Breast Ultrasound

Indications
Normal Anatomy
Technique

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INDICATIONS

Palpable mass
Focal Pain
Nipple discharge
Women under 30 yo, targeted ultrasound is the first study, mammogram as needed
Women over 30 yo, bilateral mammogram is the first study, targeted ultrasound as needed

Breast Ultrasound

Palpable mass
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Indications
Abnormal Mammogram

Mass
Increasing asymmetry/focal asymmetry
Architectural distortion
Calcifications

MRI
Nuclear medicine
CAT Scan
Other

Cat Scan

MRI
Nuclear medicine
CAT Scan
Other

Guidance

Cyst aspiration/FNA
Pre biopsy needle localization
Core biopsy
Intra operative localization
Tumor ablation

Monitoring response to neoadjuvant chemotherapy – breast and chest wall
Implants
INDICATIONS
Whole Breast Screening Ultrasound

ACRIN 6666
21 sites, TJUH

2637 women
hetero/dense, h/o breast ca, ADH, ALH, LCIS, atypical papilloma; lifetime risk>25% - Gail/Claus model

Combined Screening with Ultrasound and Mammography Alone in Women with Elevated Risk of Breast Cancer
Wendie A. Berg MD JAMA.2008;299(18)2151-2163

• adding a single screening US will yield additional 4.3 cancers/1000 high risk women
• predominantly small and node negative

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• 935 women with dense breasts in the general population
• 3.2 additional small cancers/1000
• small, node negative

Screening US in Patients with Mammographically Dense Breasts: Initial Experience with Connecticut Public Act 09-41
Regina Hooley Radiology 2012

• High risk women with contraindication to MRI
• Dense breasts

• 1/2 women < 50
• 1/3 women > 50
• Decreased mammographic sensitivity(30-48%)
• Higher interval cancer rate
• Increased risk of breast cancer 4-6 fold

Issues

• High false positive rate, increasing need for biopsies, call backs
• not able to image most DCIS
• hand held operator dependent
• technical issues with AWBUS
• work flow issues

Density breasts

Definition – heterogeneously or extremely dense

• 1/2 women < 50
• 1/3 women > 50
• Decreased mammographic sensitivity(30-48%)
• Higher interval cancer rate
• Increased risk of breast cancer 4-6 fold
The patient has been informed of her breast density as mandated by the Pennsylvania Breast Density Notification Act. There are four categories of breast tissue density: almost entirely fat, scattered fibroglandular densities, heterogeneously dense, and extremely dense. The first two categories are considered non dense, and the last two are dense. The denser the breast tissue appears, the more it can mask abnormalities. In women with extremely dense breast parenchyma and no other risk factors, in addition to annual screening mammography, supplemental screening with MRI is appropriate for women at high risk for development of breast cancer as determined through formal risk assessment by a qualified health professional. Please advise your patient to check with her insurance provider about these options as coverage may vary.
40 yo pre neoadjuvant Post treatment non dense breasts goes away on spot compression? palpable lump non dense breasts
palpable lump

palpable deep mass

mass on the mammogram near the chest wall

palpable mass near chest wall

cHEST WALL MASS

mam – sono correlation
Scar

Screening MRI

contra lateral breast

Pre treatment MRI
contralateral breast
male chest wall mass

implants
the not so simple cyst
Cyst

Not a Cyst

Normal Anatomy

Technique
NORMAL ANATOMY
15-20 LOBES
nipple - ducts – TDLU - lobule
Chest Wall Ultrasound - Inflammatory Breast Cancer

9 yo palp lump under nipple
Artemis of Ephesus

**TECHNIQUE**
- Real time, hand held transducer
- 7.5 – 18 MHz
- Dynamic focus
- High resolution imaging

**TECHNIQUE**
- Patient supine, semi-erect, sitting or on side
- Ipsilateral arm above head
- Shoulder elevated
TECHNIQUE
- Radial
- Anti-radial
- Sagittal
- Transverse

- Label according to mammographic clock
- Label distance from nipple/areolar margin
- Label area of clinical concern (palpable mass, pain)

TECHNIQUE
- Focal zone
- Gain
- TGC
- Adequate depth for far field
- Gel pad for near field
- Compression
- Position change
TECHNIQUE
- Duplex Doppler
- Spatial Compound Imaging
- Harmonic Imaging
- Extended field
- 3D
- Elastography

DOPPLER - absent, internal, vessels in rim
- Confirmation solid vs. cystic
- Lymph node, abscess
- Pre biopsy
- Vessel Characterization – contrast agents
Color Doppler streaming allows for electronic steering of transducer array, allowing for multiple scanning angles, reduction of speckle, clutter, and artifacts, and improvement of detail of mass margins. Calcification posterior enhancement is less apparent with compound imaging.
**Compound Imaging**

Transmit at one frequency, receive at multiples of that frequency.

- 6MHz transmit/12MHz receive
- Reduces clutter and reverb within cysts, increases lesion conspicuity, marginal definition.
- Good to "clean up" cysts.

**Extended Field**

Panoramic image

- Good for locating multiple masses, correlating with mammogram.
- Implants.
Ultrasound Technology - continuing study

- Elastography
- 3D/4D = volumetric imaging
- Whole Breast Imaging
- Improved Lesion Detection/Characterization – vascular-contrast, calcifications
- Computer Aided Detection

Elastography – based on tissue stiffness – soft, intermediate, hard

ACR BI-RADS

Tissue Composition: homogeneous fat/glandular

Masses - Shape: oval, round, irregular
**Masses - Orientation**
- parallel
- not parallel

**Masses - Margin**
- Circumscribed
- Not circumscribed
  - indistinct
  - angular
  - microlobulated
  - spiculated

**Echo Pattern**
- Anechoic
- Hyperechoic
- Complex cystic and solid
- Hypoechoic
- Isoechoic
- Heterogeneous

**Posterior Acoustic Features**
- no enhancement
- enhancement
- shadowing
- combined pattern

**Calcifications**
- in a mass
- outside of a mass
- introductal

**Associated Features**
- architectural distortion
- duct changes
- skin changes
- thickening
- retraction
- edema
- vascularity
- internal vascularity
- washout
- enhancement
- elastography assessment
- soft
- intermediate
- hard
**Special Cases**
- simple cyst
- clustered microcyst
- complicated cyst
- mass in or on skin
- foreign body including implants
- lymph nodes: intramammary and axillary
- vascular abnormalities – Maders, AVM’s
- post surgical fluid collection
- fat necrosis

**Assessment Categories: BI-RADS**

0 Incomplete
1 Negative
2 Benign
3 Probably Benign
4 Suspicious
5 Highly Suggestive of Malignancy
6 Known Biopsy Proven Cancer

**Category 0: Incomplete**
- need additional imaging evaluation: additional imaging and/or prior films

**Category 1: Negative**
- nothing to comment on, no change, no significant findings

**Category 2: Benign**
- also negative, but describes a characteristically benign finding such as:
  - simple cyst
  - intramammary lymph node
  - implant problem
  - stable, probable fibroadenoma
  - stable post-surgical change
**Category 3: Probably Benign**
- Solid mass with circumscribed margins, oval shape, parallel (probable fibroadenoma)
- Nonpalpable complicated cysts, and clustered microcysts

**Management of a Probably Benign Mass found at Ultrasound (nonpalpable)**
- If a mass is obscured >25% at mammography, or if only seen on US, then US features determine management
- If no malignant features at US, follow-up US at 6, 12, 24 mos
- Biopsy for interval increase in size >10%
- 0.2% false neg rate

**Category 4: Suspicious**
- 3-95% chance of malignancy

**Category 4 Subdivisions**
- 4A: lesion needing intervention with a low suspicion for malignancy (2-10%)
- 4B: moderate suspicion for malignancy (10-50%)
- 4C: high suspicion for malignancy (50-95%), but not classic

**Category 5: Highly Suggestive of Malignancy**
- high probability of being cancer (>95% chance of malignancy)
In 2003, the InSitu Foundation performed a study and found that dogs can sniff out lung and breast cancer by smelling a patient's breath, the New York Daily News reported. According to the InSitu Foundation, dogs' accuracy levels for the early detection of lung and breast cancer has been found to be 88 percent specific and 99 percent sensitive.

We’ve been barking up the wrong tree!

Thank You!