Breast Series: Emerging Technologies in Breast Imaging

Series Courses

AMA PRA Category 1 Credits ™: 3.25
ARRT Category A+ Credits: 4.00
Tue, Dec 2 8:30 AM - 12:00 PM   Location: Arie Crown Theater

Participants

Moderator
Liane Elizabeth Philpotts MD : Nothing to Disclose
Margaret Louise Zuley MD : Research Grant, Hologic, Inc

Sub-Events

VSBR31-01 Contrast Enhanced Digital Mammography
D. David Dershaw MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the method of generating a contrast enhanced mammographic imaging. 2) To learn how iodine contrast enhancement differs from gadolinium enhancement. 3) To understand what the current experience in contrast mammography suggests how it might be clinically useful.

ABSTRACT

The presentation will review the principles behind generating a contrast enhanced digital mammographic image after the injection of iodine contrast. Risks of the procedure will be presented. Enhancement kinetics will be discussed and compared with date on gadolinium. Experience of several investigators with contrast enhanced mammography will be reviewed, and the possible clinical usefulness of contrast mammography will be discussed.

VSBR31-02 The Potential Impact of Applying Magnetic Resonance Imaging ACR BI-RADS Lexicon Morphology Descriptors to Characterize Breast Lesions on Contrast Enhanced Spectral Mammography
Rasha Mohamed Kamal MD (Presenter): Nothing to Disclose, Rasha Wessam MD, PhD : Nothing to Disclose, Dorrie Saleh Salem MD : Nothing to Disclose, Maha Hussein Hatil MD : Nothing to Disclose, Marwa Anas Haggag MSC : Nothing to Disclose, Radwa Essam MBBS : Nothing to Disclose, Lamia Adel MD : Nothing to Disclose, Yassmine Mourid MD : Nothing to Disclose, Iman Godda MD : Nothing to Disclose, Nelly Alieldin MD : Nothing to Disclose, Sahar Mansour MD : Nothing to Disclose

PURPOSE

The purpose of the study is to assess the potential impact of using the standardized MRI ACR BI-RADS lesion morphology descriptors in the characterization of breast lesions on Contrast Enhanced Spectral Mammography (CESM).

METHOD AND MATERIALS

Institutional review board approval and patient informed consent were obtained from 271 patients with 350 breast lesions who underwent CESM. According to the MRI morphology descriptors, lesions were classified into enhancing and non-enhancing. Enhancing lesions were classified into focus (12/261 cases, 4.6%), mass (168/261, 64.4% cases) and non mass (81/261 cases, 31%). Irregular mass shape (p value: 0.00), uncircumscribed margins (p value: 0.00) and heterogeneous enhancement (p value: 0.027) was significantly indicative of a malignant pathology. Ring pattern of contrast uptake was identified in 24 lesions: 13/24, (54.2%) benign and 11/24 (45.8%) malignant. Segmental and regional non mass enhancement with a heterogeneous or clumped pattern was significantly higher with malignant pathologies (p value: 0.003). Applying the MRI morphology descriptors to CESM yielded a sensitivity, specificity and accuracy of 92.2%, 81.9% and 88% respectively.

CONCLUSION

The standardized ACR BI-RADS morphology descriptors; with the exception of the ring pattern of contrast uptake, can be applied in the interpretation of CESM and thus provides accurate characterization of breast lesions.

CLINICAL RELEVANCE/APPLICATION

The current study can be used as a pilot study for constructing a CESM BI-RADS lexicon that is...
essential for precise lesion characterization and provides pertinent guidance for appropriate management procedures.

**Added Value of Contrast-enhanced Spectral Mammography as Part of One Stop Breast Unit**

Anne-Marie Tardivel (Presenter): Nothing to Disclose

**PURPOSE**

To assess the added value on medical and surgical strategy of contrast-enhanced spectral mammography (CESM) in comparison to mammography (MG) and ultrasound (US) in breast cancer in a One Stop Breast unit.

**METHOD AND MATERIALS**

Between September 2012 and September 2013, 195 women with a suspicious or undetermined breast lesion on MG and US underwent bilateral CESM in a one shot-stop breast unit. BI-RADS categories and probability of malignancy, retrospectively and blindly estimated by two radiologists, were compared to pathology or follow-up for typically benign lesions. Diagnostic performances were estimated. Size measurement of index lesions on CESM, US and MG were compared to pathology. Changes of medical and surgical strategy were recorded.

**RESULTS**

299 lesions were detected including 221 malignant lesions (172 infiltrative ductal carcinoma, 28 lobular infiltrative carcinoma, 13 ductal carcinoma in situ, 4 infiltrative mixed carcinoma, 3 tubular carcinoma, 1 mucinous carcinoma) in 157 / 195 patients (81%). CESM sensitivity, specificity, positive predictive value and negative predictive value were 94% (IC 89%-96%), 74% (IC 63%-83%), 91% (IC 86%-94%) and 81% (IC 70%-89%), respectively, with 18 false-positive and 14 false-negative findings. In 115 index lesions, MG and CESM were more accurate than US compared to pathology (p

**CONCLUSION**

Routine use of CESM confirms its good clinical performances. CESM may be performed easily in a One Stop Breast unit and may change significantly the diagnostic and treatment strategy in breast cancer staging.

**CLINICAL RELEVANCE/APPLICATION**

CESM is a valuable imaging technique allowing to reduce mammogram uncertainty in a post screening one shot-stop breast unit.

**Diagnostic Accuracy of Contrast-enhanced Breast Tomosynthesis and Dynamic Contrast-enhanced Breast MRI**

Chen-Pin Chou MD (Presenter): Research funded, Hologic, Inc , Chia-Ling Chiang MD : Nothing to Disclose , Wei-Teng Wang : Nothing to Disclose

**PURPOSE**

To compare the diagnostic accuracy of contrast-enhanced breast tomosynthesis (CEBT) and dynamic contrast-enhanced breast MRI (DCE-MRI) for breast lesions detected on digital mammogram.

**METHOD AND MATERIALS**

Institutional review board approved the study. Written informed consent was obtained from all patients. A total of 212 consecutive women suspected of having breast lesions on digital mammogram between March 2012 and April 2014 were enrolled in this study. All women had both CEBT and DCE-MRI before biopsy. For the dual-energy CEBT, a modified Selenia Dimensions (Hologic, Inc.) machine was used. Simultaneously 2D mammogram and 3D tomosynthesis were taken after injection with 1.5 mL iodine contrast agent per kilogram of body weight and imaged between 2 and 6 minutes after injection. Contrast-enhanced images were taken in the suspicious breast (pre-contrast MLO view, post-contrast CC and MLO view) and contralateral breast (post-contrast MLO view). The BI-RADS classifications on CEBT were finally determined based on findings on combinations of 2D mammogram, 3D tomosynthesis and post-contrast subtraction 2D and 3D images. Women were also evaluated at 1.5T (GE) or 3T MRI (Siemens) with dedicated breast coil. Different radiologists interpreted CEBT and DCE-MRI.

**RESULTS**

Total 259 histological findings were available in 212 women (mean age 51.3 years, range 31-70 years). About 79% women had clinical symptoms. 31 women had at least two breast lesions in unilateral breasts. 8 women had bilateral breast lesions. The most common findings of lesions was microcalcification (60%). The pathology revealed 167 benign lesions and 92 breast malignancies (52 carcinoma in situ, and 40 invasive breast cancers). The sensitivity/ specificity of CEBT and DCE-MRI for diagnosing breast cancers were 93%/53% and 86%/74%, respectively.

**CONCLUSION**

CEBT and DCE-MRI showed similar diagnostic performance for abnormal lesions on mammogram.

**CLINICAL RELEVANCE/APPLICATION**

CEBT is an flexible imaging tool for women who cannot undergo breast MRI for various reasons,
Contrast-enhanced mammography and tomosynthesis are promising applications of digital mammography to increase conspicuity of the different breast lesions. We aimed to compare the performance of these applications in staging of breast cancer to detect the proper modality required for accurate pre-operative evaluation.

**METHOD AND MATERIALS**

Ethics committee approval was obtained in this retrospective analysis where examinations of 115 masses in 103 cases were done. Evaluation methods included regular digital mammography, 3-D tomosynthesis, and contrast-enhanced spectral mammography. For acquisition, the system attains a 'Combo-mode' imaging technique (2D+3D imaging) that acquires a traditional digital mammogram and a tomosynthesis scan 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. Evaluated masses were biopsied and proved malignancy (70 masses) were further evaluated regarding lesions' extension, size, multiplicity and related calcifications.

**RESULTS**

Tomosynthesis provided near estimation of cancer extension to pathology data (n=58, 83%) followed by contrast-enhanced (n=32, 46%) and regular mammography (n=51, 73%). Contrast-enhanced mammography presented the least assessment for calcifications, yet the most accurate size estimation with a median value of 0.4 compared to 0.5 and 1.5 for tomosynthesis and regular mammography respectively. Multiplicity was better demonstrated by contrast mammography equally with sensitivity of 92% followed by tomosynthesis (77%) and regular mammography (54%). The combined analysis of the three modalities provided an estimated accuracy of 88% in the pre-operative evaluation of breast cancer.

**CONCLUSION**

The combined application of tomosynthesis and contrast-enhanced digital mammogram enhance the performance of the standard mammogram and present an informative method in staging breast cancer.

**CLINICAL RELEVANCE/APPLICATION**

Digital mammography (DM) is still limited by overlapped densities that may provide false negative/positive diagnosis. Advanced applications of DM; tomosynthesis and contrast-enhanced mammography could improve the performance and provide better evaluation of breast lesions.

**PURPOSE**

To characterize the dosimetric properties of clinical digital breast tomosynthesis (DBT) systems during a single combo (2D + 3D) scan in a screening environment.

**METHOD AND MATERIALS**

Mean glandular radiation dose as recorded in the DICOM header was extracted for 950 asymptomatic patients (mean age 56.3 yrs; range 28 - 90 yrs) undergoing routine 2D + 3D combo breast screening (CC and/or MLO compressions, 3449 breasts) on one of two Hologic Dimensions systems. Dose was evaluated as a function of compressed breast thickness (CBT). Analysis was performed for individual BIRADS tissue density categories as determined by expert radiologists.

**RESULTS**

BIRADS breast tissue density among the study group was: almost entirely fatty (11.1%); scattered fibroglandular densities (51.5%); heterogeneously dense (28.2%) and extremely dense (9.2%). CBT ranged from 1.4 - 10.7 cm (mean = 6.0 cm). For 2D images with CBT < 7 cm (n = 2610), a tungsten/rhodium anode/filter combination was used with dose ranging from 0.54 - 4.49 mGy (mean = 1.52 mGy). For 2D images with CBT > 7 cm (n = 839), tungsten/silver anode/filter combination was used and dose ranged from 1.43 - 4.88 mGy (mean= 2.46 mGy). For DBT images, a tungsten/aluminum anode/filter was used for all compressed thicknesses (n = 3449) with dose ranging from 3.47 mgY (mean = 2.39 mgY). The total dose for a 2D+3D combo exam ranged from 1.56 mgY - 8.88 mgY (mean = 4.12 mgY), with 28 of 3504 (0.8%) combo exposures = 3 mgY for breasts with CBT = 4.2 cm. The relative dose contribution from the 2D and 3D portions of the scan changed monotonically with changing BIRADS classification, with 3D+2D dose ratio increasing from ~1 for extremely dense breasts to > 1.5 for fatty breasts.
CONCLUSION

Based on current automatic exposure control algorithms used in DBT, reconstructing 2D images from DBT projection images will reduce radiation dose by ~50% for dense breasts and ~40% for fatty breasts, enabling opportunities to refine the dosimetric properties of DBT and improve image quality.

CLINICAL RELEVANCE/APPLICATION

Breast screening using 2D + 3D combo DBT has demonstrated improved breast cancer detection and reduced FP (recall) rates. Dose in the majority of combo exposures is ~3mGy; thus, substituting “synthetic 2D” for conventional DM images affords opportunities to better refine the dosimetric properties and image quality of DBT.

RESULTS

As determined by interpreting radiologist; compression thickness (mm) and total MGD (TMGD, mGy) for the 2 standard (cranio-caudal and mediolateral oblique) views per breast were recorded. TMGD was independently compared to thickness, density, and age using univariate and multivariate regression. Subgroup analysis for low vs high density (fatty and scattered vs heterogeneous and extremely dense) was performed.

RESULTS

There were 200 DBT exams with mean age of 56 ±10.0 years (range 35-78). 110 exams were low density [33 fatty (16.5%), 77 scattered (38.5%)] and 90 were high density [67 heterogeneous (33.5%), 23 extremely dense (11.5%)]. The average TMGD was 14.95 mGy and average thickness was 57.3 mm. When correlated with radiation dose, there was a positive correlation with thickness (r=+0.92), but weak correlation with density (r=+0.20) and age (r=0.21). Thickness is a significant determinant of total radiation dose (R2=0.87) and with density (R2=0.04) and patient age (R2=0.04) to a lesser extent. Using the multivariate model, we found that all three variables were statistically significant and increased the ability to predict patient total radiation dose (R2=0.93). For low density, the average TMGD was 15.3 mGy and average thickness was 61.2 mm. For high density, the average TMGD was 14.23 mGy and average thickness was 52.6 mm. Thickness showed a stronger correlation with radiation dose for patients with less dense than more dense breasts (less: r=+0.97, R2=0.96; more: r=+0.91, R2=0.85; p<0.0001), indicating that TMGD increases more quickly with an increase in thickness for patients with low density breasts than for patients with high density breasts

CONCLUSION

Radiation dose received by patients undergoing screening DBT significantly correlates with patient’s breast thickness, and less so with breast density and age.

CLINICAL RELEVANCE/APPLICATION

For patients undergoing screening DBT, breast thickness should be considered as an important contributor to overall radiation dose in addition to breast density and patient age.

METHOD AND MATERIALS

This IRB approved retrospective study included all screening DBT exams performed at our institution from 1/1/2014 to 1/31/2014. Our DBT protocol included 2D and 3D acquisitions. Patient age, density as determined by radiologist; compression thickness (mm) and total MGD (TMGD, mGy) for the 2 standard (cranio-caudal and mediolateral oblique) views per breast were recorded. TMGD was independently compared to thickness, density, and age using univariate and multivariate regression. Subgroup analysis for low vs high density (fatty and scattered vs heterogeneous and extremely dense) was performed.

RESULTS

For the BI-RADS scale, the average AUC for DBT plus RM was 0.915, DBT alone 0.907 and FFDM was 0.799. For POM, the average AUC for DBT plus RM was 0.915, DBT alone 0.907 and FFDM was 0.799.

METHOD AND MATERIALS

First, FFDM from group A and DBT with and without RM from group B were evaluated. Each participant completed two reading sessions spaced 4 weeks apart to minimize recall bias. Modified BI-RADS and percentage probability of malignancy (POM) scale were used and the reader-specific area under the curve (AUC) was analyzed. In addition, the visualization of masses and microcalcifications as well as the appearance of noise were also compared and scored separately for each case in DBT and RM

RESULTS

Based on current automatic exposure control algorithms used in DBT, reconstructing 2D images from DBT projection images will reduce radiation dose by ~50% for dense breasts and ~40% for fatty breasts, enabling opportunities to refine the dosimetric properties of DBT and improve image quality.

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Comparison with Synthetic 2D Mammography Reconstructed from Digital Breast Tomosynthesis and Digital 2D Mammography for the Detection of T1 Breast Cancer

Ji Soo Choi MD, PhD (Presenter): Nothing to Disclose, Eun Sook Ko MD: Nothing to Disclose, Boo-Kyung Han MD, PhD: Nothing to Disclose, Eun Young Ko MD, PhD: Nothing to Disclose, Soo Yeon Hahn MD: Nothing to Disclose

PURPOSE
To evaluate the interpretative performance of synthetic two-dimensional (2D) mammography (C-View) reconstructed from digital breast tomosynthesis (DBT) for detection and characterization of small invasive cancers, compared to digital 2D mammography (DM).

METHOD AND MATERIALS
This study consecutively enrolled 107 patients (mean age 52.1 years) with T1-stage invasive breast cancers (=2cm in size, mean size 12.9±4.3 mm) confirmed by surgical excision from January to June 2013. For each patient, DM and DBT were performed, and C-View was reconstructed from each set of DBT slices. Three breast radiologists, blinded to histology, interpreted DM and C-view, and recorded visibility (four-point scale; 1 no visible finding, 2 low conspicuity, 3 medium conspicuity, 4 high conspicuity) and morphology of detected cancers. Diagnostic performance of C-view was compared with that of DM in terms of detectability and visibility. Subgroup analyses were performed according to mammographic density (dense 29/ non-dense 78).

RESULTS
There was no significant difference in detection sensitivity of T1 breast cancers between C-View (range 62.6-71.0%) and DM (60.7-71.0%) for all readers (P>0.05). The visibility scores of C-View and DM were also not significantly different for each observer (range of mean scores 2.6-2.9 for C-View, 2.4-2.9 for DM; P>0.05). Common presentation of detected cancers on both C-View and DM were irregular spiculated masses (67.7% vs. 69.0%) and microcalcifications (14.5% vs. 15.5%). In the subgroup analysis according to mammographic density, C-View and DM showed no significant difference in detectability and visibility of T1 breast cancers. These two modes of dense breast group showed lower detection sensitivity (range 53.8-65.4% for C-View, 51.3-65.4% for DM) and lower visibility scores (range 62.6-71.0%) and DM (60.7-71.0%) for all readers (P>0.05). The visibility scores of C-View and DM were also not significantly different for each observer (range of mean visibility score 2.3-2.7 for C-View, 2.1-2.7 for DM), compare to those of non-dense group (detection sensitivity 86.2% for C-View, 86.2% for DM; range of mean visibility score 2.3-2.7 for C-View, 2.1-2.7 for DM).

CONCLUSION
Diagnostic performance of C-View and DM are comparable for detection of T1 breast cancers. Therefore, our results indicate that C-view may eliminate the need for addition of DM during DBT-based screening.

CLINICAL RELEVANCE/APPLICATION
Synthetic 2D mammography may eliminate the need for addition of digital 2D mammography during DBT-based screening, and keep the dose of DBT the same as that of digital 2D mammography.
conventional mammography screening and integrated standard 2D and 3D.

METHOD AND MATERIALS
STORM II trial is a prospective study comparing 2D-only mammography with integrated 2D/3D and with integrated synthetic 2D images/3D. From June to November 2013, all the resident women aged from 49 to 70 who attended local population-based screening, after informed consent, had digital mammography in Combo® mode; synthetic 2D images were reconstructed from the data acquired during the tomo-exposures using dedicated software (c-view®, Hologic, USA). All screens had independent, double and sequential readings: two readers interpreted sequentially 2D then 2D/3D whereas two other readers interpreted sequentially sint2D then sint2D/3D, thus each screen was read by 4 readers. Any positive screens at any reading phase was recalled. Paired data were compared using McNemar's Chi-square test.

RESULTS
Based on 3312 screens, 27 breast cancers were detected in 24 women; 19 cancers were detected by standard 2D mammography, 21 cancers were detected with integrated 2D/3D screening (p=0.50) whereas 6 more cancers were detected only by integration of synthetic 2D/3D (p=0.125). None of the cancers were detected with 2D-only mammography. There were 253 false positive (FP) recalls attributed to various screen-reading modalities: 30 from sint2D alone, 33 from standard 2D mammography alone, 91 from sint2D/3D alone and 100 from 2D/3D alone. FP recalls for the integrated readings was 155 using integrated 2D/3D versus 151 using integrated sint2D/3D (p=0.79).

CONCLUSION
Although not statistically different from 2D/3D, cancer detection was highest for integrated synthetic 2D with 3D mammography amongst various screen-reading methods evaluated in this interim analysis.

CLINICAL RELEVANCE/APPLICATION
Integrated sint2D/3D mammography may have the potential to enhance cancer detection in population breast screening providing a solution to concerns about the required double x-ray exposure in 2D/3D modality.

Interval Cancers in Patients Screened with Full Field Digital Mammography (FFDM) vs FFDM plus Digital Breast Tomosynthesis (DBT)

Nelly Salem MD (Presenter): Nothing to Disclose , Donna M. Plecha MD : Advisory Board, Hologic, Inc Research Grant, SuperSonic Imagine , Cheryl L Thompson : Nothing to Disclose

PURPOSE
To compare the rates and tumor characteristics of interval cancers diagnosed in patients screened with full field digital mammography (FFDM) versus those screened with FFDM plus digital breast tomosynthesis (DBT).

METHOD AND MATERIALS
Cancer patients diagnosed from 9/1/2011-12/31/2013 were evaluated, determining if they were interval cancers from a population screened from 9/1/2011-12/31/2012. Patients were separated into two groups: those who were screened with FFDM versus FFDM + DBT. Interval cancers were defined as those that presented less than a year of a negative screening mammogram with a symptom. Age, breast density, interval time period from a negative mammogram, tumor size, stage, lymph node status, and treatment regimens were recorded.

RESULTS
15,551 women were screened between 9/1/2011 and 12/31/2012 with 11,185 screened with FFDM and 4,366 women screened with FFDM + DBT. Overall 22 interval cancers were identified, 18 were patients who underwent screening with FFDM, and 4 were screened with FFDM + DBT. This is a non-significant rate of 1 cancer per 1000 patients screened with FFDM + DBT versus 1.6/1000 interval cancers in patients screened with FFDM alone (p=0.43). Overall mean cancer patient age was 62, and there was a mean of 7.7 months interval at time of diagnosis since the screening exam, with no significant difference between the two groups. When comparing the two groups of interval cancer patients, there was no statistical significance in breast density, cancer grade, stage, size, lymph node status, mastectomy rate, rate of chemotherapy or radiation therapy between the two groups.

CONCLUSION
Our results show a non-significant 38% lower interval cancer rate when screening with FFDM + DBT versus FFDM alone. We found no significant difference between the two groups of interval cancer patients comparing age, breast density, interval time at diagnosis, cancer grade, stage, size, lymph node status, mastectomy rate, rate of chemotherapy or radiation therapy.

CLINICAL RELEVANCE/APPLICATION
DBT is a promising supplement to mammographic screening for breast cancer. Studies have shown decreased recall rates and increased cancer detection rates, however the effect on interval cancers has not been evaluated. Our results demonstrate no significant difference in the interval cancer rate or characteristics of the interval cancers between patients screened with DBT + FFDM versus FFDM alone.

Comparison of the Use of BIRADS Category 3 before and after Implementation of Digital Breast Tomosynthesis in a Large Screening Population

Elizabeth McDonald MD, PhD (Presenter): Nothing to Disclose , Susan Pae Weinstein MD : Nothing to Disclose , Marie Synnestvedt : Nothing to Disclose , Emily F. Conant MD : Scientific Advisory Board, Hologic, Inc , Anne Marie McCarthy : Nothing to Disclose , Mitchell Dennis Schnall MD, PhD : Nothing to Disclose
(1) Compare the utilization of BI-RADS category 3 (BR3, recommend short-interval follow-up) after a recall from screening before and after implementation of screening digital breast tomosynthesis (DBT). (2) Determine whether DBT will reduce the use of short-interval follow-up by lesion subtype.

METHOD AND MATERIALS

Retrospective IRB approved review of 15,633 screening DBT exams from 10/1/2011-2/28/2013 and 10,751 screening digital mammography (DM) exams from 9/1/2010-8/30/2011 was performed. The initial recall populations for DM and DBT were 1116 and 1372, respectively. That group was further searched for a de novo assignment of category 3. Exams were cataloged according to finding type: calcifications (C), asymmetry or focal asymmetry (A), mass (M), and architectural distortion (AD). Some exams were recalled for more than one finding type. Differences between groups were compared using Wilcoxon Rank Sum Test.

RESULTS

There were significantly less patients recommended for short-interval follow-up in the DBT cohort (172/10751, 1.6% DM versus 203/15633, 1.3% DBT, p=0.042). However, this difference was no longer significant when the lower recall rate of the DBT cohort was taken into account (172/1116, 15.4% DM versus 203/1372, 14.8% DBT, p=0.70). The finding types given a BR3 for the DM cohort were C (67/172, 39.0%), M (41/172, 23.8%), A (71/172, 41.3%), and AD (5/172, 2.9%) and DBT cohort, C (66/203, 32.5%), M (62/203, 30.5%), A (96/203, 47.3%) and AD (9/203, 4.4%). There was no significant difference in the use of BR3 for any finding type (p=0.20, 0.15, 0.24 and 0.44, respectively).

CONCLUSION

Screening DBT does not reduce the frequency of BR3 assessment after recall from screening and also does not change the types of findings recommended for short-interval follow-up.

CLINICAL RELEVANCE/APPLICATION

Screening with DBT does not reduce the number of patients recommended for short-interval follow-up after initial diagnostic evaluation.

VSB31-15

Cancer Yield of Architectural Distortion Detected on Screening Tomosynthesis

Ana P. Lourenco MD : Nothing to Disclose, Kelly Damico MD (Presenter): Nothing to Disclose, Luke M. Partyka MD : Nothing to Disclose, Martha Beretta Mainiero MD : Nothing to Disclose

PURPOSE

To determine the cancer yield of architectural distortion (AD) seen only or better on digital breast tomosynthesis (DBT) compared to digital mammography (DM) during routine screening.

METHOD AND MATERIALS

An IRB approved, HIPAA compliant retrospective review of all screening DBT performed at an academic breast center from March 2012 through November 2013 identified all BI-RADS 0 results. BI-RADS 0 reports were then reviewed to identify all cases of AD or possible AD. Cases were consensus reviewed by two fellowship trained breast radiologists and scored according to visibility of the AD (seen only on DM, better on DM, equally on DM and DBT, better on DBT, or only on DBT). All additional imaging and pathology results corresponding to the AD were reviewed, and results recorded in a database.

RESULTS

Of the 25,369 screening DBT exams, there were 1,769 (7%) BI-RADS 0 results. Of these, there were 84 (4.7%) reports of AD or possible AD. 32 were excluded, as AD or possible AD was not confirmed on consensus review. 52 cases of AD or possible AD detected at screening form the basis of this study. Of these, 26 (50%) were seen only on DBT, 23 (44%) seen better on DBT than DM, and 2 (4%) seen equally on DBT and DM. There were no cases seen only or better on DM. Of the 52 cases, 26 went on to biopsy (50%) with malignancy diagnosed in 54% (14/26) (biopsy positive predictive value). Biopsy also identified 7 radial scars and 5 benign findings. All 26 of the biopsied cases were either seen only on DBT or seen better on DBT. Of the malignancies, 57%(8/14) were DBT only findings. Surgical excision was required in 81% (21/26) of cases biopsied. Of the 26 cases that did not undergo biopsy, 8 (31%) were assessed as BI-RADS 3 and 13 (50%) as BI-RADS 1/2 on diagnostic evaluation. 1 case was lost to follow-up. 4 cases were assessed as BI-RADS 4/5 for lesions separate from the possible AD. Average follow-up for lesions not undergoing biopsy was 9.7 months. Overall cancer yield was 27% (14/52).

CONCLUSION

DBT detects areas of malignant AD not readily seen on DM. The 27% cancer yield in this study suggests that AD should not be dismissed even if detected only on DBT.

CLINICAL RELEVANCE/APPLICATION

The cancer yield and biopsy positive predictive value of AD detected only on DBT is high. This finding should not be dismissed when identified at routine screening DBT.

VSB31-16

Comparison of Digital Mammography (FFDM) and FFDM Plus Digital Breast Tomosynthesis in Mammography Screening for Cancer Detection according to Breast Parenchyma Density

Per Skaane MD, PhD (Presenter): Equipment support, Hologic, Inc Consultant, Hologic, Inc

VSBR31-15 VSBR31-16
PURPOSE

To compare cancer detection using full-field digital mammography (FFDM) versus FFDM plus digital breast tomosynthesis (DBT) in a population-based screening according to BI-RADS density.

METHOD AND MATERIALS

The prospective screening trial was approved by the Ethical Committee. All women signed a written consent. 25,547 women age 50-69 y. underwent FFDM and DBT. Prospective independent readings were performed, using a 5-point rating scale for probability of cancer (1-5) for each breast. Eight radiologists participated in the interpretation alternating between the two modes. The trial had 4 arms including one arm offering FFDM+CAD and another offering synthetic 2D in lieu of conventional FFDM. This analysis includes only two arms, namely FFDM alone versus FFDM+DBT. All cases with a positive score by at least one reader were discussed at arbitration meeting before final decision whether to recall the woman for diagnostic workup. At arbitration meeting case-based consensus BI-RADS density scores were recorded. Cancers detected on FFDM and FFDM+DBT were stratified by breast density. McNemar test was used to compare detection in each of the density groups by mode.

RESULTS

257 screen-detected malignancies were found: 20 in breasts with density 1; 105 in density 2; 110 in density 3; and 22 in breasts with BI-RADS density 4. Overall, a true positive (TP) score under the FFDM alone mode was 163/257 (63%) compared with 211/257 (82%) under the FFDM+DBT mode (p

CONCLUSION

Tomosynthesis has the potential to significantly increase the cancer detection rate in mammography screening of women with breast density BI-RADS 2-4. We observed no increase in women with BI-RADS density 1.

CLINICAL RELEVANCE/APPLICATION

Tomosynthesis may significantly improve the cancer detection rate in mammography screening of women with BI-RADS density 2-4.

SCREENING RECALLS AFTER TOMOSYNTHESIS MAMMOGRAPHY: ARE ADDITIONAL MAMMOGRAPHIC VIEWS NECESSARY?

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PURPOSE

Tomosynthesis (tomo) has been shown to reduce recalls from screening mammography and be equivalent or superior to conventional (2D) spot views. The value of spot tomo views has not yet been assessed. The purpose of our study is to determine in what lesions is additional diagnostic mammographic imaging beneficial.

METHOD AND MATERIALS

A retrospective review of the breast imaging database was performed to identify all BIRADS 0 cases in patients undergoing tomosynthesis screening in a 6 month period, July 1, 2013 to December 31, 2013. Of 295 BIRADS 0 lesions, 157 lesions in 138 patients who had tomo spot views and US as part of the diagnostic work-up were included. Cases were retrospectively blindly reviewed on a dedicated workstation by 4 readers. Two readers evaluated each lesion for a total of 314 lesion assessments. Readers evaluated the screening tomosynthesis exam, followed by the US images and finally the additional diagnostic spot tomo views. The type of lesion (asymmetry, mass, architectural distortion), breast density, forced BIRADS and likelihood of malignancy were assessed at each stage. The outcome of cases in terms of final BIRADS assessment and biopsy results, when appropriate, was assessed.

RESULTS

The mammographic findings consisted of 182 asymmetries, 83 masses, and 49 architectural distortions. In 226 (72%), additional spot tomo views were assessed as not helpful to screening tomosynthesis. Spot views were reported helpful in assessing 57%(28/49) architectural distortions, 25%(45/182) asymmetries and 18%(15/83) masses. Spot views were considered more helpful in assessing lesions noted on one view only (41%), the majority of which were asymmetries (75%) and architectural distortions (20%), compared with two views (17%). Readers identified all 9 cancers with tomo and US. No additional cancers were detected with spot tomo views.

CONCLUSION

Spot tomosynthesis views did not add to the diagnostic evaluation in the majority of non-calcification cases recalled from tomosynthesis screening but were useful in many cases of questioned architectural distortion. The overall sensitivity of screening tomo and US alone was equivalent to that with spot images.

CLINICAL RELEVANCE/APPLICATION

Routine screening tomosynthesis views allow adequate assessment of most mammographic findings such that US alone is required in the work up of the majority of cases recalled from screening which can save costs, radiation, exposure and time.