Syllabus Outline:

Specialty area: Addressing Clinical Needs

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Highlights:

- Digital Breast Tomosynthesis (DBT) is emerging as the new standard of care for breast cancer screening due to its improvements in both sensitivity and specificity when compared to conventional digital mammography (DM).
- Breast Density is known to lower the sensitivity and specificity of mammography and is also a risk factor for breast cancer. How does DBT compare to CE-MR in the detection of cancer, particularly in women with dense breast tissue where the sensitivity of conventional 2D digital mammography (DM) is known to be limited?

Title of Talk: "Finding Cancer in the Dense Breast: MRI or Tomosynthesis"

- **TARGET AUDIENCE** — Radiologists, imaging scientists, technologists, healthcare providers and consumers
- **OUTCOME/OBJECTIVES** — To update information available on digital breast tomosynthesis (DBT) and contrast enhanced MRI (CE-MR) in breast cancer screening
- **PURPOSE** — Screening with conventional digital mammography (DM) is known to be limited by it's relatively low sensitivity and the high rate of false positives prompting additional imaging and often biopsies, particularly in women with >50% breast density (1,2). Digital breast tomosyntheis (DBT), which provides a quasi-3D imaging format, has been shown to both decreased false positives as well as increase cancer detection across all breast densities (3-7). Increased breast density is known to lower the sensitivity and specificity of mammography and is also a risk factor for breast cancer. In some early studies, screening with DBT has been shown to find more cancer, even in denser breasts. Supplemental screening with US has been shown to increase cancer detection compared with 2D DM alone in women at intermediate risk and with > 50% breast density but the modality is fraught with high levels of false positives and is very operator dependent. CE-MR has been shown to detect many more additional cancers than screening ultrasound but is also fraught with false positives.

  A review of current literature shows very little data directly comparing DBT to breast MRI in the screening population. However, a few small studies have compared the findings from DM and ultrasound with DBT and CE-MRI in the staging of patients with

newly diagnosed breast cancer. Mariscotti et al (8), in a study of 231 women with 250 malignant lesions undergoing pre-operative MR (after 2D mammography +US and DBT), demonstrated that DBT compared to 2D and US increased the detection of additional sites by 2.8% (7/250) compared to a 4.0% increase (10/250) with CE-MR. Similarly, Mercier et al (9) in a prospective trial of 75 patients with BIRADs category 4 or 5 2D mammograms +/- US, showed a 10.5% increase in detection of additional sites of malignancy detected when DBT was added compared to 2D mammography and US but a 17% increase in additional sites with CE-MR.

Additional preliminary data will be presented comparing DM versus DBT screen detected cancer patients undergoing CE-MR imaging for extent of disease (10).

- **METHODS**

The study was an IRB approved, retrospective review. The study population was comprised of two separate cohorts, the first consisting of 26,563 patients who were screened with both DM and DBT from October 1, 2011 through November 20, 2013. The second cohort consisted of 10,751 patients screened the year prior with only DM (September 1, 2010 through August 30, 2011). The screened patients who went on to have a subsequent MR were identified, consisting of 235 of the DBT patients (utilization rate of 0.88%) and 83 of the DM patients (utilization rate of 0.77%). From this cohort, the patients who specifically had an MRI performed for newly detected, histologically proven breast cancer were identified: 83 in the DBT cohort (utilization rate of 0.31%) and 26 in the DM cohort (utilization rate of 0.21%). Three MR exams were excluded from the DM group due to lack of insufficient follow-up, leaving 23 studies. These two staging groups comprise our study population.

The staging MRs were reviewed and separated into three separate categories: true positive, false positive, or true negative. A true positive was defined as additional disease detected by MR in either the contralateral breast or, in the ipsilateral breast greater than 2 cm away from the index malignancy. A false positive was defined as an MR suspicious lesion that was subsequently histologically proven as a benign finding. A true negative was defined as no additional clinically significant lesions in either breast detected on the MR. Findings related to lymph nodes were not included in the analysis. The true positives and false positive cases were reviewed by three fellowship trained breast imagers. Differences between the true positives, false positives, and true negatives were compared using the Wilcoxon Rank Sum test.

- **RESULTS**

In the DBT cohort, there were true positives in 8/83 patients (10%), false positives in 12/83 (14%) and true negatives in 63/83 (76%). In the DM cohort, there were true positives in 7/23 (30%), false positive in 3/23 (13%), and true negatives in 13/23 (57%). The DBT cohort had significantly less true positive staging MR exams than the DM cohort (p=0.012). There was no significant difference in the incidence of false positive findings or true negatives between the two cohorts (p=0.87 and 0.70, respectively).

Table 1

Cohort	**True Positive**	**False Positive**	**True Negative**	**Total**
DBT	8 (10%)	12 (14%)	63 (76%)	83
DM	7 (30%)	3 (13%)	13 (57%)	23

- **DISCUSSION**

In our study, in both DM and DBT screened populations with new cancer diagnoses, MR was able to detect additional cancer. However, with the implementation of DBT, the number of true positives was less than when screening is performed with DM alone. In addition, there no statistically significant difference in the incidence of MRI detected false positives in the DM and DBT cohorts, indicating that the false positive detection remains fairly constant irrespective of the initial screening study. We also showed no statistically significant difference in the incidence of the true negative groups between the two studies (follow-up is on-going).

DBT has been shown to improve lesion conspicuity, decrease false positives and increase cancer detection across all breast densities. Therefore, it is not surprising that there are less additional sites of malignancy found when patients with DBT screen detected cancer undergo staging MRI compared to when women with DM screen detected cancers are staged with MRI. When additional sites are seen on CE-MRI, it is more often in women with denser or more "complex" breast parenchymal patterns suggesting that further stratification of patients by density and texture may help determine which patients may benefit most from staging and therefore, potentially screening breast MR.

- **CONCLUSION**

Digital breast tomosynthesis is rapidly being implemented as the new standard of care for screening and diagnostic, problem-solving

mammography. With improvements in both specificity and sensitivity with the quasi 3-D imaging of DBT, there may potentially be less gain from supplemental screening with MR in some patient populations. Further investigation is needed to better refine stratification strategies for which patients may benefit most from which screening modality or combination of modalities.

- **REFERENCES**

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