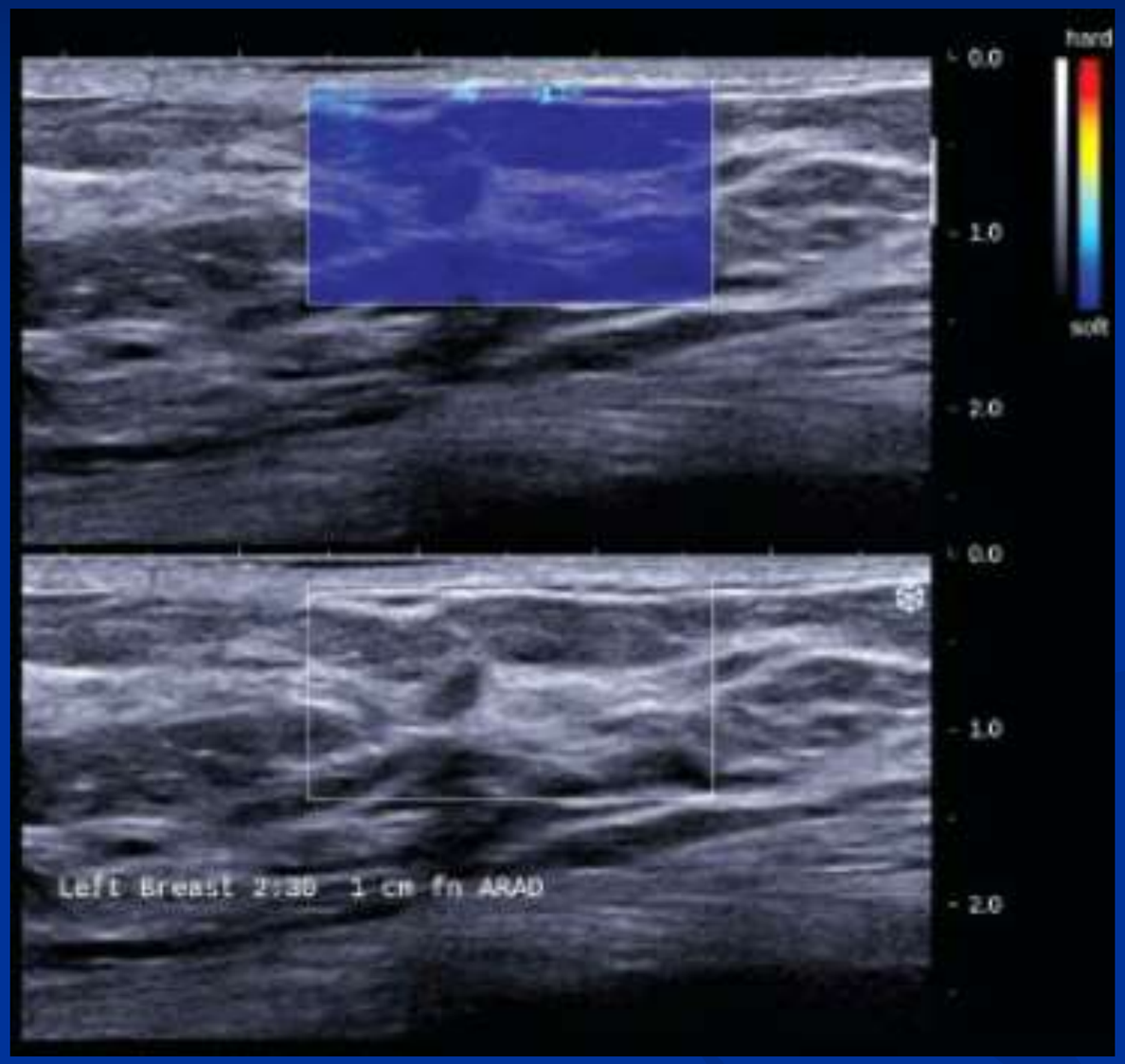
Intraductal papilloma





Abscess

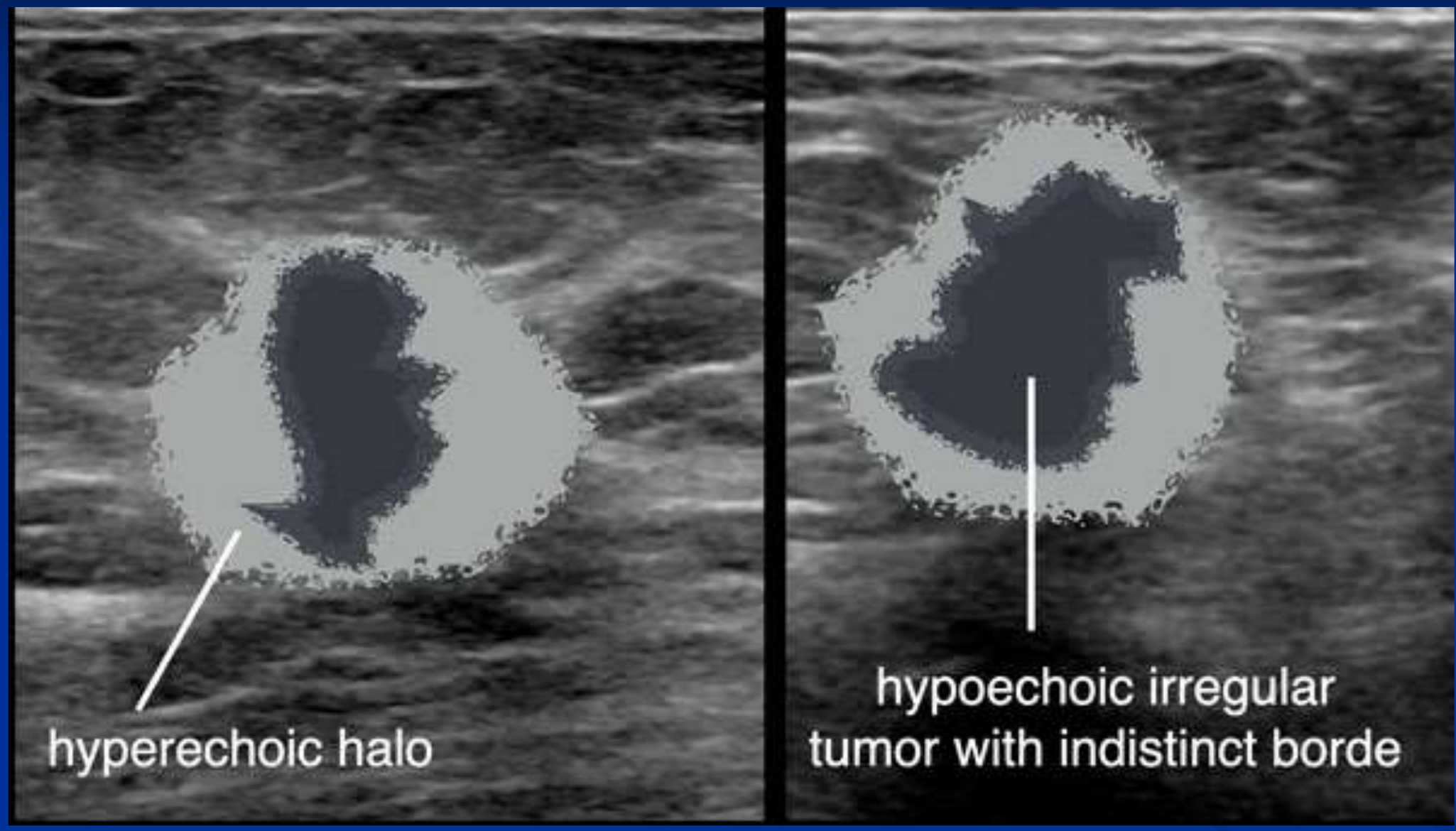

hard
soft
1
2
3
1
2
3
Left Breast 2:00 3 cm fn RAD


hard
soft
0.0
1.0
2.0
1.0
2.0
Left Breast 2:30 1 cm fn ARAD

New Associated Feature

- **Echogenic Rind**
  - Thick band of echogenic tissue surrounding all or part of a breast mass.
  - Disrupts texture of normal tissue surrounding the mass.
  - Likely represents desmoplastic reaction or peritumoral edema.

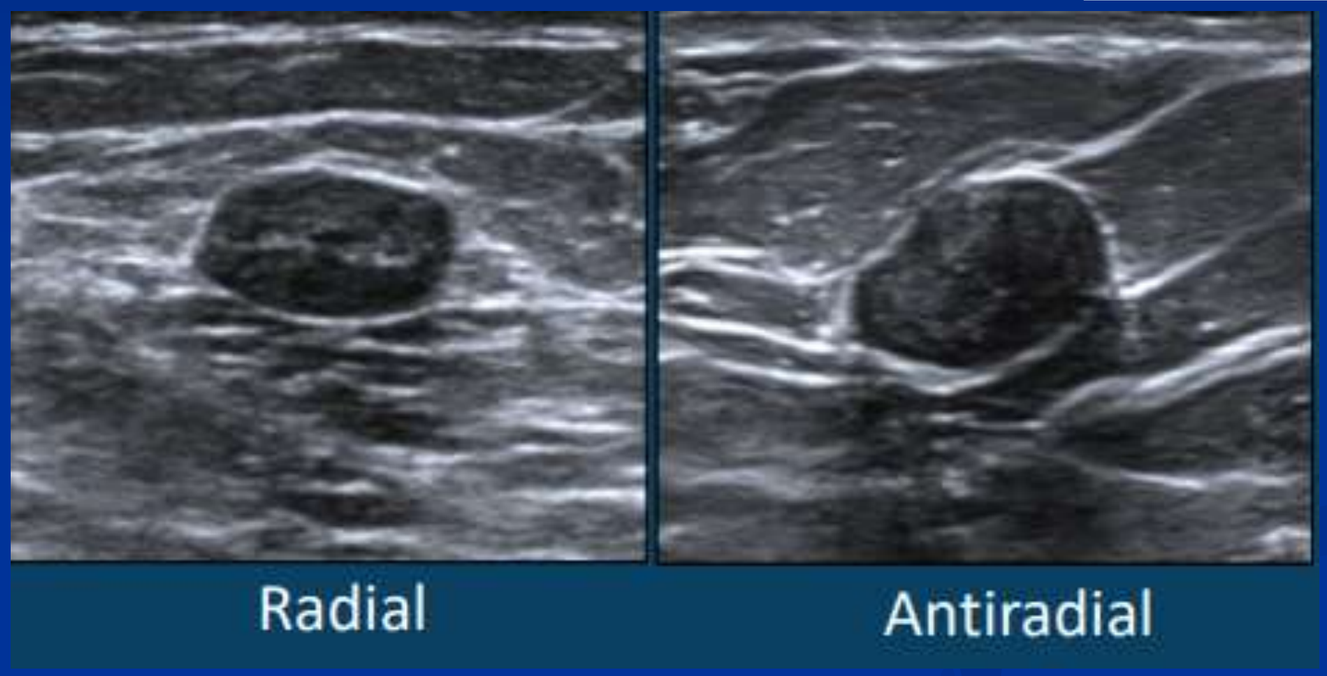
Echogenic rind



Echogenic rind :

- Distinct from echogenic pseudocapsule

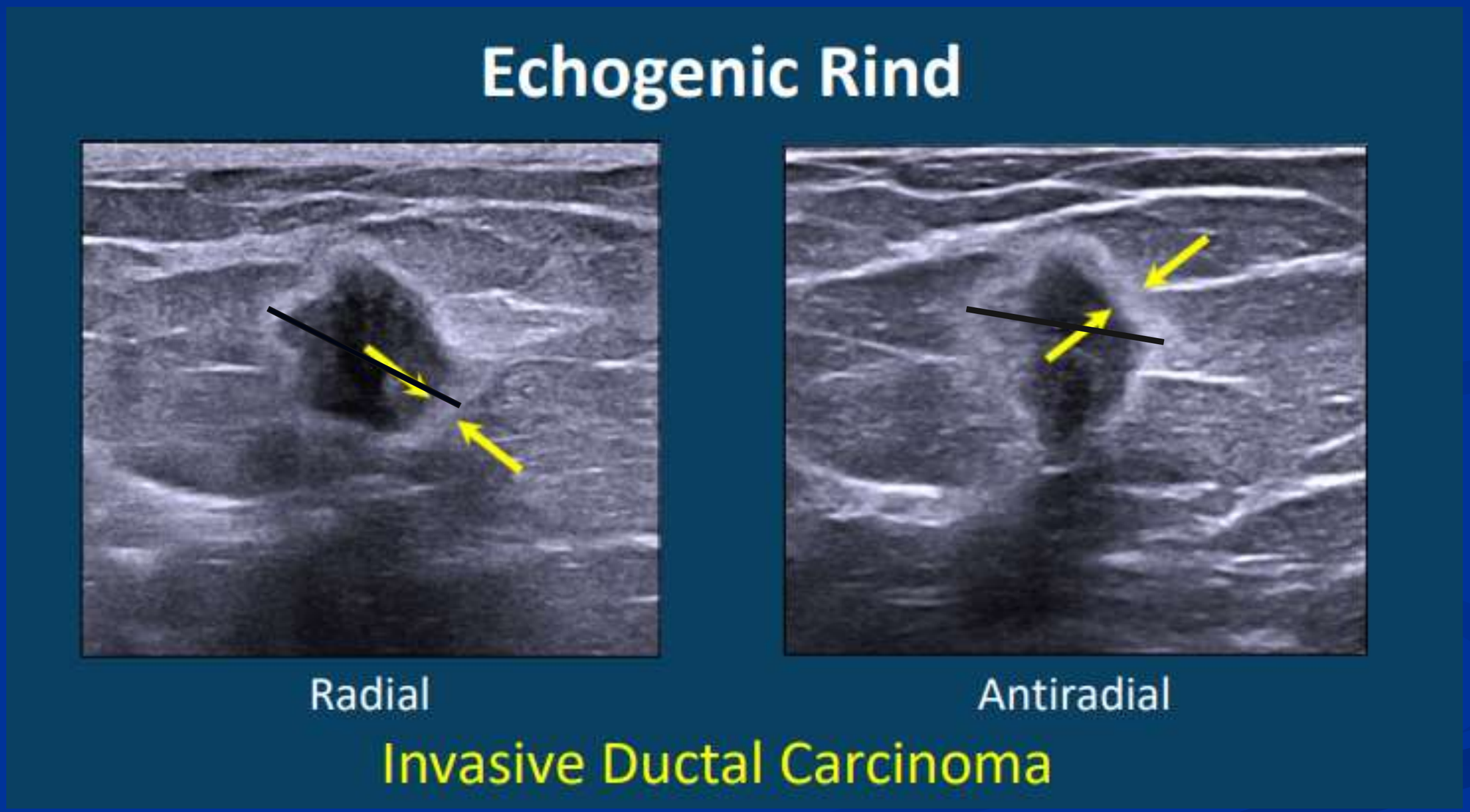
Uniformly thin, and surrounding an oval mass



- Less sharply demarcated , thicker , more variable in thickness, associated with a mass of any shape

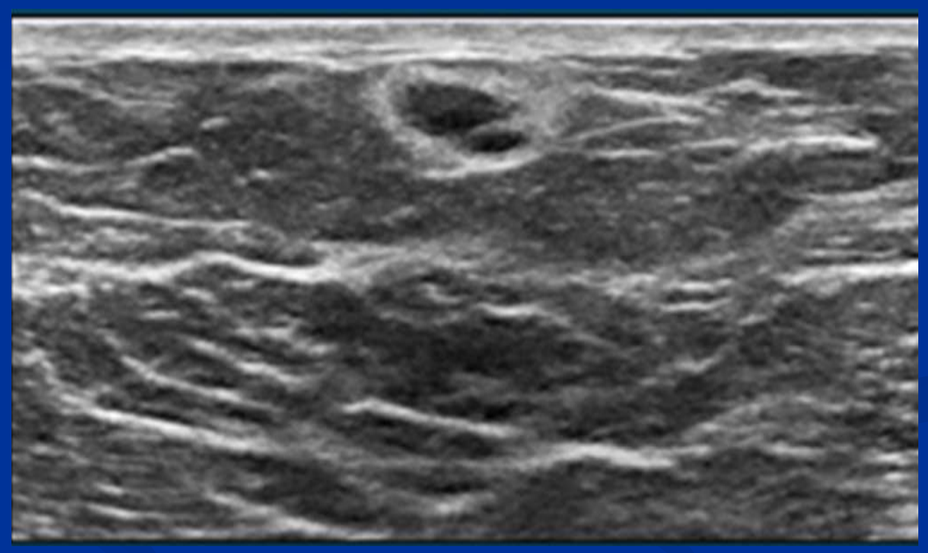
The echogenic rind should be included in the measurement of the tumor (best correlation with histology).

- Inclusion of echogenic rind in measurement of mass



- Echogenic Rind has High PPV for malignancy ⟶ biopsy unless proven benign

- Notable exception: fat necrosis



Update in Ultrasound

- **Non mass**
  - Discrete finding distinctly different from normal tissue; lacks the margination of a mass and cannot be assigned a specific shape

Nonmass

- **Echogenicity**
  - Hypoechoic, isoechoic, hyperechoic, mixed echogenicity
- Shape/Margin
  - Not applicable
- **Distribution**
- Regional, focal, linear, segmental
- **• • Orientation (?)**
  - Parallel, antiparallel

Invasive ductal and lobular CA

- **Associated imaging variables**
  - Echogenic rind, architectural distortion, posterior shadowing, hypervascularity, ductal extension or abnormal ductal changes, calcifications = suggest malignant
  - Presence of small cysts = suggests benign

- **Associated clinical variables**
  - Probability of malignancy increases in setting of nipple discharge or palpability

Importance of imaging correlation (multimodality)

- High probability of malignancy in presence of imaging correlate at other modalities
  - Architectural distortion or asymmetry at mammography
  - Abnormal enhancement at contrast-enhanced mammography or MRI

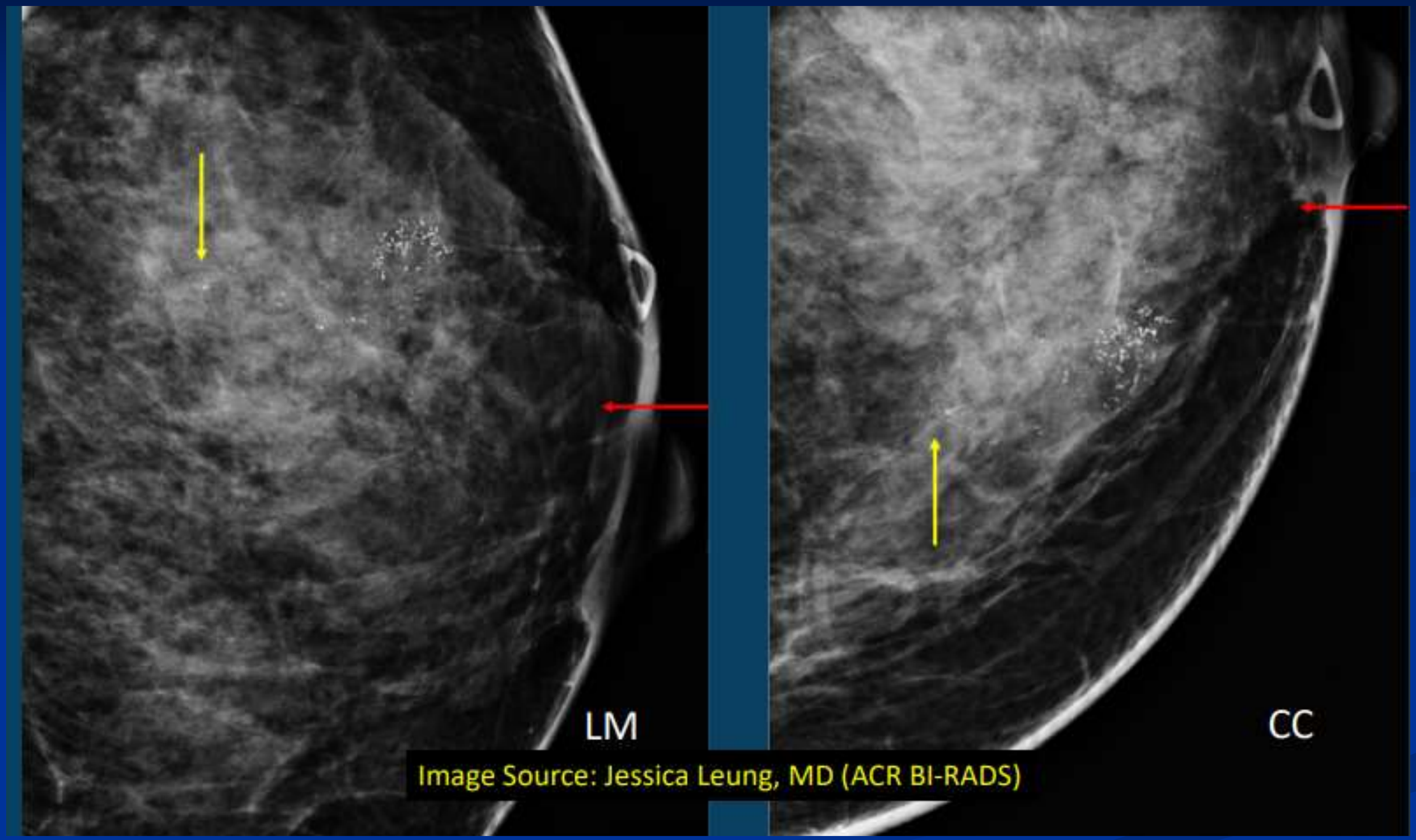
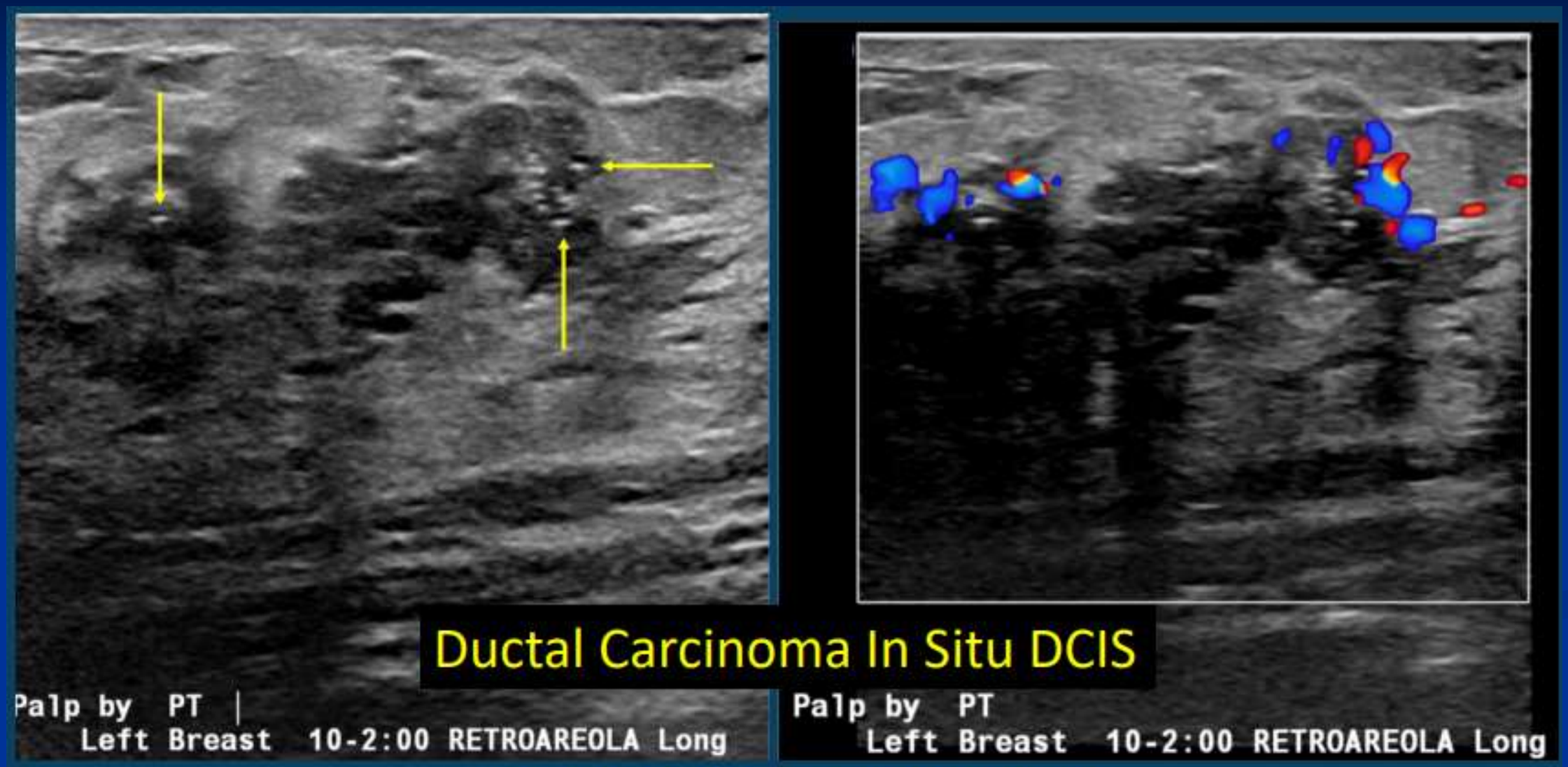
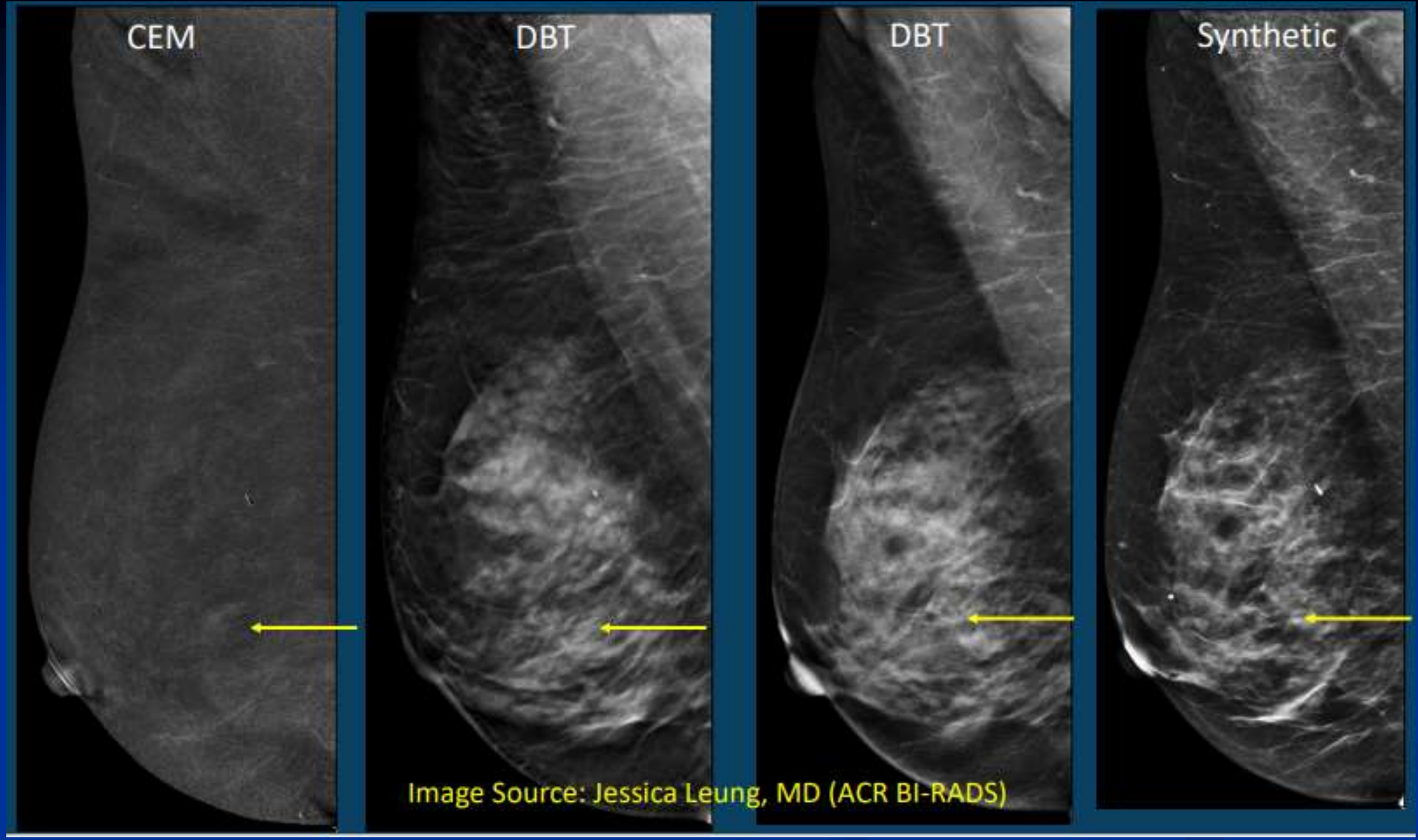


Image Source: Jessica Leung, MD (ACR BI-RADS)



Ductal Carcinoma In Situ DCIS

Image Source: Jessica Leung, MD (ACR BI-RADS)


CEM
DBT
DBT
Synthetic
Image Source: Jessica Leung, MD (ACR BI-RADS)


Complex Sclerosing Lesion

The Japan Society of Ultrasonics in Medicine, the Japan Association of Breast and Thyroid Sonology (JABTS)

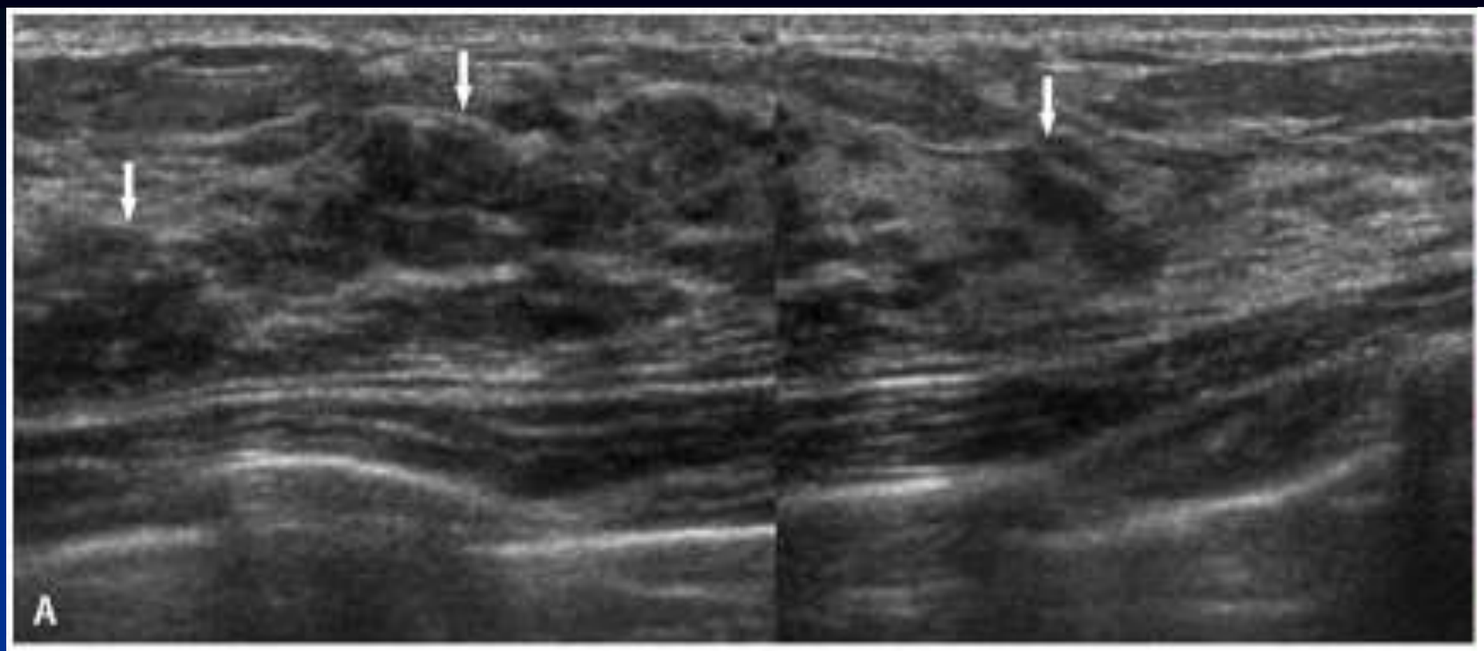
- **Non mass lesion** :A hypoechoic area with properties that differ from those of the surrounding mammary gland or contralateral mammary gland that is difficult to discern as a mass.

- In the JABTS guidelines, the echogenicity of the NON MASS is defined **relative to the surrounding mammary tissue**

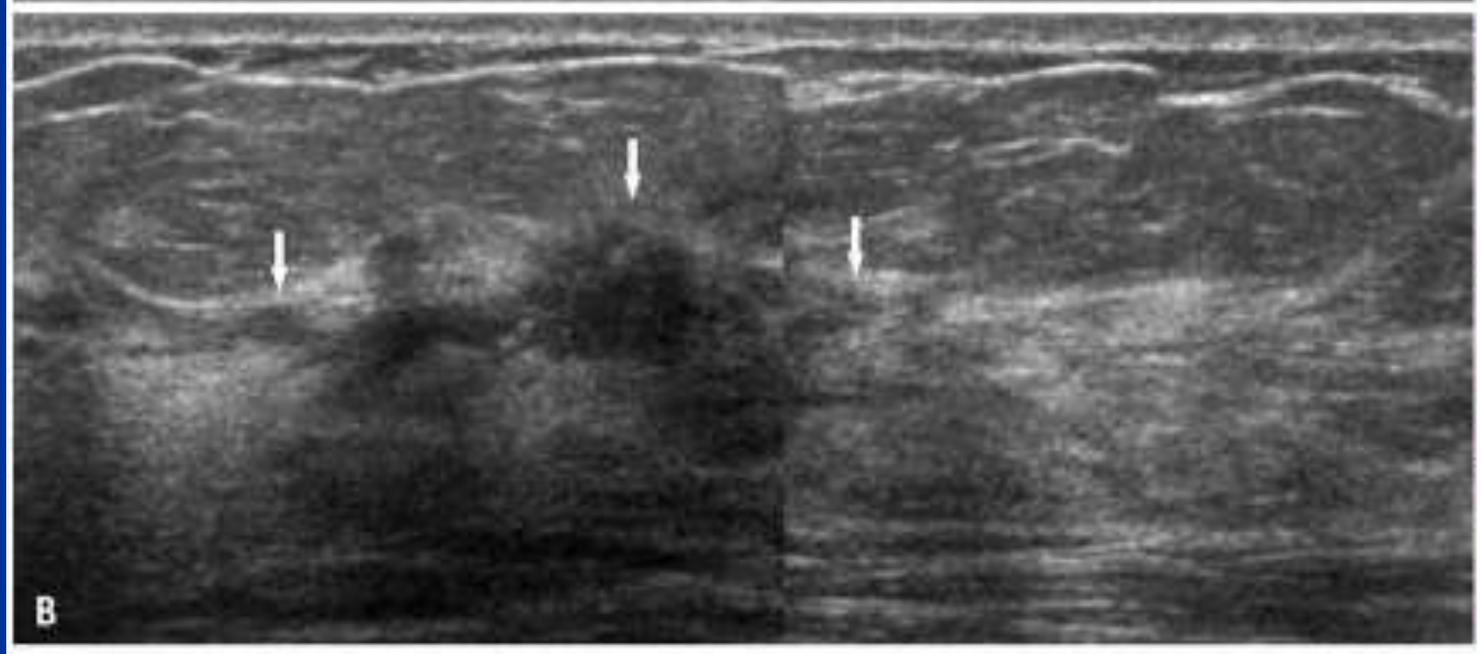
- **DDx:**

- **Benign** :Epithelial hyperplasia, fibrosis, radial scar, complex sclerosing lesions, sclerosing adenosis, mastitis.

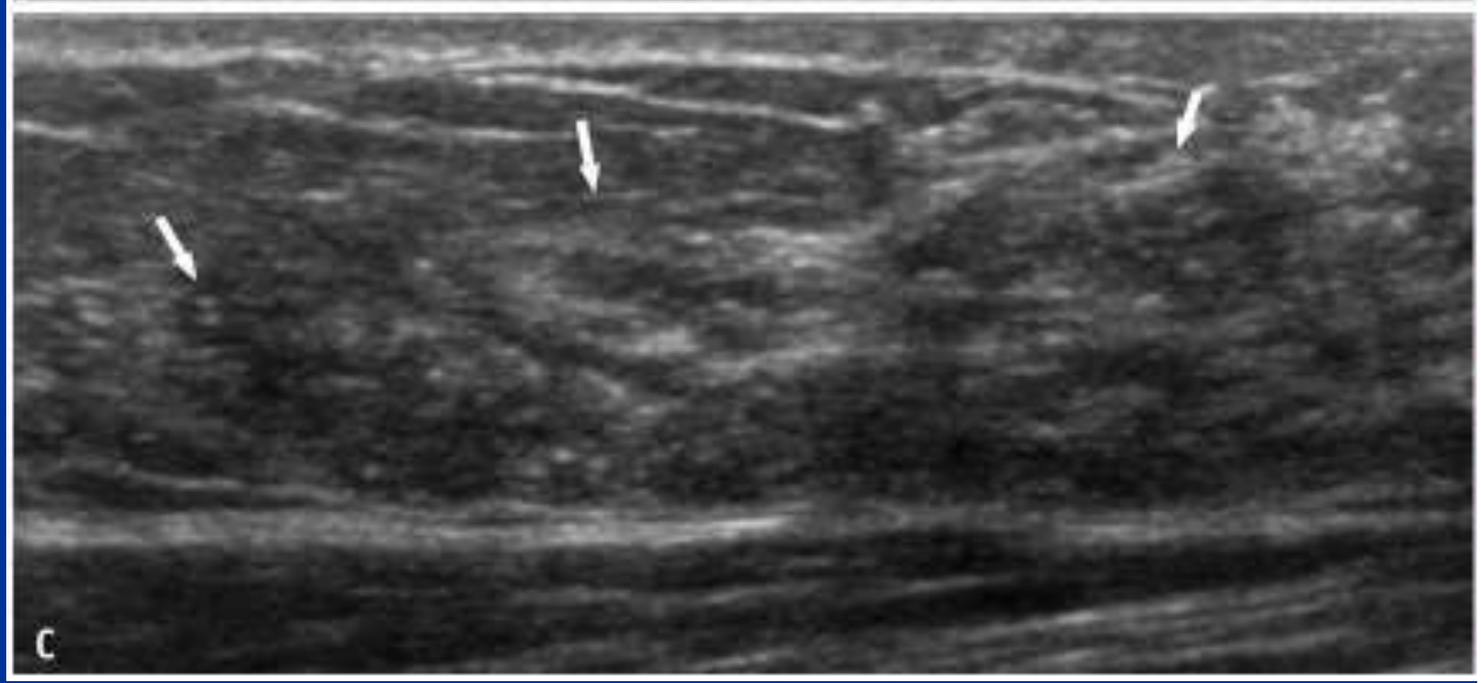
- **Malignant** :DCIS, invasive ductal carcinoma with a predominant ductal component, invasive ductal carcinoma, invasive lobular carcinoma, inflammatory carcinoma.



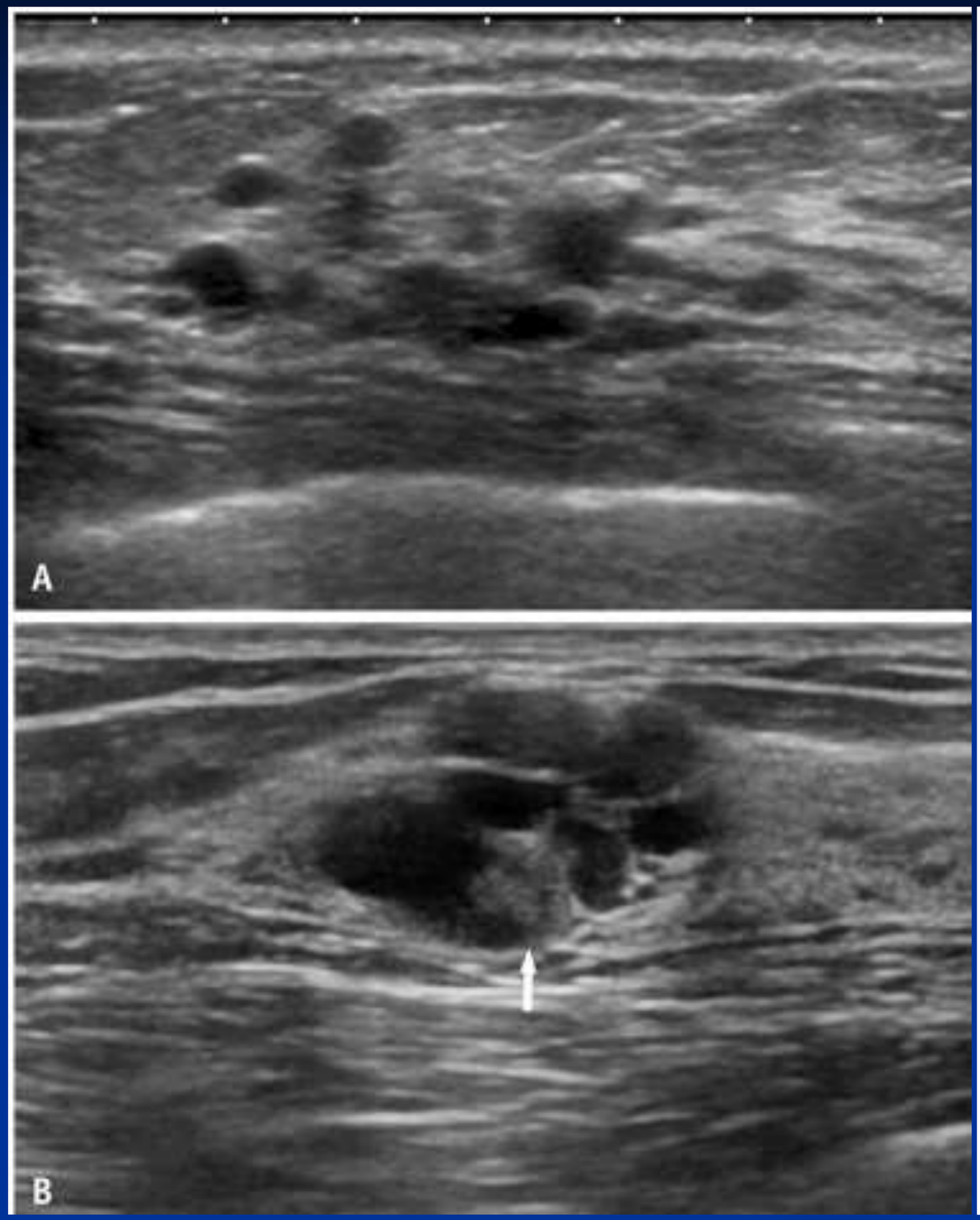
US (left) shows a geographic hypoechoic areas (arrows) with segmental distribution **(DCIS)**



Invasive lobular carcinoma. US (left) shows a geographic hypoechoic area (arrows) with segmental distribution.



Microinvasive carcinoma. US (left) shows an indistinct hypoechoic area (arrows) with segmental distribution. Numerous echogenic foci suggesting calcifications are present within the hypoechoic area.



Ductal epithelial hyperplasia.:US shows several small cysts in a localized area.

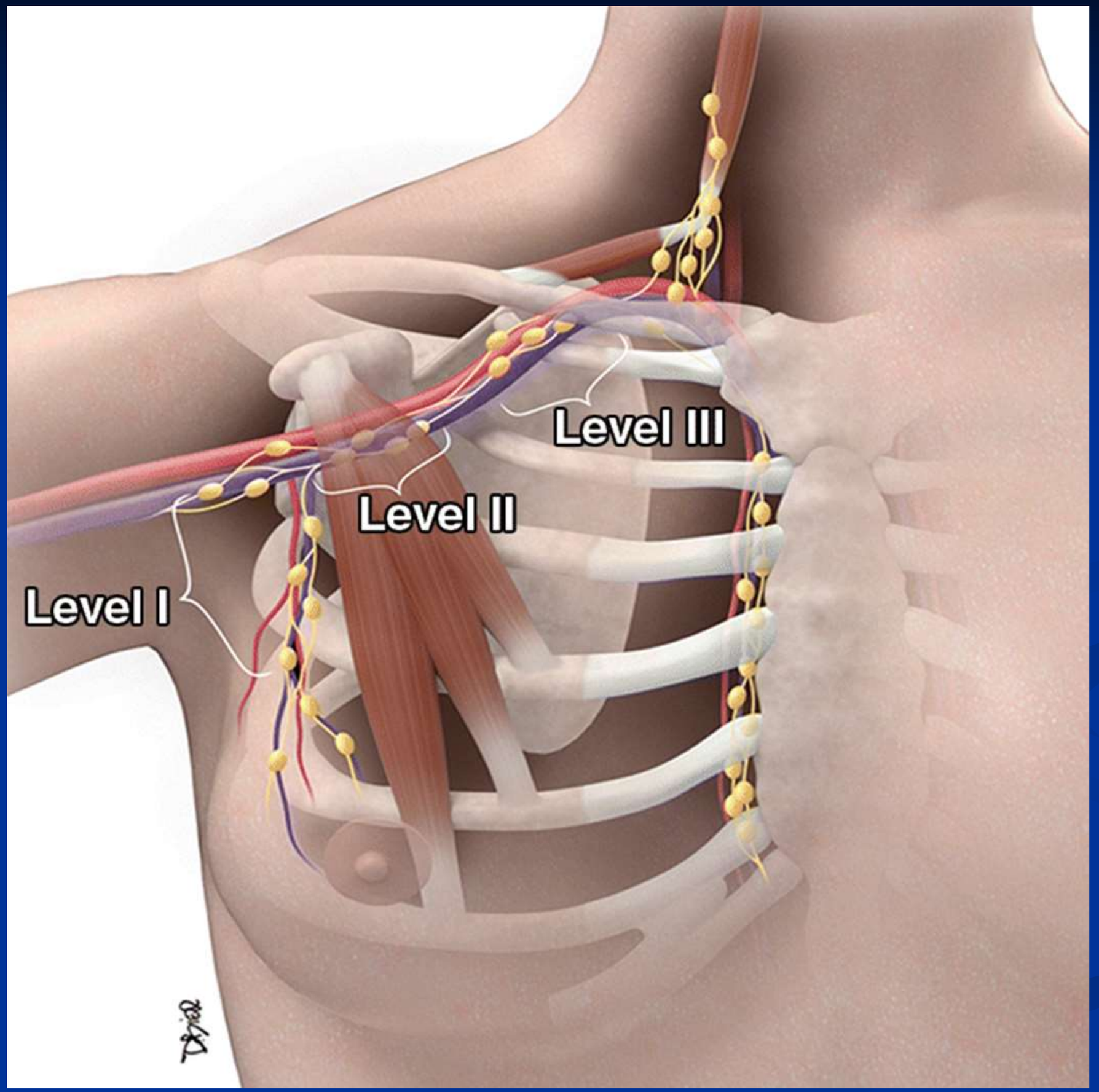
Low-grade DCIS: US shows clustered small cysts; a small solid portion (arrow) is suspected.

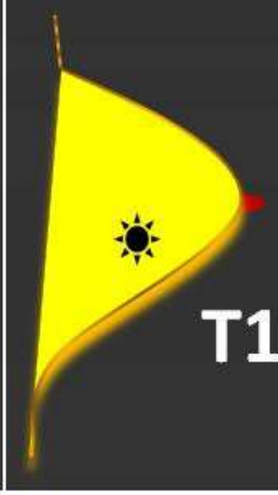
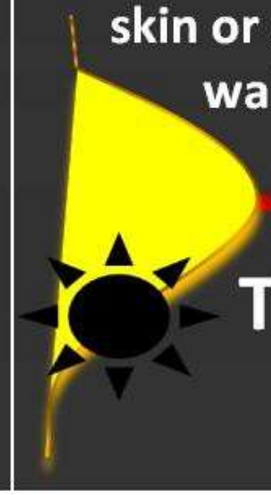
Lymph Nodes

- Expansion of discussion on lymph nodes
- **<u>Location</u>**
  - Intramammary node
  - Axillary node **(levels I, II, III)**
  - **Internal mammary node**
  - **Supraclavicular node**
- <u>Morphology</u>
  - Cortical-hilar relationship

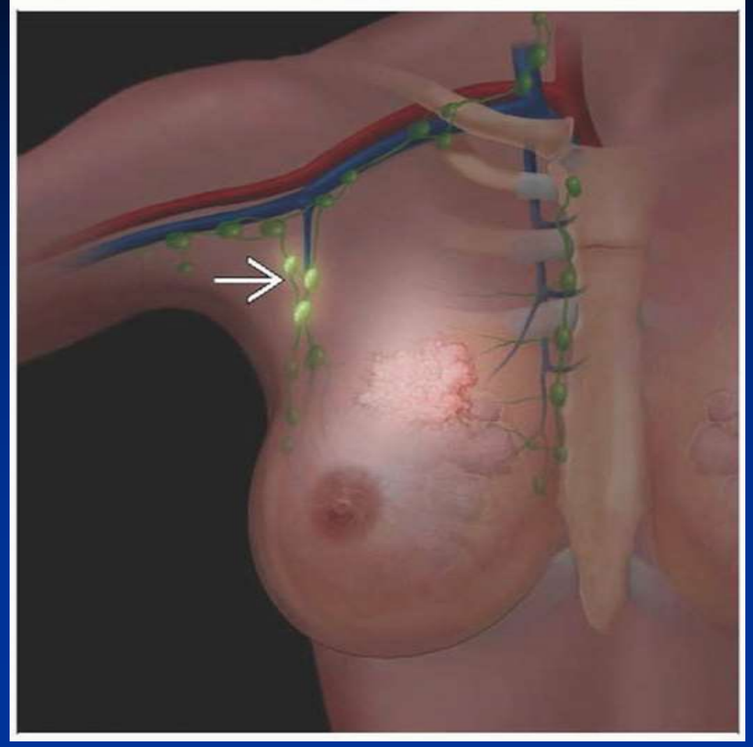
US is the primary imaging modality used for nodal staging

LYMPH NODES — INTRAMAMMARY:

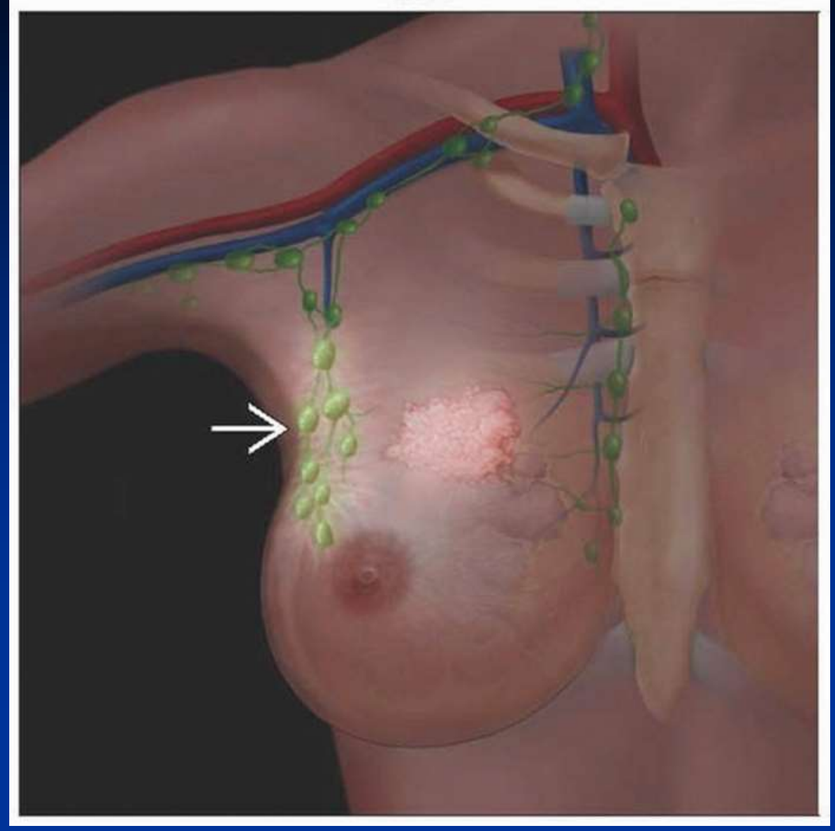

Level III
Level II
Level I

Tumor size T	Tumor size < 2 cm 	Tumor size 2-5 cm 	Tumor size > 5 cm 	Tumor extends to skin or chest wall 
Lymph Nodes **N**	**N0** **No lymph node metastasis**	**N1** **Metastasis to ipsilateral, movable, axillary LNs**	**N2** **Metastasis to ipsilateral fixed axillary, or IM LNs**	**N3** **Metastasis to infraclavicular/ supraclavicular LN, or to axillary and IM LNs**
Metastasis **M**	**M0** **No distant metastasis**	**M1** **Distant metastasis**		

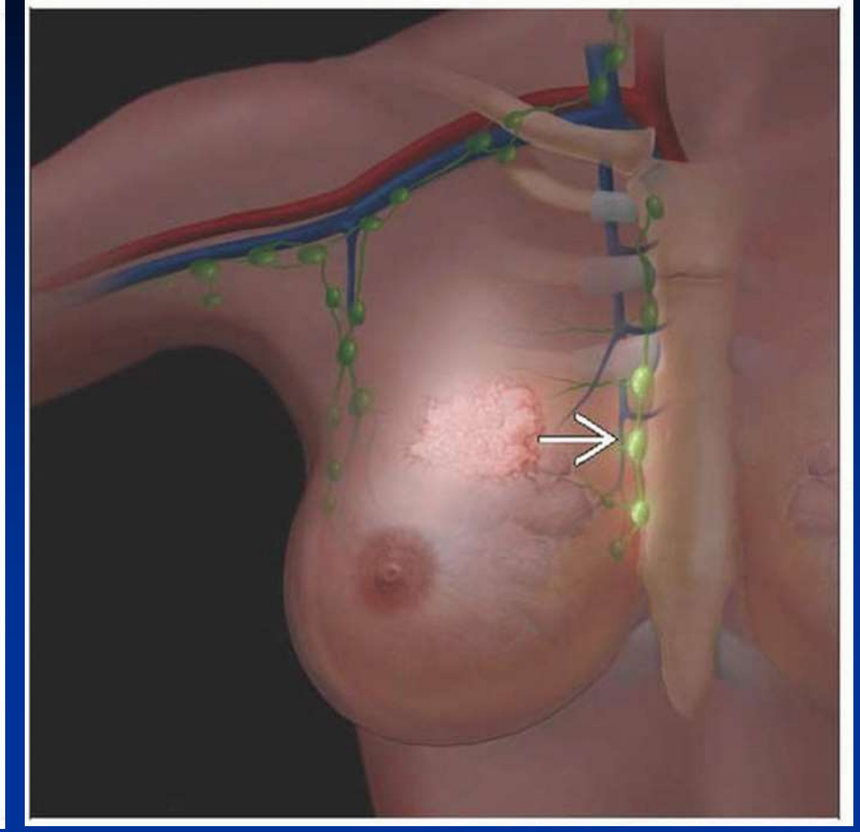
N1



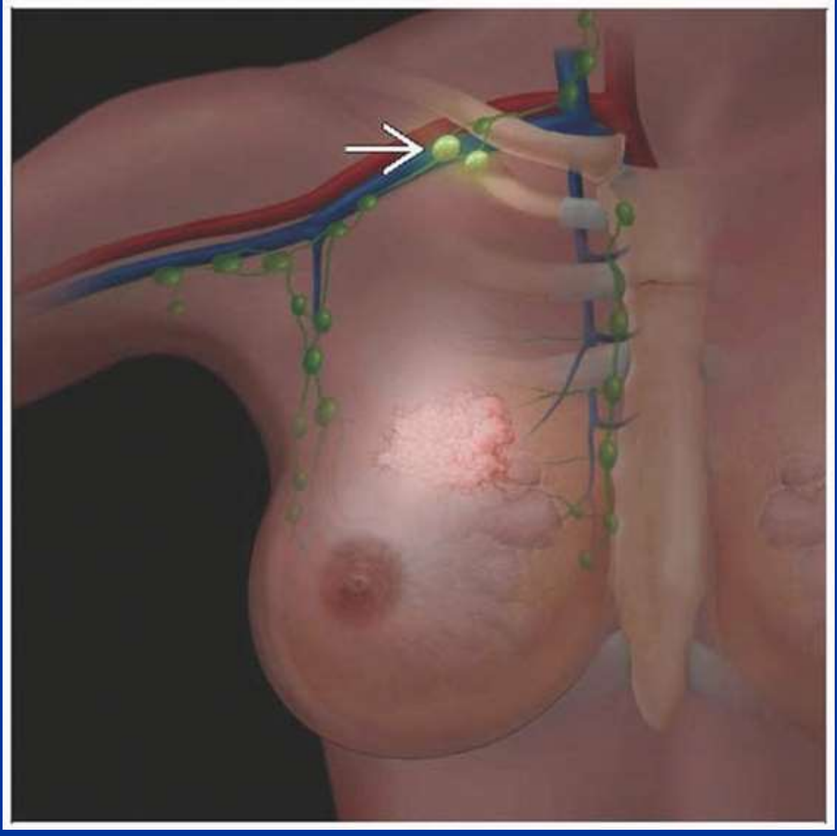
N2a



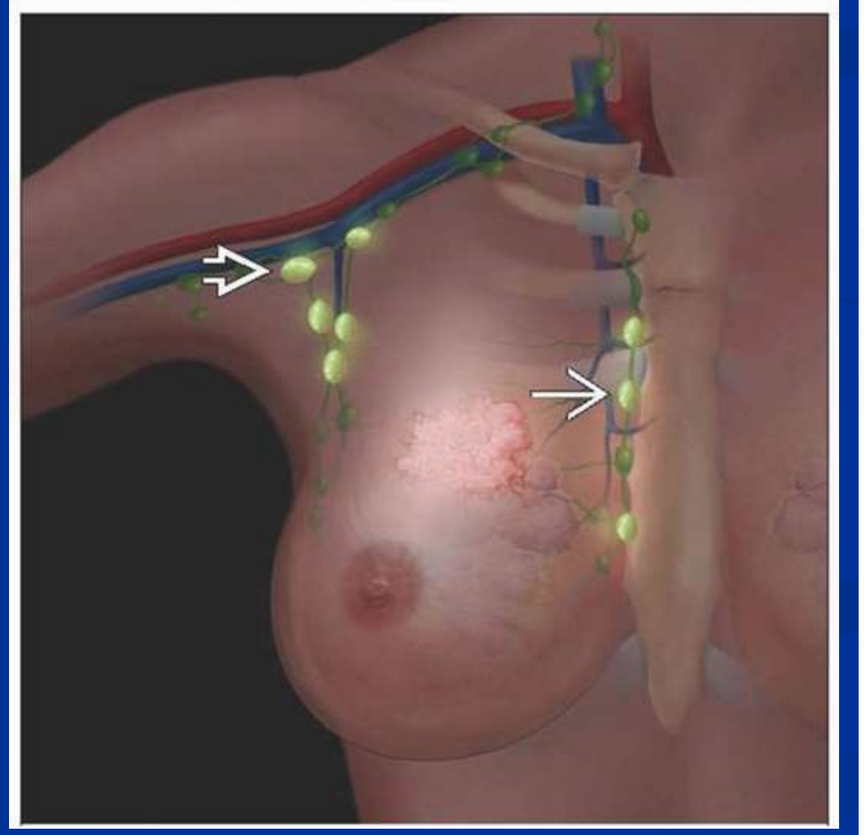
N2b



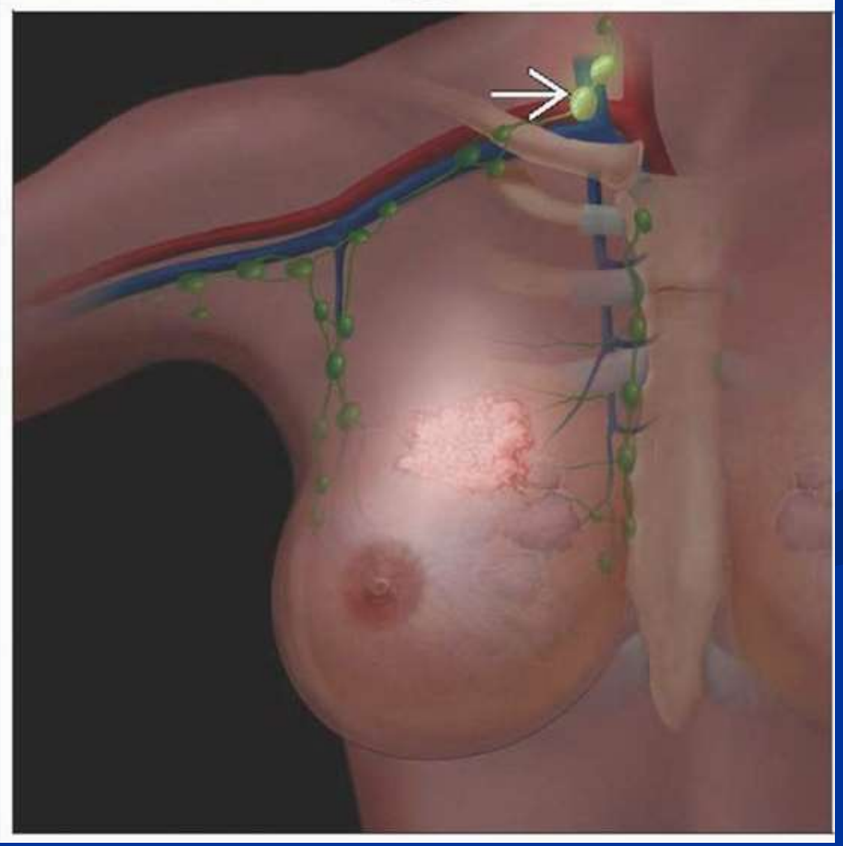
N3a

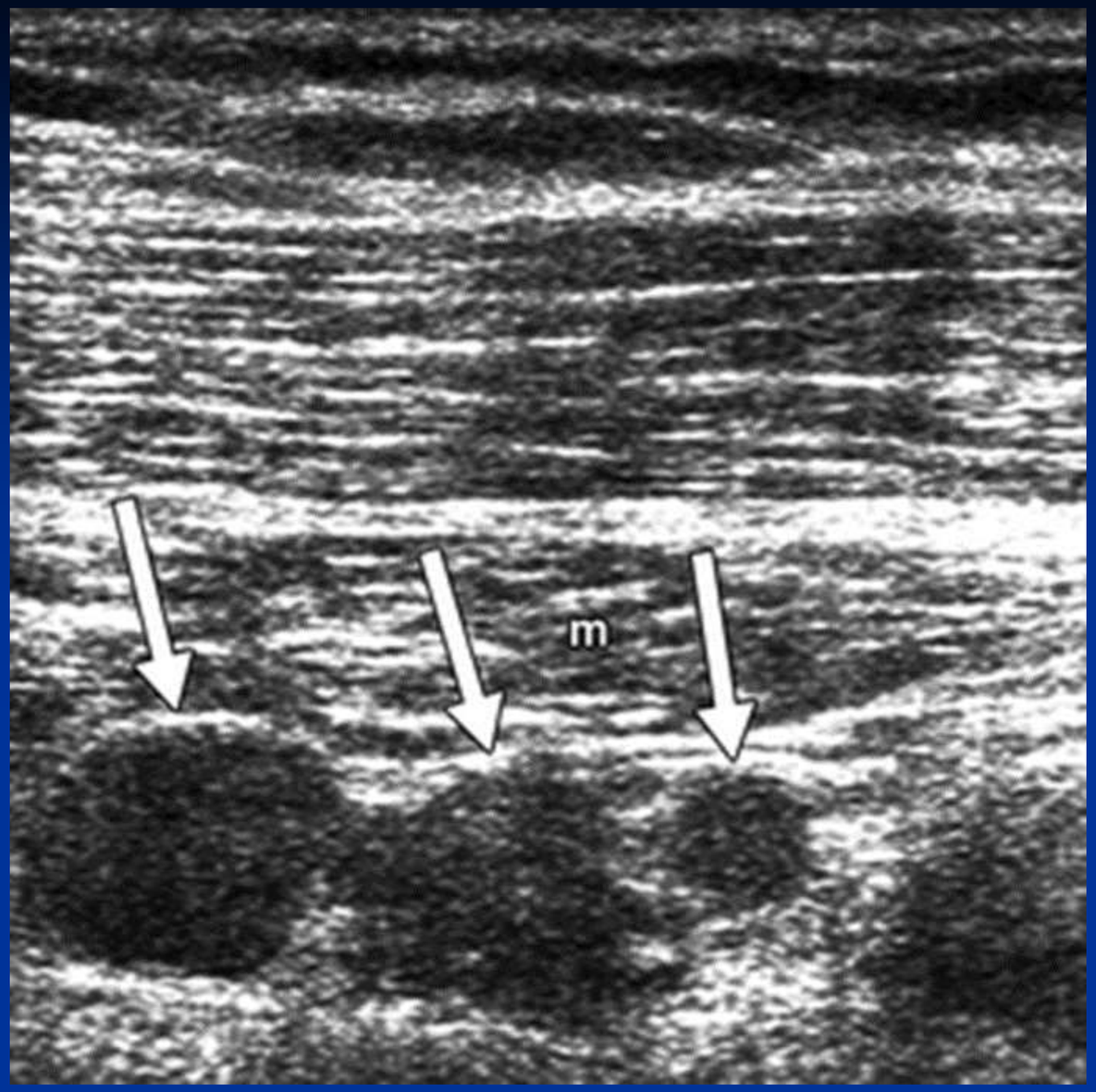


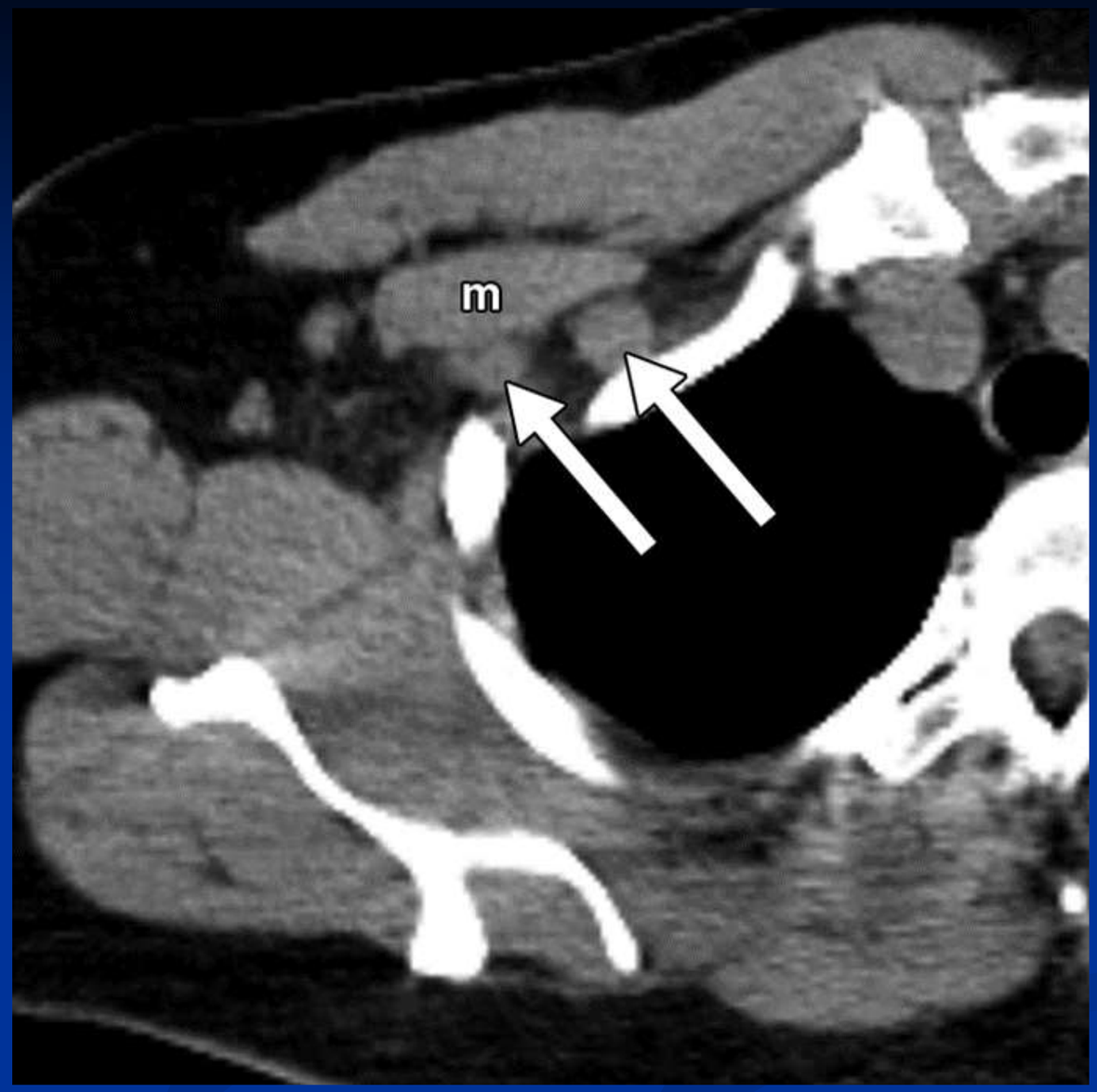
N3b



N3c

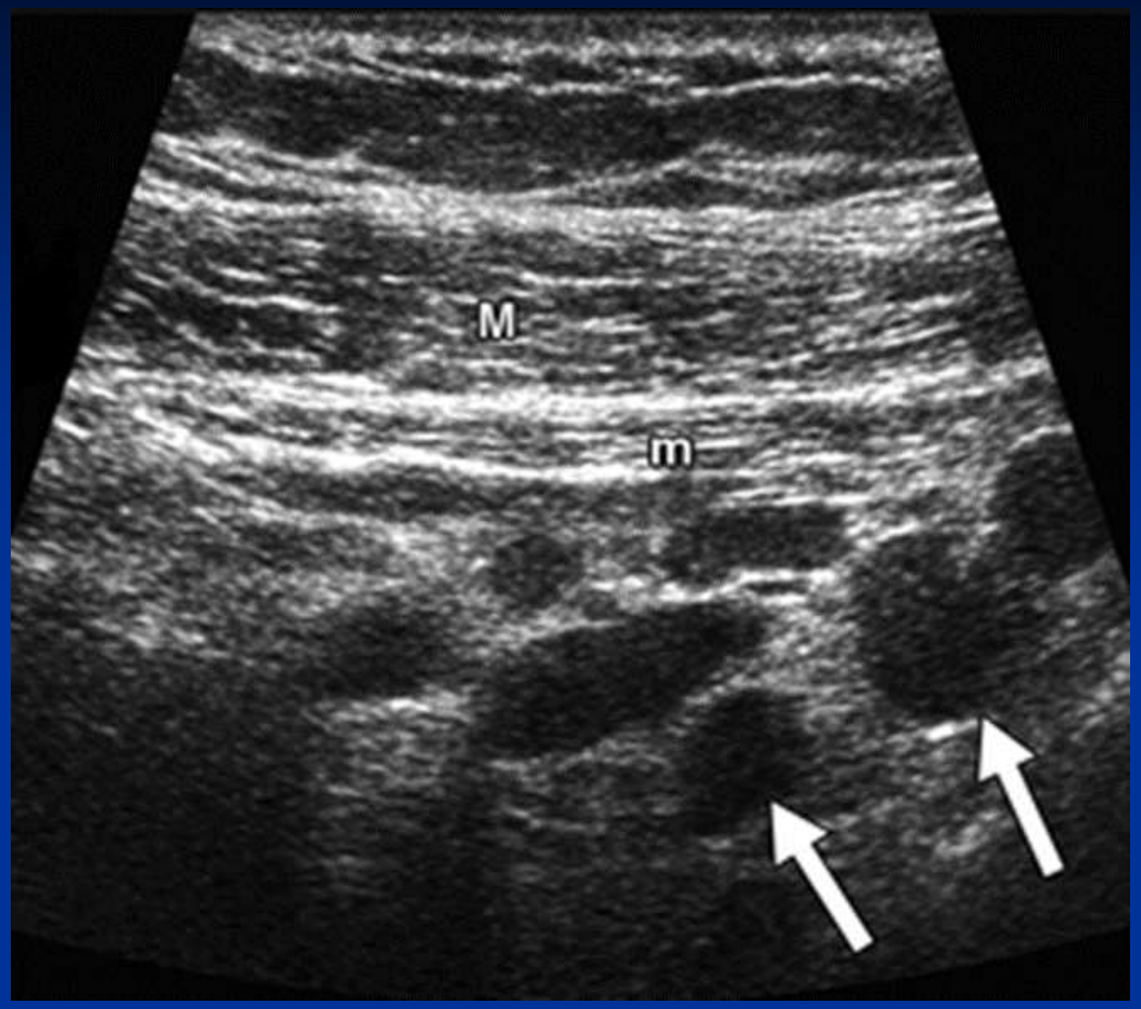


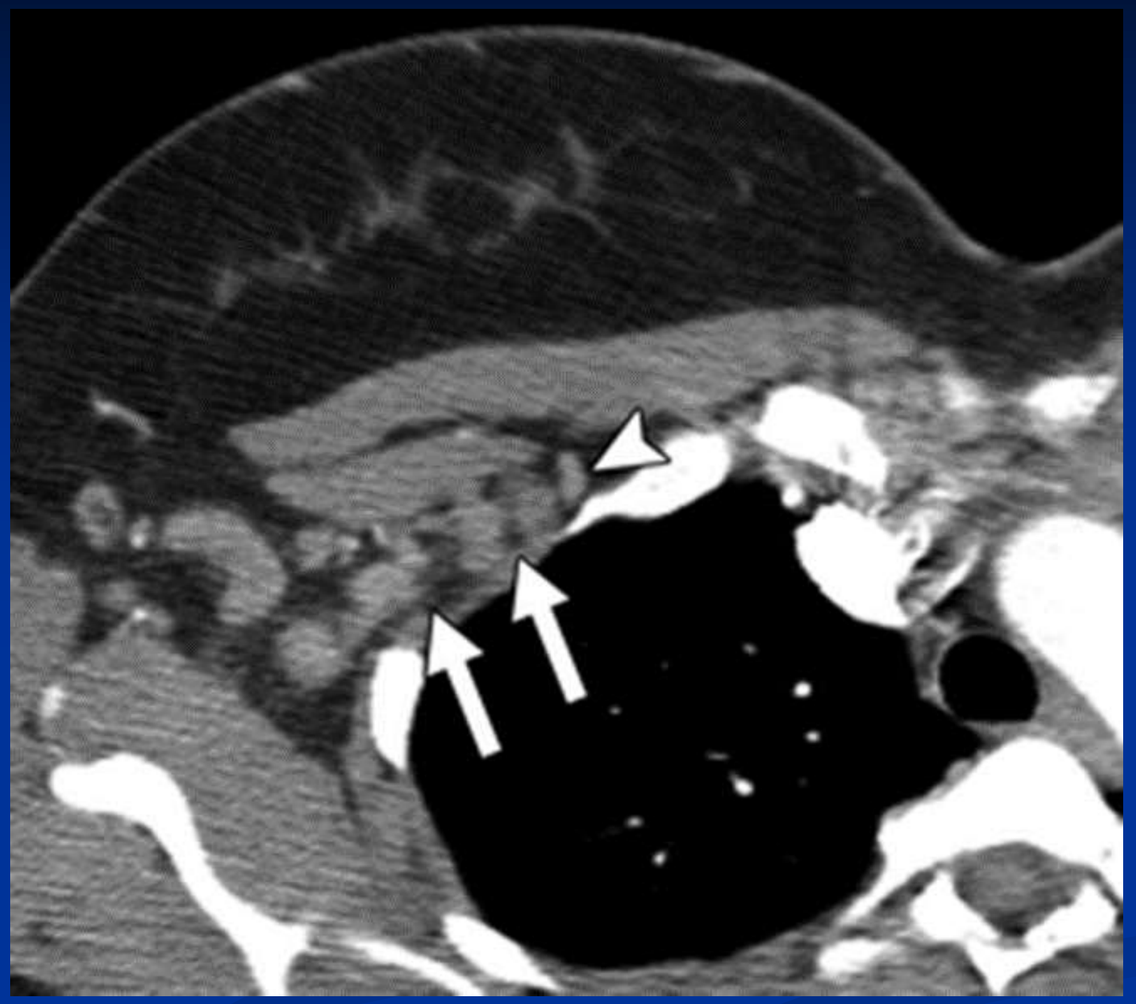




37-year-old woman with invasive ductal cancer.

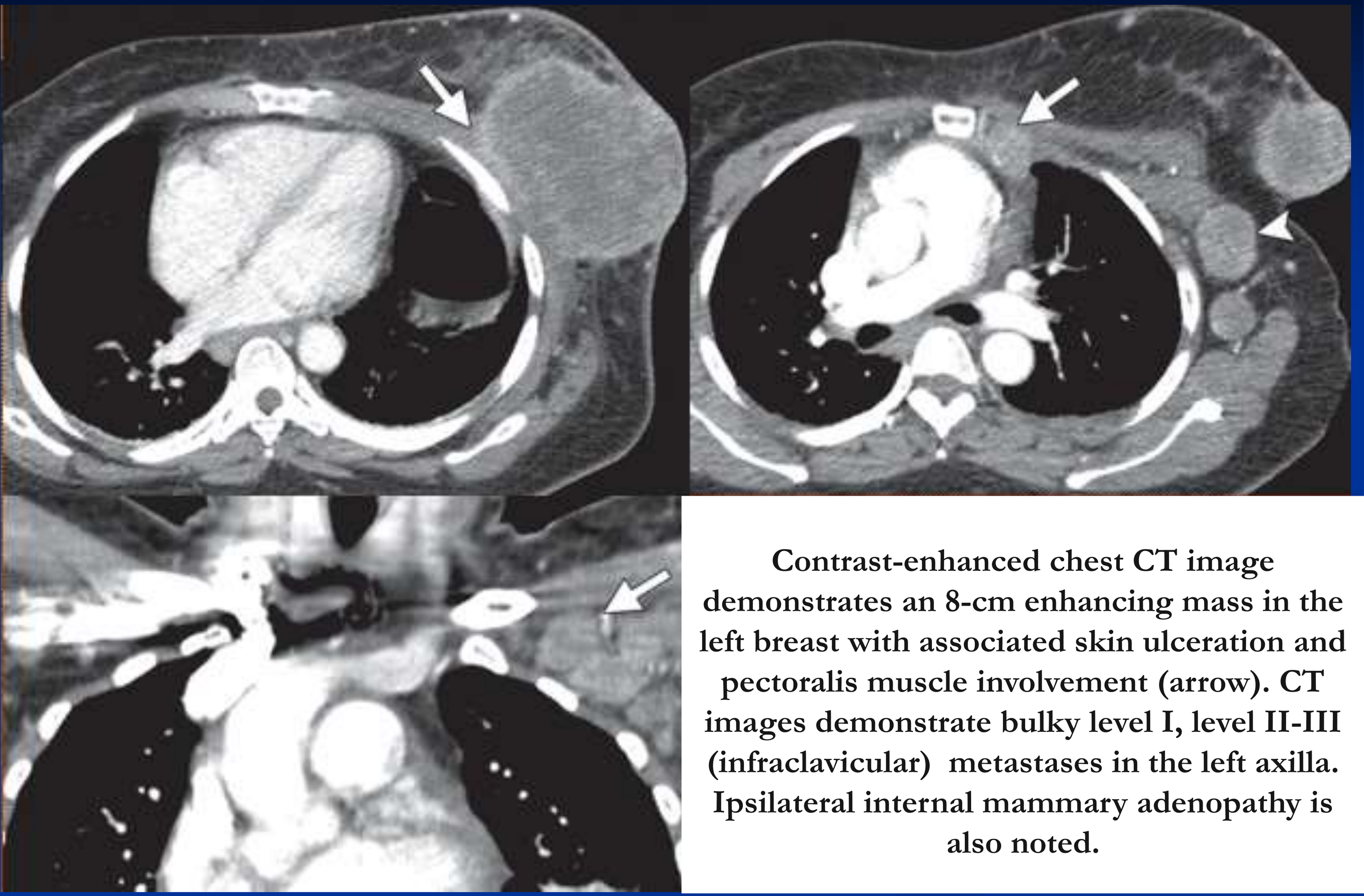
Ultrasound of right chest shows round hypoechoic masses (arrows) deep to pectoralis minor (m) muscle. CT shows correlating round masses consistent with metastatic nodes (arrows). These are level II axillary nodes



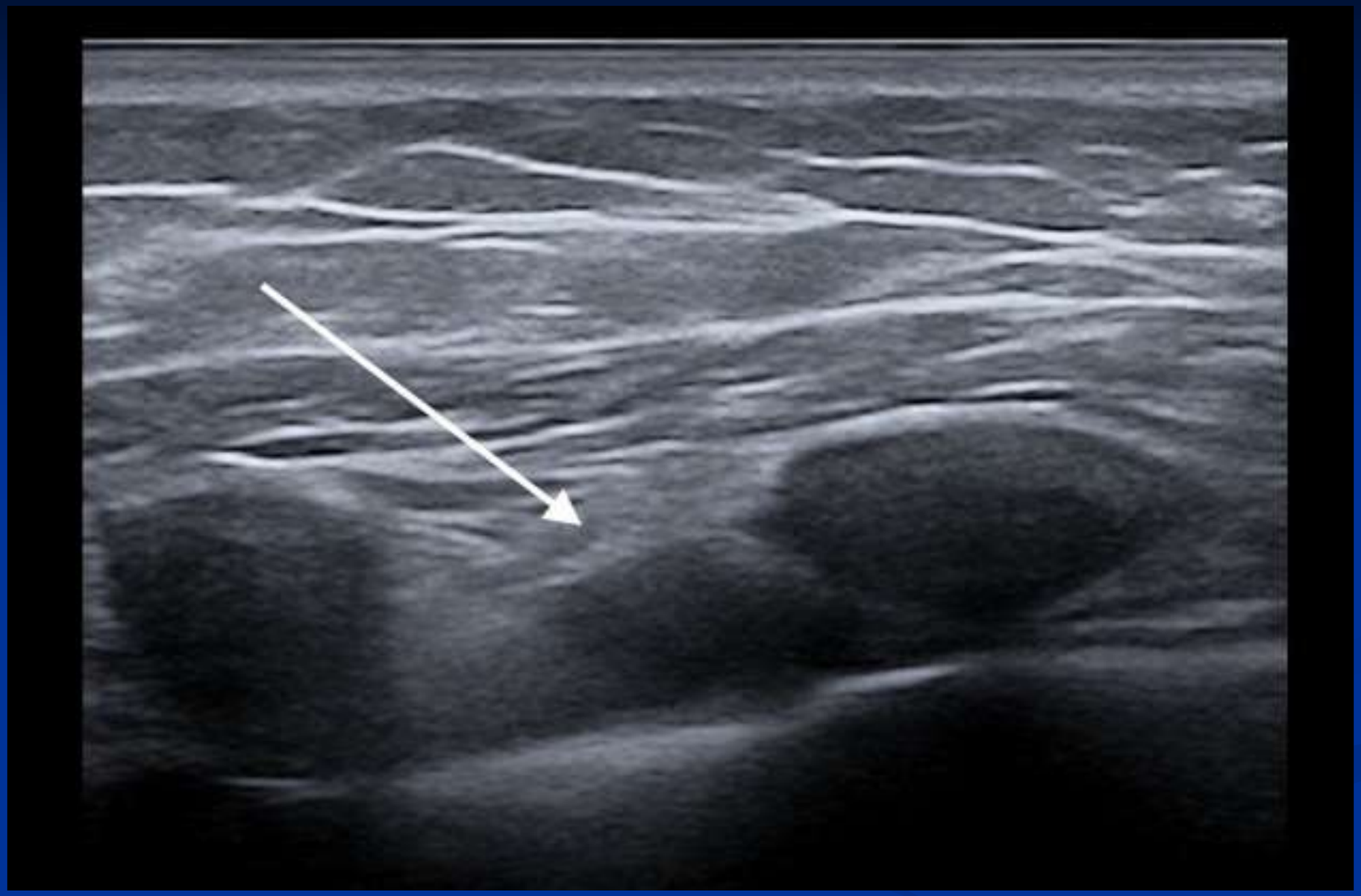


A 40-year-old woman with invasive ductal cancer in right breast.

Ultrasound of right chest shows numerous oval hypoechoic masses (arrows) deep to pectoralis major (M) and pectoralis minor (m) muscles, consistent with metastatic nodes. , majority of nodes lie between medial and lateral borders of pectoralis minor muscle and are therefore **level II axillary nodes (arrows) as correlated on CT. True infraclavicular nodes (arrowhead)(level III)** are medial to medial edge of pectoralis minor muscle.



Contrast-enhanced chest CT image demonstrates an 8-cm enhancing mass in the left breast with associated skin ulceration and pectoralis muscle involvement (arrow). CT images demonstrate bulky level I, level II-III (infraclavicular) metastases in the left axilla. Ipsilateral internal mammary adenopathy is also noted.

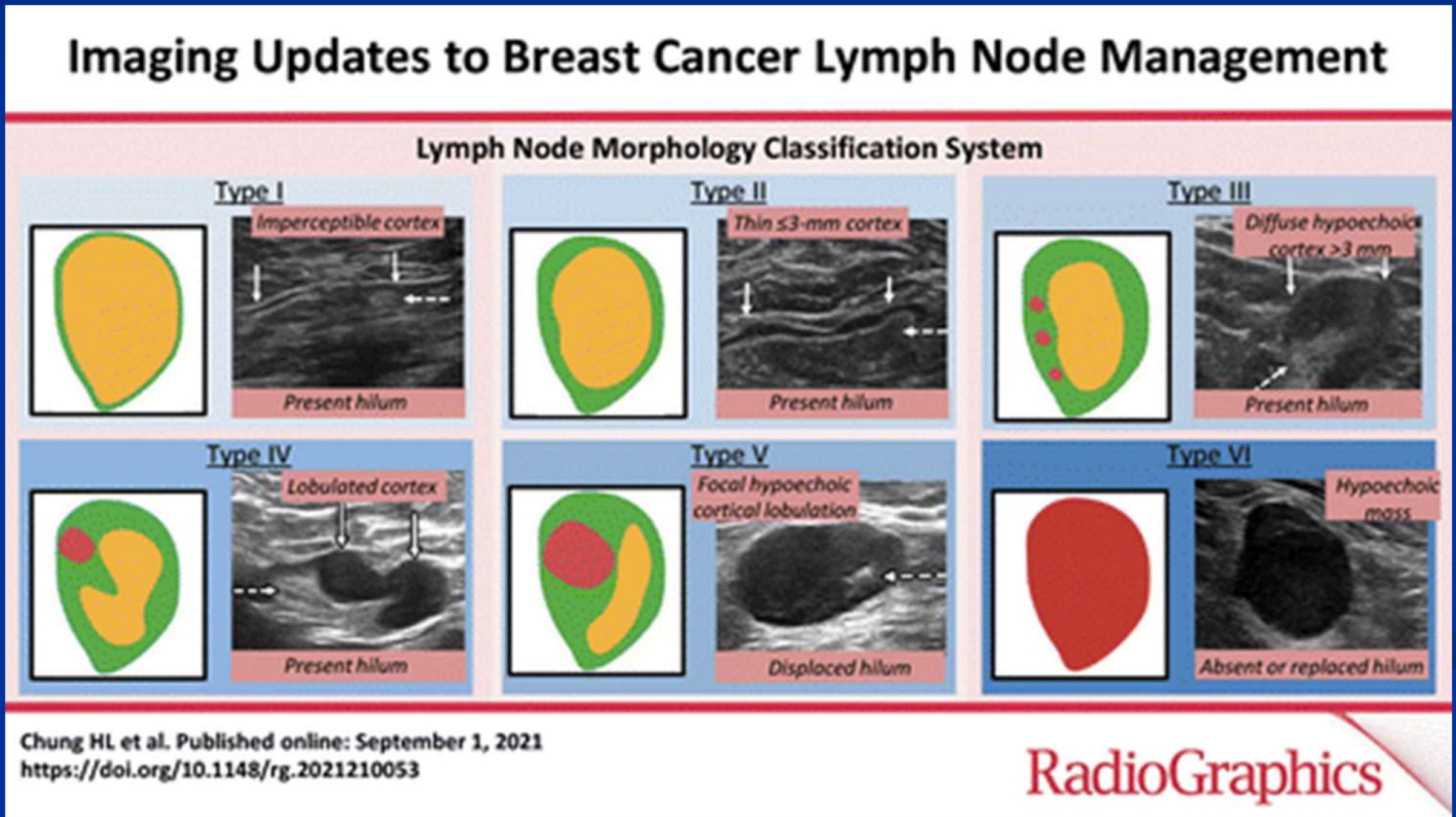


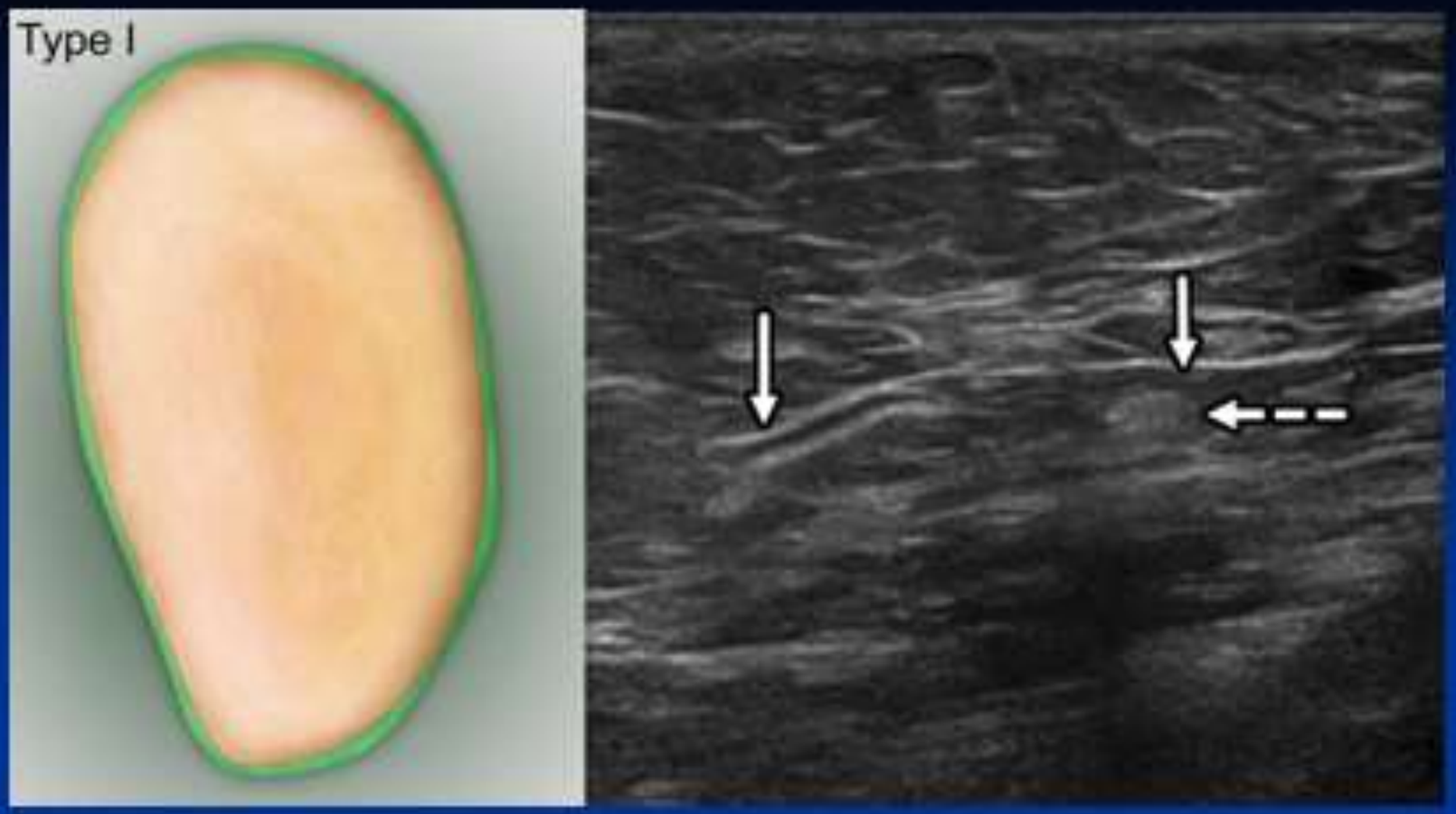
Follow-up of an asymptomatic breast cancer patient.

Ultrasound scan of the chest wall showed a round, homogeneous hypoechoic and avascular mass of approximately 1 cm. in the 4th intercostal right space, close to the costal cartilage. The appearances are suspicious for a metastasis to the internal mammary lymph node, given the history of breast cancer.

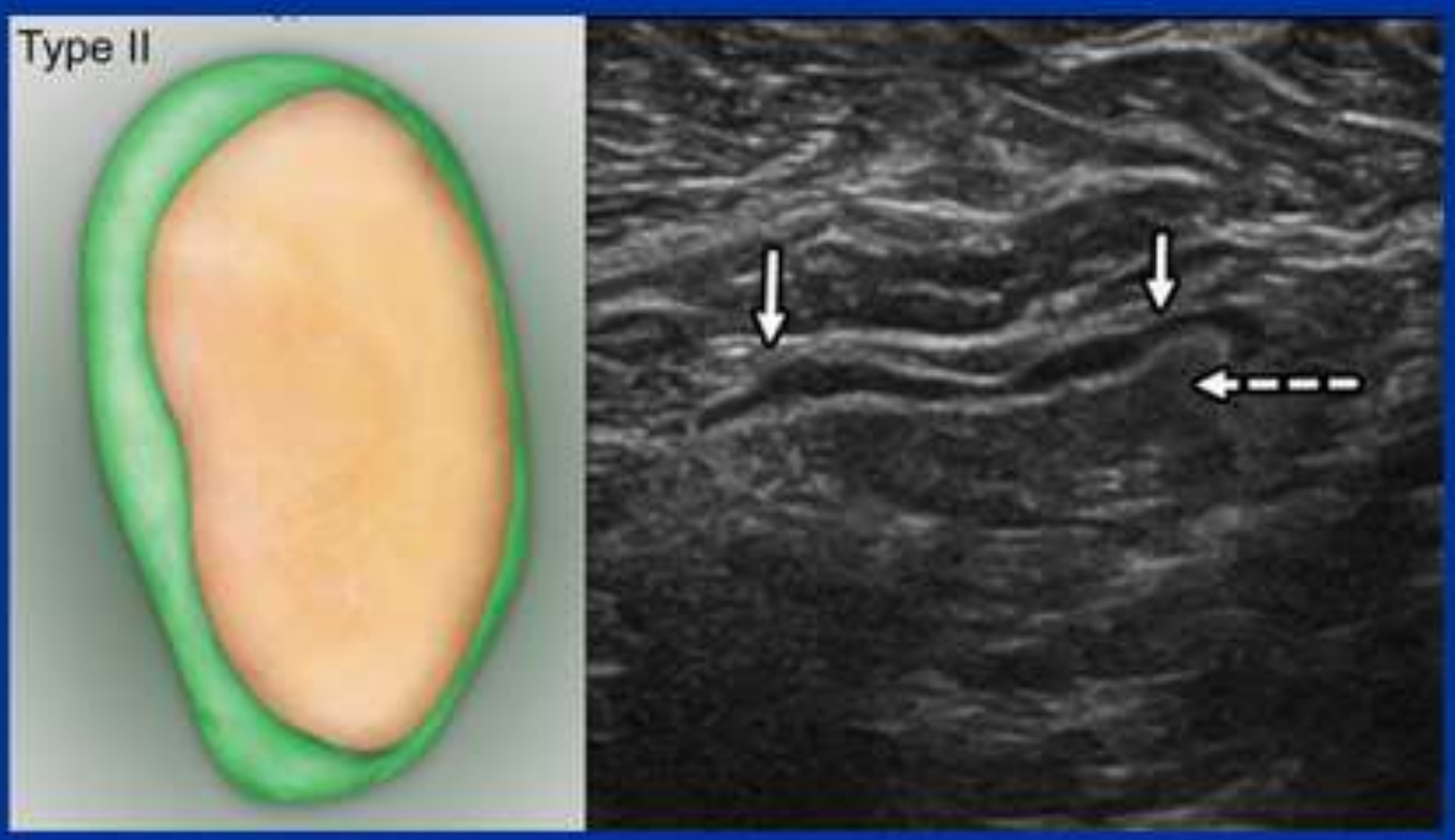
<u>It is important to identify the presence of internal mammary nodal metastases</u>, which not only changes the nodal stage and prognosis of the patient but also affects the planning of radiation therapy, requiring a wider irradiation field.

- Abnormal lymph nodes are identified on the basis of overall shape and changes in the appearance of the node cortex

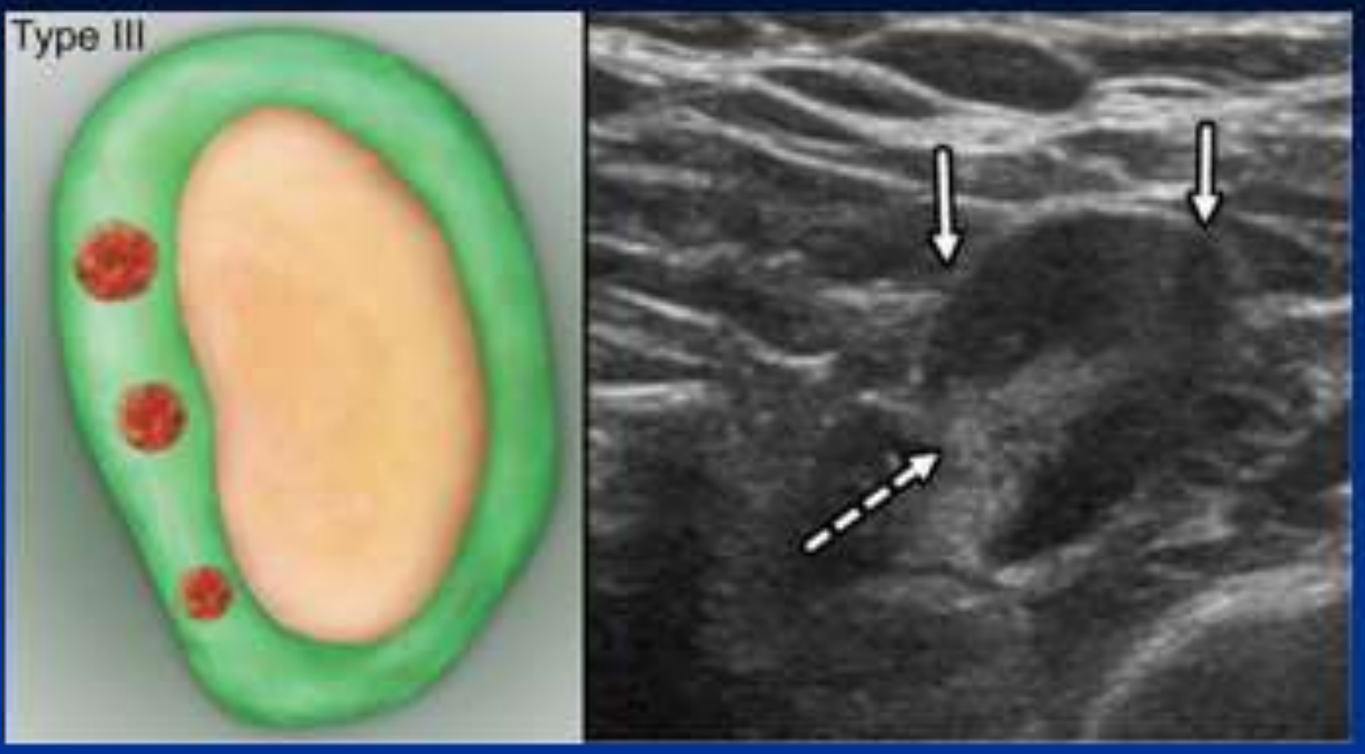




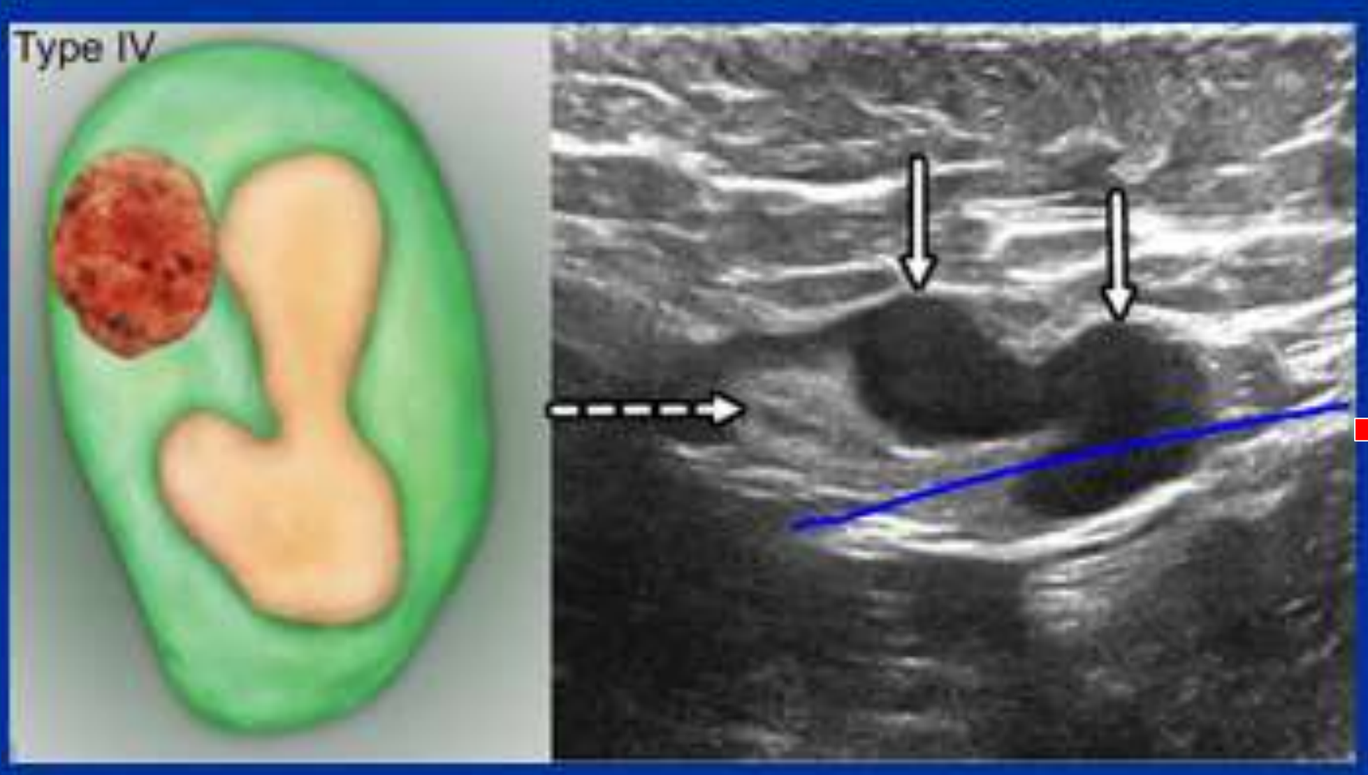
Imperceptible cortex (solid arrows) and preserved hilum (dashed arrow) is benign, with a negative predictive value (NPV) of 100%



A thin (<3 mm) cortex (solid arrows) and preserved hilum (dashed arrow) is benign, with an NPV of 100%.

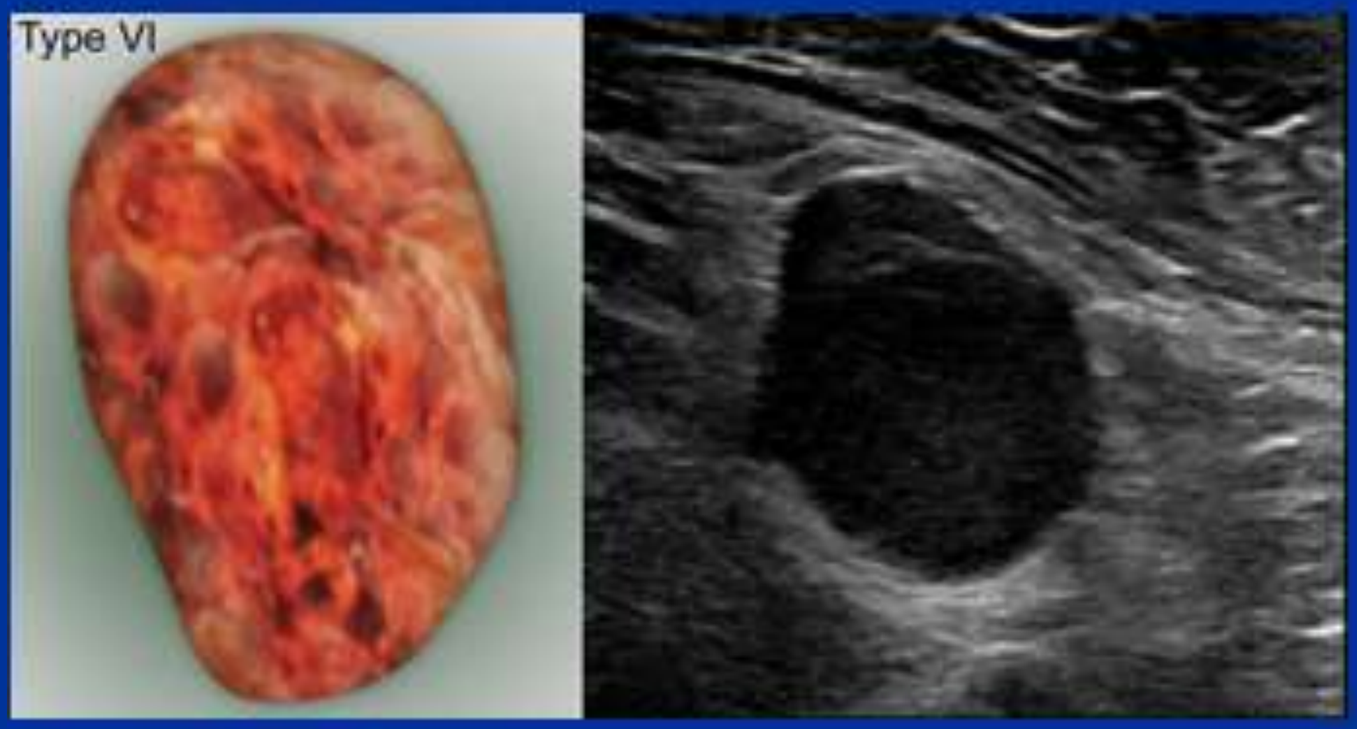


A diffuse hypoechoic cortex greater than or equal to than 3 mm (solid arrows) with preserved hilum (dashed arrow) may be malignant but is more often benign, with an NPV of 93%. This was presumed to be reactive benign cortical thickening owing to recent ipsilateral COVID-19 vaccination.

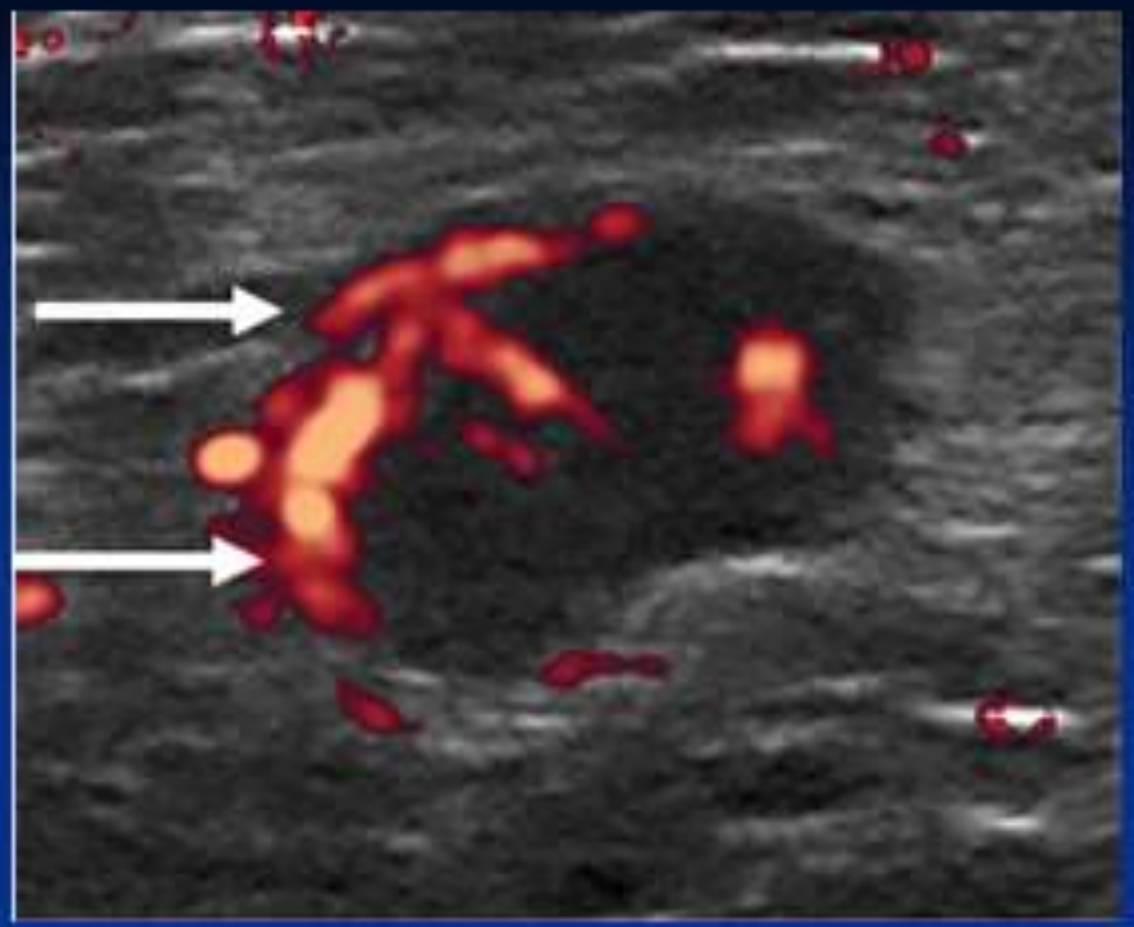


A generalized lobulated cortex (solid arrows) with hilum (dashed arrow) may be seen with benign or malignant nodes. The NPV is 89%. FNA biopsy should be targeted to the thickest portion of the cortex.

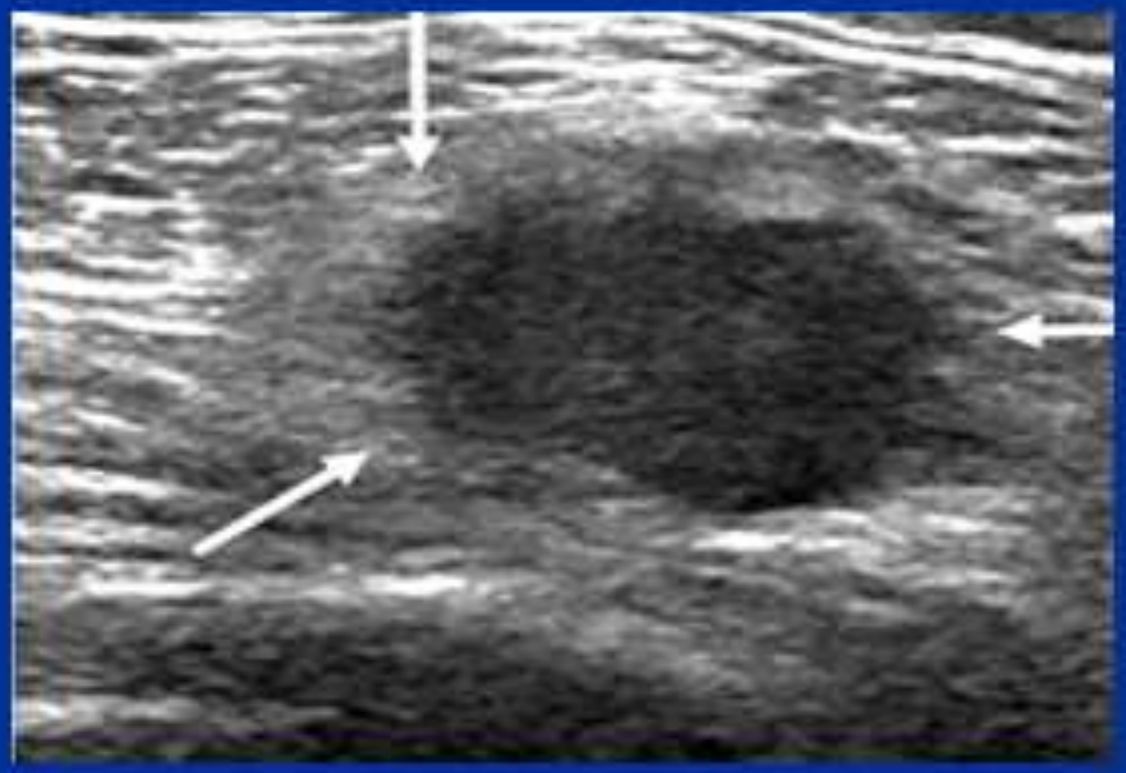
Focal and/or eccentric hypoechoic cortex and effacement and/or displacement of the hilum (dashed arrow) is demonstrated in this metastatic node. The positive predictive value (PPV) of a type V node is 29%.



Absent and/or replaced hilum is seen as a hypoechoic mass in this metastatic node. A replaced hilum is the most specific feature of malignancy. A PPV of 58%–97%

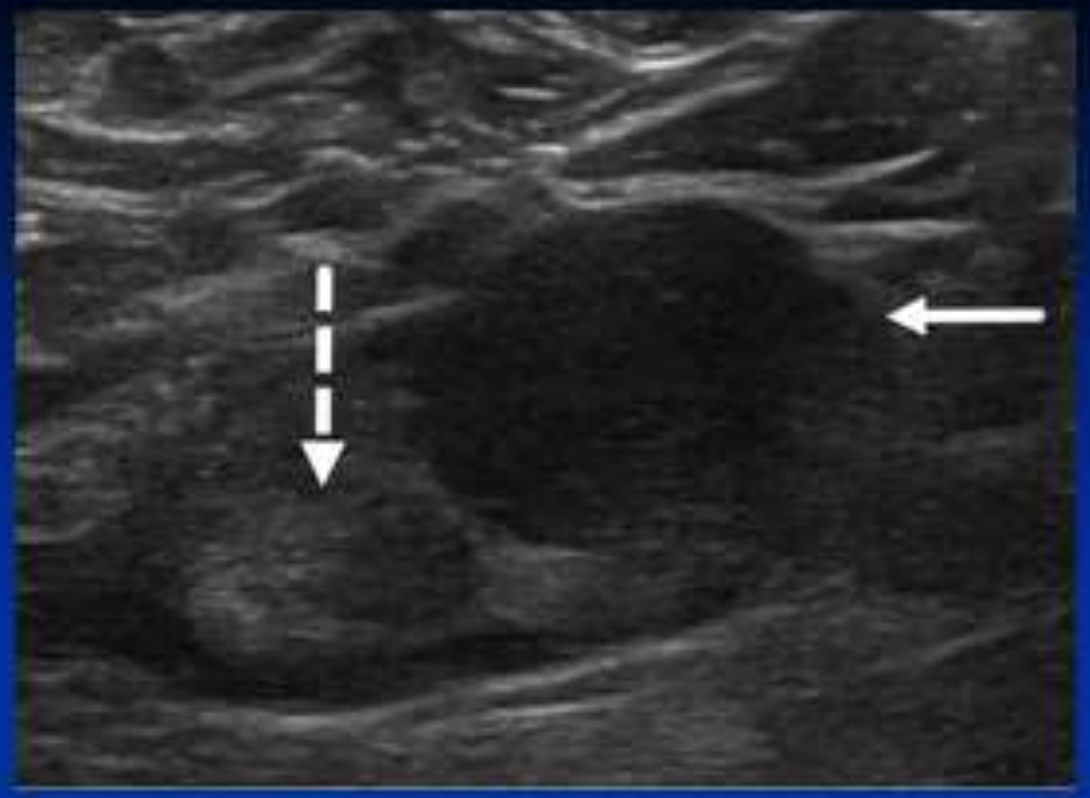


Power Doppler US image shows peripheral nonhilar blood flow (arrows) in this metastatic node. Non hilar blood flow has moderate specificity for malignancy when combined with additional suspicious features.

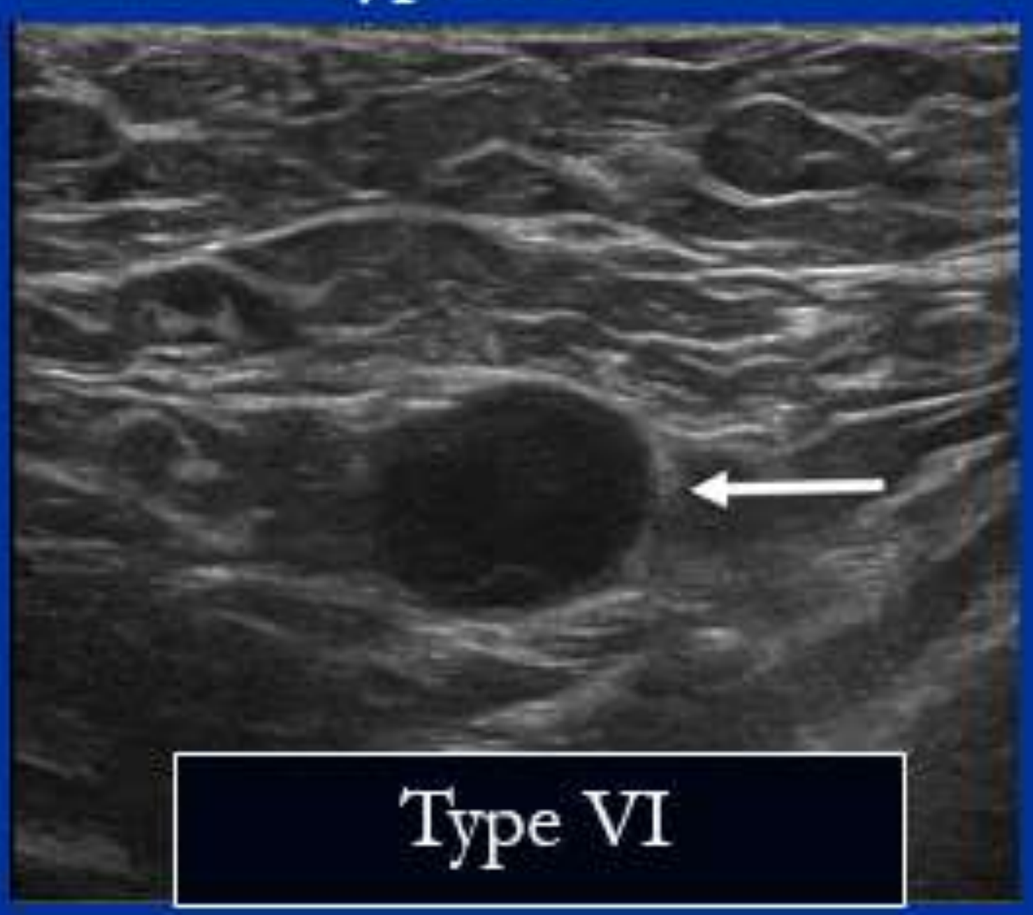


A type VI node in a 36-year-old woman with BRCA1 mutation who presented with cT4dN3cM0 metastases. A representative hypoechoic interpectoral Rotter node is seen with speculated margins and an echogenic halo (arrows), findings suggestive of extra nodal extension.

Types IV



Type V



Type VI

All underwent percutaneous needle biopsy with benign results

- US combined with FNA biopsy (US-FNA) has been shown to be consistently accurate and clinically meaningful
- US-FNA has
  - 75%–89% sensitivity
  - 98%–100% specificity
  - 85%–97% positive predictive value
  - 81% negative predictive value for lymph node metastases

THANK YOU