

Concepts in Radiology

[Based on In-App Videos]



Vol.-5



Authored By The Faculty of Conceptual Radiology

Concepts In Radiology

Volume - 5

[Based on In-App Videos]



Table of Content

<u>Chapter Name</u>	<u>Page No.</u>
Section 11. Women's imaging	
11.1. BIRADS	1
11.2. Basics of Breast Ultrasound.....	8
11.3. Basic of Mammography.....	21
11.4. Breast MRI.....	27
11.5. Approach to Uterine Masses	36
11.6. Imaging of Ovarian Masses	50
11.7. Imaging in Mullerian Anomalies	68
11.8. Imaging in Endometriosis	79
11.9. Imaging in Carcinoma Cervix.....	100
11.10. Imaging of Fibroids.....	106
11.11. Imaging in Infertility Part-1	115
11.12. Imaging in Infertility Part-2	126
11.13 Imaging in Infertility Part-3	139
Section 12. X-Ray Physics	
12.1. X-Ray Interaction with Matter.....	158
12.2. X-Ray Attenuation	163
12.3. Filtration and x-ray Quantity/Quality	169
12.4. Scatter Radiation & Collimation.....	175
12.5. Grids Part-1	180
12.6. Grids Part-2.....	184
12.7. Xray Tube & Xray Production.....	191
12.8. Fluoroscopy	194
12.9. CR, DR, Fluoroscopy & DSA.....	200
12.10. X-ray Circuit & Generator.....	211
12.11. X-Ray Film Construction & Processing	219

<u>Chapter Name</u>	<u>Page No.</u>
----------------------------	------------------------

12.12. Intensifying Screen & Image Quality Factors	224
12.13. CR (Computer Radiology) & DR (Digital Radiology).....	229
12.14. X-Ray Artifacts	237

Section 13. CT Physics

13.1. CT Physics Part-1	253
13.2. CT Physics Part-2	263
13.3. Dual Energy CT	267
13.4. CT Radiation Dose Optimisation.....	271
13.5. CT Artifacts: Recognition and Avoidance	274

Section 14. MRI physics

14.1. MRI Physics Basics	281
14.2. T1, T2 Relaxation & Image Weighting.....	285
14.3. MR Instrumentation & K Space	288
14.4. MR Sequences	292
14.5. MRI Artifacts	298
14.6. Diffusion Weighted Imaging -Physics and Applications	308
14.7. MR Spectroscopy.....	312
14.8. MR Perfusion.....	319
14.9. Fat Suppression in MRI	327
14.10. MRI Safety.....	334
14.11. MR Angiography.....	337
14.12. SWI & DTI MRI.....	342
14.13. FMRI - BOLD MRI.....	347
14.14. MR Elastography	350
14.15. Recent Advances for Theory Exam	356

Section 15. USG Physics

15.1. USG Physics	367
15.2. USG Transducer.....	373
15.3. USG Doppler Physics	380

<u>Chapter Name</u>	<u>Page No.</u>
----------------------------	------------------------

15.4. USG Elastography	395
15.5. Ultrasound Artifacts	404
15.6. Doppler Artifacts.....	410
15.7. Recent Advances in USG	415

Section 16. Miscellaneous

16.1. Iodinated Contrast Media.....	421
16.2. MRI Contrast Media	426
16.3. PCPNDT	429
16.4. PACS	434
16.5. Radiation Units	437
16.6. Radiation Protection in Diagnostic Imaging	441
16.7. AI in Radiology	444

Section **11**

Women's Imaging

CHAPTER 11.1



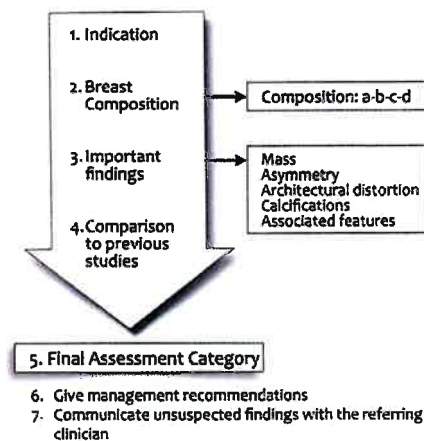
BIRADS

ACR BIRADS

5TH Edition 2013: Mammography, 2nd Edition: USG, MRI

Standard Reporting

BIRADS objective -



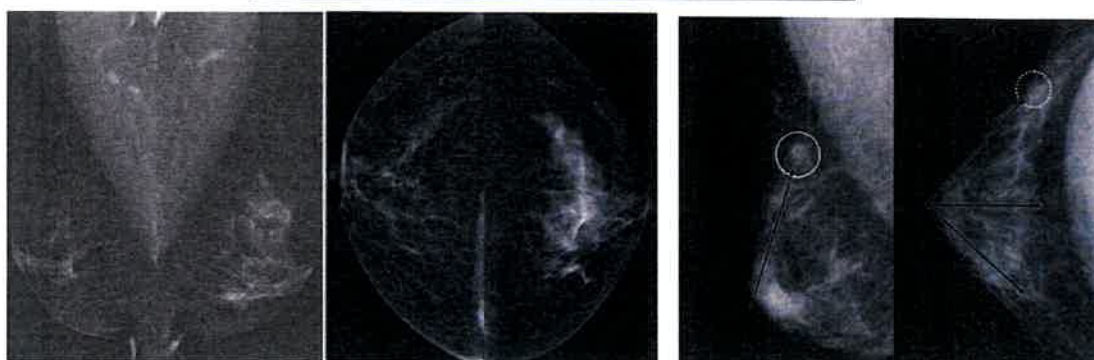
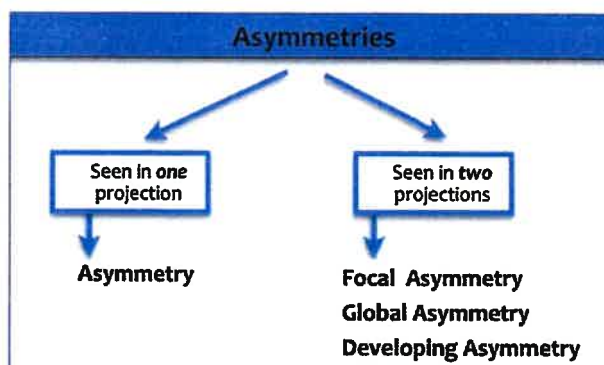
Breast Composition

Breast composition	A. Entirely fatty B. Scattered areas of fibro glandular density C. Heterogeneously dense, which may obscure masses D. Extremely dense, which lowers sensitivity
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Mass vs Asymmetry vs Architectural Distortion

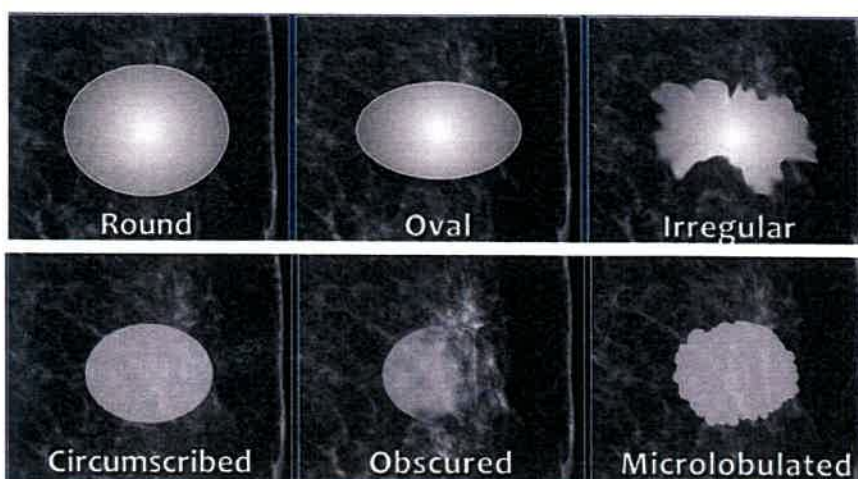


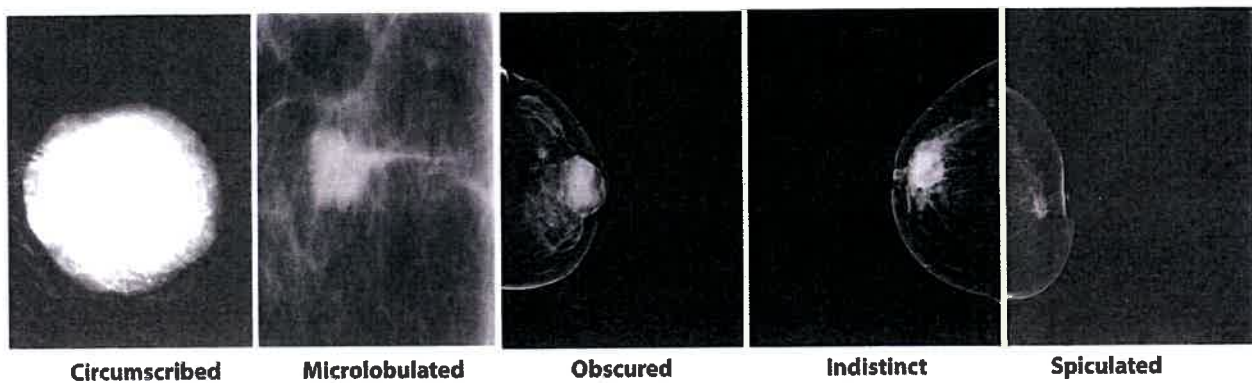
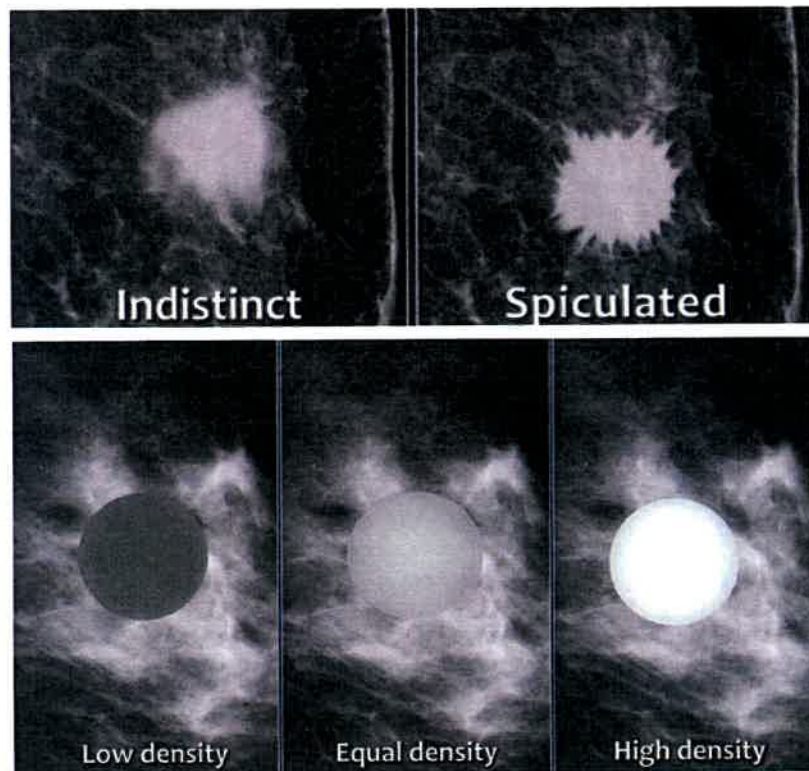
Global asymmetry

Focal asymmetry

MASS

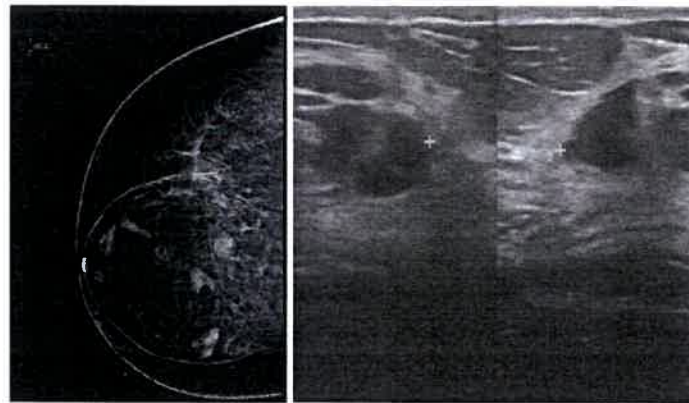
Mass	Shape	Oval – round- irregular
	Margin	Circumscribed –obscured-microlobulated-indistinct spiculated
	Density	Fat- low- equal- high





- Malignant masses with circumscribed margins-
 - Carcinomas (Medullary, Papillary, Colloid)
 - Lymphoma
 - Metastasis
- Mimics
 - Postsurgical scarring
 - Radial scar
 - Desmoid lesions and granular cell tumors

Hamartoma



Birads 2''

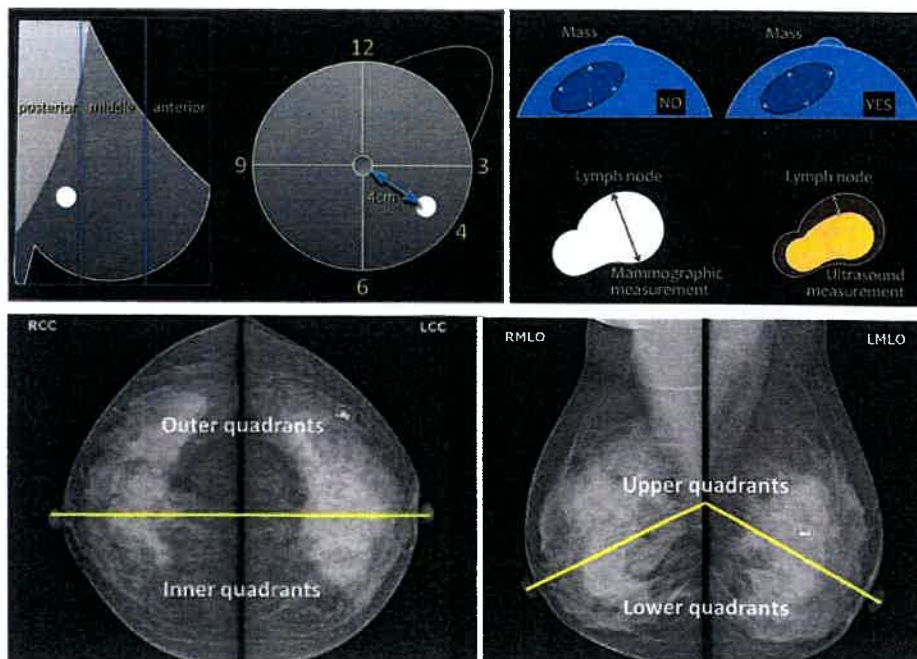
Breast within breast''

MASS

- Designation of right or left breast
- Quadrant and clockface notation
- On US: bodymark and transducer position
- Depth: anterior, middle or posterior third (Mammography only)
- Distance from nipple
- SIZE-
- Mass: LAD –perpendicular
- Spiculations: not included
- Architectural distortion, Asymmetries: LAD
- Lymph-node: SAD

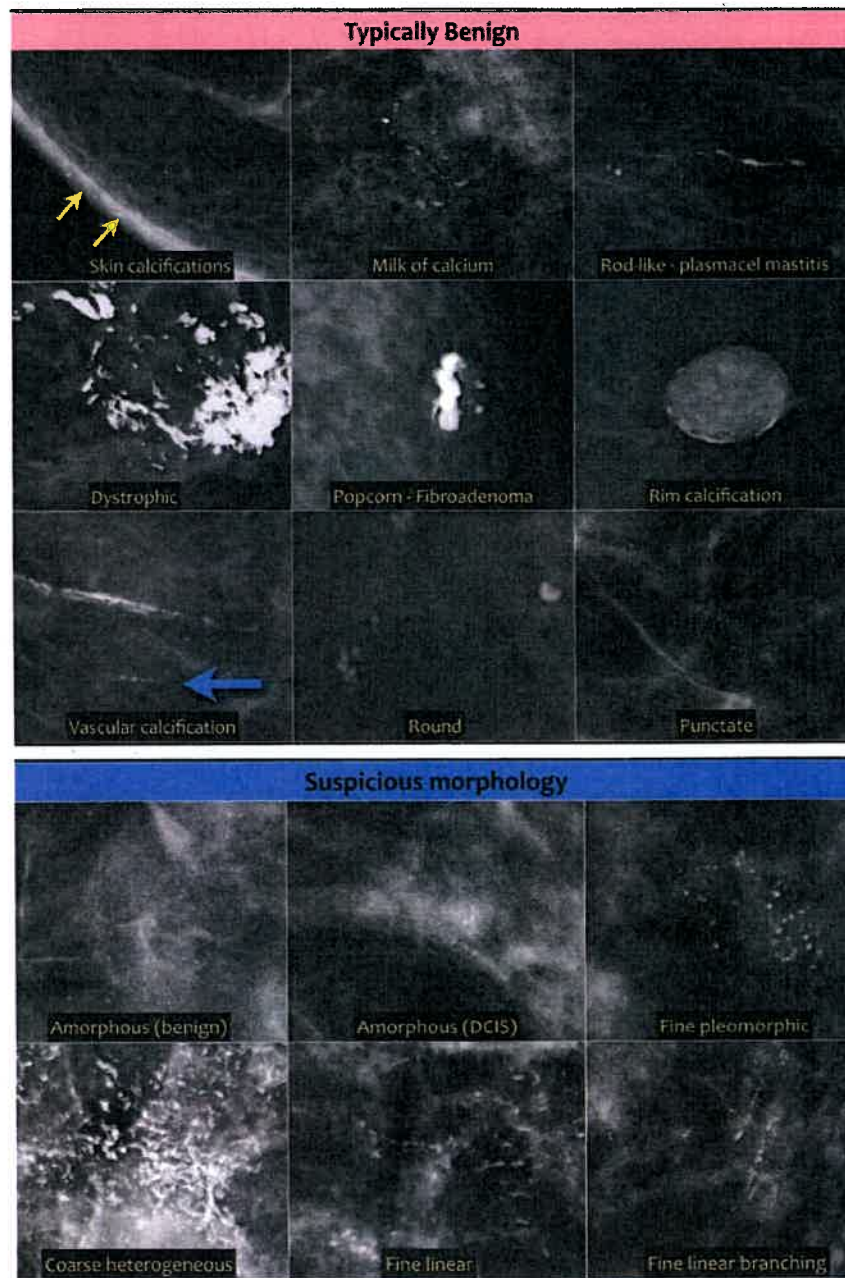
Mammography:

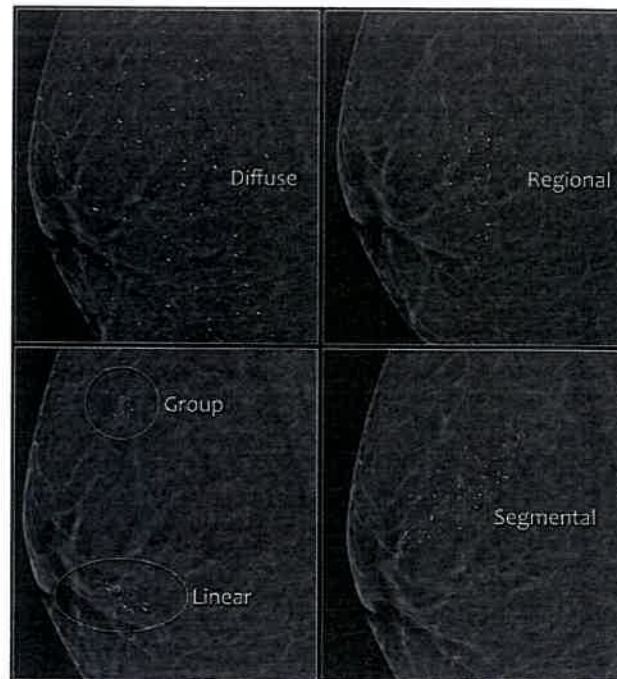
Ultrasound: cortical thickness



Calcifications

Typically Benign	Suspicious Morphology/BiRads
Skin Vascular Coarse or Popcorn-like Large rod-like Round/punctate Rim-calcification Dystrophic Fat necrosis Milk of Calcium Suture	Amorphous 4B Coarse heterogenous 4B Fine pleomorphic 4B Fine linear or 4C Fine linear branching 4C





Associated Features

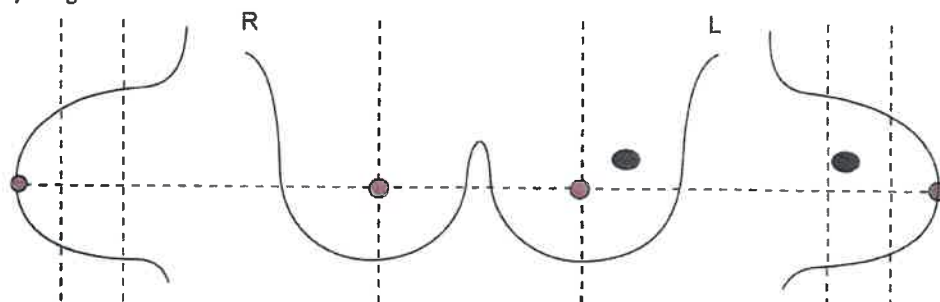
Associated features	Skin retraction - nipple retraction - skin thickening - trabecular thickening - axillary adenopathy - architectural distortion - calcifications
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Template

- Indication for examination:
 - Painful mobile lump, lateral in right breast. No previous history of breast pathology.
- **REPORT:**
 - Breast Parenchymal Density (ACR Category):
- **Right Breast:**
 - Parenchyma: No mass, asymmetrical density or architectural distortion. No microcalcifications seen.
 - Axilla: No enlarged lymph nodes
- **Left Breast:**
 - Parenchyma: No mass, asymmetrical density or architectural distortion. No microcalcifications seen.
 - Axilla: No enlarged lymph nodes
 - Comparison with previous studies: None

Impression: Normal Study

BIRADS Category: Right: 1 Left: 1



CHAPTER 11.2



Basics of Breast Ultrasound

Ultrasound (especially in breast imaging)

Advantages

- Well tolerated by patient (especially painful breast)
- Real time scanning
- Non-ionizing
- With recent advancements- improved resolution
- Vascularity (Doppler)
- Guide interventions (from most pathological areas)/ Mark lesions for follow up

Limitations

- Limited evaluation of fine suspicious calcifications (in absence of mass correlate)
- Operator dependent
- Large breast volume

Real time scanning vs evaluating static images?

Real time scanning has the following benefits:

- Mobility
- Directly assess palpable abnormalities
- See associated skin changes
- Assess all the margins of the lesion
- Architectural distortion can be better evaluated

Patient Subgroup

- Female <30yrs
- Dense breast
- Pregnant patients/ Lactating patients
- Male breast

Disease Pathologies

- Ductal discharge
- Palpable abnormalities- Mass characterization
- Lactational abnormalities
- Acute painful breast pathologies- Mastitis, Breast abscess



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Sonographic Features-

- Is it only solid vs cyst?

Benign : • Gentle lobulations (<3) • Ellipsoid shape • Thin capsule • Homogeneous echogenic • Example- fibroadenoma	Malignant : • Spiculated margins • Taller than wide • Angular margins • Posterior acoustic shadowing • Microcalcifications • Example – breast carcinoma
---	---

This yields 99.5% NPV and 98.4% sensitivity for malignancy.

Recent Advances in Ultrasound

1. Transducer

- Broad band width linear array with central frequency ~ 10MHz
- Multiple focal points are also available in newer probes
- High frequency 17-5MHz (smaller breast<3cm thickness) and 12-5MHz for larger breast upto 5cm tissue depth.

2. Spatial compounding

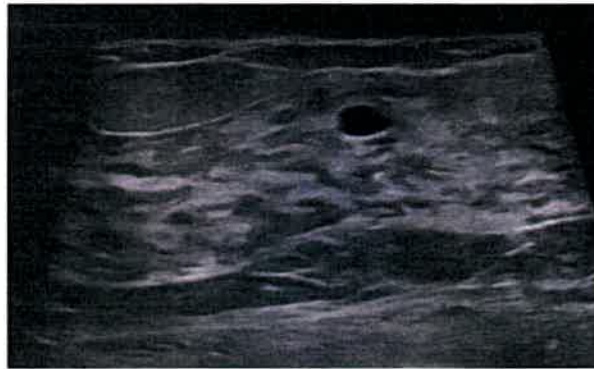


- Reduction in the posterior acoustic features (star) (enhancement as well as shadowing)
- Reduces spurious noise and speckle artefacts, Improves edge, margins and better visualization of calcifications and spiculations.



3. Harmonic imaging

- Sound is distorted as it travels through breast tissue creating frequencies
- In harmonic Imaging we select higher harmonic frequencies
- Thus, lower frequencies removed (from superficial structures/ artefactual)
- Cyst resolution and Lateral Resolution improved



4. Extended field of view = panoramic view

- By free hand probe movement, we can extend our field of view.
- By pattern recognition, a single image is created.
- ADVANTAGES:
 - Relationship and distribution of multiple lesions (Multifocal/ Multicentric)
 - Measurement of large lesion

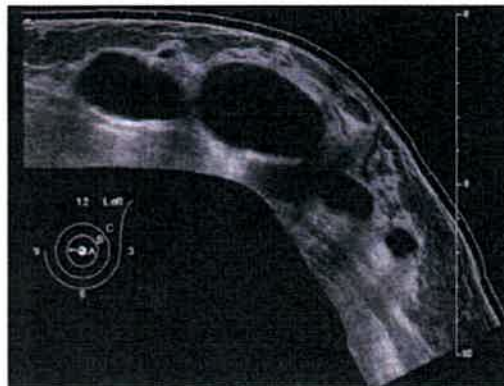


Fig. IMAGE QUALITY: EXTENDED FOV. The FOV sweep shows numerous simple cysts within the fibroglandular tissue of this 46-years-old woman.

5. Elastography

- Assess the deformability of lesion and stiffness
- It is measured by strain or shear.
- Color coded maps are present.
- Softer lesions are more likely benign ; Harder lesions are more likely malignant
- GRAY SCALE IMAGING >>>> Elastography findings
- Lexicon involves soft, intermediate and hard

Color Doppler imaging

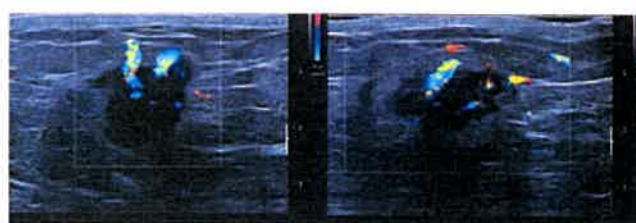
- Color and power Doppler imaging have shown overlapping features
- Neo-angiogenesis is basis for using doppler in breast masses
- However central and penetrating vascularity are seen in suspicious lesions/malignant lesions.
- MICROVASCULAR IMAGING is providing greater details and is being utilized along with AI to improve sensitivity.
- Minimal pressure, PRF:700-1000MHz, Wall filter 50-100MHz, max gain (85-90%)
- Power>color Doppler

Benign

- Capsular, regular caliber vessels
- Parallel artery and vein sign – central or peripheral

Malignancy

- Only central (to capsular)
- Penetrating (perpendicularly) afferent vessels
- Tortuous vessels

**Patient positioning for breast ultrasound –****Inner quadrants**

- Supine
- Arm relaxed flexed behind head

Outer quadrants and axilla

- Arm relaxed flexed behind head
- Contralateral oblique

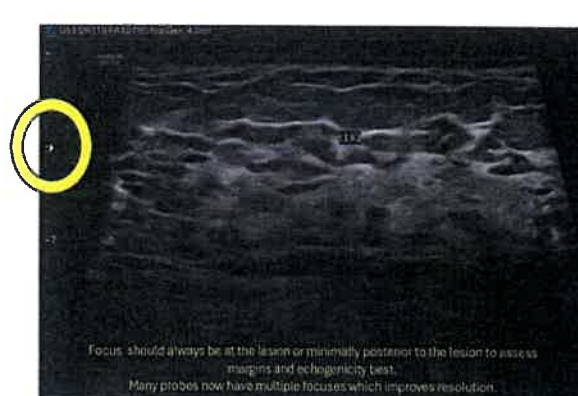
Scanning protocol**Screening –**

- Sweeping movements
- Quadrant and clock wise position
- Radial vs Anti-radial

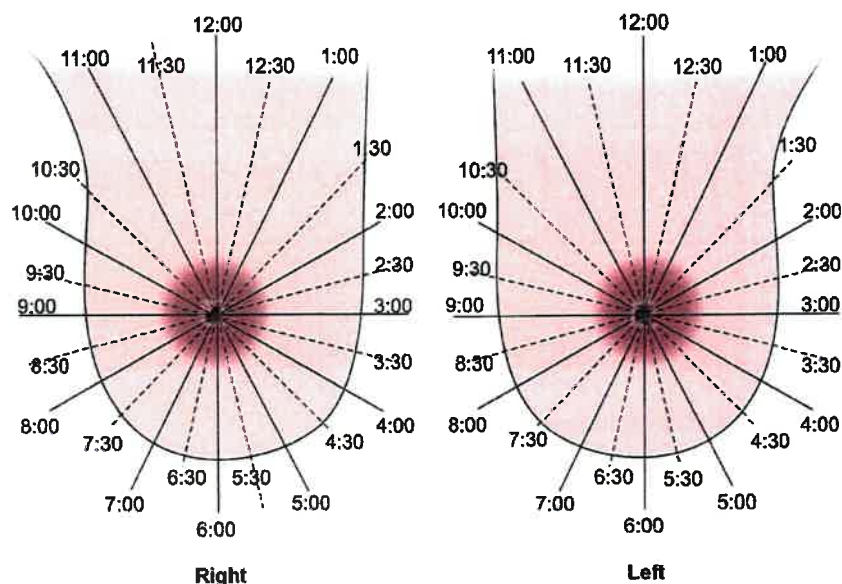
Targeted ultrasound –

- Correlate a finding seen on mammography and/or MRI
- Always check relation with adjacent structures on all modalities

- Few Techniques/Manoeuvres: Gentle firm pressure Gel standoff technique to assess Nipple areola complex Minimal pressure to get better color/doppler characteristics

**Image Annotation**

- Right or Left
- Quadrants (UOQ, UIQ, LOQ, LIQ) (4)
- Clock position
- CM FN (centimeters from nipple)
- Always take two orthogonal plane views for masses
- Always record a mass with calipers and without calipers



BIRADS US LEXICON for mass

Ultrasound		
Tissue composition (screening only)	Homogeneous background echotexture- fat Homogeneous background echotexture fibroglandular Heterogeneous background echotexture	
Masses	Shape	Oval Round Irregular
	Orientation	Parallel Not parallel
	Margin	Circumscribed Not circumscribed – Indistinct Angular Microlobulated Spiculated
	Echo pattern	Anechoic Hyperechoic Complex cystic and solid Isoechoic Heterogeneous
	Posterior features	No posterior features Enhancement Shadowing Combined pattern