Digital Mammography

SSA01

Science Session with Keynote: Breast Imaging (Multimodality Screening)

Sunday, Nov. 27 10:45AM - 12:15PM Room: Arie Crown Theater

BR DM

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants
Rachel F. Brem, MD, Washington, DC (*Moderator*) Board of Directors, iCAD, Inc; Board of Directors, Dilon Technologies LLC; Stock options, iCAD, Inc; Stockholder, Dilon Technologies LLC; Consultant, U-Systems, Inc; Consultant, Dilon Technologies LLC; Consultant, Dune Medical Devices Ltd
Maxine S. Jochelson, MD, New York, NY (*Moderator*) Nothing to Disclose

Sub-Events

SSA01-01 Breast Imaging Keynote Speaker: Multimodality Screening Part 1

Sunday, Nov. 27 10:45AM - 10:55AM Room: Arie Crown Theater

Participants
Rachel F. Brem, MD, Washington, DC (*Presenter*) Board of Directors, iCAD, Inc; Board of Directors, Dilon Technologies LLC; Stock options, iCAD, Inc; Stockholder, Dilon Technologies LLC; Consultant, U-Systems, Inc; Consultant, Dilon Technologies LLC; Consultant, Dune Medical Devices Ltd

SSA01-02 A Prospective Blind Evaluation of a 3D Functional Infrared Imaging for Risk Assessment in Women at High Risk for Breast Cancer

Sunday, Nov. 27 10:55AM - 11:05AM Room: Arie Crown Theater

Participants
Miriam Sklair-Levy, MD, Tel -Hashomer, Israel (*Presenter*) Nothing to Disclose
Eitan Friedman, MD, ramat gan, Israel (*Abstract Co-Author*) Nothing to Disclose
Anat Shalmon, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose
Arie Rudnstein, MD, TelHashomer, Israel (*Abstract Co-Author*) Nothing to Disclose
Yael Servadio, MD, ramat gan, Israel (*Abstract Co-Author*) Nothing to Disclose
Michael Gotlieb, MD, ramat gan, Israel (*Abstract Co-Author*) Nothing to Disclose
David Izhaky, PhD, Airport City, Israel (*Abstract Co-Author*) Employee, Real Imaging Ltd

PURPOSE

Three-dimensional functional infrared imaging (3DIRI) has been shown before to provide high accuracy risk assessment for the likelihood of breast cancer based on multiparametric evaluation of metabolic imaging biomarkers. In this prospective, blind study, of high risk women, 3DIRI is added twice yearly to a screening program which includes annual breast MRI and breast ultrasound or mammography surveillance. This study evaluates the diagnostic accuracy of 3DIRI's risk assessment in the screening program and population of high risk women.

METHOD AND MATERIALS

Following IRB approval, 226 female at high risk for breast cancer due to genetic predisposition, mainly known carriers of BRCA 1/2 mutation signed informed consent for this study. They underwent one, two or three rounds of screening during 24 months. Screening included 3DIRI scan and MRI or breast Ultrasound or Mammography (FFDM). All examinations were read by one of 5 breast radiologists. Women with a negative screening mammography or ultrasound, but positive 3DIRI's risk assessment score (e.g. likelihood for cancer), were referred to MRI. The sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were analyzed.

RESULTS

226women completed one, two or three rounds of screening for a total of 378 valid 3DIRI examinations over a period of two years. In 8 women a total of 8 histology confirmed cancers were detected. 3DIRI's risk assessment was positive (likelihood for cancer) in seven of these women, yielding a sensitivity, specificity, PPV and NPV of 87.5%, 84.32%, 10.77% and 99.68% respectively. In three women, cancer was missed by mammography and ultrasound, however, correctly classified as suspicious by 3DIRI and was detected by a subsequent MRI.

CONCLUSION

3DIRI can provide risk assessment for the likelihood of cancer with high accuracy in a population of women that are at high risk for breast cancer. Additional studies are necessary to evaluate its clinical utilization as adjunct to mammography in women that are at high risk for breast cancer.

CLINICAL RELEVANCE/APPLICATION

1. A novel imaging system for assessing the likelihood of breast cancer was developed with high efficacy for correctly classified women with breast cancer.2. Assessing the likelihood for breast cancer non-invasively can assist in risk-stratified screening programs

SSA01-03 The Added Value of Mammography in an Intermediate and High Risk Breast Cancer Screening Program

Sunday, Nov. 27 11:05AM - 11:15AM Room: Arie Crown Theater

Participants
Suzan Vreemann, MSc, Nijmegen, Netherlands (*Presenter*) Nothing to Disclose
Jan Van Zelst, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Albert Gubern-Merida, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Nico Karssemeijer, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Shareholder, Matakina Technology Limited Consultant, QView Medical, Inc Shareholder, QView Medical, Inc Director, ScreenPoint Medical BV Shareholder, ScreenPoint Medical BV
Ritse M. Mann, MD, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Research agreement; Siemens AG; Research agreement, Seno Medical Instruments, Inc

PURPOSE

Women at increased risk for breast cancer are regularly screened with MRI. In the Netherlands, guidelines state that supplemental mammography is recommended from the age of 30 in these women. The purpose of this study is to investigate the added value of mammography when breast MRI is available.

METHOD AND MATERIALS

An IRB approved, retrospective review of our intermediate and high risk breast cancer screening program was performed, analyzing 9582 screening breast MRI examinations and 6555 screening mammograms from 2776 women screened in the period from January 2003 to January 2014. Screening indication and age were obtained from patient records. These data were linked to the Netherlands Cancer Registry to identify all breast cancers. Of the cancers identified, imaging records were evaluated for mode and modality of detection.

RESULTS

In total 179 cancers were identified, of which 137 cancers were screen detected. Thirteen out of 137 were detected by mammography alone (detection rate of 2/1000 screening mammograms). Of those, eight (62%) were found to be ductal carcinoma in situ (DCIS). The median age at detection was 55 ± 9.84 years. Twelve (92%) of the breast cancers detected with mammography alone were detected above the age of 40. Three (23%) were detected in BRCA mutation carriers (5% of all screen detected cancers in BRCA mutation carriers). Two of those cancers were diagnosed as DCIS in women above the age of 50.

CONCLUSION

The added value of mammography in high risk screening is very limited: only 13/137 (9%) of the screen detected cancers were detected by mammography alone and most are DCIS. Mammography is especially questionable in women under the age of 40 and in BRCA mutation carriers. Consequently, the age to start mammography in intermediate and high risk screening needs to be reconsidered.

CLINICAL RELEVANCE/APPLICATION

There is no ground for mammography on top of MRI for early detection of breast cancer in women at increased risk below the age of 40. In older women the added value is still very limited.

SSA01-04 Interobserver Variability in Detection of Architectural Distortion: Comparison of Digital Mammography and Digital Breast Tomosynthesis

Sunday, Nov. 27 11:15AM - 11:25AM Room: Arie Crown Theater

Awards
Trainee Research Prize - Fellow

Participants
Elizabeth H. Dibble, MD, Providence, RI (*Presenter*) Nothing to Disclose
Ana P. Lourenco, MD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Grayson L. Baird, PhD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Robert C. Ward, MD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Arthur S. Maynard III, MD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Martha B. Mainiero, MD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare interobserver variability in detecting architectural distortion (AD) on digital mammography (DM) and digital breast tomosynthesis (DBT).

METHOD AND MATERIALS

IRB-approved, HIPAA compliant retrospective search of radiology database at a tertiary breast center for "AD" or "possible AD" on screening from 3/5/12-11/27/13. Controls were matched for age, side of prior malignancy, side of new malignancy on presented mammogram, side of prior surgery, and date of mammogram when possible. Patient demographics, imaging findings, pathology findings, and follow-up imaging results were recorded. 2 breast radiologists and 2 breast imaging fellows blinded to outcomes independently reviewed images of 2 patient groups in 4 sessions: Group A DM only, Group B DBT only, then after a 1 month interval Group A DBT only, Group B DM only. For each breast, readers recorded presence or absence of AD and confidence in interpretation on a scale of 1-4.Agreement was examined using weighted Kappa. Differences in confidence between DBT vs DM and attendings vs fellows were examined using generalized mixed modeling with sandwich estimation. Agreement was examined for each breast, not each patient; outcomes are examined by breast but differences between breasts are not anticipated. Unilateral cases were removed (n=4).

RESULTS

59 patients with AD and 59 controls were identified. Mean age was 58.9 (range 42-86) and 57.5 (range 41-77), respectively. 79.7%(47/59) of patients with AD and 78.0%(46/59) of controls had heterogeneously or extremely dense breasts. 23.7%(14/59) of patients with AD and 25.4%(15/59) of controls had prior surgery. DM interobserver variability was 0.53 and 0.57 for right and left breasts, respectively. DBT interobserver variability was 0.72 and 0.69 for right and left breasts, respectively. Agreement was better for DBT than DM; confidence was higher with DBT, $p<.001$ (Table 1).

CONCLUSION

DBT decreases interobserver variability and increases reader confidence in the detection of AD.

CLINICAL RELEVANCE/APPLICATION

DBT decreases interobserver variability and increases reader confidence in the detection of AD. This may lead to improved detection of this subtle manifestation of breast cancer.

SSA01-05 Concordance of Interpretations of Multi-modality Breast Cancer Screening in Women with Dense Breasts

Sunday, Nov. 27 11:25AM - 11:35AM Room: Arie Crown Theater

Participants
Janie M. Lee, MD, Bellevue, WA (*Presenter*) Research Grant, General Electric Company
Savannah C. Partridge, PhD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Daniel S. Hippe, MS, Seattle, WA (*Abstract Co-Author*) Research Grant, Koninklijke Philips NV; Research Grant, General Electric Company
Christoph I. Lee, MD, Los Angeles, CA (*Abstract Co-Author*) Research Grant, General Electric Company
Habib Rahbar, MD, Seattle, WA (*Abstract Co-Author*) Research Grant, General Electric Company
Constance D. Lehman, MD, PhD, Boston, MA (*Abstract Co-Author*) Research Grant, General Electric Company; Medical Advisory Board, General Electric Company
John R. Scheel, MD, PhD, Seattle, WA (*Abstract Co-Author*) Research suppor, General Electric Company

PURPOSE

To compare concordance of interpretations for digital mammography (2D) and digital breast tomosynthesis (3D), without and with automated whole breast ultrasound (ABUS) for screening women with dense breasts and at intermediate to high risk of developing breast cancer.

METHOD AND MATERIALS

This study was HIPAA compliant and IRB-approved. All women received multimodality screening with 2D, 3D, and ABUS. Routine 2D and 3D views were obtained. The 3D examination consisted of two-view tomosynthesis and synthetic 2D images of each breast. 2D and 3D examinations were interpreted by independent readers, with initial BI-RADS assessment (Categories 0, 1, or 2) recorded. Each reader then interpreted the ABUS examination, and provided combined 2D+ABUS or 3D+ABUS assessments. For examinations with positive results (BI-RADS 0), recalled lesions underwent further evaluation with diagnostic 2D views, hand-held breast ultrasound, or both. The final BI-RADS assessment was recorded. Lesion location, characteristics, and pathology results (for biopsied lesions) were recorded. Biopsy recommendation rates were compared using Fisher exact tests.

RESULTS

Of 121 women, mean age was 54 years (range 26-81 years). Forty-three women (36%) had a family history of breast cancer, 25 (21%) had a personal history of breast cancer, and 53 (44%) had both. For 2D and 3D alone, the recall rates were 5.0% (6/121) and 3.3% (4/121), respectively. Two women (25%) had lesions recalled by both readers while 6 women (75%) had lesions recalled by only one reader. For combined 2D+ABUS and 3D+ABUS interpretations, the recall rates were 13% (16/121) and 11% (13/121), respectively. Of women recalled, five (21%) had lesions recalled by both readers; the remaining 19 women (79%) had lesions recalled by only one reader. The biopsy recommendation rate tended to be higher for lesions recalled by both readers (3/5, 60%) than for lesions recalled by only one reader (3/19,16%), p=0.078. Of 6 biopsies performed, 1 had malignant and 5 had benign pathology results.

CONCLUSION

For multimodality screening with two readers for each woman, the majority of recalls were seen only by one reader. There was a trend towards a higher biopsy recommendation rate for lesions recalled by both readers.

CLINICAL RELEVANCE/APPLICATION

When adopting a new screening modality, double reading may reduce false-positive recalls during the "learning curve" phase.

SSA01-06 The Efficacy of 5-Year Consecutive Ultrasound (US) Surveillance for Detection of Axillary Lymph Node Recurrence in Breast Cancer Patients Treated with Sentinel Lymph Node Biopsy (SLNB)

Sunday, Nov. 27 11:35AM - 11:45AM Room: Arie Crown Theater

Awards
Student Travel Stipend Award

Participants
Bo Ra Kwon, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Jung Min Chang, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
So Min Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sung Ui Shin, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Su Hyun Lee, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Nariya Cho, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Woo Kyung Moon, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Screening the axilla remains elective in ultrasound (US) screening for breast cancer and the efficacy of screening US for axillary recurrence in breast cancer patients treated with sentinel lymph node biopsy (SLNB) is unclear. The purpose of this study was to determine the efficacy of screening US in breast cancer patient treated with SLNB for evaluation of recurrences in breasts and axillae.

METHOD AND MATERIALS

A retrospective chart review was performed on 367 consecutive patients who were treated with mastectomy or breast conserving surgery and SLNB between January and June 2011. Among these, 303 patients who received annual follow-up screening during 5 years were included. Whole breast ultrasounds including both breasts, excision sites, and axillae were performed and interpreted by expert breast radiologists with mammographic information. The cancer detection rate, recall rate, and positive predictive value (PPV3) of biopsies in breasts and axillae were calculated separately on the basis of pathology or follow-up data.

RESULTS

A total 303 patients underwent 2045 screening US combined with MG during 5-year follow-up period, 12 had recurrences (5.87 per 1,000 cases) including one axillary recurrence (0.49 per 1,000 cases), and 8 occurred within the third year and 4 occurred in the fourth and fifth year. Among recurred breast cancers, 8 breast lesions were detected by combined US and MG with 5-year accumulated cancer detection rate of 3.91 per 1,000 cases. Axillary recurrence was detected on chest CT scan by minimal size change, not by US. During the period, 244 cases were recalled for breast (11.9%), and 33 cases for axillary lesion (1.6%), and US-guided biopsy was performed in 38 breasts and 10 axillary findings, respectively. The PPV3 for breast was 26.3%, and 0% for axilla.

CONCLUSION

Screening US combined with MG detected 3.91 recurred cancers per 1,000 cases for 5-year follow-up period in breast cancer patients treated with SNLB. Axillary recurrence was very rare compared to in-breast recurrence and screening the axilla was not helpful for detecting axillary recurrence, although the recall rate is lower than that of breast lesions.

CLINICAL RELEVANCE/APPLICATION

Our study supports the benefit of screening axillae in patient treated with SNLB is minimal, even though the recall rate is not as high as screening breasts.

SSA01-07 Performance Metrics of Screening Tomosynthesis: Analysis by Patient Age and Baseline versus Incidence Exam

Sunday, Nov. 27 11:45AM - 11:55AM Room: Arie Crown Theater

Participants
Liane E. Philpotts, MD, New Haven, CT (*Presenter*) Nothing to Disclose
Xiao Wu, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Madhavi Raghu, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Howard P. Forman, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Mammographic screening is criticized due to the imbalance of false positives with true positive cancer detection, particularly in younger women undergoing baseline exams when cancer incidence is lower. Digital breast tomosynthesis (DBT) has lower RR and higher cancer detection rates (CDR) than 2D mammography. The purpose of this study was to examine the performance metrics of screening DBT by patient age and baseline versus incidence screening.

METHOD AND MATERIALS

A IRB-approved audit of the breast imaging electronic database (PenRad) was performed to identify all DBT screening exams over 4-years at our main hospital and 2 satellite offices (total 46,140 exams). The data was sorted by patient age in 5-yr intervals: 40-44, 45-49, ,… 75-79, 80+. True positive, false positive, true negative, and false negative cases were identified and overall sensitivity, specificity and accuracy calculated. The data for baselines was analyzed separately from incidence exams. Statistical analyses performed included Chi square, student t and correlation tests.

RESULTS

The overall sensitivity, specificity, and accuracy of tomosynthesis screening in all age groups was very high. There was no significant correlation found between sensitivity and age. Sensitivity in 40-44 (86.4%) was higher than in the 45-49 group (82.8%). Specificity and overall accuracy increased with age, ranging from 88.7% in 40-44, to 96% in the oldest groups. When comparing baseline versus subsequent mammography, metrics were significantly worse ($p<0.0001$). Subsequent mammography had higher accuracy than baseline in all age groups except 80+. Specifically, RR in baseline 40-44 (20%) was actually lower than other groups including 45-49 (23%) and 50-54 (27%)($p=0.02$). The overall accuracy for baseline exams decreased with age significantly with the best accuracy found in the 40-44 (80%) and the lowest in the 70-74 group (65%) ($p=0.05$). Importantly, when only incidence exams were assessed, there were no significant differences in screening outcomes between the 40-44 and the 45-50 groups ($p=0.225$).

CONCLUSION

Tomosynthesis screening yields excellent results in all age groups. Although accuracy is slightly lower in younger women, this effect is erased once non-baseline exams are compared.

CLINICAL RELEVANCE/APPLICATION

Screening with DBT performs at a high level and with similar accuracy between age groups such that younger women should not be deterred from undergoing screening.

SSA01-08 Predictors of Surveillance Mammography Outcomes in Women with a Personal History of Breast Cancer

Sunday, Nov. 27 11:55AM - 12:05PM Room: Arie Crown Theater

Participants
Kathryn Lowry, MD, Boston, MA (*Presenter*) Nothing to Disclose
Lior Braunstein, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Konstantinos Economopoulos, MD,PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Laura Salama, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Constance D. Lehman, MD, PhD, Boston, MA (*Abstract Co-Author*) Research Grant, General Electric Company; Medical Advisory

Board, General Electric Company
Janie M. Lee, MD, Bellevue, WA (*Abstract Co-Author*) Research Grant, General Electric Company
G. Scott Gazelle, MD, PhD, Boston, MA (*Abstract Co-Author*) Consultant, General Electric Company Consultant, Marval Biosciences Inc
Elkan F. Halpern, PhD, Boston, MA (*Abstract Co-Author*) Research Consultant, Hologic, Inc; Research Consultant, Real Imaging Ltd; Research Consultant, Gamma Medica, Inc; Research Consultant, K2M Group Holdings, Inc
Jay R. Harris, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Alphonse G. Taghian, MD, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Women with a personal history of breast cancer who survive their initial cancer face risk for second breast cancers, including subsequent ipsilateral breast tumor recurrence (IBTR) and contralateral breast cancers. The purpose of this study was to identify predictors of poor mammography surveillance outcomes based on clinicopathologic features.

METHOD AND MATERIALS

This study was HIPAA compliant and IRB approved. We performed a retrospective chart analysis on a cohort of women with American Joint Committee on Cancer (AJCC) Stage I or II invasive breast cancer and subsequent local recurrence or contralateral breast cancer diagnosed from 1997-2014. Information on ER, PR, HER2 status and histologic grade of primary breast cancer (PBC) was used to approximate biologic subtype (Luminal A, Luminal B, Luminal B-HER2, HER2, and Triple Negative subtypes). Poor surveillance outcome was defined as second breast cancers which were not detected by screening mammography, including interval cancers (diagnosed within 12 months of a negative screening mammogram) or clinically detected cancers diagnosed without a screening mammogram within the past year. Chi square statistics and logistic regression were performed to identify predictors of poor mammography surveillance outcome, including patient demographics, PBC characteristics, systemic treatment, breast density, and time to second cancer diagnosis.

RESULTS

The final cohort included 164 women with IBTR (n=65) or contralateral cancer (n=99). Of these, 124 second cancers were detected by surveillance mammography, and 40 were detected by breast symptoms. On univariate analysis, poor surveillance outcome was associated with age <50 years at primary breast cancer diagnosis p<0.0001), PBC AJCC stage II (p=0.007), and heterogeneously or extremely dense breasts (p=0.04). On multivariate analysis, age <50 years at PBC diagnosis remained the only significant predictor of poor surveillance outcome (p=0.001).

CONCLUSION

Women diagnosed with PBC before the age of 50 are at risk of poor surveillance mammography outcomes, and may be appropriate candidates for more intensive clinical and imaging surveillance.

CLINICAL RELEVANCE/APPLICATION

Women with primary breast cancer diagnosed before age 50 are less likely to have second events detected by surveillance mammography and may be an important population for more intensive surveillance.

SSA01-09 Breast Imaging Keynote Speaker: Multimodality Screening Part 2

Sunday, Nov. 27 12:05PM - 12:15PM Room: Arie Crown Theater

Participants
Maxine S. Jochelson, MD, New York, NY (*Presenter*) Nothing to Disclose

CESM: Hands-on Workshop: GE Vendor Workshop

Sunday, Nov. 27 11:00AM - 12:00PM Room: Booth 5528

Participants

PARTICIPANTS

Jordana Phillips, MD

PROGRAM INFORMATION

This one-hour workshop led by a Peer Educator will introduce GE's SenoBright™ contrast-enhanced spectral mammography (CESM) technology that helps answer cases with inconclusive mammogram and ultrasound findings. Attendees will: Learn the unique features of GE's dual-energy acquisition | Understand how CESM exams are acquired on the SenoClaire™ system | Review clinical cases on the Seno Iris™ Workstation software during physician guided hands-on exam interpretation.

Registration

http://ge.cvent.com/events/ge-breast-health-advantage-workshop/event-summary-b904d22132614dc2b7633ee3b34f22de.aspx

3D DBT: Hands-on Workshop: GE Vendor Workshop

Sunday, Nov. 27 3:00PM - 4:00PM Room: Booth 5528

Participants

PARTICIPANTS

Bruce F. Schroeder, MD

PROGRAM INFORMATION

This one-hour workshop led by a Peer Educator will introduce GE's SenoClaire™ breast tomosynthesis including an overview of design elements, and a review of clinical case study presentations covering masses, calcifications, superposition and associated findings to increase clinical confidence. Attendees will: Learn the unique features of GE's Tomosynthesis design | See how accurate DBT exams are acquired on the SenoClaire system | Review clinical cases on the Seno Iris Workstation software during physician guided hands-on exam interpretation.

Registration

http://ge.cvent.com/events/ge-breast-health-advantage-workshop/event-summary-b904d22132614dc2b7633ee3b34f22de.aspx

SSE02

Breast Imaging (Quantitative Imaging and CAD)

Monday, Nov. 28 3:00PM - 4:00PM Room: E450A

BR BQ DM IN

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants
Sungheon G. Kim, PhD, New York, NY (*Moderator*) Nothing to Disclose
Robert M. Nishikawa, PhD, Pittsburgh, PA (*Moderator*) Royalties, Hologic, Inc; Research Consultant, iCAD, Inc;

Sub-Events

SSE02-01 Concurrent CAD for Digital Breast Tomosynthesis

Monday, Nov. 28 3:00PM - 3:10PM Room: E450A

Participants
Richard A. Benedikt, MD, San Antonio, TX (*Presenter*) Nothing to Disclose
Cynthia A. Swann, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose
Aaron D. Kirkpatrick, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose
Alicia Toledano, DSc, Kensington, MD (*Abstract Co-Author*) Consultant, iCAD, Inc
Senthil Periaswamy, PhD, Nashua, NH (*Abstract Co-Author*) Director of Research, iCAD, Inc
Justin E. Boatsman, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose
Jonathan Go, Nashua, NH (*Abstract Co-Author*) Sr. Vice President, iCAD, Inc
Jeffrey W. Hoffmeister, MD, Nashua, NH (*Abstract Co-Author*) Employee, iCAD, Inc; Stockholder, iCAD, Inc

PURPOSE

Digital Breast Tomosynthesis (DBT) is more accurate than Full-Field Digital Mammography (FFDM) alone, but prolongs reading time. A reader study evaluated the concurrent use of a Computer-Aided Detection (CAD) system to shorten reading time, while maintaining performance.

METHOD AND MATERIALS

A CAD system was developed to detect suspicious soft tissue lesions (masses, architectural distortions and asymmetries) in DBT planes. Rather than marking lesions, detected locations are extracted from the DBT planes and blended into the corresponding 2D synthetic image. Thus, lesions can be efficiently viewed in a CAD-enhanced 2D synthetic image without overlapping tissue. Twenty (20) radiologists retrospectively reviewed 240 cases in a multi-reader, multi-case (MRMC) crossover design. An enriched DBT sample included 67 malignancies in 60 patients and compared reading with CAD versus without CAD. All readers reviewed all cases with and without CAD in 2 visits separated by a memory washout period of at least 4 weeks. Radiologist performance was assessed by measuring Area Under the Receiver Operating Characteristic (ROC) Curve (AUC) for malignant lesions with CAD versus without CAD. Reading time, sensitivity, specificity and recall rate were also assessed.

RESULTS

Reading time improved 29.2% with use of CAD (95% CI: 21.1%, 36.5%; $p < 0.01$). Reader performance was non-inferior with CAD, for nonlinferiority margin delta = 0.05. Average AUC increased by 0.007 (95% CI: l0.013, 0.028; non-inferiority $p < 0.01$), from 0.839 without CAD to 0.846 with CAD. Average sensitivity increased with CAD from 0.847 without CAD to 0.870 with CAD (95% CI: -0.006, 0.053); showing a 0.032 increase in average sensitivity for soft tissue densities (95% CI: l0.002, 0.066), from 0.837 without CAD to 0.869 with CAD. Average specificity decreased from 0.525 without CAD to 0.507 with CAD (-0.018; 95% CI: -0.041, 0.005), and average recall rate for non-cancers increased from 0.476 without CAD to 0.494 with CAD (0.018; 95% CI: -0.005, 0.041).

CONCLUSION

Concurrent use of CAD results in a 29.2% faster reading time with non-inferiority of radiologist performance compared to reading without CAD.

CLINICAL RELEVANCE/APPLICATION

Concurrent use of CAD maintains high performance of DBT with a significant reduction in reading time.

SSE02-02 Dynamic Textural Analysis of Pre-treatment DCE-MRI Predicts Pathological Complete Response to Neoadjuvant Chemotherapy in Breast Cancer

Monday, Nov. 28 3:10PM - 3:20PM Room: E450A

Awards
Student Travel Stipend Award

Participants
Nathaniel Braman, Cleveland, OH (*Presenter*) Nothing to Disclose
Maryam Etesami, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Prateek Prasanna, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Christina Dubchuk, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Donna M. Plecha, MD, Strongsville, OH (*Abstract Co-Author*) Research Grant, Hologic, Inc;
Anant Madabhushi, PhD, Piscataway, NJ (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Fewer than 30% of breast cancer patients who undergo neo-adjuvant chemotherapy (NAC) prior to surgery achieve pathological complete response (pCR). A pre-treatment dynamic contrast-enhanced MR imaging (DCE-MRI) biomarker predictive of pCR would enable more precise prognosis assessment and NAC targeting. We explore radiomic analysis of computer-extracted dynamic texture features at two DCE-MRI enhancement phases as a means of predicting breast cancer NAC response from baseline imaging.

METHOD AND MATERIALS

75 1.5T DCE-MRI scans prior to NAC were retrospectively analyzed. 22 patients had histology-confirmed pCR, while 53 had partial or non-response (NR). Computer-extracted texture features (Haralick, Co-occurrence of Local Anisotropic Gradient Orientations (CoLIAGe), and Laws) were separately extracted from initial and peak enhancement phases. The 5 most distinguishing features were selected by interaction capping and used to train a random forest classifier in a 3-fold cross-validation setting. Ability to predict pCR was assessed by area under the receiver operating characteristic curve (AUC) among all patients and within luminal (ER/PR+, 9 pCR, 41 NR) and non-luminal (triple-negative and HER2+, 13 pCR, 12 NR) patient subgroups.

RESULTS

Initial post-contrast phase texture features were effective in predicting pCR within luminal lesions (AUC = .863 ± .051), as well as identifying responders without separation by subtype (.831 ± .044). Prediction of pCR from initial phase was less reliable within the non-luminal group (AUC = .743 ± .087), yet peak contrast features better entified non-luminal responders than within luminal or all subtype groups (.831± .060 vs. .732 ± .054 and .679 ± .043). Top distinguishing features for the luminal group were homogeneity-based: standard deviation of CoLIAGe energy and sum variance, Haralick inverse difference moment. Non-luminal studies were partially identified by similar homogeneity features like CoLIAGe energy, but also by Laws energy features that detect "spottiness" and edges.

CONCLUSION

Dynamic textural analysis of DCE-MRI phases was shown to successfully predict pCR to NAC in luminal and non-luminal breast cancers.

CLINICAL RELEVANCE/APPLICATION

The ability to identify patients who will achieve pCR to NAC from baseline DCE-MRI texture features may provide a pre-treatment indicator of pathological complete response to neo-adjuvant chemotherapy, avoiding both under and over treatment of breast cancer subtypes.

SSE02-03 Could 'Deep Learning' Reduce Unnecessary Biopsies of Mammographic Microcalcifications?

Monday, Nov. 28 3:20PM - 3:30PM Room: E450A

Participants
Karen Drukker, PhD, Chicago, IL (*Presenter*) Royalties, Hologic, Inc
Benjamin Q. Huynh, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Maryellen L. Giger, PhD, Chicago, IL (*Abstract Co-Author*) Stockholder, Hologic, Inc; Stockholder, Quantitative Insights, Inc; Co-founder, Quantitative Insights, Inc; Royalties, Hologic, Inc; Royalties, General Electric Company; Royalties, MEDIAN Technologies; Royalties, Riverain Technologies, LLC; Royalties, Mitsubishi Corporation; Royalties, Toshiba Corporation;
Bonnie N. Joe, MD, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Karla Kerlikowske, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Jennifer S. Drukteinis, MD, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose
Bo Fan, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Serghei Malkov, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
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John A. Shepherd, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate whether a machine learning technique known as deep learning, which selects image pixel data directly (rather than human-designed features) in the extraction of image descriptors, has potential to reduce breast biopsies of benign mammographic microcalcifications without associated findings.

METHOD AND MATERIALS

The HIPAA compliant dataset contained diagnostic mammography images of biopsy-sampled BIRADS 4 and 5 lesions in 107 patients for whom the lesion was visible only as microcalcifications. There were 21 patients with breast cancer (7 invasive and 14 in situ), and 86 with benign lesions. For each image a 256x256 region of interest containing the microcalcification was selected by an expert radiologist. The region of interest was used directly as input to a deep learning method trained on a very large independent set of non-medical images. The image descriptors thus extracted were subsequently used in a nested leave-one-out-by-case (i.e., patient) model selection and classification protocol. The number of benign breast biopsies that could be avoided at zero loss in sensitivity to diagnose cancer was evaluated for the deep learning method and compared to that obtained based on a subjective probability of malignancy assigned by an expert radiologist as part of this study. Here, bootstrapping was used to assess statistical significance.

RESULTS

At 100% sensitivity, on average, the numbers of benign biopsies that could be avoided were 38 of 86 by the deep learning-based method and 11 of 86 based on the probability of malignancy assigned by the radiologist. The deep learning-based method operated at 44% specificity (95% confidence interval [34-55%]) and the study radiologist at 13% [6-20%] ($p<.001$). Note that clinical specificity for this dataset was zero since all lesions underwent biopsy.

CONCLUSION

There seems to be great potential for the application of deep learning methods as an aid to radiologists in the analysis of medical images.

CLINICAL RELEVANCE/APPLICATION

Reducing the number of unnecessary breast biopsies without loss in diagnostic sensitivity is an important step towards improved breast cancer diagnosis and cost reduction.

SSE02-04 Quantitative Characteristics of Background Parencymal Enhancement in Longitudinal Breast DCE-MRIs of Healthy Women

Monday, Nov. 28 3:30PM - 3:40PM Room: E450A

Participants
Aly Mohamed, PhD, Pittsburgh, PA (*Presenter*) Nothing to Disclose
David Gur, PhD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Brenda F. Kurland, PhD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Margarita L. Zuley, MD, Pittsburgh, PA (*Abstract Co-Author*) Research Grant, Hologic, Inc;
Wendie A. Berg, MD, PhD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Rachel Jankowitz, MD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Jules H. Sumkin, DO, Pittsburgh, PA (*Abstract Co-Author*) Institutional research agreement, Hologic, Inc; Advisory Board, General Electric Company
Shandong Wu, PhD, MSc, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Breast DCE-MRI background parenchymal enhancement (BPE) has been reported to be associated with breast cancer risk. It became clinically important to understand key characteristics of BPE in developing it as a potential risk biomarker. In this study we investigated quantitative statistics and temporal variations of BPE in a longitudinal breast DCE-MRI dataset acquired from healthy women.

METHOD AND MATERIALS

We retrospectively identified 251 longitudinal breast DCE-MRI scans (earliest on Sep 2004 and latest on Dec 2015) from 93 women (31% have BRCA1/2 mutations) who underwent high-risk breast MRI screening at our institution (2-6 sequential scans per woman). For all the 251 scans, the average age-at-scan was 48.8±7.2 YO (range 26-67), the average between-scan time was 419±165 days (range 171-1605), and 134 (53%) were pre-menopausal with the rest post-menopausal. All 93 women remain breast cancer-free at the time of analysis. Fully automated computerized methods were applied to quantify BPE from the first post-contrast sequence at both bilateral and unilateral level. A quantitative BPE measure (BPE%) was derived as the percentage of the volume of enhanced voxels (at least 20% relative enhancement) over the fibroglandular tissue relative to the volume of fibroglandular tissue. A set of descriptive statistics were computed for BPE%, and variability of BPE% between sequential scans was measured by the intraclass correlation coefficient (ICC) in a linear mixed effects model.

RESULTS

For all 251 scans, mean BPE% was 25.1% ±13.7 (range 1.1% - 83.9%); the Pearson's correlation coefficient of BPE% between left (mean 27.4%±14.7) and right breasts (mean 24.2%±14.1) was 0.85; mean BPE% was 29.7%±15.0 (range 9.2% - 83.9%) for pre-menopausal and 20.9%±10.9 (range 1.1% - 67.0%) for post-menopausal scans (unpaired t-test $p<0.0001$). For 71 (or 48) women who had at least 2 (or 3) sequential scans, ICC of BPE% was 0.63 (or 0.46), and temporal variations of BPE% between longitudinal scans are shown in the figure.

CONCLUSION

In longitudinal DCE-MRI scans of breast cancer-free women, BPE% is highly correlated bilaterally, significantly higher among pre- than post-menopausal women, and the mean value decreases with aging.

CLINICAL RELEVANCE/APPLICATION

Quantitative characterization of BPE in longitudinal MRIs of healthy women will help determine BPE's temporal variability and reproducibility, building baseline measures for its use as a risk biomarker.

SSE02-05 Applying Data-driven Imaging Biomarker in Mammography for Breast Cancer Screening

Monday, Nov. 28 3:40PM - 3:50PM Room: E450A

Participants
Eun-Kyung Kim, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
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Sun Young Min, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Minhong Jang, Seoul, Korea, Republic Of (*Abstract Co-Author*) Officer, Lunit Inc
Anthony S. Paek, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) CEO, Lunit Inc

PURPOSE

To assess feasibility of data-driven imaging biomarker (DIB; an imaging biomarker that is derived from large-scale medical image data by using deep learning technology) in mammography and evaluate its potential for detection of breast cancer.

METHOD AND MATERIALS

We collected 9,757 digital mammograms from five institutions. 3,228 cancer cases were confirmed by pathology. 6,529 normal cases were defined by BIRADS final assessment category 1 without developing malignancy for 2 years. Each case includes 4 views of mammograms. 800 cases were randomly chosen as validation (n=400) and test (n=400) sets, and the remainder (2428 for cancer, 5,729 for normal) were used for training. The core algorithm of DIB-M (DIB for mammography) is deep convolutional neural network; a deep learning algorithm specialized for images. It learns discriminative features directly from training data according to the final task (cancer detection). For each case in training data, the probability of cancer inferred from DIB-M is compared with the

ground-truth diagnosis result (cancer: 1, normal: 0). Then the model parameters for DIB-M are updated based on the error between the prediction and the ground-truth. Training proceeds to minimize the prediction error of the entire training set, and the final DIB-M performed the best on the validation set is used for evaluation. We performed the experiment with 3 different random-split datasets to verify performance consistency.

RESULTS

AUC was 0.813 and 0.814 for the validation and test sets, respectively. Accuracy at threshold 0.5 was 72.9% (validation) and 73.4% (test). Sensitivity (specificity) according to different thresholds for the test set is: 0.940 (0.383), 0.810 (0.635), 0.690 (0.778), 0.505 (0.903), and 0.313 (0.983) with respect to the thresholds 0.1, 0.3, 0.5, 0.7, and 0.9. ROC curves according to 3 random sets were similar (Fig.1).

CONCLUSION

This research showed the potential of DIB-M as a screening tool for breast cancer. Further studies using a large number of high-quality data including benign cases are needed to further investigate its feasibility as a screening tool.

CLINICAL RELEVANCE/APPLICATION

Unlike previous computer-aided detection (CAD) algorithms, DIB-M is purely based on data-driven features from a large-scale mammography data instead of manually designed features. With further validation, DIB-M may help radiologists to diagnose breast cancer with higher accuracy and efficiency.

SSE02-06 Computer-Aided Detection (CAD)-Generated Kinetic Features of Preoperative Breast MR Imaging: Association with Disease-Free Survival of Patients with Invasive Breast Cancer

Monday, Nov. 28 3:50PM - 4:00PM Room: E450A

Participants
Jin You Kim, MD, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hyun Jung Kang, MD, Busan, Korea, Republic Of (*Presenter*) Nothing to Disclose
Seung Hyun Lee, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Tae Hong Lee, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Suk Kim, MD, Pusan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To retrospectively investigate whether the kinetic features of breast cancers assessed with computer-aided detection (CAD) at preoperative magnetic resonance (MR) imaging are associated with disease-free survival in patients with invasive breast cancer.

METHOD AND MATERIALS

This is an institutional review board-approved retrospective study, with a waiver of informed consent. Between January 2012 and February 2013, 330 consecutive women (mean age, 52.9 years; age range, 32-88 years) with newly diagnosed invasive breast cancer who had undergone preoperative MR imaging and curative surgery were identified. We retrospectively reviewed all preoperative MR images using a commercially available CAD system and noted the following kinetic parameters for each lesion: peak enhancement (the highest pixel signal intensity in the first post-contrast series), angio-volume (the total volume of the enhancing lesion), and delay enhancement profiles (the proportions of washout, plateau, and persistent-enhancing component within a tumor). Cox's proportional hazards modeling was used to identify associations between CAD-generated kinetic features and disease-free survival, after controlling for clinicopathological variables.

RESULTS

A total of 31 recurrences developed at a median follow-up time of 42 months (range, 3-50 months). The mean peak enhancement was significantly higher in patients with recurrences than in those who remained disease-free (553.65 ± 686.59 vs. 249.89 ± 263.25, P=0.020). Multivariate Cox's analysis showed that a higher peak enhancement (hazard ratio [HR]=1.001, 95% confidence interval [CI]=1.000-1.002, P=0.009) and presence of lymphovascular invasion (HR=2.433, 95% CI=1.086-5.449, P=0.031) were independently, and significantly, associated with poorer disease-free survival.

CONCLUSION

A higher CAD-measured peak enhancement at preoperative breast MR imaging was independently associated with poorer disease-free survival of patients with invasive breast cancer.

CLINICAL RELEVANCE/APPLICATION

Kinetic features assessed by applying computer-aided detection (CAD) to preoperative breast MR images can be used to identify a subgroup of breast cancer patients at high risk of recurrence.

DBT vs Mammography in a Randomized Screening Trial: GE Vendor Workshop

Monday, Nov. 28 4:00PM - 4:30PM Room: Booth 5528

Participants

PARTICIPANTS

Pierpaolo Pattacini, MD

PROGRAM INFORMATION

Initial results and interim analysis of diagnostic performance, interval cancers, and other performance indicators including more than 19,000 women from the breast cancer screening program of Reggio Emilia's province in Italy.

Registration

http://ge.cvent.com/events/ge-breast-health-advantage-workshop/event-summary-b904d22132614dc2b7633ee3b34f22de.aspx

SPSI26

Special Interest Session: How Radiologists Can Improve Mammography Screening in the U.S.-Get Organized

Monday, Nov. 28 4:30PM - 6:00PM Room: S402AB

BR DM SQ

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants

LEARNING OBJECTIVES

1) Describe opportunities for improved adherence with regular breast cancer screening through systems and partnerships with referring physicians. 2) Describe the importance of assessment of mammography interpretative skills and regular feedback on performance to improve the overall accuracy of mammography. 3) State the shortcomings in current assessment of breast cancer risk and how breast cancer screening facilities can insure accurate risk assessment for all patients.

Sub-Events

SPSI26A Introduction

Participants
Robert A. Smith, PhD, Atlanta, GA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

SPSI26B Improving Adherence to Breast Cancer Screening Using a Systems-based Approach in a Primary Care Network

Participants
Steven J. Atlas, MD, MPH, Boston, MA, (satlas@mgh.harvard.edu) (*Presenter*) Editor with royalties, UpToDate, Inc

LEARNING OBJECTIVES

View learning objectives under main course title.

Active Handout:Steven J. Atlas

http://abstract.rsna.org/uploads/2016/16044138/ACTIVE SPSI26B RSNA 2016 Presentation - Atlas.pdf

SPSI26C State of the Art (and Feasible!) Risk Assessment in a Breast Imaging Center

Participants
Mary Freivogel, Greenwood Village, CO, (mary.freivogel@riaco.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

SPSI26D Assessing and Improving the Interpretation of Mammography Images

Participants
Matthew G. Wallis, MD, Cambridge, United Kingdom (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

ABSTRACT

Evaluation of screening has to encompass both population level outcomes as well as individual practitioner performance. To alter (improve) performance feedback needs to be tailored, educationally focused and bench marked against peers. Radiologists want to do the best for their patients and have a competitive nature so the key to delivering change is to allow individuals to understand their performance. This requires dedicated data collection with the emphasis on data completeness and interpretive skills to translate numbers in to intelligent information.The ability to determine sensitivity is key to looking at population performance but this requires accurate and timely data linkage to Cancer Registries with comprehensive coverage which is far from straight forward. In lieu of this a great deal of information can be obtained from 3 figures: number screened, number recalled and number of cancers found but for any form of statistical stability this requires a minimum number of women to be screened every year (probably at least 3,000).When comparing individuals or services within a national programmes or individual countries simple cancer detection can be very misleading without taking in to account the characteristics of the programme and the background population and I will argue for the development of age standardised, expected invasive cancer detection rates. I will illustrate my talk with examples from the UK programme and show how regular audit and feedback has been used to improve performance.

SPSI26E Panel Discussion

Participants

Robert A. Smith, PhD, Atlanta, GA (*Presenter*) Nothing to Disclose
Mary Freivogel, Greenwood Village, CO (*Presenter*) Nothing to Disclose
Matthew G. Wallis, MD, Cambridge, United Kingdom (*Presenter*) Nothing to Disclose
Steven J. Atlas, MD, MPH, Boston, MA (*Presenter*) Editor with royalties, UpToDate, Inc

LEARNING OBJECTIVES

View learning objectives under main course title.

SSG01

Breast (Tomosynthesis Diagnostic)

Tuesday, Nov. 29 10:30AM - 12:00PM Room: E451A

BR DM MR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants
Emily F. Conant, MD, Philadelphia, PA (*Moderator*) Consultant, Hologic, Inc; Consultant, Siemens AG
Debra S. Copit, MD, Philadelphia, PA (*Moderator*) Grant, Hologic, Inc

Sub-Events

SSG01-01 BI-RADS 3 Re-defined with Tomosynthesis: Mammographic Features and Imaging Frequency

Tuesday, Nov. 29 10:30AM - 10:40AM Room: E451A

Participants
Madhavi Raghu, MD, New Haven, CT (*Presenter*) Nothing to Disclose
Thomas McCann, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Taraneh Hashemi-Zonouz, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Sarah H. O'Connell, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Laura S. Sheiman, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Reni S. Butler, MD, Madison, CT (*Abstract Co-Author*) Nothing to Disclose
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Liane E. Philpotts, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Tomosynthesis can improve diagnostic confidence with potential fewer BI-RADS 3 (BR 3) mammographic follow-up recommendations. As this rate declines, the criteria and frequency of imaging lesions previously classified as probably benign may need to be re-defined. The purpose of this study is to determine the frequency, timing, and duration of follow-up imaging for probably benign lesions with tomosynthesis.

METHOD AND MATERIALS

A retrospective, IRB approved review of the breast imaging database was conducted to identify all diagnostic mammograms categorized as BR3 and performed with tomosynthesis over 3 years (1/12-1/15). 1-3 year follow-up data was collected. Biopsy outcomes of all studies re-classified as BR4 or 5 at follow-up were collected to determine malignancy rate, timing of cancers diagnosis (6,12,24 or 36 months) and mammographic features (focal asymmetries, masses, calcifications or architectural distortions).

RESULTS

12611 diagnostic studies were performed with tomosynthesis and 2535 (20%) were categorized as BR3. 12-36 month follow up data was available in 2212 patients (87%). 145 patients were re-classified as BR4 or 5 at follow-up resulting in 25 malignancies (1.0%): 16 invasive cancers & 9 DCIS. 24/25 malignancies were node negative and presented as masses (12), calcifications (11) or distortions (2). No asymmetries resulted in malignancy. A majority of cancers 22 (88%) were diagnosed at the first follow up imaging:15 at 6 month interval, 3 at 12 months and 4 at 24 months. Three were diagnosed during the second follow up imaging: 1 invasive, 2 DCIS. The only node positive case was in a 52 year old woman with new onset nipple retraction and a new mass diagnosed as invasive lobular carcinoma at the 6 month interval.

CONCLUSION

The BR3 malignancy rate remained low at 1.0% with most cancers manifesting as masses or calcifications, suggesting that focal asymmetries may be categorized as benign. Most malignancies were diagnosed at the first follow up study, indicating that continued surveillance for 2-3 years may be unnecessary when the diagnostic work-up is performed with tomosynthesis.

CLINICAL RELEVANCE/APPLICATION

Mammography with tomosynthesis may alter diagnostic workflow patterns and may ultimately also re-define the imaging features and follow up intervals for probably benign lesions.

SSG01-02 Detection of Non-Calcified T1-stage Invasive Breast Cancer using Digital Breast Tomosynthesis and Full-field Digital Mammography: Factors Affecting Tumor Visibility and the Effect on Diagnostic Performances

Tuesday, Nov. 29 10:40AM - 10:50AM Room: E451A

Participants
Jung Min Chang, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Ann Yi, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Su Hyun Lee, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sung Ui Shin, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Nariya Cho, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Woo Kyung Moon, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To identify significant variables associated with visibility of non-calcified T1-stage invasive breast cancers on digital breast

To identify the significant variables associated with visibility of non-calcified T1-stage invasive breast cancers on digital breast tomosynthesis (DBT) interpretation combined with 2D full-field digital mammography (FFDM), and to evaluate the effect of variables on diagnostic performance.

METHOD AND MATERIALS

This retrospective study was approved by our institutional review board, and the requirement to obtain informed consent was waived. Between January 2012 and December 2014, a total of 265 patients (106 non-calcified T1-stage invasive breast cancers and 159 negative controls) who underwent FFDM and DBT were included. The visibility scores (1-3; poorly, fairly, definitely visible) of 106 cancers were assessed on DBT+FFDM and FFDM images in a separate session. Independent variables associated with poorly visible tumors were identified using the logistic regression model. In a total of 265 patients stratified by the independent variable, diagnostic performances of DBT+FFDM and FFDM were compared using the McNemar's test.

RESULTS

For 106 cancers, the mean visibility score was higher in DBT+FFDM compare to FFDM (2.5 vs.1.8; P=.001). Extremely dense breast was the only independent factor associated with poorly visible tumors (odds ratio, 0.02; P<.001). In 55 patients with extremely dense breasts, sensitivity (63.6% vs.59.1%; P=.642) and specificity (84.8%vs.75.8%; P=.078) were not improved by addition of DBT compared to FFDM, whereas were significantly improved (94.0%vs.69.0%; P<.001), (98.4%vs.81.7%; P=.002) in 210 patients with the other mammographic densities.

CONCLUSION

Extremely dense breast was associated with poor visibility in interpreting DBT combined with FFDM for non-calcified T1-stage invasive breast cancers, and no additional diagnostic yield was observed compared to FFDM in women with extremely dense breasts.

CLINICAL RELEVANCE/APPLICATION

Our study supports the benefit of adding DBT to FFDM for detection of non-calcified T1 breast cancers in non-extremely dense breast, whereas the role is minimal in extremely dense breasts.

SSG01-03 Tomosynthesis Increases Detection of Invasive Lobular Carcinoma and Less Aggressive Breast Cancer

Tuesday, Nov. 29 10:50AM - 11:00AM Room: E451A

Participants
Serine E. Baydoun, MD, Iowa City, IA (*Presenter*) Nothing to Disclose
Limin Yang, MD, PhD, Iowa City, IA (*Abstract Co-Author*) Nothing to Disclose
Jinhu Xiong, Iowa City, IA (*Abstract Co-Author*) Nothing to Disclose
Laurie L. Fajardo, MD, MBA, Park City, UT (*Abstract Co-Author*) Consultant, Hologic, Inc; Scientific Advisory Board, Hologic, Inc; Consultant, Koninklijke Philips NV; Advisory Board, Koninklijke Philips NV; Consultant, Siemens AG; Consultant, FUJIFILM Holdings Corporation; Advisory Board, Galena Biopharma, Inc

PURPOSE

To evaluate the added benefit of using Tomosynthesis (3D) in invasive breast cancer detection on screening and diagnostic mammograms with correlation to pathology, receptor status and breast density.

METHOD AND MATERIALS

An IRB approved retrospective review of all mammogram reports from October 2012-May 2015 was performed to identify biopsy-proven invasive breast cancer cases. Cancer detection rate on screening and diagnostic mammograms by digital 2D only versus 2D+3D was compared. Correlation with breast density, pathology and receptor status was performed.

RESULTS

Of 22238 screening mammograms & 7848 diagnostic mammograms, 2D+3D was used in 12543 screening & 4093 diagnostic cases. 177 cases were biopsy proven invasive breast cancer; 59 detected on exams performed with 2D only (24 screening, 35 diagnostic) & 118 detected on exams performed with the adjunct use of 3D (53 screening, 65 diagnostic). 3D significantly improved cancer detection rate in both screening & diagnostic mammograms (4.2 vs 2.5 per 1000; 15.9 vs 9.3 per 1000, p<0.01). Of the 118 cancers diagnosed on 2D+3D exams, the malignancy was either only or better detected by 3D in 62 patients. Characteristics of cancers depicted on 3D included: higher frequency of invasive lobular carcinoma (ILC) (12/118 vs 3/118, p<0.01); higher frequency of less aggressive invasive carcinoma (Grade 1, grade 2, ER/PR positive, Her2 negative cancers, p<0.01); similar frequency of aggressive carcinoma (Grade 3, positive Her2, triple negative). Tomosynthesis also detected more invasive carcinoma in patients with dense breasts (p<0.01).

CONCLUSION

Tomosynthesis increases breast cancer detection in both the screening and diagnostic population. Depiction of ILC & less aggressive invasive cancer (low and intermediate grade, ER/PR positive, Her2 negative) was higher by tomosynthesis. Compared with 2D mammography, tomosynthesis demonstrates enhanced detection of architectural distortion and subtle assymetries, a feature commonly seen in less aggressive, slower growing tumors as well as invasive lobular carcinoma.

CLINICAL RELEVANCE/APPLICATION

Tomosynthesis improves the detection of subtle asymmetries and architectural distortions associated with ILC and less aggressive cancers, as well as in patients with dense breasts.

SSG01-04 Usefulness of Synthetic MMG (SMMG) and Thick Slab Images with DBT (Digital Breast Tomosynthesis) for Optimization of Clinical Workflow

Tuesday, Nov. 29 11:00AM - 11:10AM Room: E451A

Participants
Nachiko Uchiyama, MD, Tokyo, Japan (*Presenter*) Nothing to Disclose

Mari Kikuchi, MD, Chuou-ku, Japan (*Abstract Co-Author*) Nothing to Disclose
Minoru Machida, MD, PhD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Ryusuke Murakami, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Yasuaki Arai, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Concurrent usage of 2D MMG (MMG) and DBT is inevitable in diagnostic usage currently. The number of images with MMG and DBT increases by dozens of times compared with MMG only. The reprocessing of DBT data to generate a 2D MMG-like image and thick slab images of DBT will provide decrease of radiation dose and number of images. In this study, we evaluated the diagnostic accuracy of SMMG with or without DBT and compared with MMG and compared the diagnostic accuracy between two different DBT slab thickness settings.

METHOD AND MATERIALS

The pixel pitch of the MMG and the DBT images was 0.085 × 0.085 mm. The SMMG images were reconstructed from the 25 raw and processed projection images utilizing 3D volume ray casting method. With one-view MMG and DBT, the radiation doses, utilizing the ACR phantom 156, were 1.20 and 1.80 mGy. All patients received a full two-view MMG and DBT. MMG, SMMG, and SMMG plus DBT images from 108 cases (38 cases of breast cancer and 70 cases of normal or benign) were analyzed and the mean age was 57.0 y.o. The images were evaluated independently by four readers utilizing ROC analysis with the BI-RADS and POM (Probability of Malignancy) scale. In addition, the diagnostic performance between images of 2mm slice thickness with 1mm overlap as current setting and that of 6mm thick synthetic slabs with 3mm overlap reconstructed with a special edge preserving algorithm were compared respectively utilizing ROC analysis.

RESULTS

With DBT, the AGDs were 1.65 mGy in CC view and 1.59 mGy in MLO view. With BIRADS, the average AUC for MMG, SMMG, and SMMG plus DBT were 0.817, 0.813 and 0.892. With POM scale, those were 0.822, 0.813, and 0.898. SMMG plus DBT demonstrated superior diagnostic accuracy compared with MMG and SMMG alone ($p<0.01$). On the other hand, between SMMG and MMG alone, there were no statistical differences in each ($p>0.05$). The average AUC for 2mm and 6mm slab images with BIRADS were 0.893 and 0.893. With POM scale, those were 0.896 and 0.895. There were no statistical differences between 2mm and 6mm slab images ($p>0.05$).

CONCLUSION

SMMG plus DBT will offer the benefit of increased diagnostic accuracy compared with MMG and a 40% decrease of radiation dose compared with MMG plus DBT. Thick slab DBT images will contribute to decrease reading overload compared with current setting without impairing diagnostic accuracy.

CLINICAL RELEVANCE/APPLICATION

SMMG and thick slab images with DBT will be useful to optimize clinical workflow.

SSG01-05 Preoperative Staging in Women with Known Breast Cancers: Comparison between Digital Breast Tomosynthesis (DBT) and Magnetic Resonance Imaging (MRI)

Tuesday, Nov. 29 11:10AM - 11:20AM Room: E451A

Participants
Federica Pediconi, MD, Rome, Italy (*Presenter*) Nothing to Disclose
Francesca Galati, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Elena Miglio, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Maria L. Luciani, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Giovanna Panzironi, MD, Roma, Italy (*Abstract Co-Author*) Nothing to Disclose
Carlo Catalano, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the accuracy in tumor extent and size assessment of Digital Breast Tomosynthesis (DBT) and Magnetic Resonance Imaging (MRI) in women with known breast cancers.

METHOD AND MATERIALS

From May 2014 to January 2016, 44 patients (mean age 54.9) with known breast cancer were enrolled. All patients underwent MR exam using a GE DISCOVERY 750 3T, with bilateral breast coil and dedicated protocol, and a DBT projection with Siemens Mammomat Inspiration system. A radiologist with 15 years of experience in breast imaging, evaluated blindly each imaging set. Sensitivity, PPV and accuracy of MRI and DBT were calculated, using histology as the gold standard. The correspondence of the number of lesions identified on MRI vs Histological Examination and on DBT vs Histological Examination was calculated. The maximum tumor size of the lesions on MRI vs DBT was also evaluated and the measurements were considered concordant if they were within ±3 mm.

RESULTS

On histological examination 58 lesions were detected. MRI had a sensitivity of 98%, PPV 89%, and accuracy 88%; TDM sensitivity was 85%, PPV 95%, and accuracy 84%. The correspondence of the number of identified lesions was good (MRI vs Histological Examination 94% , DBT vs Histological Examination 78%) and the correspondence of the dimensional values of the lesions was moderate (MRI vs DBT 64%).

CONCLUSION

MRI provided higher diagnostic performance than DBT in the pre-operative evaluation of disease, especially in dense breasts. MRI was the most accurate technique, however DBT showed good accuracy , and proved to be a valid tool in patients with known breast cancer.

CLINICAL RELEVANCE/APPLICATION

In cases when MRI couldn't be done, DBT could be a valid tool for preoperative staging.

SSG01-06 Synthetic Digital Mammography with Additional Digital Tomosynthesis Compared to Conventional Full-field Digital Mammography with Additional Digital Tomosynthesis

Tuesday, Nov. 29 11:20AM - 11:30AM Room: E451A

Participants
Nicole Berger, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Andrea Luparia, Trento, Italy (*Abstract Co-Author*) Nothing to Disclose
Luca A. Carbonaro, MD, San Donato Milanese, Italy (*Presenter*) Nothing to Disclose
Giovanni Di Leo, San Donato Milanese, Italy (*Abstract Co-Author*) Travel support, Bracco Group
Marco Ali, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Francesco Sardanelli, MD, San Donato Milanese, Italy (*Abstract Co-Author*) Speakers Bureau, Bracco Group Research Grant, Bracco Group Speakers Bureau, Bayer AG Research Grant, Bayer AG Research Grant, IMS International Medical Scientific

PURPOSE

To compare the diagnostic accuracy of synthetic digital mammography (SM) with additional digital tomosynthesis (DBT) to full-field digital mammography (FFDM) with DBT.

METHOD AND MATERIALS

IRB approved retrospective study including consecutive patients with FFDM, which were recalled after a suspicious mammogram for screening at our institution between March and November 2015; they all performed a DBT exam (Giotto Tomo system, IMS, Italy) and an ultrasound as work up. Three breast imagers rated FFDM with DBT and SM with DBT independently for Breast Imaging Reporting and Data System (BI-RADS) and density (ACR). Inter-reader agreement was used to compare the two techniques for negative (BI-RADS 1-2) and positive (BI-RADS 3-5) findings. Bland-Altman Plots of each reader were assessed to compare the BI-RADS and ACR rating of both techniques. $P<0.05$ was regarded as significant. Radiations doses for FFDM vs. DBT were noted and compared.

RESULTS

146 patients were evaluated. Inter-reader agreement was substantial for both FFDM 0.69 (95% coefficient interval, 95%CI 0.62 – 0.76) and SM 0.73 (95%CI 0.66 – 0.79) regarding positive and negative rating. Comparing FFDM to SM reading all readers, the differences were not statistically significant ($P=0.054$). Out of 11 cancers diagnosed at work up, one cancer was undetected by all both at FFDM and SM. Only one reader showed a significant higher rating ($P=0.009$) of BI-RADS for using FFDM compared to SM. All three readers showed no difference ($P>0.058$) between both methods by rating the density rated by using the ACR and >85% of all measurements lay between the 95%CI showing a good comparison between the two techniques. Radiation dose for FFDM vs. DBT was for the cranio-caudal projection 1.49±0.56 mGy vs. 1.97±0.87 mGy ($P<0.001$) and for the medio-lateral oblique projection 1.73±0.67 mGy vs. 2.09±0.87 mGy ($P<0.001$).

CONCLUSION

Overall, no statistically significant differences were found between SM with DBT and FFDM with DBT readings regarding BI-RADS- and ACR, with just a 21-32% increase in radiation dose.

CLINICAL RELEVANCE/APPLICATION

Synthetic digital mammography (SM) plus tomosynthesis (DBT) is comparable to digital mammography (FFDM) plus DBT regarding BI-RADS- and ACR-ratings and could be applied in screening programs.

SSG01-07 Imaging Features of Breast Cancers on Digital Breast Tomosynthesis According to the Subtypes

Tuesday, Nov. 29 11:30AM - 11:40AM Room: E451A

Participants
Su Hyun Lee, MD, PhD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Jung Min Chang, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sung Ui Shin, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ann Yi, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Nariya Cho, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Woo Kyung Moon, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate imaging features of breast cancers on digital breast tomosynthesis (DBT) according to the subtypes and to determine whether it affects the visibility of breast cancers on DBT.

METHOD AND MATERIALS

This study was approved by our institutional review board and the requirement for written informed consent was waived. Between December 2011 and February 2014, a retrospective database review identified 277 invasive breast cancers in 273 women who underwent DBT for preoperative evaluation. Three blinded radiologists independently reviewed DBT images to determine the visibility of cancers and morphologies in terms of mass and microcalcification. Visibility score of each breast cancer was determined by the number of readers correctly detected the cancer (0-3) and divided into low (0-1) and high (2-3) visibility groups. Morphologies of breast cancers were reviewed by two unblinded readers in consensus. Clinicopathologic factors associated with the visibility groups were evaluated using chi-square tests or independent samples t-test. Morphologic imaging features of breast cancer subtypes were analyzed using chi-square tests.

RESULTS

The median age was 49 years (range, 22-78). Breast density was almost entirely fatty in 4% (11/273), scattered fibroglandular in 16% (44/273), heterogeneously dense in 58% (159/273), and extremely dense in 22% (59/273). Of 277 invasive cancers (mean size 2.2 cm; range, 0.2-9.5 cm), 186 (67%) were HR(+)HER2(-), 47 (17%) were HR(+/-)HER2(+), and 44 (16%) were HR(-)HER2(-). The most common findings on DBT was spiculated mass for HR(+)HER2(-) cancers; fine linear branching microcalcifications with non-spiculated mass for HR(+/-)HER2(+) cancers; and non-spiculated mass without microcalcification for HR(-)HER2(-) cancers ($P<.001$). Low visibility of breast cancers on DBT was more frequent in extremely dense breasts ($P=.020$), small pathologic tumor

size (P<.001). Breast cancer subtype was not a significant factor associated with the visibility on DBT.

CONCLUSION

Breast cancers showed different imaging findings on DBT according to the subtypes, however, it did not affect the visibility of breast cancers.

CLINICAL RELEVANCE/APPLICATION

Typical findings of breast cancers on DBT according to the subtypes may help to interpret DBT.

SSG01-08 Use of Digital Breast Tomosynthesis (DBT) as a Guide in a Consecutive Series of 178 Vacuum Assisted Biopsies (VAB): Feasibility and Clinical Usefulness

Tuesday, Nov. 29 11:40AM - 11:50AM Room: E451A

Participants
Vincenzo Sabatino, MD, Trento, Italy (*Presenter*) Nothing to Disclose
Anna Ventriglia, MD, Verona, Italy (*Abstract Co-Author*) Nothing to Disclose
Marco Pellegrini, MD, Trento, Italy (*Abstract Co-Author*) Nothing to Disclose
Paolina Tuttobene, MD, Trento, Italy (*Abstract Co-Author*) Nothing to Disclose
Carmine Fanto, MD, Trento, Italy (*Abstract Co-Author*) Nothing to Disclose
Marvi Valentini, MD, Trento, Italy (*Abstract Co-Author*) Nothing to Disclose
Andrea Luparia, Trento, Italy (*Abstract Co-Author*) Nothing to Disclose
Daniela Bernardi, MD, Trento, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To analyze the diagnostic accuracy and clinical usefulness of DBT-guided VAB in the assessment of suspicious mammographic nonpalpable lesions

METHOD AND MATERIALS

The study included 178 consecutive breast lesions that, after IRB approval, between January and December 2013, underwent mammographic-guided VAB biopsy. Inclusion criteria: non palpable mammographic findings, suspicious grades R3-R5 acccording to European Guidelines, biospied using DBT-guide. Esclusion criteria: lesions biopsied using standard stereotactic-guide, 7/178. The study considered 166 subjects (average age, 55 years; range, 31-83) with 171 lesions. Samplings were performed using 9G needles and an added on system. Patient were in sitting position (144/171) or lateral decubitus (27/171). Specimen radiographs were performed in 133/171 cases. Age of women (59 years), degree of suspicious (R3,R4,R5), lesion morphology (microcalcifications, opacity, distortion) and size (2 cm) were analysed, checking their possible correlation with VAB histological outcomes (B1-B5) by chi-square test. Procedure time for all DBT-guide biopsies was measured. Reference standards were surgical histology and/or a follow-up at least of 12 months

RESULTS

67,8% of the women were 50 years and older. Lesions had at imaging a level of suspicionclassified R3 in 91, R4 in 60 and R5 in 20 cases. Lesions were microcalcifications (141, 82.5%), small opacities (6, 3.5%), distortions (24, 14%) with sizes 2cm in 67/171 cases. VAB histology report was negative (B1=4; B2=49) in 53 (31%) cases; borderline (B3) in 47 (27,5%) cases, 33 of them with atypia; suspicious (B4) in 4 (2,3%) cases; positive (B5) in 66 (38,6%) cases. 1/171 (0,6%) was a lymphoma. Age and suspicious grades significantly correlated with VAB histology (p <0.005). 102 patients underwent surgery without any downgrading of VAB histology. In the remaining cases during follow up there was no development of carcinoma. On average DBT biopsy time was 9 minutes, lower than that reported in literature

CONCLUSION

DBT-guided VAB showed an high diagnostic accuracy and an excellent clinical performance proving to be a fast and feasible system for sampling suspicious mammographic nonpalpable lesions

CLINICAL RELEVANCE/APPLICATION

In the future DBT-guide may replace standard stereotactic-system for the assessment of suspicious non palpable lesions

SSG01-09 Added Cancer Yield of Screening Breast MRI in the Modern Era of Digital Breast Tomosynthesis

Tuesday, Nov. 29 11:50AM - 12:00PM Room: E451A

Awards
Student Travel Stipend Award

Participants
Ashley A. Roark, MD, Boston, MA (*Presenter*) Nothing to Disclose
Pragya A. Dang, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Bethany L. Niell, MD, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose
Elkan F. Halpern, PhD, Boston, MA (*Abstract Co-Author*) Research Consultant, Hologic, Inc; Research Consultant, Real Imaging Ltd; Research Consultant, Gamma Medica, Inc; Research Consultant, K2M Group Holdings, Inc
Geoffrey M. Rutledge, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Constance D. Lehman, MD, PhD, Boston, MA (*Abstract Co-Author*) Research Grant, General Electric Company; Medical Advisory Board, General Electric Company

PURPOSE

To compare the added cancer yield and performance of screening breast MRI in high-risk women screened with digital breast tomosynthesis (DBT) versus digital mammography (DM).

METHOD AND MATERIALS

Following IRB approval, medical record review identified 4,418 screening breast MRI exams: 2,127 performed 1/2013-1/2015 with a

negative DBT exam in the prior year (DBT group) and 2,291 performed 1/2010-1/2012 with a negative DM exam in the prior year (DM group). Specific MRI exam indications (genetic mutation, family history, prior chest irradiation, personal history of breast cancer or of high-risk lesion) were recorded. Added cancer yield, abnormal interpretation rate (AIR) and positive predictive values (PPV1,2,3) were calculated using ACR BI-RADS 5th edition definitions. Logistic regression analysis was used to compare the groups, adjusting for differences in patient demographics (age, exam indication, mammographic breast density, presence of prior MRI exam).

RESULTS

Mean patient age was 52 years (range 25-86 years). 34 cancers were identified by MRI in the DBT group with an added cancer yield of 16 cancers/1000 screens (30/1000 prevalence screens and 14/1000 incidence screens) compared to 11 cancers/1000 MRI screens in the DM group (7/1000 prevalence screens and 12/1000 incidence screens). No significant differences were found in cancer detection before or after adjusting for differences in patient demographics (age, exam indication, mammographic breast density, presence of prior MRI exam) ($p= 0.20$ vs. $p= 0.23$). The AIR (BI-RADS 0, 3, 4, 5) was 7.3% (155/2127) in the DBT group and 7.4% (170/2291) in the DM group. PPV1, PPV2, and PPV3 were 22% (34/155), 33% (32/98) and 35% (32/92) in the DBT group and 15% (26/170), 23% (18/77), and 28% (18/64) in the DM group. Of the cancers detected in the DBT group, 79% (27/34) were invasive; of these, 74% (20/27) were <1 cm in size and 85% (23/27) node negative.

CONCLUSION

In high-risk women screened with DBT, the added cancer yield with supplemental MRI screening is similar to the added cancer yield of MRI after DM, with most cancers being invasive, sub-centimeter and node negative.

CLINICAL RELEVANCE/APPLICATION

In the modern era of screening mammography with DBT, MRI continues to be an important supplemental screening modality for high-risk women and detects otherwise occult early-stage invasive cancers.

Lunch & Learn: Advances in Mammography and Tomosynthesis through Photon-counting Spectral Technology: Supported by Philips Digital Mammography AB (invite-only)

Tuesday, Nov. 29 12:30PM - 1:30PM Room: S403B

Participants

PROGRAM INFORMATION

This course does not offer CME credit. Registration required.

RSVP

http://www.2.forms.healthcare.philips.com/LP=852

CESM - Could it be an MRI alternative?: GE Vendor Workshop

Tuesday, Nov. 29 1:00PM - 1:30PM Room: Booth 5528

Participants

PARTICIPANTS

Sean Leong, MD

PROGRAM INFORMATION

Contrast enhanced spectral mammography (CESM) is a new technology. Learn how Dr. Sean Leong has been implemented CESM into private practice as an alternative to Breast MRI for women with indeterminate mammograms.

Registration

http://ge.cvent.com/events/ge-breast-health-advantage-workshop/event-summary-b904d22132614dc2b7633ee3b34f22de.aspx

SSJ01

Science Session with Keynote: Breast Imaging (Contrast Mammography/CT)

Tuesday, Nov. 29 3:00PM - 4:00PM Room: Arie Crown Theater

BR CT DM

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants
John M. Lewin, MD, Denver, CO (*Moderator*) Consultant, Hologic, Inc; Consultant, Novian Health Inc
Priscilla J. Slanetz, MD, MPH, Belmont, MA (*Moderator*) Nothing to Disclose

Sub-Events

SSJ01-01 Breast Imaging Keynote Speaker: Introduction to Contrast-enhanced Spectral Mammography

Tuesday, Nov. 29 3:00PM - 3:10PM Room: Arie Crown Theater

Participants
John M. Lewin, MD, Denver, CO (*Presenter*) Consultant, Hologic, Inc; Consultant, Novian Health Inc

SSJ01-02 Clinical Utility of CESM for Architectural Distortion without Mass: Retrospective Review of 49 Cases

Tuesday, Nov. 29 3:10PM - 3:20PM Room: Arie Crown Theater

Awards
Student Travel Stipend Award

Participants
Michelle E. Naylor, MD, Scottsdale, AZ (*Presenter*) Nothing to Disclose
Bhavika K. Patel, MD, Phoenix, AZ (*Abstract Co-Author*) Nothing to Disclose
Adrian M. Miller, MD, Memphis, TN (*Abstract Co-Author*) Nothing to Disclose
Victor J. Pizzitola, MD, MPH, Scottsdale, AZ (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Investigate whether CESM can be used to safely rule out or rule in malignancy in patients with suspicious architectural distortion seen on standard mammography or DBT.

METHOD AND MATERIALS

This IRB-approved retrospective study reviewed 410 consecutive CESM examinations from a 17-month period ending January 2016. Study cases included AD in patients with BIRADS 4 or 5 on mammograms and with available pathology.CESM was performed utilizing standard protocol. The AD descriptors, sonographic correlates and enhancement characteristics were recorded from the radiology reports. Pathology results were collected from the biopsy and/or surgical excision reports and divided into benign, radial scar, high-risk and malignant.

RESULTS

Final data set included 49 lesions in 45 patients (4 of the patients had 2 qualifying lesions). The histopathology demonstrated 29 invasive carcinomas and one case of DCIS, ranging in size from 0.4 cm to 4.7 cm (histologic measurements). There were 16 cases of invasive ductal carcinomas, 12 cases of invasive lobular carcinoma and 1 case of low-grade adenosquamous carcinoma. There were 9 radial scars and 10 benign lesions. Two of the radial scars also contained high-risk lesions (ADH and FEA).Thirty-seven of the 49 cases (75.5%) of AD were shown to enhance on CESM. Of these 29/37 were positive for carcinoma, with a PPV of enhancement of 78.4%. The sensitivity of enhancement on CESM for AD was 96.7% (29/30), the specificity was 57.9% (11/19) and the NPV was 91.7% (11/12). The false positive rate was 21.6% (8/37) and the false negative rate was 8.3% (1/12). Accuracy of enhancement on CESM for AD was 81.6% (40/49).

CONCLUSION

A PPV of enhancement on CESM of 78% leads us to conclude that any enhancing area of AD should be biopsied. Our small study included a sensitivity of 97% with one non-enhancing malignant lesion of 4 mm in a patient with significant background enhancement, potentially obscuring enhancement of the malignancy. Further research is needed on the importance of timing CESM with menstrual cycles.Within our data, 29 of the 30 malignancies (96.7%) associated with enhancement and architectural distortion were invasive, highlighting the significance of AD as a finding associated with invasion.

CLINICAL RELEVANCE/APPLICATION

The high sensitivity (97%) and high NPV (92%) of CESM in AD lesions is promising of CEDM serving as an adjunct modality to diagnose malignancy and avoid biopsy, respectively.

SSJ01-03 Influence of Advanced Applications of Digital Mammogram Versus Magnetic Resonance Imaging on the Staging Evaluation of Breast Cancer

Tuesday, Nov. 29 3:20PM - 3:30PM Room: Arie Crown Theater

Participants
Maha H. Helal IV, MD, Cairo, Egypt (*Presenter*) Nothing to Disclose
Rasha M. Kamal, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose
Marwa A. Haggag, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose

Radwa Essam, MBBCh, MBBS, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose
Sahar Mansour, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose
Ahmed E. Hassan, MBBCh, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose
Asmaa I. Abdelaziz, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

For many years magnetic resonance imaging (MRI) being a multislice soft tissue focused and contrast based modality was considered the method of choice in staging of breast cancer. In the current work we compared the performance of advanced applications of digital mammogram: contrast-enhanced spectral mammography (CESM) and digital breast tomosynthesis (DBT) with that of MRI to detect the modality suitable for assessment of cancer extension.

METHOD AND MATERIALS

Our work is a prospective, ethics approved analysis that included 300 malignant proved breast pathologies. Evaluation methods included regular digital mammography, 3-D tomosynthesis and contrast enhanced spectral mammography. For acquisition the system acquires a traditional digital mammogram and a tomosynthesis scanning in the same compression. For contrast -enhanced images: low (22–33 kVp) and high (44–49 kVp) energy exposures were taken in the same projections after IV injection of contrast agent. Analysis considered lesions' extension, size, multiplicity and related calcifications. Operative data was the gold standard

RESULTS

CESM and MRI showed equal performance in estimating the accurate cancer size (accuracy: 95%). Tomosynthesis was superior in evaluating mass extension with an accuracy of 85% compared to 83% for MRI. Multiplicity was better demonstrated by CESM that showed an accuracy of 96% compared to 93% for that of MRI. The overall performance of digital mammogram aided by advanced applications (DBT and CESM) in staging of breast cancers was 95.7% sensitivity, 88% specificity and 93% total accuracy versus 95%, 76.5% and 91.3% respectively for MRI.

CONCLUSION

MRI breast was inferior to DBT in estimation of proper diease extend and to that of CESM in detection of multipilcity. The advanced applications of digital mamogram and MRI breast; both showed comparable estimation of the breast cancer size.

CLINICAL RELEVANCE/APPLICATION

Digital mammography aided by advanced applications: breast tomosynthesis and contrast-enhanced spectral mammogram provides an easy, fast and convenient breast imaging method that could be an alternative to MRI in breast cancer staging

SSJ01-04 Diagnostic Performance of Contrast-Enhanced Spectral Mammography(CESM) Compared Digital Mammography and Ultrasound in Screening

Tuesday, Nov. 29 3:30PM - 3:40PM Room: Arie Crown Theater

Awards
Student Travel Stipend Award

Participants
Vera Sorin, BMedSc, RAMAT GAN, Israel (*Presenter*) Nothing to Disclose
Miriam Sklair-Levy, MD, Tel -Hashomer, Israel (*Abstract Co-Author*) Nothing to Disclose
Yael Yagil, MD, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose
Anat Shalmon, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose
Arie Rudnstein, MD, TelHashomer, Israel (*Abstract Co-Author*) Nothing to Disclose
Yael Servadio, MD, ramat gan, Israel (*Abstract Co-Author*) Nothing to Disclose
Michael Gotlieb, MD, ramat gan, Israel (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Little is known regarding the use of contrast mammography in screening population. The purpose of this study is to evaluate and compare the diagnostic performance of contrast mammography compared to digital mammography and digital mammography combined with ultrasound (US) among women screened for breast cancer

METHOD AND MATERIALS

A retrospective cohort study of 438 consecutive women who underwent contrast mammography for screening indication between 2012 and 2016, sequentially followed by breast US. The BIRADS score of contrast mammography, digital mammography, and digital mammography and US was evaluated and compared with the actual disease status. Actual disease status was assessed by histopathology biopsy result, MRI or imaging follow-up. Diagnostic performance was assessed by the sensitivity, specificity, PPV and NPV for each screening method. Statistical analysis was performed using McNemar's test and ROC curve analysis.

RESULTS

438women were followed for 4years, mean follow up 18 moths, range 3-44months. A total of 23 carcinomas were detected. Contrast mammography detected 21/23 carcinomas, sensitivity 91.3% specificity 92.3% (PPV and NPV were 40%, 99.5%). Mammography detected 11/23 carcinomas , sensitivity 47.8%, specificity 93.7%. (PPV and NPV were 30%, 97%). Mammography combined with US detected 17/23 carcinomas, sensitivity of 73.9%%, specificity of 85.8% (PPV and NPV 22%, 98%). The differences in sensitivity and specificity were statistically significant (p=0.002). For the ROC curve, AUC was 0.926 for contrast mammography , 0.722 for digital mammography and 0.798 for digital mammography with US (p<0.0001).

CONCLUSION

Contrast enhanced spectral mammography significantly increased the diagnostic performance in the screening population of our study.

CLINICAL RELEVANCE/APPLICATION

Contrast enhanced spectral mammography may be a valuable screening tool for the early detection of breast carcinoma, providing anatomic and metabolic information It is feasible for screening in clinical practice with higher sensitivity compared to digital

mammography ..

SSJ01-05 Comparison of Contrast Enhanced Digital Mammography and Whole Breast Screening Ultrasound for Supplemental Breast Cancer Screening

Tuesday, Nov. 29 3:40PM - 3:50PM Room: Arie Crown Theater

Participants
Janice S. Sung, MD, New York, NY (*Presenter*) Nothing to Disclose
Maxine S. Jochelson, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Carol H. Lee, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Jonine L. Bernstein, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Anne S. Reiner, MPH, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Elizabeth A. Morris, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Christopher E. Comstock, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the performance of contrast enhanced digital mammography (CEDM) and whole breast screening ultrasound (WBUS) for supplemental breast cancer screening.

METHOD AND MATERIALS

This is a prospective IRB approved trial recruiting asymptomatic women scheduled for a screening mammogram and WBUS within 30 days of one another. Once accrued to the trial, a CEDM was performed in place of the screening mammogram. Between December, 2014 – March, 2016, 126 women enrolled. The CEDM and WBUS were performed at the same visit and interpreted independently by 2 radiologists blinded to the other modality. For the CEDM, the low dose 2D FFDM images were first interpreted alone prior to being given the contrast-enhanced images. Once final recommendations for each modality were recorded, the patient was managed per standard institutional practice after integrating findings of both studies. For indeterminate findings seen on the contrast-enhanced images of the CEDM but not the low dose 2D or targeted ultrasound, an MRI was performed for further evaluation. If no suspicious correlate was present on the MRI, a 6 month follow up CEDM was recommended. The cancer detection rate (CDR), number of work ups generated for findings seen only on the contrast-enahnced images alone, and the PPV3 of biopsy were determined. Risk factors (breast density, family history (FH), personal history (PH), BRCA status, prior high risk lesion) were recorded.

RESULTS

The mean patient age was 54 (range: 30-72). 106/126 (84%) of women had dense breasts. 5 (4%) women had no additional risk factors, 50 (40%) a PH of breast cancer, and 41 (33%) a FH in a 1st degree relative. 5 cancers (1 IDC, 1 invasive adenosquamous carcinoma, 3 DCIS) were detected in 4 women for a CDR of 40/1000. Of the 5 cancers, 1 (DCIS) was seen on the 2D FFDM, 2 (1 IDC, 1 DCIS) on the WBUS, and all 5 cancers were detected on the CEDM. MRI was recommended for further evaluation of CEDM only findings in 9 (8%) of patients; of these 4 were negative. The PPV3 of biopsy was 42% of CEDM and 50% for WBUS.

CONCLUSION

The cancer detection rate of CEDM is higher than both 2D FFDM and WBUS. However, an MRI may be recommended in 8% of patients for further evaluation of CEDM only findings.

CLINICAL RELEVANCE/APPLICATION

Our early results suggest that CEDM has the potential to be a more sensitive alternative to WBUS for supplemental breast cancer screening.

SSJ01-06 Breast Cancer Characteristics and Shrinkage Patterns in Neo-Adjuvant Chemotherapy Monitoring: Comparison Between Contrast-Enhanced Spectral Mammography and Breast-MRI

Tuesday, Nov. 29 3:50PM - 4:00PM Room: Arie Crown Theater

Participants
Valentina Iotti, MD, Reggio Emilia, Italy (*Presenter*) Nothing to Disclose
Sara Ravaioli, Reggio Emilia, Italy (*Abstract Co-Author*) Nothing to Disclose
Gabriele Levrini, MD, Reggio E., Italy (*Abstract Co-Author*) Nothing to Disclose
Vanessa Marchesi, Villa Minozzo, Italy (*Abstract Co-Author*) Nothing to Disclose
Chiara Coriani, Reggio Emilia, Italy (*Abstract Co-Author*) Nothing to Disclose
Sabrina Caffarri, Verona, Italy (*Abstract Co-Author*) Nothing to Disclose
Roberto Sghedoni, PhD, Reggio Emilia, Italy (*Abstract Co-Author*) Nothing to Disclose
Andrea Nitrosi, PhD, Reggio Emilia, Italy (*Abstract Co-Author*) Nothing to Disclose
Rita Vacondio, Reggio Emilia, Italy (*Abstract Co-Author*) Nothing to Disclose
Vladimiro Ginocchi, Reggio Emilia, Italy (*Abstract Co-Author*) Nothing to Disclose
Pierpaolo Pattacini, Reggio Emilia, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare Contrast-Enhanced Spectral Mammography (CESM) and contrast-enhanced Magnetic Resonance (MRI) in assessing response to neo-adjuvant chemotherapy (NAC) as a function of breast cancer histological and molecular characteristics. To evaluate if shrinkage patterns may influence measurements of residual tumor after NAC.

METHOD AND MATERIALS

Between October 2012 and December 2014, 54 consenting woman with breast cancer and indication of NAC were enrolled into this prospective study. 46 of them completed the study. Histological characteristics were: 40 Infiltrating Ductal Carcinoma (IDC), 4 Infiltrating Lobular Carcinoma (ILC) and 2 Metaplastic Carcinoma. Molecular characteristics were: 3 Luminal A, 16 Luminal B, 6 Luminal B HER+, 12 Triple Negative and 9 HER2+. Patients underwent CESM and MRI before, during and after the end of NAC. Shrinkage patterns were classified into: concentric (C), spotty (S), disappearance (D). Post-NAC CESM and MRI size measurements were compared to post-operative histopathology (gold standard) through correlation (Pearson's "r").

RESULTS

Overall correlation coefficients for CESM and MRI versus pathology post-NAC were r=0.866 and r=0.728, with mean underestimations in size of 4 mm and 8 mm, respectively. Main variances in correlation were seen in ILC (r=0.628 for CESM and r=-0.298 for MRI) and Luminal B (r=0.750 for CESM and r=-0.003 for MRI). Imaging shrinkage pattern overall were: 22 C, 15 S and 9 D. ILC presented 75% of S pattern and 25% of D; Luminal B presented 50% of C pattern, 44% of S and 6% of D. The mean underestimation in size versus histopathology differed between CESM and MRI only in S pattern both for ILC (30 mm on CESM vs 56 mm on MRI) and Luminal B (2 mm on CESM vs 18 mm on MRI). In D pattern it was respectively of 7 mm in ILC and of 5 mm in Lobular B for both CESM and MRI; in C pattern 3 mm in Lobular B for both CESM and MRI.

CONCLUSION

CESM may be more reliable than MRI in defining the response to NAC, in particular for challenging histological and molecular types of breast carcinomas as ILC and Luminal B. CESM is less influenced by the presence of the spotty shrinkage pattern, insidious to detect and define.

CLINICAL RELEVANCE/APPLICATION

Compared to MRI, CESM showed better results in defining the response after Neo-Adjuvant Chemotherapy in breast cancer, especially for challenging histological and molecular types like ILC and Luminal B.

RC415

Digital Breast Tomosynthesis

Tuesday, Nov. 29 4:30PM - 6:00PM Room: E353B

BR DM

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Cherie M. Kuzmiak, DO, Chapel Hill, NC, (Cherie_kuzmiak@med.unc.edu) (*Moderator*) Research Grant, FUJIFILM Holdings Corporation;

LEARNING OBJECTIVES

ABSTRACT

Sub-Events

RC415A The Nuts & Bolts of DBT Technology

Participants
Stamatia V. Destounis, MD, Scottsville, NY, (sdestounis@ewbc.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the DBT technology and history of design, testing and implementation. 2) Review important relevant literature- past and current. 3) Provide overview of implementation into a clinical practice. 4) Assess advantages and disadvantages of DBT.

ABSTRACT

RC415B Implementing DBT into Your Practice

Participants
Jocelyn A. Rapelyea, MD, Washington, DC (*Presenter*) Speakers Bureau, General Electric Healthcare Company; Research consultant, Q-view LLC.; Research consultant, QTUS

RC415C DBT-Directed Breast Biopsy

Participants
Liane E. Philpotts, MD, New Haven, CT, (liane.philpotts@yale.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Define the work-up and appropriate case selection for DBT stereotactic biopsy or needle localization. 2) Outline the basic steps in performing DBT-stereotactic biopsy and needle localization. 3) Discuss the challenges and limitations of DBT-stereo and provide trouble-shooting tips. 4) Review histological concordance and appropriate management options. 5) Discuss recent literature of performance outcomes.

ABSTRACT

3D DBT: Hands-on Workshop: GE Vendor Workshop

Wednesday, Nov. 30 1:00PM - 2:00PM Room: Booth 5528

Participants

PARTICIPANTS

Bruce F. Schroeder, MD

PROGRAM INFORMATION

This one-hour workshop led by a Peer Educator will introduce GE's SenoClaire™ breast tomosynthesis including an overview of design elements, and a review of clinical case study presentations covering masses, calcifications, superposition and associated findings to increase clinical confidence. Attendees will: Learn the unique features of GE's Tomosynthesis design | See how accurate DBT exams are acquired on the SenoClaire system | Review clinical cases on the Seno Iris Workstation software during physician guided hands-on exam interpretation.

Registration

http://ge.cvent.com/events/ge-breast-health-advantage-workshop/event-summary-b904d22132614dc2b7633ee3b34f22de.aspx

CESM: Hands-on Workshop: GE Vendor Workshop

Wednesday, Nov. 30 3:00PM - 4:00PM Room: Booth 5528

Participants

PARTICIPANTS

Jordana Phillips, MD

PROGRAM INFORMATION

This one-hour workshop led by a Peer Educator will introduce GE's SenoBright™ contrast-enhanced spectral mammography (CESM) technology that helps answer cases with inconclusive mammogram and ultrasound findings. Attendees will: Learn the unique features of GE's dual-energy acquisition | Understand how CESM exams are acquired on the SenoClaire™ system | Review clinical cases on the Seno Iris™ Workstation software during physician guided hands-on exam interpretation.

Registration

http://ge.cvent.com/events/ge-breast-health-advantage-workshop/event-summary-b904d22132614dc2b7633ee3b34f22de.aspx

SSM01

Breast Imaging (Tomosynthesis Screening)

Wednesday, Nov. 30 3:00PM - 4:00PM Room: E451A

BR DM

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants
Margarita L. Zuley, MD, Pittsburgh, PA (*Moderator*) Research Grant, Hologic, Inc;
Liane E. Philpotts, MD, New Haven, CT (*Moderator*) Nothing to Disclose

Sub-Events

SSM01-01 3D Breast Tomosynthesis with Digital Mammography versus Digital Mammography Alone: Comparison of Performance Metrics at Prevalence versus Incidence Screens

Wednesday, Nov. 30 3:00PM - 3:10PM Room: E451A

Participants
Kathryn Lowry, MD, Boston, MA (*Presenter*) Nothing to Disclose
Pragya A. Dang, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Natasha K. Stout, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Elkan F. Halpern, PhD, Boston, MA (*Abstract Co-Author*) Research Consultant, Hologic, Inc; Research Consultant, Real Imaging Ltd; Research Consultant, Gamma Medica, Inc; Research Consultant, K2M Group Holdings, Inc
G. Scott Gazelle, MD, PhD, Boston, MA (*Abstract Co-Author*) Consultant, General Electric Company Consultant, Marval Biosciences Inc
Constance D. Lehman, MD, PhD, Boston, MA (*Abstract Co-Author*) Research Grant, General Electric Company; Medical Advisory Board, General Electric Company
Anne Marie McCarthy, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Prior screening trials with digital breast tomosynthesis (DBT) have suggested reduced recall rates and increased cancer detection rates compared with digital mammography (DM) alone. However, most trials have only examined test performance after the first (prevalence) DBT exam, and it is not clear whether these effects are sustained on subsequent exams. The purpose of this study was to compare the performance of DBT at initial and subsequent screens to performance with DM.

METHOD AND MATERIALS

After IRB approval, electronic medical records review identified screening mammograms performed 1/2009-2/2011 before DBT integration (DM), and performed 1/2013-2/2015 after DBT integration. DBT examinations were grouped into initial DBT examinations (DBT1) and DBT examinations with one or two prior DBT exams (DBT2+). Women without documentation of any prior screening mammography were excluded from analysis. Differences in recall rates, cancer detection rates, and biopsy rates were examined using chi square statistics.

RESULTS

A total of 69,049 screening DM examinations were compared with 12,153 DBT1 screens and 43,267 DBT2+ screens. Recall rates significantly decreased with DBT1 relative to DM (53 versus 62 recalls per 1,000; $p<0.001$), and DBT2+ remained significantly lower than DM (56 per 1000; $p<0.0001$). Total cancer detection rate significantly increased with DBT1 relative to DM (6.4 versus 4.4 per 1,000; $p=0.003$), but decreased at DBT2+ exams and was no longer significantly different than DM (4.4 per 1,000; $p=0.97$). Invasive cancer detection rate similarly increased at DBT1 exam compared to DM (4.4 versus 2.8 per 1,000, $p=0.003$) but decreased at DBT2+ (3.0 per 1,000; $p=0.53$). A similar trend was observed with biopsy rates, which increased with DBT1 compared with DM (12.1 versus 9.2 per 1,000; $p=0.002$) and decreased with DBT2+ exams (10.3 per 1,000; $p=0.07$).

CONCLUSION

Cancer detection rates increase with initial DBT examinations relative to DM but return to similar rates as DM at subsequent examinations, suggesting an underlying prevalence screen effect. The benefit of recall reductions observed with initial DBT screening persists on subsequent screens.

CLINICAL RELEVANCE/APPLICATION

The added value of DBT over time appears to be the benefit of improvements in recall rather than sustained increased cancer detection rates that are found with initial DBT prevalence screens.

SSM01-02 Detection of High Risk Breast Lesions Following the Addition of Tomosynthesis to Conventional Digital Screening Mammography

Wednesday, Nov. 30 3:10PM - 3:20PM Room: E451A

Awards
Student Travel Stipend Award

Participants
Arielle A. Bauer, MD, Aurora, CO (*Presenter*) Spouse, Employee, Medtronic plc; Spouse, Stockholder, Medtronic plc
Alexandra Colvin, BS, Aurora, CO (*Abstract Co-Author*) Nothing to Disclose
Wei-Shin Wang, MD, Aurora, CO (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the performance of conventional digital screening mammography with digital breast tomosynthesis in the detection of high risk breast lesions.

METHOD AND MATERIALS

The institutional review board approved this study. A database search from May 2009 through May 2015 was performed to identify all high risk lesions (atypical ductal hyperplasia, atypical lobular hyperplasia, lobular carcinoma in situ, and complex sclerosing lesion) initially detected through screening mammography. The number of digital screening mammograms and digital screening mammograms with tomosynthesis were also tabulated during the interval. Widespread digital breast tomosynthesis was instituted in May 2012. A total of 5,376 digital screening mammograms were performed from May 2009 to May 2012, while 28,423 digital screening mammograms with tomosynthesis were performed between May 2012 and May 2015. The Fischer exact test was employed to determine any significant association between screening modality and the detection of high risk lesions.

RESULTS

Seventy-four high risk lesions were identified with conventional digital screening mammography, corresponding to a detection rate of 1.38%, while eighty high risk lesions were identified after the institution of tomosynthesis, corresponding to a detection rate of 0.3% ($p < .001$). Of those that underwent surgical excision, 20.3% of the lesions identified with conventional mammography were upstaged, while 15% of lesions identified with digital mammography plus tomosynthesis were upstaged ($p = 0.2$).

CONCLUSION

The addition of tomosynthesis to conventional digital mammography significantly decreases the detection rate of high risk lesions when compared to conventional digital mammography.

CLINICAL RELEVANCE/APPLICATION

The addition of tomosynthesis to conventional digital mammography decreases the detection of high risk breast lesions while increasing breast cancer detection and is recommended for women undergoing breast cancer screening.

SSM01-03 New Image Processing for Digital Breast Tomosynthesis and Mammography Improved for Feature Enhancement and Dose Reduction

Wednesday, Nov. 30 3:20PM - 3:30PM Room: E451A

Participants
Tokiko Endo, MD, Nagoya, Japan (*Presenter*) Institutional Grant support, FUJIFILM Holdings Corporation
Takako Morita, MD, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
Mikinao Ooiwa, Nagaya, Japan (*Abstract Co-Author*) Nothing to Disclose
Namiko Suda, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
Misaki Shiraiwa, MD, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
Kazuaki Yoshikawa, MD, Hamada, Japan (*Abstract Co-Author*) Nothing to Disclose
Yukie Hayashi, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
Hirotoshi Ogawa, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
Takao Horiba, Kagamihara, Japan (*Abstract Co-Author*) Nothing to Disclose
Shu Ichihara, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
Yasuyuki Satoh, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Digital breast tomosynthesis (DBT) used in combination with digital mammography (FFDM) has been reported as lacking in its ability to demonstrate and allow characterization of microcalcifications, while the main improvement required for DBT+FFDM is dose reduction. In this study, we applied newly developed image processing to DBT and FFDM, and evaluated diagnostic performance at a combined dose the same as that of conventional FFDM alone.

METHOD AND MATERIALS

An institutional review board approved this study and written informed consent was provided by all patients. Mediolateral oblique and craniocaudal images of 200 breasts were obtained from 100 subjects aged 27–85 years (mean, 51 years). An improved reconstruction algorithm for DBT was developed to enhancing microcalcification shape and mass margins. New image processing for FFDM was developed to enhancing fine breast structure while suppressing noise. Images were acquired with the average glandular dose (AGD) for the improved DBT and FFDM processing at approximately 40 % and 70 % that of conventional FFDM respectively. The diagnostic accuracy of FFDM with new processing and reduced dose was the same as conventional FFDM in a comparison of two cohorts with almost the same number of findings. Four radiologists qualified in breast imaging interpreted the images independently. Diagnostic accuracy was assessed by comparing sensitivity, specificity and area under the receiver operating characteristic curve (AUC).

RESULTS

Sensitivity of DBT+FFDM with new processing and reduced dose increased significantly to the level of conventional FFDM (79.2 % vs. 70.8 %, P = 0.033) while maintaining specificity and AUC. All of four radiologists showed increased sensitivity (75.0 % vs. 62.5 %, 79.2 % vs. 75.0 %, 83.3 % vs. 75.0 %, and 79.2 % vs. 70.8 %). The AGD per view of the conventional FFDM and the improved DBT+FFDM was 1.04–3.50 mGy (mean, 1.78 mGy) and 1.03–2.57 mGy (mean, 1.62 mGy) respectively.

CONCLUSION

New image processing for DBT+FFDM for mammographic feature enhancement and dose reduction provided sensitivity improved above that of conventional FFDM alone, even at the same total AGD.

CLINICAL RELEVANCE/APPLICATION

New image processing for DBT+FFDM improved diagnostic sensitivity, while reducing patient dose dramatically.

SSM01-04 Comparison of Screening Performance Metrics in a Large Established Tomosynthesis Practice with

Conventional Digital Mammography: Are the Initial Reported Benefits Sustained?

Wednesday, Nov. 30 3:30PM - 3:40PM Room: E451A

Participants
Pragya A. Dang, MD, Boston, MA (*Presenter*) Nothing to Disclose
Kathryn Lowry, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Anne Marie McCarthy, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Elkan F. Halpern, PhD, Boston, MA (*Abstract Co-Author*) Research Consultant, Hologic, Inc; Research Consultant, Real Imaging Ltd; Research Consultant, Gamma Medica, Inc; Research Consultant, K2M Group Holdings, Inc
Constance D. Lehman, MD, PhD, Boston, MA (*Abstract Co-Author*) Research Grant, General Electric Company; Medical Advisory Board, General Electric Company

PURPOSE

Current evidence suggests decreased abnormal interpretation rates (AIR) and increased cancer detection rates (CDR) with Digital Breast Tomosynthesis (DBT) when compared to conventional digital mammography (DM). However, most of the reported performance metrics are from early experience with this technology. It remains unknown if these benefits are sustained over time. The purpose of our study is to compare screening performance of a large established DBT practice two years after initial implementation of DBT with DM alone, adjusting for patient variables and radiologist experience known to impact performance.

METHOD AND MATERIALS

In this IRB approved, HIPAA compliant study, we reviewed medical records to identify consecutive screening DBT exams from 1/2013-3/2015, and consecutive screening DM exams from 1/2009–3/2011. Performance statistics were calculated according to American College of Radiology BI-RADS 5th edition. AIR, CDR, positive predictive values (PPV), and Recommendations for Biopsy (RecBX) were compared for the two time periods. Logistic regression analysis was performed to assess for differences in performance, adjusting for patient demographics (age, density, race, presence of prior mammograms) and radiologist years of experience.

RESULTS

The study included 155,285 exams (78,298 DM and 76,987 DBT exams) (mean age: 57.7 years, range 28-98). After adjusting for patient demographics (age, density, race, presence of prior exam) and radiologist experience, the AIR of the DBT group (6.26, 4822/76987) was significantly lower than the DM group (6.89, (5397/78298), ($p<0.0001$); [adjusted OR: 0.72, 95% Confidence Interval [CI] (0.70-0.76)]; adjusted CDR for DBT (4.9/1000 screens) was not significantly different from DM (4.7/1000), ($p=0.74$); and the adjusted RecBX for 2D (1.26%) was slightly higher than DBT (1.25%) ($p<0.001$). The PPVs (1,2,3) for DM and DBT were 6.6%, 34.8%, 40.7%, and 7.8%, 36.4%, and 41.1%, respectively.

CONCLUSION

Reduction in AIRs with DBT reported in smaller studies from early implementation of this technology are sustained over time. CDRs, however, are unchanged from the DM group in a mature tomosynthesis practice over time.

CLINICAL RELEVANCE/APPLICATION

The benefit of reduced false positives with implementation of tomosynthesis is sustained over time; however, increased cancer detection rates as noted in earlier studies may not persist in established tomosynthesis practices.

SSM01-05 Clinical Screening Performance of Tomosynthesis with Synthesized 2D Mammograms Compared to Tomosytheisis with Full Field Digital Mammography

Wednesday, Nov. 30 3:40PM - 3:50PM Room: E451A

Awards
Student Travel Stipend Award

Participants
Emily Ambinder, MD, MSc, Baltimore, MD (*Presenter*) Nothing to Disclose
Susan C. Harvey, MD, Lutherville, MD (*Abstract Co-Author*) Nothing to Disclose
Babita Panigrahi, MD, BS, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Ryan W. Woods, MD, MPH, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Digital breast tomosynthesis (DBT) in screening mammography decreases recall rate and increases cancer detection rate. Most practices combine DBT with a 2D full field digital mammogram (FFDM) in order to facilitate comparison to prior FFDM exams. However, the combination of FFDM and DBT has a two-fold higher radiation dose. In order to mitigate the increased radiation dose, we began using synthesized 2D mammograms (SM) in place of FFDM for patients undergoing screening mammography with DBT following FDA approval of this method. The purpose of this study was to evaluate the screening performance of DBT with SM compared to the combination of DBT and FFDM for screening mammography.

METHOD AND MATERIALS

We retrospectively reviewed all screening studies utilizing DBT between 2014 and 2016. We divided the studies into two groups : DBT+FFDM (studies performed on or before 2/15/2015) and DBT+SM (studies performed after 2/15/2015). Overall recall rate, recall rate for specific findings, positive predictive value 1 (PPV1), and cancer detection rate (CDR) were compared between the two groups using the Chi-square test.

RESULTS

There were 5342 screening exams in the DBT+FFDM group and 14980 screening exams in the DBT+SM group. The total recall rate was 7% for the DBT+FFDM group and 7.2% for the DBT+SM group ($p=0.66$). There was no effect on positive predictive value 1 (7.08 versus 7.61, $p=0.87$) or cancer detection rate (4.87 versus 5.27, $p=0.81$). The number of technical callbacks between these groups was similar (0.37% versus 0.40%, $p=0.89$). Indications for recall were also compared between the two groups. No differences were found between recall rates for masses (2.68% versus 2.97%, $p=0.29$), calcifications (1.37% versus 1.46%,

p=0.69), asymmetries (2.68% versus 2.65%, p=0.91), or distortions (0.80% versus 0.40%, p=0.89).

CONCLUSION

When DBT is performed for screening, the use of a synthesized 2D mammogram rather than an additional FFDM has no significant effect on recall rate, positive predictive value 1, or cancer detection rate, and spares unnecessary radiation dose.

CLINICAL RELEVANCE/APPLICATION

Synthesized 2D mammogram can replace the traditional 2D digital mammogram for patients undergoing screening with digital breast tomosynthesis, decreasing radiation dose.

SSM01-06 Lesion Conspicuity on Synthetic Mammography Images Compared to Full Field Digital Mammography Images in the Screening Setting

Wednesday, Nov. 30 3:50PM - 4:00PM Room: E451A

Participants
Catherine S. Giess, MD, Wellesley, MA (*Presenter*) Nothing to Disclose
Eren D. Yeh, MD, Boston, MA (*Abstract Co-Author*) Consultant, Hologic, Inc; Consultant, Statlife
Eva C. Gombos, MD, Boston, MA (*Abstract Co-Author*) Royalties, Reed Elsevier
Elisabeth P. Frost, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Christine M. Denison, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Sona A. Chikarmane, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Reza Pakdaman, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Sughra Raza, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the conspicuity of imaging findings evaluated at screening mammography on synthetic mammography (SM) + digital breast tomosynthesis (DBT) images to conspicuity on full field digital mammography (FFDM) + DBT images.

METHOD AND MATERIALS

Seven breast imagers each prospectively evaluated approximately 100-200 screening mammograms (FFDM, DBT, and SM; total 1206 examinations) over a 12 week period in sets of 10-50 consecutive examinations per screening session. Radiologists alternated viewing SM + DBT first, followed by FFDM views at one interpretation session, and subsequently viewed FFDM views + DBT followed by SM at the next interpretation session. Presence / absence of evaluable findings, and finding conspicuity [masses (M), calcifications (C), asymmetries (A), focal asymmetries (FA), and architectural distortion (AD)] on SM compared to FFDM were evaluated and BIRADS 0 or 1 / 2 assigned. DBT-only findings were excluded from analysis.

RESULTS

Results: Mammograms in 1206 patients were reviewed, with 119 patients recalled (9.9%). There were 409 evaluated findings (after 11 DBT-only findings excluded) considered BIRADS 0, 1, or 2, including 72 A, 35 FA, 49 AD, 119 C, and 134 M. Mass conspicuity on SM compared to FFDM included 72 equal, 5 more conspicuous, 54 less conspicuous, and 3 not seen on SM. FA/A conspicuity on SM compared to FFDM included 45 equal, 16 more, and 46 less. AD conspicuity on SM compared to FFDM included 1 only on SM, 18 equal, 27 more, and 3 less. C conspicuity on SM compared to FFDM included 7 only on SM, 13 equal, 95 more and 4 less. FFDM had significantly better conspicuity than SM for masses and asymmetries ($p < 0.001$); SM had significantly better conspicuity for calcifications and architectural distortion than FFDM ($p<0.001$).

CONCLUSION

Most findings are seen on both SM and FFDM during screening mammography. A strength of SM compared to FFDM is conspicuity of calcifications and architectural distortions, while a relative weakness is conspicuity of masses and asymmetries. Radiology practices replacing FFDM with SM should be aware that masses and asymmetries may be less conspicuous, potentially increasing emphasis on DBT data for detecting these findings.

CLINICAL RELEVANCE/APPLICATION

SM can be used to replace FFDM and lower radiation dose. However, radiologists utilizing SM should be aware of its relative strengths and weaknesses compared to FFDM in depicting different lesion types.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Catherine S. Giess, MD - 2015 Honored Educator
Eren D. Yeh, MD - 2015 Honored Educator
Sughra Raza, MD - 2015 Honored Educator

MSCB51

Case-based Review of Breast (An Interactive Session)

Thursday, Dec. 1 1:30PM - 3:00PM Room: S100AB

BR DM

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Janie M. Lee, MD, Bellevue, WA, (jmlee58@uw.edu) (*Director*) Research Grant, General Electric Company

LEARNING OBJECTIVES

1) Identify the appropriate application of multimodality breast imaging for routine screening, supplemental screening, and diagnostic indications. 2) Select appropriate methods for imaging-guided percutaneous breast biopsy and perform post-biopsy radiologic-pathologic correlation. 3) Calculate performance measure values for a breast imaging audit and compare with appropriate performance benchmarks.

Sub-Events

MSCB51A Screening: Digital Mammography and Tomosynthesis

Participants
Sarah M. Friedewald, MD, Chicago, IL, (sarah.friedewald@nm.org) (*Presenter*) Consultant, Hologic, Inc; Research Grant, Hologic, Inc; Consultant, C. R. Bard, Inc

LEARNING OBJECTIVES

View learning objectives under main course title.

ABSTRACT

MSCB51B Supplemental Screening

Participants
Susan Weinstein, MD, Philadelphia, PA (*Presenter*) Consultant, Siemens AG

LEARNING OBJECTIVES

View learning objectives under main course title.

ABSTRACT

The discussion will review the imaging modalities currently available for supplemental screening. The pros and cons of each modality will be discussed as well as the pertinent literature.

MSCB51C Evaluating the Symptomatic Patient

Participants
Sughra Raza, MD, Boston, MA, (sraza1@partners.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Sughra Raza, MD - 2015 Honored Educator

RC715

Interventional Breast Procedures

Thursday, Dec. 1 4:30PM - 6:00PM Room: N228

BR DM

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Cherie M. Kuzmiak, DO, Chapel Hill, NC, (Cherie_kuzmiak@med.unc.edu) (*Moderator*) Research Grant, FUJIFILM Holdings Corporation;

LEARNING OBJECTIVES

ABSTRACT

Sub-Events

RC715A Sonographic Directed Breast Procedures-Optimizing the Patient Experience through Competency, Compassion, and Communication

Participants
Mary S. Soo, MD, Durham, NC, (mary.soo@duke.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Differentiate breast lesions amenable to sonographic directed breast biopsy from those requiring stereotactic guidance or surgical excision. 2) Assess and communicate procedure- and patient-related factors that will optimally prepare patients for sonographically-guided breast biopsy procedures. 3) Identify and apply biopsy techniques that enhance competency and contribute to safe, efficient and accurate sonographically-guided breast biopsies. 4) Critique their skills in providing clear and compassionate communication during biopsy recommendation and delivery of results.

RC715B Mammographic Directed Breast Biopsy: The Emerging Role of DBT Biopsy

Participants
Jules H. Sumkin, DO, Pittsburgh, PA (*Presenter*) Institutional research agreement, Hologic, Inc; Advisory Board, General Electric Company

LEARNING OBJECTIVES

1) Apply the techniques learned to be able to perform an upright DBT directed breast biopsy from a technical perspective. 2) Contrast the advantages and disadvantages of performing DBT directed biopsy Vs Prone Stereotactic biopsy. 3) Identify the types and location of lesions which are best suited for DBT biopsy Vs Prone Stereotactic biopsy. 4) Describe the impact of using DBT directed biopsy on breast center operations.

ABSTRACT

Similar to the need for MRI biopsy capability in a practice that performs breast MRIs, the need for tomosynthesis guided breast biopsies in a practice using tomosynthesis is inevitable as there are certain lesions seen only on tomosynthesis that would be impossible to biopsy utilizing 2D stereotactic guidance. Since the introduction of DBT directed biopsy several years ago it has become apparent that there are certain types and locations of lesions which are most ammenable to DBT directed biopsy Vs traditional prone stereotactic biopsy. This course will review the limited literature on this topic, describe how to perform a DBT directed biopsy, discuss which lesion types and locations are most ammenable to using this technique, and consider what the operational impact the technology has on the breast center.

RC715C The Pathology is Back: What Next?

Participants
Amy S. Campbell, MD, Washington, DC, (amy.s.campbell@gunet.georgetown.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify key information in the pathology report needed to differentiate benign, malignant and high-risk lesions. 2) Examine the process of determining radiologic and pathologic concordance. 3) Describe what constituters a discordant lesion and when to recommend repeat biopsy or surgical excision. 4) Define high-risk lesions and discuss management considerations. 5) Develop a strategy for critical evaluation of the pathology report in conjunction with imaging to render appropriate recommendations.

ABSTRACT

SST01

Breast Imaging (Multi-modality Diagnostic)

Friday, Dec. 2 10:30AM - 12:00PM Room: E450B

BR DM MR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants
Mary S. Newell, MD, Atlanta, GA (*Moderator*) Stockholder, Kimberly-Clark Corporation ; Stockholder, E. I. du Pont de Nemours & Company ; Stockholder, Bristol-Myers Squibb Company; Stockholder, Merck & Co, Inc; Stockholder, Johnson & Johnson ; Stockholder, Eli Lilly and Company
Sarah M. Friedewald, MD, Chicago, IL (*Moderator*) Consultant, Hologic, Inc; Research Grant, Hologic, Inc; Consultant, C. R. Bard, Inc

Sub-Events

SST01-01 Changes in Patients' Surgical Management after Preoperative Breast MRI: Preliminary Results from the MIPA Study

Friday, Dec. 2 10:30AM - 10:40AM Room: E450B

Participants
Rubina Manuela Trimboli, San Donato Milanese, Italy (*Presenter*) Nothing to Disclose
Giovanni Di Leo, San Donato Milanese, Italy (*Abstract Co-Author*) Travel support, Bracco Group
Ritse M. Mann, MD, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Research agreement; Siemens AG; Research agreement, Seno Medical Instruments, Inc
Marina A. Benito, MD, PhD, Cordoba, Spain (*Abstract Co-Author*) Nothing to Disclose
Chiara Zuiani, MD, Udine, Italy (*Abstract Co-Author*) Nothing to Disclose
Francesco Sardanelli, MD, San Donato Milanese, Italy (*Abstract Co-Author*) Speakers Bureau, Bracco Group Research Grant, Bracco Group Speakers Bureau, Bayer AG Research Grant, Bayer AG Research Grant, IMS International Medical Scientific
Evelyn Wenkel, MD, Erlangen, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens AG
Katja C. Siegmann-Luz, Tubingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Marc Lobbes, MD, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Corinne Balleyguier, MD,PhD, Villejuif, France (*Abstract Co-Author*) Nothing to Disclose
Massimo Calabrese, MD, Genova, Italy (*Abstract Co-Author*) Nothing to Disclose
Katja Pinker-Domenig, MD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Gianfranco Scaperrotta, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose
Jeroen Veltman, MD, Hengelo, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Umit A. Ozcan, MD, Istanbul, Turkey (*Abstract Co-Author*) Nothing to Disclose
Federica Pediconi, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Julia Camps Herrero, DIPLPHYS, Alzira, Spain (*Abstract Co-Author*) Nothing to Disclose
Gabor Forrai, MD, Budapest, Hungary (*Abstract Co-Author*) Nothing to Disclose
Steven E. Harms, MD, Fayetteville, AR (*Abstract Co-Author*) Consultant, Aurora Imaging Technology, Inc Consultant, Seno Medical Instruments, Inc
Inge-Marie Obdeijn, MD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Mireille Van Goethem, Edegem, Belgium (*Abstract Co-Author*) Nothing to Disclose
Marcos F. Docema, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
James E. Anderson, MBBCh, Perth, Australia (*Abstract Co-Author*) Nothing to Disclose
Claudio Losio, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Daniela Sacchetto, Turin, Italy (*Abstract Co-Author*) Researcher, im3D SpA
Fiona J. Gilbert, MD, Cambridge, United Kingdom (*Abstract Co-Author*) Research Grant, GlaxoSmithKline plc; Research Grant, General Electric Company; Research Grant, Hologic, Inc
Thomas H. Helbich, MD, Vienna, Austria (*Abstract Co-Author*) Research Grant, Medicor, Inc Research Grant, Siemens AG Research Grant, C. R. Bard, Inc
Nehmat Houssami, MBBS, Sydney, Australia (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

MIPA is an ongoing prospective observational multicenter study enrolling two concurrent groups of women with a newly diagnosed breast cancer, not candidate to neoadjuvant therapy, receiving or not receiving MRI before surgery.

METHOD AND MATERIALS

A total of 34 centers from 14 countries were selected for participation. For each breast, the surgical treatment planned at mammography/US and the actually performed one were recorded. For the MRI group, any change in the patients' surgical management due to MRI was noted. Mastectomies and reoperations were the surgical patients' outcomes. Raw odds ratios (OR) were adjusted for patient age and breast density for MRI group over non-MRI group. McNemar and c2 tests were used for comparisons.

RESULTS

Up to March 2016, 1st, 4,295 patients were enrolled, 1,926 (45%) having a complete case report form and suited for analysis. Of 1,926 patients, 954 (49.5%) did not undergo MRI and 972 (50.5%) underwent MRI. Mastectomy rate planned at mammography/US was 134/954 (14.0%) for the non-MRI group and 195/972 (20.1%) for the MRI group (P<.001): adjusted OR 1.4 (95% confidence interval [CI] 1.2–1.6). In the MRI-group, planned mastectomies passed to 203/972 (20.9%) after MRI (P=.016). MRI-detected new contralateral cancers were 8/972 (0.8%). Actual mastectomy rate was 140/954 breasts (14.7%) in the non-MRI group and 203/972 (20.9%) in the MRI group (P<.001): adjusted OR 1.4 (95%CI 1.2–1.6). Of 769 breasts conservatively treated, MRI did not change

the surgical treatment in 569 (74%), while prompted a wider or >1 excision in 100 (13%) and a less extensive surgical treatment in 100 (13%). Per-patient reoperation rate for close/positive margins was 124/954 (13.0%) in the non-MRI group and 68/972 (7%) in the MRI group (P<.001): adjusted OR 0.5 (95%CI 0.4–0.6).

CONCLUSION

These preliminary results showed that most mastectomies were already planned at mammography/US so that preoperative MRI was used mainly as a confirmation tool. This selection bias also contributed in determining a lower reoperation rate in women undergoing MRI. Conservative treatment was modified by MRI in relation to disease extent, with a balance between increased and decreased breast tissue removal.

CLINICAL RELEVANCE/APPLICATION

Preoperative MRI prompts a very low rate of additional mastectomies and allows for tailoring conservative treatment.

SST01-02 Role of Breast MRI for Detecting and Characterizing Papillary Lesions: Comparison with Conventional Digital Ductography and Histological Findings

Friday, Dec. 2 10:40AM - 10:50AM Room: E450B

Participants
Marco Moschetta, MD, Bari, Italy (*Presenter*) Nothing to Disclose
Michele Telegrafo, MD, Bari, Italy (*Abstract Co-Author*) Nothing to Disclose
Tina Introna, Bari, Italy (*Abstract Co-Author*) Nothing to Disclose
Luigi Coi, bari, Italy (*Abstract Co-Author*) Nothing to Disclose
Amato Antonio Stabile Ianora, Bari, Italy (*Abstract Co-Author*) Nothing to Disclose
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PURPOSE

To evaluate the role of breast contrast enhanced MR imaging (CE-MR) for detecting and characterizing papillary lesions and to compare the obtained results with conventional digital ductography, having the histological findings as the reference standard.

METHOD AND MATERIALS

49 consecutive patients with spontaneous, unilateral, single-pore nipple discharge underwent conventional digital ductography and CE-MRI (1.5 Tesla device) with morphological (T2-TSE, STIR) and dynamic sequences (THRIVE). Sensitivity, specificity and diagnostic accuracy values for both ductography and CE-MRI were calculated having post-surgical histological examination (n=43) and 12 month MR follow up (n=6) as the reference standard. The obtained performance values were compared by using Mc Nemar test searching for any statistical significant difference between the two imaging tools.

RESULTS

CE-MRI detected papillary lesions in 41/49 (84%) patients (mass like enhancement, n=30 - papillomas; ductal enhancement, n=7 – papillomatosis; linear enhancement, n=4 – papillary carcinomas) with sensitivity, specificity and accuracy values of 95%, 100% and 96%, respectively. Conventional digital ductography detected papillary lesions in 33/49 (67%) patients (single filling defects, n=26 – papillomas; multiple filling defects, n=4 – papillomatosis; filling stops with ductal distortions, n=3; papillary carcinomas) with sensitivity, specificity and accuracy values of 77%, 100% and 80%, respectively. A significant difference between the two imaging tools was found in terms of sensitivity and diagnostic accuracy ($p<0.05$).

CONCLUSION

Breast CE-MRI represents an accurate and non invasive tool for diagnosing and classifyng papillary lesions with higher sensitivity and accuracy values as compared with conventional ductography.

CLINICAL RELEVANCE/APPLICATION

Breast CE-MRI allows to diagnose and classify papillary lesions with high accuracy and can replace conventional ductography in the management of patients.

SST01-03 Dynamic Contrast-Enhanced and Diffusion-Weighted MR Imaging of Estrogen Receptor-positive Invasive Breast Cancers: Correlations between Quantitative MR Parameters and Ki-67 Proliferation Status

Friday, Dec. 2 10:50AM - 11:00AM Room: E450B

Participants
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PURPOSE

We explored whether quantitative parameters derived from dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) and diffusion-weighted imaging (DWI) correlated with the Ki-67 proliferation status in patients with estrogen receptor (ER)-positive invasive breast cancer.

METHOD AND MATERIALS

Between October 2014 and February 2015, 88 women with 88 ER-positive invasive breast cancers underwent preoperative DCE-MRI and DWI. The perfusion parameters (Ktrans, Kep, and Ve) and apparent diffusion coefficients (ADC) of each tumor were recorded. Correlations between these quantitative parameters and the Ki-67 proliferation status were sought using multivariate regression analysis and by construction of receiver operating characteristic (ROC) curves. The Ki-67 proliferation index was categorized as high (≥ 14%) or low (< 14%).

RESULTS

In the high-Ki-67 group, the mean Ktrans was significantly higher (P < 0.001) than that of the low-Ki-67 group, and the mean ADC significantly lower (P < 0.001). However, the mean Kep and Ve values did not differ between the two groups (P = 0.248 and P = 0.055, respectively). The ROC curve showed that cutoffs of 0.277 for Ktrans and 0.894×10-3 mm2/s for ADC, respectively, optimally predicted a high Ki-67 status (areas under the curve = 0.728 and 0.722; both P values < 0.001). Univariate analysis showed that a higher Ktrans (≥ 0.277), a lower ADC (≤ 0.894×10-3 mm2/s), a larger tumor size (> 2 cm), a higher histological grade (grade 3), and the presence of axillary metastasis were significantly associated with high-Ki-67 status (all P values < 0.05). Of these variables, a higher Ktrans (> 0.277; adjusted odds ratio (OR) = 8.893, 95% CI = 1.937-40.821; P = 0.005) and a higher histological grade (grade 3; adjusted OR = 8.353, 95% CI = 1.521-45.862; P = 0.015) independently predicted a high Ki-67 status.

CONCLUSION

MRI-derived quantitative parameters including Ktrans and the ADC were correlated significantly with the Ki-67 proliferation status in patients with ER-positive invasive breast cancer. Furthermore, upon multivariate analysis, a higher Ktrans was the strongest independent predictor of a high Ki-67 proliferation index.

CLINICAL RELEVANCE/APPLICATION

Quantitative parameters derived from DCE-MRI and DWI facilitate evaluation of proliferative tumor activity before surgery and may serve as useful imaging biomarkers predicting breast cancer prognosis.

SST01-04 Invasive Lobular Carcinoma: Detection and Multiplicity with Multimodalities

Friday, Dec. 2 11:00AM - 11:10AM Room: E450B

Participants
In Hye Chae, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
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Jeoung Hyun Kim, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the diagnostic performances of mammography, sonography, breast specific gamma imaging (BSGI), PET, digital breast tomosynthesis (DBT) and magnetic resonance imaging (MRI) for the detection of invasive lobular carcinoma (ILC).

METHOD AND MATERIALS

This is a retrospective study of women with surgically proven ILC. All patients underwent surgery at our institution from October 2011 to November. All patients were performed various imaging modalities, prior to the surgery; mammography, sonography, BSGI, PET, DBT, and/or 3-T MRI. The imaging findings were classified as positive or negative for ILC, by experienced breast radiologists. The final surgical pathology made into the reference standard. The detection rate was evaluated for each index cancer per breast. The diagnostic performances were also evaluated for multiple suspicious lesions per breasts.

RESULTS

A total of 78 breasts in 76 women (mean age; 51 years, range; 33-85 years) had ILCs, two patients had bilateral invasive lobular carcinomas and 32 breasts had multiple ILCs per breast. Patients preoperatively underwent mammography (n=72), sonography (n=77), BSGI (n=50), PET (n=74), DBT (n=15), and MRI (n=76). For index cancer, the detection rate was 100 % for sonography, MRI, and DBT, while the detection rate of BSGI, PET and mammography were follows; 96.0%, 93.2% and 87.5%, respectively. For multiple ILCs, DBT had a sensitivity of 100%, MRI had a sensitivity of 93.3%, sonography, PET, BSGI, and mammography as follows (75.0%, 56.7%, 38.1% and 22.6%, respectively). The sensitivity of sonography for multiple ILCs (75.0%) was significantly higher than that of mammography (22.6%, P = .000) and BSGI (38.1%, P =.006). The diagnostic accuracy for multiple ILCs were 100% in DBT, 73.6% in PET, 71.4% in sonography, 67.1% in MRI, 60% in BSGI and 56.9% in mammography.

CONCLUSION

Sonography, DBT and MRI showed 100% detection rate of main ILCs. DBT was the most accurate imaging modality, whereas mammography and BSGI showed relatively low diagnostic performances, for the multiplicity of ILCs. DBT is an effective modality for patients with ILCs, and has a promising role in the diagnosis of multiple ILCs.

CLINICAL RELEVANCE/APPLICATION

Digital breast tomosynthesis can demonstrate multiple suspicious lesions of invasive lobular carcinoma and is recommended as part of preoperative evaluation in patients with invasive lobular carcinoma.

SST01-05 National Performance Benchmarks for Modern Diagnostic Digital Mammography: Update from the Breast Cancer Surveillance Consortium

Friday, Dec. 2 11:10AM - 11:20AM Room: E450B

Participants
Brian L. Sprague, PhD, Burlington, VT (*Abstract Co-Author*) Nothing to Disclose
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Karla Kerlikowske, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
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Diana S. Buist, PhD,MPH, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To establish contemporary performance benchmarks for modern diagnostic digital mammography.

METHOD AND MATERIALS

This HIPAA compliant, IRB approved study included data from six Breast Cancer Surveillance Consortium registries (414 radiologists;90 radiology facilities). Women characteristics, mammogram indication and findings, linked with cancer diagnoses from state cancer registries were prospectively collected on women undergoing diagnostic digital mammography at participating facilities. We included 373,176 examinations conducted during 2007-2013 on 246,206 women. Performance statistics overall and stratified by diagnostic indication were calculated according to the American College of Radiology BI-RADS 5th edition. Benchmarks were derived from the distribution of performance metrics across radiologists.

RESULTS

Overall, diagnostic performance measures were: cancer detection rate (CDR), 32.9 per 1000; abnormal interpretation rate, 12.6%; positive predictive value-2, 26.2%; positive predictive value-3, 28.9%; false negative rate, 4.8 per 1000; sensitivity, 87.2%; specificity, 90.4%; cancers stage 0 or 1, 63.9%; minimal cancers, 46.9%; mean size of invasive cancers, 21.1 mm; invasive cancers node negative, 70.1%. Performance varied widely across specific diagnostic indications (e.g., additional evaluation of a recent mammogram, breast lump, short interval follow-up) and across radiologists. CDR ranged from 9.9/1000 for short interval follow-up exams to 61.4/1000 for evaluation of a breast lump. Cancers detected for exams evaluating a breast lump had poorer prognostic characteristics, including a high percentage of invasive cancers (93.3%), low percentage of minimal cancers (17.0%), larger mean tumor size (28.4 mm), and a high percent of node positive disease (41.0%). Comparison to prior studies reveals substantial changes in diagnostic mammography performance since the change from film to digital mammography, including increased cancer detection rates and declining specificity and positive predictive values.

CONCLUSION

These performance measures can serve as national benchmarks, which may help transform variation in radiologists' diagnostic interpretive performance into targeted quality improvement efforts.

CLINICAL RELEVANCE/APPLICATION

Data from a large set of mammography facilities in the US linked to cancer registries provide contemporary performance benchmarks for diagnostic mammography in the era of modern digital mammography.

SST01-06 Dense or Not Dense: Implications of Visual and Quantitative Mammographic Density Assessment

Friday, Dec. 2 11:20AM - 11:30AM Room: E450B

Awards
Student Travel Stipend Award

Participants
Meaghan Mackesy, MD, Boston, MA (*Presenter*) Nothing to Disclose
Elisabeth P. Frost, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Eva C. Gombos, MD, Boston, MA (*Abstract Co-Author*) Royalties, Reed Elsevier
Catherine S. Giess, MD, Wellesley, MA (*Abstract Co-Author*) Nothing to Disclose
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PURPOSE

Legislation requiring radiologists to inform women if they have mammographically dense tissues exists in numerous states and is expanding. The historically used visual assessment of density is known to suffer from intra- & inter-observer variability. Ideally, computer based quantitative tools should be objective & more robust. The purpose of this study was to assess the frequency of agreement between visual and quantitative density-based risk stratification in a screening mammography population.

METHOD AND MATERIALS

IRB approved review of 2566 screening mammograms performed between December 2015 & March 2016 was performed, noting radiologists' visually assessed density (RD) & quantitative (Quantra ™) density (QD) assignment for each case, based on BIRADS density categories A-D. All cases with discrepant RD & QD categories were tabulated. Within discrepant cases, we identified those with the discrepancy between categories A/B and C/D, or non-dense versus dense (NDvD). NDvD cases were blindly reviewed by a consortium of experienced breast imagers who assigned a visual density category to each case by consensus. This categorization was then compared to the prospective RD and QD.

RESULTS

RD & QD assignments were discrepant in 590 out of 2566 cases (23%). Of the discrepant cases, 224/590 (38%) had NDvD discrepancy (accounting for 8.7% of all 2566 cases). Of the 224 NDvD discrepant cases, RD resulted in 128 heterogeneous or extremely dense cases, QD resulted in 96. Of the 224 NDvD cases, there were 13 RD category A, all assigned category C by QD; and 5 RD category D cases which were assigned QD category A (3) or B (2). Consortium review deemed QD assignments in these cases unquestionably incorrect. In 177/224 (79%) of NDvD discrepant cases, the consortium density assignment was in agreement with prospective RD.

CONCLUSION

Quantitative density assessment would ideally categorize density of all screening mammograms correctly, identifying women at higher cancer risk who may benefit from supplemental screening. However, at present, this method has limitations and concurrent visual inspection is necessary to avoid misclassification of screening mammograms.

CLINICAL RELEVANCE/APPLICATION

Given legislation requiring density reporting, variability of qualitative & quantitative density assessment has far-reaching implications, both for supplemental screening & overall risk assessment.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Catherine S. Giess, MD - 2015 Honored Educator
Eren D. Yeh, MD - 2015 Honored Educator
Sughra Raza, MD - 2015 Honored Educator

SST01-07 Dedicated Breast PET (dbPET): The Extraordinary Contribution of Molecular Imaging in the Management Breast Cancer

Friday, Dec. 2 11:30AM - 11:40AM Room: E450B

Participants
Michel Herranz Carnero, Santiago de Compostela, Spain (*Presenter*) Nothing to Disclose
Pablo Aguiar, PhD, Santiago de compostela, Spain (*Abstract Co-Author*) Nothing to Disclose
Sonia Argibay, MD, PhD, Santiago de Compostela, Spain (*Abstract Co-Author*) Nothing to Disclose
Ines Dominguez, Santiago de Compostela, Spain (*Abstract Co-Author*) Nothing to Disclose
Alvaro Ruibal, MD, PhD, Santiago de Compostela, Spain (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the value of this technology in the routine management of breast cancer patients. Different approaches are discussed, from the use in monitoring therapy, to correlation with magnetic Resonance imaging and even the development of the first 3D PET guided biopsy system on the world.

METHOD AND MATERIALS

Five hundred women with known or suspected breast carcinoma were enrolled in this study. A prone position high-resolution dedicated breast PET and MRI examinations were performed. A joint reading of MRI and PET scans side-by-side by a nuclear medicine physician and a radiologist was performed. Sensitivity, specificity, positive and negative predictive value, functional quantification, volume characterization and heterogeneity were registered. Final consideration of MRI and dbPET scans were compared with post-surgical pathology reports

RESULTS

A total of 537 lesions were assessed. Lesion size range was 0.2 to 7.6 cm. In lesion-by-lesion analysis, sensitivity and specificity of MRI alone were 91% and 54%, respectively; while lesion-based sensitivity of dbPET was 93% and breast-based specificity was 100%. The positive predictive value and the negative predictive value for MRI alone were 69% and 85%, respectively; and for dbPET were 100% and 89%, respectively. In a significant number of cases, dbPET helped to clarify or disprove positive findings by MRI, and helped to define new positives that had gone unnoticed at MRI, When treatment was successful, a significant difference was found between pre- and post-Neoadyuvant Chemotherapy status and the SUVmax ($p < 0.001$) of breast tumors. An exquisite -and unexpected- millimeter correlation with post-surgical pathology at the end of neoadjuvant therapy has been found in dbPET images.

CONCLUSION

Dedicated breast PET scans increase the specificity of MRI. The results of the current study show that FDG-dbPET is more effective than MRI in detecting true breast cancer positives. dbPET MAMMI has proven to be an excellent tool for monitoring of neoadjuvant therapy, showing earlier and better precision and accuracy than conventional techniques. Such an association might be of relevant importance to treatment continuity or adjustment.

CLINICAL RELEVANCE/APPLICATION

dbPET MAMMI has proven to be an excellent tool for diagnosis and monitoring of neoadjuvant therapy, showing earlier and better precision and accuracy than conventional techniques.

SST01-08 89Zr-trastuzumab PET/CT for Detection of Unsuspected HER2-positive Metastases in Patients with HER2-negative Primary Breast Cancer

Friday, Dec. 2 11:40AM - 11:50AM Room: E450B

Participants
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Jason S. Lewis, PhD, New York, NY (*Abstract Co-Author*) Shareholder, pHLIP, Inc; Research support, MabVax Therapeutics, Inc
David Hyman, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Jorge Carrasquillo, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine if imaging with 89Zr-trastuzumab, a HER2-targeting PET tracer, can detect HER2-positive metastases in patients with HER2-negative primary breast cancer.

METHOD AND MATERIALS

Patients with HER2-negative primary breast cancer and distant metastases evident on CT, MR, or FDG PET/CT were enrolled in an IRB-approved prospective clinical trial. Patients underwent PET/CT with 5 mCi of 89Zr- trastuzumab in a total of 50 mg trastuzumab to screen for 89Zr-DFO-trastuzumab-avid metastases. Metastases avid for 89Zr-trastuzumab were biopsied to define HER2 status. Patients with pathologically proven HER2-positive metastases went on to receive HER2 targeted therapy to evaluate treatment response.

RESULTS

Nineteen patients have been enrolled in this prospective clinical trial, all of whom had pathologic retesting that confirmed HER2-negative primary breast cancer, and 13 of whom have so far been imaged with 89Zr- trastuzumab PET/CT. Seven patients demonstrated suspicious foci on 89Zr-DFO-trastuzumab PET/CT. Three of these seven patients had 89Zr-DFO-trastuzmab directed biopsy that confirmed the presence of HER2-positive metastases on pathology (by ASCO criteria). Four of these seven patients with suspicious foci had HER2-negative disease on pathology, and were classified as false positives for HER2-imaging on 89Zr-trastuzumab PET/CT. Of the three patients with biopsy proven HER2-positive metastases, two have completed a course of HER2-targeted therapy, and both demonstrated treatment response.

CONCLUSION

89Zr-trastuzmab PET/CT imaging may detect unsuspected HER2-positive metastases in patients with HER2-negative primary breast cancer. 89Zr-trastuzmab PET/CT also demonstrated a number of foci which were HER2-negative on pathology, and may represent false positive HER2-imaging.

CLINICAL RELEVANCE/APPLICATION

This is a proof of concept that HER2-targeted imaging can identify unsuspected HER2-positive malignancy and identify additional candidates for HER2-targeted therapy.

SST01-09 Quantitative CAD for Mammograms: Reducing False Positive Biopsies

Friday, Dec. 2 11:50AM - 12:00PM Room: E450B

Participants
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William G. Bradley JR, MD, PhD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Eric Weise, San Diego, CA (*Abstract Co-Author*) Researcher, CureMetrix, Inc

PURPOSE

Almost 2% of screening mammograms result in biopsy, and approximately 70% of these biopsies are benign (Allison, Cancer, 2015). Decreasing the number of unnecessary biopsies would be cost effective and decrease patient anxiety about breast cancer screening. We evaluated a novel algorithm that differentiates benign and malignant calcifications and compared these results to those of experienced radiologists in selecting cases for biopsy. The algorithm is based on a quantitative learning algorithm that takes into account morphology and clustering formation of benign and malignant calcifications as well as stability over time.

METHOD AND MATERIALS

In this IRB approved study, we performed a comparative analysis on 391 patients' screening and diagnostic mammograms where tissue was sent to biopsy based on suspicious calcifications detected by MQSA certified, fellowship-trained breast imaging radiologists. Cases from 2 different centers were reviewed.These images were evaluated with the qCAD and compared to the expert radiologists' reads. The outcome of the algorithm is an analytical function determined by the training datasets that mathematically define both malignant and benign calcifications. The algorithm is self-learning, improving over time as it encounters more patient cases.

RESULTS

Out of the 391 cases sent to biopsy, 302 cases were benign and 89 malignant (including DCIS). In a preliminary study using 44 cases (30 cases benign and 14 malignant), the algorithm detected 100% of confirmed cancer cases and had 11 cases with false positives, substantially fewer than the 30 false positives by the radiologists. If biopsy recommendations were based on the algorithm up to 63% of biopsies could have been avoided. The PPV of 32% could have been increased to 56% with the benefit of the qCAD.

CONCLUSION

This novel algorithm demonstrates that it can reduce the number of false negative biopsies based on suspicious calcifications by up to 63%. Also, the algorithm can be used to evaluate both screening and diagnostic mammograms.

CLINICAL RELEVANCE/APPLICATION

The use of this quantitative CAD for mammography may be useful in reducing false positive breast biopsies and significantly increasing the positive predictive value (PPV) of biopsy. This may lead to health savings costs as well as eliminate pain and distress for many patients.