Diagnostic Dilemmas of Breast Imaging

Common Causes of Error in Breast Cancer Detection
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Initial Imaging

Mammography:

- The standard for detection of breast cancer
- Screening mammography is performed to detect an abnormality
- Diagnostic mammography is used to further evaluate an abnormality detected at screening or a clinical problem

Screening Mammography:

- The false-negative rate of screening mammography is approximately 8%–10%
- High-quality mammography with attention to detail and positioning can significantly augment the accuracy of image interpretation

Mammography Pitfalls

Causes of Missed Breast Cancers:

- Dense parenchyma obscuring lesion
- Incorrect interpretation of a suspicious finding
- Poor positioning or technique
- Perception error
- Subtle features of malignancy
- Slow growth of a lesion
Missed Cancer and Dense Breasts

- Dense breast tissue compromises detection of masses
- Particularly problematic with
  - Non-calcified lesions
  - Non-distorting lesions
  - Equal density masses

Calcified lesions
- Radiologist must be particularly attentive in searching for areas of faint microcalcifications
- Particular attention in areas of clinical palpable concern
- Diagnostic mammography with magnification views are used to evaluate the morphology of suspicious or faint microcalcifications
- Management based on worst features of any calcifications detected

Distorting lesions
- Architectural distortion may be the only sign of malignancy in a dense breast
- Characterized by areas of tethering or disruption of orientation of normal parenchymal elements
- Unless documented as a postsurgical scar, architectural distortion must be further evaluated with additional views
- U/S also helpful in detection of solid masses in an area of distortion

Unequal density masses
- Masses of density equal to that of the surrounding tissue lack inherent contrast
- Low density lesions still carry a risk of malignancy and cannot be discounted due to their density
- High density lesions may be associated with tightly clustered cells (cancer) or fluid filled cavities (cysts)
  - High density breast masses are three times more likely to be malignant than their low-density counterparts

Case Example Pearl:
Any patient with dense breast parenchyma, a palpable mass, and negative mammographic findings should undergo ultrasound for further characterization
Missed Cancer and Incorrect interpretation

Interpretive error factors:

- Lack of experience
- Fatigue or inattention
- Prior images not used for comparison
- Failure to obtain all needed views to fully assess the character of a lesion
- Judging an abnormality by its most benign features (aka being the optimist)

Case Example Pearls:

- A lesion with suspicious features is still suspicious even if only seen well in one view – think the worst!
- Don’t discount a lesion that partially persists on additional views – work it up with more views and consider U/S!

Missed Cancer and Poor Technique

- The technologist must optimize image contrast to avoid obtaining over- or under- penetrated images
- Proper positioning of the photocell
- Careful attention to daily processor quality control
- The technologist should always review the images under proper mammographic viewing conditions to assess the adequacy of technique
- Image blur can obscure microcalcifications

Case Example Pearls:

- You get what you expect – expect good quality imaging

Missed Cancer and Perception Error

- Perception error occurs when the lesion is included in the field of view but is not recognized by the radiologist
- Lesion may or may not have subtle features of malignancy that cause it to be less visible:
  - Small non spiculated masses
  - Architectural distortion
  - Subtle asymmetry
  - Small clusters of amorphous or faint microcalcifications
- To avoid perception error, images should be reviewed as mirror images
- The radiologist should compare like areas on the side-by-side images to identify any focal asymmetric density or low-density mass
Case Example Pearls:
- Failure to diagnose multifocal and multicentric breast cancers can directly affect patient treatment. Beware of “satisfaction of search!”
- Multifocal breast cancer is defined as two or more cancers in the same quadrant
- Multicentric breast cancer is defined as two or more cancers in different quadrants - breast conservation therapy is contraindicated

Missed Cancer and Subtle Malignancy Features

- Areas of architectural distortion (recall earlier case example)
- Relatively well circumscribed masses
  - Well-circumscribed cancers are relatively uncommon, they do exist:
    - Medullary
    - Colloid (mucinous)
    - Papillary carcinoma
  - Invasive ductal carcinoma NOS is usually not circumscribed
    - Because it occurs frequently, it accounts for the majority of circumscribed cancers
- Focal asymmetric densities
  - These findings in isolation have a low positive predictive value for malignancy
  - When they are associated with microcalcifications or architectural distortion, the risk of malignancy is significantly increased
  - In the absence of tumor or infection, focal developing densities should prompt further assessment and, usually, biopsy
- Dilated ducts
  - Are infrequently associated with malignancy
  - Patterns of ductal dilatation that suggest malignancy include:
    - Unilateral solitary dilated duct
    - Dilated ducts associated with microcalcifications
    - Dilated ducts associated in a non-subareolar location
- Small groups of amorphous or punctate microcalcifications

Case Example Pearls:
- Spot views of a circumscribed mass that proves to be a cancer will often demonstrate some area of indistinctness or microlobulation of the margin. So work it up even if at first glance it looks benign on screening exam!
- New asymmetries always get a work up!
Missed Cancer and Slow Lesions

- Doubling time for breast cancers has been reported to range from 44 to 1,869 days
- Malignant calcifications have been reported to be stable at mammography for as long as 63 months
- Low-grade malignancies may not undergo obvious change between annual interval screenings

Case Example Pearls:
- A lesion with features that strongly suggest malignancy but that has been stable for 1 – 2 years still requires biopsy
- Particular caution should be used in evaluating stable masses or lesions with suspect morphologic features that decrease in size in patients who are receiving tamoxifen

Conclusions

Mammography:
- The standard for detection of breast cancer
- **Screening** mammography is performed to detect an abnormality
- **Diagnostic** mammography is used to further evaluate a screening abnormality or a clinical problem

To reduce the possibility of missing a cancer, the radiologist should:
- Not rely on screening views alone to diagnose a detected abnormality - complete the evaluation with diagnostic mammography
- Review clinical data and use U/S to help assess palpable or mammographically detected masses
- Be strict about positioning and technical requirements to optimize image quality
- Be alert to subtle features of breast cancers
- Compare current images with multiple prior studies to look for subtle increases in lesion size
- Look for other lesions when one abnormality is seen
- Judge a lesion by its most malignant features
Clinicians should consider the following when working up patients with breast complaints:

- Do not order screening exams for patient with palpable findings on clinical exam - a diagnostic mammogram and ultrasound is indicated
- Never let a negative imaging work up stop a biopsy of a clinically suspicious finding – particularly true of nipple abnormalities (Paget’s) and skin findings (inflammatory breast CA)
- Consider if a work up is really complete – never hesitate to ask the radiologist if there is something else that can be done if you are suspicious – MRI, nuclear medicine imaging will be discussed next session and may a reasonable adjunct to a work up