Breast Ultrasound

A Critical Component of Breast Disease Diagnosis

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Breast Ultrasound
Diagnosis & Intervention
Anatomy of the Breast

The Breast & Chest Wall
Anatomy of the Breast

Lymph Node Drainage
Breast Cancer

US Breast Cancer Statistics

**Incidence**

Estimated 233,000 new cases of invasive breast cancer in 2014, and 63,000 cases of *in situ* breast cancer (*DCIS/LCIS*)

2-5 breast cancers / 100 women in US

*Overall 1 in 8 lifetime risk*

2% < 30 years of age, 15% < 40, 85% > 30

40,000 breast cancer related deaths expected in 2014

2,500 new cases of breast cancer in men expected in 2014, overall risk 1/1000
Breast Cancer

US Breast Cancer Statistics

Risk Factors

Risk increases with increasing age

Age at first pregnancy < 19 (0.5), >35 2.0
Late menopause, after age 55 2.0
Maternal breast cancer (1.8), sister (2.5), mother and sister 5.6
Prior breast cancer 4.5
Ovarian and endometrial cancer 2.0
Benign breast diseases (fibroadenoma, hyperplasia, ADH) 1.5-4.4

BRCA1 = 55-65% risk before age 70, BRCA2 carries a 45% risk

Risk assessment: GAIL Model questionnaire, lifetime risk > 20% screening MRI
Breast Cancer

Prevention & Detection

Remember that 85% of women diagnosed with breast cancer have NO risk factors…

Prevention and Detection

Baseline mammogram at age 35, age 30 if first degree relative with history

Screening mammogram every year after age 40

Consider baseline mammogram 10 years earlier than age mother/sister diagnosed

Mammographic detection has decreased mortality 25-30%

10-20% of breast cancers are “interval cancers”…develop within 1 year

Almost 10% of breast cancers are found on monthly self exam
Breast Cancer

Diagnostic Imaging

Mammography

Primary screening tool

Digital mammography recently shown to be more sensitive than film (dense breasts)

Ultrasound

Problem solving tool, targeted imaging, detailed lesion characterization

Important for management decision making

Excellent for guiding biopsy, aspiration or pre-op localization procedures

MRI

Previously problem solving tool, now pivotal in breast cancer & DCIS detection

Increased sensitivity for multi-focal and bilateral cancers

Nuclear Medicine – PET

Limited by lesion size, usually lesion must be > 1 cm
Breast Imaging

Elastography

Shearwave elastography, performed using Aixplorer MultiWave Ultrasound System, colorizes palpable masses on basis of their elasticity. Image shows malignant breast lesion with hard shell. Stiff tissue is indicated in red; soft tissue in blue. (Provided by SuperSonic Imagine)
Breast MRI showing multifocal cancer in the right breast
Breast Cancer

Cell Types

Non-Invasive Breast Cancer (“pre cancer”) – 15%

- Ductal Carcinoma in situ (DCIS), Lobular Carcinoma in situ (LCIS)

Invasive Breast Cancer – 85%

- Infiltrating Ductal Carcinoma – 65%
- Infiltrating Lobular Carcinoma – 5-10%
- Tubular Carcinoma – 6-8%
- Medullary Carcinoma – 2%
- Mucinous / Colloid – 1-2%
- Papillary – 2-4%
- Paget’s Disease of the Nipple – 5%
- Inflammatory Breast Carcinoma – 1-4%
Breast Cancer

Histology
Breast Cancer

Lesion Characterization

Equipment

10-14 MHz linear transducer, high quality machine

? Image improvement techniques…effect on shadowing (cross-beam)

Staff: most seasoned and well trained sonographers, preferably breast certified

Lesion Characteristics

Echogenicity: anechoic, hyperechoic, isoechoic, hypoechoic, “internal echoes”

Borders: sharp “cookie cutter,” lobular, ill-defined

Geometry: wider > tall, taller > wide

Acoustics: posterior enhancement, edge shadowing, dense shadowing

Vascularity: absent, vascular, “vascular pedicle”

Relationship to fascial planes (“Green sign”)

Size & Location: centimeters, clockface position, depth (A,B,C)
Benign Breast Disease

Asymmetrical Breast Tissue
Benign Breast Disease

Asymmetrical Breast Tissue

Accessory fibroglandular tissue

Fibrocystic breast tissue
Benign Breast Disease

*Palpable Mass or Ridge*

Prominent Cooper’s ligaments simulating a mass
Benign Breast Disease

Palpable Mass

Lactating adenoma, third trimester of pregnancy
Benign Breast Disease

Palpable Mass

Fibroadenoma

Phylloides Tumor
Benign Breast Disease

Palpable Mass

Sebaceous cyst

Sebaceous cyst, communicating
Benign Breast Disease

*Palpable Mass*

Breast Abscess
Breast Ultrasound

Simple Cyst Definition

What Constitutes A “Simple Cyst”

COMPLETELY anechoic
Sharp “cookie cutter” margins
Round or oval (favorable) geometry, wider \( \geq \) tall
Posterior enhancement, avascular

This Means…

NO internal echoes
NO lobulation of borders
NO tall geometry
NO absence of posterior enhancement
NO vascularity
Breast Ultrasound

Simple Cyst Definition
Breast Ultrasound

Simple Cyst Definition

Hmmm... Why is he showing me this image?
Breast Ultrasound

Simple Cyst Definition

U/S guided cyst aspiration
Breast Imaging

Mammographic Appearance of Cancer
Breast Ultrasound

Sonographic Appearance of Cancer
Breast Ultrasound

Benign or Malignant?

What would you call this lesion?

Can you do anything to further characterize?

Colorflow confirms solid lesion
Disruption of fascial planes (\(\text{? Sign}\))

Infiltrating Duct Carcinoma
Breast Ultrasound

Benign or Malignant?

What would you call this lesion?

*Infiltrating Duct Carcinoma, mucinous type*
Breast Ultrasound

Benign or Malignant?

What would you call this lesion?

Benign, Sebaceous cyst
Breast Ultrasound

Benign or Malignant?

What would you call this lesion?

Is there anything else you should do to evaluate it?
Breast Ultrasound

Benign or Malignant?

Infiltrating Duct Carcinoma, mucinous type

Biopsy procedure
Breast Ultrasound

Benign or Malignant?

What would you call this lesion?

*Infiltrating Duct Carcinoma, NOS*
Breast Ultrasound

Benign or Malignant?

What would you call this lesion?

Benign, Fibrocystic breast tissue
Breast Ultrasound

Benign or Malignant?

What would you call this lesion?

Infiltrating Lobular Carcinoma
Breast Ultrasound

Benign or Malignant?

What would you recommend for this lesion? Follow-up in 6 mos?

Infiltrating Duct Carcinoma, 7 mm
Breast Ultrasound

Benign or Malignant?

What would you call this lesion?

Infiltrating Duct Carcinoma
Breast Ultrasound

Benign or Malignant?

What would you call this lesion? Sign?

Infiltrating Duct Carcinoma, 5mm
Breast Ultrasound

Benign or Malignant?

What would you call this lesion?

Infiltrating Duct Carcinoma
Breast Ultrasound

Benign or Malignant?

What would you call this lesion?

*Infiltrating Duct Carcinoma*
What would you call this lesion

Benign, Intraductal papilloma, multifocal
Breast Ultrasound

Multiple Appearances of Breast Cancer

What do all of these breast cancers have in common?
They are all from women under the age of 40!
Breast Ultrasound

Mystery Case

Do you see an abnormality?

Infiltrating Duct Carcinoma
Breast Ultrasound

Mystery Case

Do you see an abnormality?

Benign, Ruptured silicone implant with lymph node involvement
Breast Ultrasound

Male Breast Carcinoma
Breast Ultrasound

What Is This?
Breast Ultrasound

Male Gynecomastia

LEFT NIPPLE SAG
Breast Ultrasound

Ultrasound Guided Intervention

Ultrasound guided 14g core biopsy