DIGITAL BREAST TOMOSYNTHESIS

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Module Outline

1. Case presentation
2. What is DBT?
3. Why do we need DBT?
4. Is it really that good?
5. What does the future hold?
42-year-old female presenting from an outside imaging center with abnormal mammogram and ultrasound.
Mrs. K is a 42 yo female presenting from an outside imaging center with abnormal mammogram and ultrasound. PMH significant for breast cancer in mother at age 58.

Mrs. K’s breast density is extremely dense. Outside mammogram and ultrasound demonstrate regional architectural distortion in the left breast middle depth laterally, with corresponding BI-RADS 5 irregular spiculated mass left breast 3:00 sonographically. The left axilla is negative.
Interpretation of outside bilateral mammogram and ultrasound
Digital breast tomosynthesis
Targeted ultrasound of left breast and axilla
OSH Mammograms: Where’s the Abnormality?
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Findings: Regional architectural distortion in the left breast middle depth laterally, with corresponding BI-RADS 5 irregular spiculated mass left breast 3:00 sonographically. The left axilla was negative.
Due to the patient’s extremely dense breast tissue, digital breast tomosynthesis (DBT) was obtained. Note the increased prominence of Mrs. K’s left breast mass on DBT compared to her outside mammogram.
2D vs 3D (DBT): Where’s the Abnormality?
2D vs 3D (DBT): Where’s the Abnormality?

This mass was very difficult to detect on L MLO MMG but becomes very apparent on L MLO DBT.

Spiculated margins are more pronounced.
MMG only showed architectural distortion and was unable to detect the spiculated mass. DBT showed architectural distortion as well as a spiculated mass measuring no less than 2.7 cm mammographically in the left breast 3:00 middle depth. The DBT findings correlate with ultrasound. Lymph nodes were normal.
Discussion: What is Digital Breast Tomosynthesis (DBT)?

- Received FDA approval in 2011
- DBT creates a 3D image of the breast using x-rays
- Breast positioning is the same as conventional mammogram, but with less compression
- X-ray source moves over an arc of excursion with reconstruction into thin slices to minimize the influence of overlapping breast structures.
- Total radiation dose of digital mammography plus tomosynthesis is approximately 2 times the current digital mammography dose but remains well below the limits defined by the FDA$^{1,4,5}$. 

1. [FDA's approval of DBT](https://www.fda.gov/medical-devices) 
2. [DBT in practice](https://www.sciencedirect.com/science/article/pii/S0027580512003675) 
3. [Radiation dosimetry in DBT](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7183027/)
Discussion: What is Digital Breast Tomosynthesis (DBT)?

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The denser the breast tissue, higher the risk of developing breast cancer. When compared to women with fatty breasts, women with extremely dense breasts have a...

- four-fold increased risk of breast cancer
- 18-fold higher risk of interval cancer*
- 1.9-fold increased risk of breast cancer death²

*Interval cancer = detected/presenting within 12 months after a normal screening mammogram. More likely to behave aggressively and have a poor prognosis.
Discussion: Research Studies

- *JAMA* study showed tomosynthesis images increased the detection of invasive breast cancers by 41 percent and decreased recalls for additional imaging by 15 percent.

- In an analysis of 7292 screening examinations, Ciatto et al demonstrated a significant increase in cancer detection rate from 5.3 to 8.1 cancers per 1000 women screened, with 20 of 59 cancers seen only after addition of tomosynthesis to conventional digital mammography.
No study has examined this question for tomosynthesis. We can only extrapolate findings from 2D mammography studies.

For 2D mammography, screening reduces breast cancer mortality when it reduces the rate of advanced cancers (stage II or higher) and increases detection of small node-negative invasive cancers.

Women with dense breasts are more likely to have stage II and III disease detected on screening MMG, mostly because these cancers go undetected until they are larger.

If DBT is able to detect cancers in dense breasted women earlier, then it might also reduce patient mortality.
# DBT Summary Points

## PROS
- Higher sensitivity (detection of cancers), especially cancers w/o calcifications
- Higher specificity (lower recall rate from screening)
- Lighter breast compression = more comfortable for patient
- Improved cancer detection in dense breasts

## CONS
- Lack evidence on mortality outcomes
- Software/hardware upgrades for reading and storing the larger tomosynthesis images
- Increased radiation dose
- More expensive
References