Breast Ultrasound Boot Camp

Dr. Adam Braithwaite
Delaney Radiology

US Features of Malignancy

- Not Circumscribed - Irregular shape, Indistinct margins
- Hypoechoic relative to surrounding tissue
- Not Parallel
- Posterior shadowing
Breast Cancer

- 1 in 8 women will be diagnosed with breast cancer in their lifetime
- 250,000 new cases in 2015
- 40,000 deaths in 2015
- Death rates decreasing since 1990 due to treatment advances and earlier detection
- 2.8 million survivors

Breast Cancer

- Every 2 minutes a woman in US is diagnosed with breast cancer
- 100 million results on Google compared to 41 million for lung cancer and 27 million for prostate cancer
- #1 Lawsuit Against Radiologists

Breast Anatomy

- 6-20 ducts that open on the nipple
- Each defines a lobe or segment of breast
- Beneath nipple, lactiferous sinuses
- Segmental segmental terminal duct

Image Marking

- Measure Transducer!
- 1 cm Equals a regular M & M.
- 2 cm mass like a Peanut M & M.

Helpful Hints
What is BI-RADS?

BREAST IMAGING REPORTING AND DATA SYSTEM (BI-RADS)

• Common Language
• Consistent Care and Management

BI-RADS - Masses

• Mass Shape
• Mass Margin
• Echo Pattern

Mass Shape

• Oval
• Round
• Irregular

Mass Shape - Oval

• elliptical
• egg-shaped
• May have 2 or 3 lobulations
Mass Shape - **Round**

- spherical
- circular
- globular

Mass Shape

- Round and Oval
- DDx:
  - Cyst
  - Fibroadenoma
  - Papilloma
  - Sebaceous Cyst
  - Other Benign
  - Cancer

Mass Shape - **Irregular**

- shape cannot be characterized
- DDx:
  - Radial scar
  - Fat necrosis
  - Phyllodes tumor
  - FA, papilloma, etc
  - Cancer until proven otherwise

Mass Orientation

- Parallel
- Not Parallel

Parallel

- In relation to skin line
- “Wider than Tall”
- Horizontal

Not Parallel

- “Taller than Wide”
- Vertical
BI-RADS - Masses

- Mass Shape
- Mass Margin
- Echo Pattern

Mass Margin - Often most important feature of a mass

Mass Margin - Circumscribed

- Abrupt transition between lesion and tissue
- 100% sharply demarcated
- Likely benign
- No guarantee

Mass Margin - Indistinct

- Margins poorly defined
- Possible infiltration
- Includes echogenic rim

Mass Margin - Angular

Not Circumscribed

- Indistinct
- Angular
- Microlobulated
- Spiculated
Mass Margin - *Microlobulated*

- Lines radiating from margins of a mass

*Note: biopsy even if stable! (tubular CA?)*

Mass Margin - *Spiculated*

- Lines radiating from margins of a mass

BI-RADS - Masses

- Mass Shape
- Mass Margin
- *Echo Pattern*

Echo Pattern

- Anechoic
- Hyperechoic
- Complex Cystic and Solid
- Hypoechoic
- Isoechoic
- Heterogeneous

Anechoic

Cyst
Hyperechoic

Complex Cystic and Solid
- Complex Cyst
- Complex Mass

Colloid Carcinoma – NOT Lipoma

Adenocarcinoma

Special Case – Complicated Cyst

Careful - This Was A Cancer!

Abscess

Hypoechoic

Invasive Ductal Carcinoma
Isoechoic

Tubular Adenoma

Heterogeneous

Metaplastic Carcinoma

Posterior Features

• Enhancement
• Shadowing
• Mixed

Enhancement

• Sound Passes Through Mass
• Cyst or High Grade Cancer

Triple Negative Cancer

Cysts

Shadowing

• Sound Impeded by Mass
• Associated with Fibrosis

Calcification

• Cannot See Fine Microcalcifications Associated with DCIS, So Mammograms Still Necessary
Intraductal Calcification

Associated Features

- Architectural Distortion
- Duct Changes
- Skin Changes
- Edema
- Vascularity
- Elasticity

Architectural Distortion

Can Look like Indistinct Mass. Terminology should not matter though as both should be biopsied unless a known stable surgical scar.

Duct Changes

Lactation

Solitary Dilated Duct Abnormal even without Mass or Debris and is associated with DCIS
Skin Changes

- Lymphedema
- Inflammatory Cancer

Skin should be less than 2 mm in thickness.

Vascularity

- Called a complex Cyst

Vascularity

- IDC

Imaging Tricks

- Better flow? Less compression. Compression occludes vessels. But remember that flow is a supportive, NOT primary feature. Cancer can have no flow.

Elasticity

- Measures the "Stiffness" of a lesion. Associated NOT Primary feature.

Special Case - Cyst

- Circumscribed
- Round or Oval
- Anechoic
- Posterior Enhancement
Simple Cyst

Clustered Microcysts
- Cluster of Anechoic Masses
- 2-3 mm each
- Septations
- **NO DISCRETE SOLID COMPONENT**
- Margins Not Indistinct

Clustered Microcysts

Skin Mass
- Epidermoid Inclusion Cyst
- Keloid
- Mole
- Pimple
- Neurofibroma
- Accessory Nipple

Sebaceous Cyst

Physical Exam is the key to Diagnosing Skin Lesions. Sebaceous Cyst should have dark pore. Use stand off pad or extra gel to see pore.

Accessory Nipple
Intramammary Node

- Circumscribed Margin
- Round or Oval
- Echogenic Hilum
- Hilar Vessel
- Morphology More Important than size!
- Normal up to 2 cm, Though Can Be Larger if Predominantly Fat

Normal IMLN

Abnormal LN

Inflamed IMLN

Special Case – Vascular Abnormality

AVM

Mondor Disease
BREAST IMAGING REPORTING AND DATA SYSTEM (BI-RADS)

• BI-RADS 0 – Incomplete; Needs further imaging
• BI-RADS 1 – Negative; routine follow up
• BI-RADS 2 – Benign; routine follow up
• BI-RADS 3 – Probably Benign; Short interval follow up (usually 6 months)
• BI-RADS 4 – Suspicious; Biopsy
• BI-RADS 5 – Highly Suggestive of Malignancy; Biopsy
• BI-RADS 6 – Known Malignancy

**Category 0** = Needs Additional Imaging Evaluation

- Almost always used in a screening situation
- Role of Screening US
- Additional 3 cancers per 1000 patients

**Category 1** = Negative

- There is nothing to comment on.
  - symmetric
  - no masses
  - no calcs
  - no distortion

**Category 2** = Benign Finding

- Finding is present but DEFINITELY benign
- Continue w/ routine screening

**Category 3** = Probably Benign Finding – Short interval follow-up

- Should get diagnostic workup
- Circumscribed mass
- Round or Oval Margins
- Complicated cyst (aspirate)

**Category 3** = Probably Benign Finding – Short interval follow-up

- <2% risk of malignancy
- Biopsy if **ANY** change at follow up
- **Note:** NEVER off screening
- Most Incorrectly and Overused BIRADS Category
NOT
Probably Benign Lesions

• Extremely dense but o/w negative
• Multiple bilateral masses
• Any lesion that has is palpable

Category 4 ⇔ Suspicious Abnormality – Biopsy should be considered

• Possibility of cancer (2 - 94%)
• Almost always Biopsy
• Optional for self audit:
  ❖ 4A (low) – Enlarging Circumscribed Mass
  ❖ 4B (intermed) – Questionable margins
  ❖ 4C (moderate) – Irregular Mass

Category 5 ⇔ Highly Suggestive of Malignancy – Appropriate action should be taken

• Note: Excise if core biopsy is benign

Category 6 ⇔ Known Biopsy-Proven Malignancy – Appropriate action should be taken

• Known cancer prior to therapy

Angular Margins

DCIS

Category 5

Known Biopsy-Proven Malignancy – Appropriate action should be taken

• Known cancer prior to therapy
CASES

Fibroadenoma

Hx:
Baseline screening mammogram

Invasive CA - Pt refused treatment

Diagnosis?

Diagnosis?

Case 12

2002

Invasive CA - Pt refused treatment

Diagnosis?
Multiple bilateral partially circumscribed similar appearing masses

BIRADS 2, benign

“Recommend routine screening in one year.”

0.14% interval cancers in one year (vs. 0.24%)

DDx: Cysts vs Fibroadenomas
w/u: *Don’t* ultrasound unless palpable
Metastatic disease is very uncommon.
Most common met: from contralateral breast.
History of non-breast primary?
Lymphoma, melanoma, lung, ovarian.
Breast Mass

Invasive Ductal Carcinoma

Margin!!

Breast Mass

IDC
Clinical History and Stability is Key

Radial Scar

Focal Fibrosis
Unilateral Axillary Adenopathy
Malignant lymph node - ICA with calc UQQ

Hx:
Palpable lump
Causes of Gynecomastia

Idiopathic (newborn, adolescent, senile)

Drugs
Cimetidine, Digitalis, Spirinolactone, THC

Other
Cirrhosis, Testicular tumors

Interesting
Morticians (Estrogens in embalming fluid)
Exposure to estrogens in manufacture of oral contraceptives
Use of hair preparations containing estrogens

Mixed fat/tissue:
• hamartoma (fibroadenolipoma)
• lymph node
• fat necrosis
• galactocele
Hamartoma

- "breast within a breast"
- "slice of sausage" pattern

Fat Necrosis

Mixed fat/tissue:
- lymph node
- hamartoma
- fat necrosis
- galactocele

MIXED FAT/TISSUE: Galactocele, milk fistula, lymph node, hamartoma, fat necrosis

Milk Fistula Post Biopsy

Galactocele: Cyst with inspissated milk

Image 3/15/2015 24
Galactocele

Oil Cysts

Intracystic Invasive Ductal Carcinoma
• 63 year old woman
  - Presented with large palpable mass
  - Reports six month history of left breast swelling
  - Recent onset of nipple discharge
Intracystic Papillary Carcinoma In Situ
Phyllodes Tumor

- Rare fibroepithelial tumor resembling fibroadenomas
- Occur in women ages 30-70, mean 52
- On mammo are lobulated, round or oval masses usually noncalcified
- On US well defined solid masses with heterogeneous internal echoes and may have fluid filled clefts

Phyllodes

- Classification is controversial
- Usually classified as benign, borderline or malignant (75-80% are benign) Fewer than 20% of the malignant lesions metastasize, usually to lungs, pleura or bone.
- Excisional biopsy recommended

Juvenile FA

27 y/o unilateral mammo, palpable mass
Hx:
s/p lumpectomy; new palpable lump

Findings: Lump at surgical site

DDX: Cancer, seroma, hematoma, abscess
Invasive Lobular Cancer

- 10-15% of breast cancers
- Common mammographic finding is architectural distortion.
- Others include normal exam, spiculated mass, poorly defined mass, asymmetric opacity, round or oval well defined mass, microcalcifications (uncommon)

40 yo diabetic female with new palpable thickening
Diabetic Mastopathy

- Differential: Cancer, abscess, hematoma, diabetic mastopathy

Mass Margin - *Circumscribed*

- DDx: “circumscribed cancers”
  - Peanut M&Ms
  - Papillary Carcinoma
  - Medullary carcinoma
  - Mucinous carcinoma

Papillary Cancer
Colloid (Mucinous) Carcinoma

- “Peanut M & Ms”
- Better prognosis than NOS invasive ductal CA
- May be well defined on mammo, but remember if a well defined mass is cancer it is statistically more likely to be NOS invasive ductal CA

Epidermal Inclusion Cyst (Sebaceous Cyst)
Granular Cell Tumor

- Exact mimic of IDC
- Enlarging palpable, painless, fixed mass
- Spiculated mass
- Complete excision or recurs

Fat necrosis

Palpable mass-snowstorm

Double lumen implant rupture

Diagnosis?

Bilateral Lobular Carcinoma