

Breast Imaging Update: Old Dog New Tricks

Claire McKay, DO
M&S Imaging Assoc.
San Antonio, TX
cmckayhart@juno.com

Goals

- Describe modalities available, old and new
- Provide understanding of pros and cons
- Provide knowledge of ordering appropriate tests for patients for the time and expense
- Ensure that primary care physicians have the information to discuss modalities with patients

Mammography

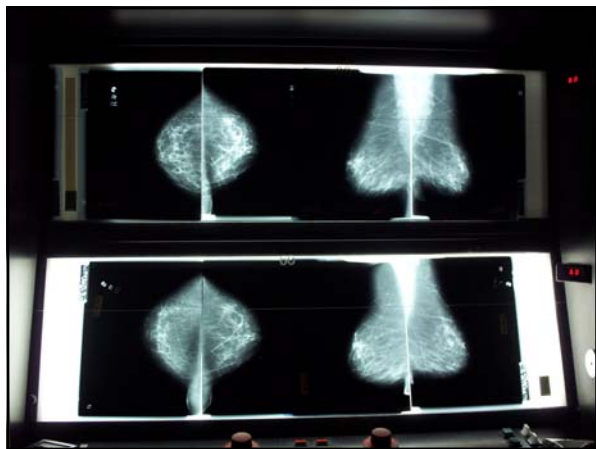
- Low dose XRay
- Appropriate to screen large population @ low \$
- Used for more than 70 years
- Modern application since 1969
- Compression important for seconds
- Radiation risk: very low
 - XRT for CA = several thousand rads
 - Mammogram every year for 50 yrs = 20-40 rads

Screen vs Diagnostic

- Asymptomatic vs symptomatic
- Goal to find cancer too small to be palpable
- Local breast CA <1 cm has 5 yr survival @ 97%
- Post cancer patients dilemma

Screening Mammography

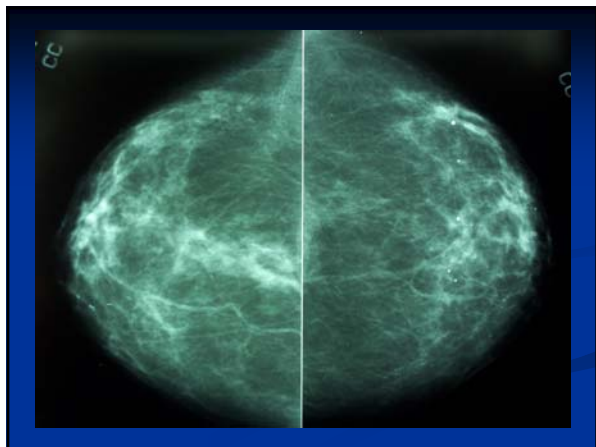
- Asymptomatic woman
 - Woman 40 and older
 - Woman <40 with mother, sister, daughter
- Cyclical pain challenge
- Nodular breasts change
- Try to keep costs low

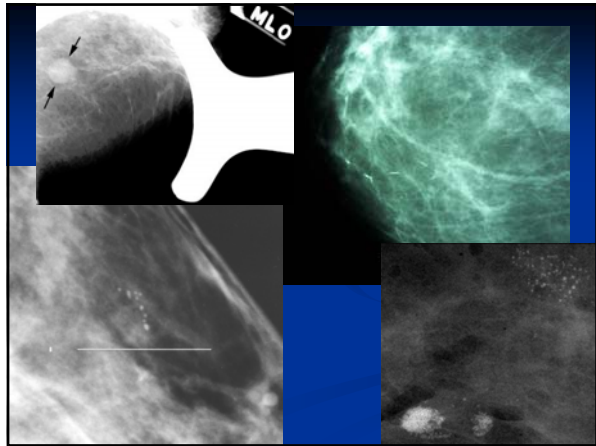


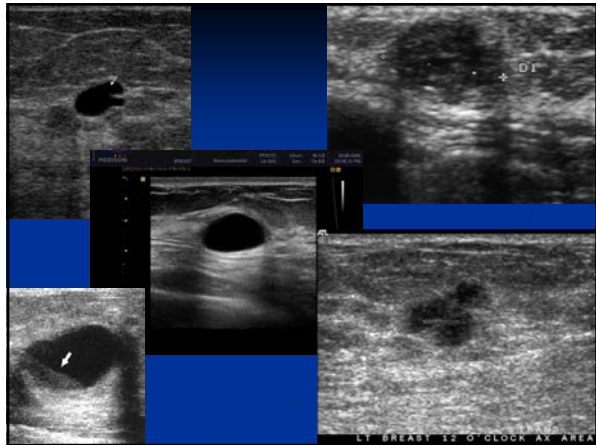


Diagnostic Workup

- Symptomatic
 - Standard 2 views, may need others
 - >30 begin with mammogram, may need US
 - <30 begin with US
 - Male workup: mammogram and US







BIRADS: Breast Imaging and Reporting and Data System

- American College of Radiology standard description and followup
- Category 0 – 6
 - 0: Needs additional followup
 - 1: Nothing on which to comment. 1 yr followup
 - 2: Benign findings. 1 yr followup
 - 3: Short term followup, 3-6-9 months
 - 4: Suspicious findings. Recommend biopsy
 - 5: Malignant features. Urge biopsy
 - 6: Known malignancy

Galactogram/Ductal Lavage

- Ductogram
- Used to determine bloody nipple discharge
 - Bloody vs brown vs green vs yellow or white
- Contrast injected into nipple with XR
- Lavage fluid and evaluate cytology

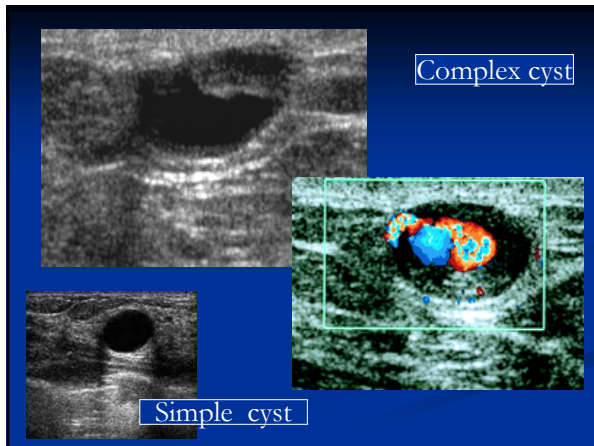
Galactogram filling defects



Ductal lavage

Ultrasound

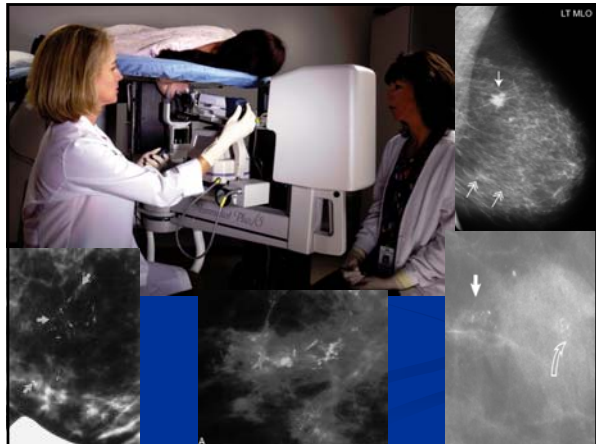
- Aid in diagnostic workup or biopsy
 - Cystic vs solid, tail vs shadow
 - Size and shape
- Cannot see microcalcifications, thus not appropriate for screening
- Helpful in dense breasts



Imaging Guided Breast Biopsy

- Biopsy to remove tissue for pathological diagnosis
- Sampling >96% successful
- 70% of biopsies are benign
- FNA vs Core biopsy 11g or 14g
 - FNA 18 or 20g needle
 - Core bx: US, Stereotactic/vac, MRI





Magnetic Resonance Imaging

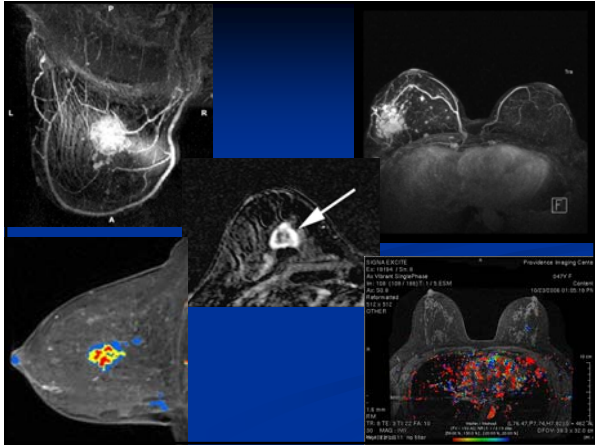
- Magnetization and radio waves to produce multiplanar images
- Augmented breasts: silicone vs saline
- Gadolinium contrast may be used
 - Dense parenchyma
 - Post surgical
 - Multicentric cancers
 - Dynamic imaging now widely used
 - Time intensity curves

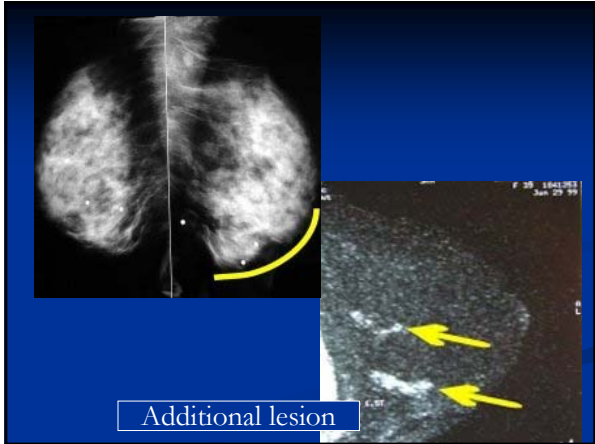
MRI Disadvantages

- Cost remains high: machine, maintenance, breast coil
- Time intense: 30 minutes plus processing time
- Prone
- Large breasted women won't fit the coil
- Specificity remains moderate even with CAD
- Claustrophobia, aneurysm clips, pacemakers, cochlear implants
- Cannot detect calcifications
- GFR guidelines
- What to do with all the information

MRI Advantages

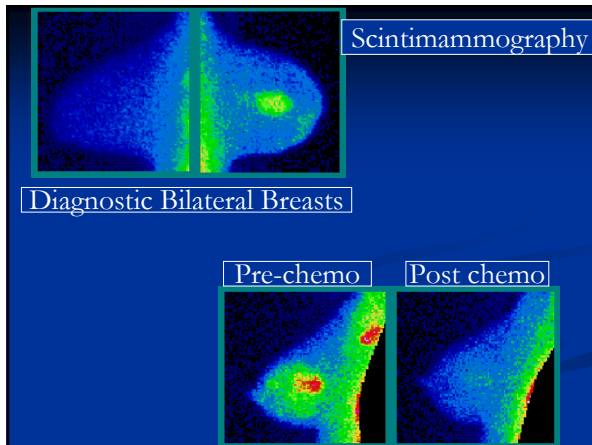
- Advantages:
 - Sensitivity 96%, comparable to mammo+US
 - 10-15% breast CA is mammographically occult
 - 2 - 3 % breast CA is mammo AND US occult
 - Contrast enhancement is very sensitive
 - Sensitive for ruptured silicone implants





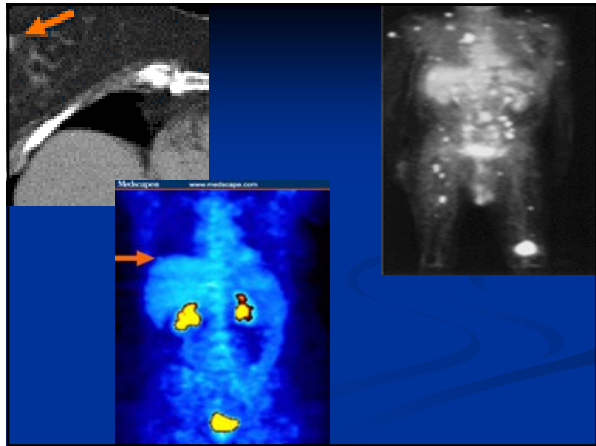
Nuclear Medicine

- Tc99 Sestamibi or Tetrofosmin (1992)
 - Sensitivity 80-90%, av 85%; specificity 89%
 - False positive: FA, FCC, inflammation, sclerosing adenosis, epithelial hyperplasia
 - Post biopsy or XRT will affect uptake.
 - Prone position
 - Lesions should be over 10 mm



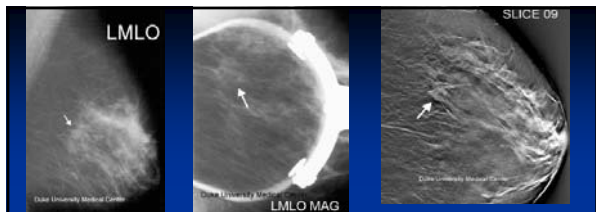
Nuclear Medicine

- PET: F-18-fluorodeoxyglucose (FDG), metabolized like sugar
- Active cancer cells use the FDG then decay; emission of positrons are imaged
- DCIS not well imaged, B9 lesions absent/low FDG uptake
- Newer cameras can detect 0.4 cm lesions and now developing PET imaging for primary breast cancers
- Developing PET/CT to merge images and improve resolution of PET; won't be used for primary lesions but helpful in metastatic workup

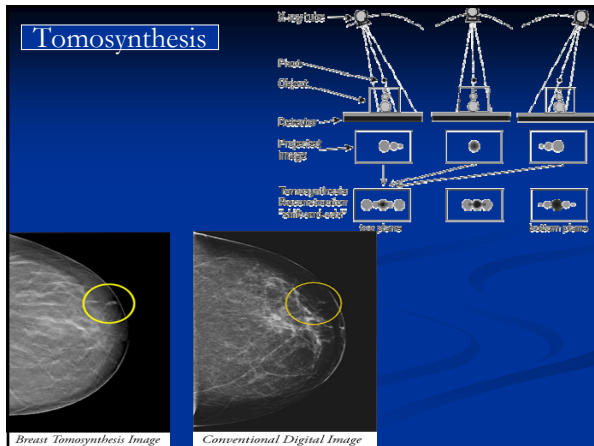


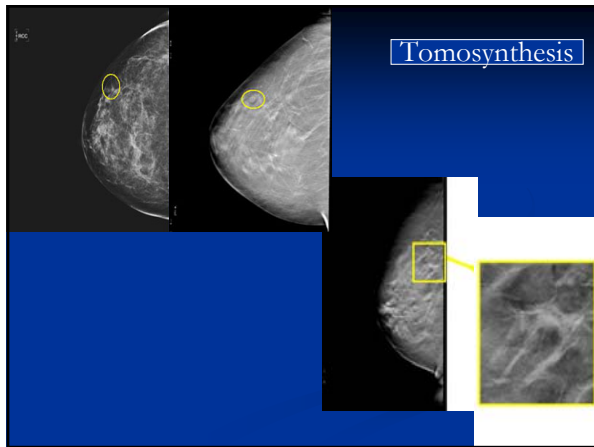
Tomosynthesis

- Digital Tomosynthesis (DTS)
 - the limited angle technique, which allows the reconstruction of tomographic planes on the basis of the information contained within the images



The goal is to provide 3D information at the same high resolution and reasonable dose as mammography, while possibly reducing compression for improved patient comfort. Since the system will be based on digital mammography, it will also be faster and cheaper than alternatives requiring dedicated equipment such as CT or MR.



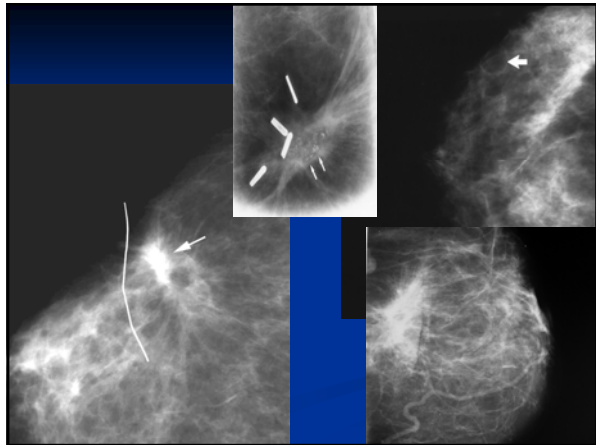


Mammography after Lumpectomy

- Excisional biopsy with wide margin
- Often with radiation (XRT) or brachytherapy, possible chemotherapy
- Mammogram presurgery, post 6 months and q 6 mo X 3 to 5 to 8 yrs on the affected side
- XRT and surgery cause scar that will develop and peak up to 6 months post intervention
- Very important to compare old mammograms

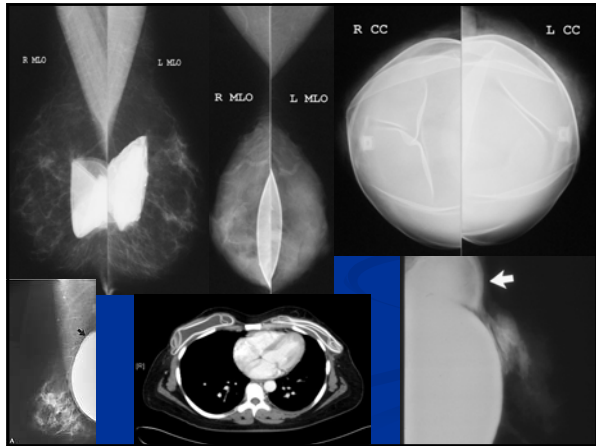
Mammography Post Mastectomy

- Radical mastectomy, no annual imaging but may image as needed; US and MRI may help
- Subcutaneous mastectomy with nipple and skin intact should be imaged annually
- Radical mastectomy with implant reconstruction do not need annual mammography
- Radical mastectomy with TRAM flap (transverse rectus abdominus myocutaneous) reconstruction do not need annual mammogram



Mammography after Augmentation

- Screening should be done pre and post augmentation
- Annual screen with CC/MLO with pushback views
- Silicone ruptures may not show on a mammo but do show well on an MRI
- Rare for mammogram to cause a rupture



Digital Mammography

- XR are used just like standard mammography
- Difference is in the recording, viewing, storage
- May be transported over phone lines to any computer
- Digital as accurate as standard, additional techniques to manipulate images may reduce callbacks
- Improving resolution for calcifications

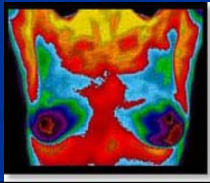


Computer Aided Diagnosis (CAD)

- Digital computer to help identify abnormal mammographic findings
- May work off FFDM or convert analog to digital
- Marks masses, densities, calcifications
- FDA approved
- Attorneys love it, over and over and over

Thermography

- Thermal imaging
- Measure and map heat from the breast w/camera, computer hot spots
- Angiogenesis increases heat, maps heat
- Usually used by Chiropractors
- FDA approved but as adjunct to Mammo/US
- High false positive, not reliable



Computed Tomography Laser Mammogram

- CTLM uses laser to examine planes of tissue to produce 3-D images
- Clinical studies only, not FDA approved
- Electrical impedance imaging uses electrical conductivity of cells because cancer cells conduct electricity better.

Screen vs Diagnostic

- 42 yo F with right breast pain, periareolar to posterior, lingering for 3 months. No discharge.
- 21 yo F with bilateral breast pain. 2cm lump right upper outer that comes and goes.
- 32 yo F with thumb sized lump left medial breast for 4 weeks, greenish discharge bilateral.
- 64 yo M with right breast bigger than left and tender nipple for 4 months, no discharge.
- 82 yo F, bloody nipple discharge off /on for 6 months.
- 45 yo F with normal screening mammo 3 months prior, now with palpable nodule left high lateral breast/axilla.

Conclusion

- Many modalities available and always improving
- Mammography and ultrasound are still most cost effective in initial workup and diagnosis
- Digital mammography is continually improving and just now has the resolution of film screen
- Radiation to patients remains low for workup
- ACR continues to monitor guidelines for quality

Thank you!!

C. McKay, DO