Is Attendance at a Breast Center Risk Assessment Clinic Improved with a High Risk Recommendation in the Standardized Mammography Report?

Authors

Presenting: Ankur Vaidya (University of Maryland, Baltimore County)

Ankur Vaidya (University of Maryland, Baltimore County), Alison Chetlen (Penn State Milton S. Hershey Medical Center), Susann Schetter (Penn State Milton S. Hershey Medical Center)

Purpose: In our institution, breast radiologists make recommendations through standardized mammography reports that women at high risk for breast cancer consider evaluation by a high-risk provider, such as a geneticist, oncologist, or breast surgeon. A standardized reporting recommendation was introduced into our mammography report in the year 2012 to recruit women of significant increased risk into our risk assessment clinic. Did the radiologists' recommendations that a high-risk woman consider evaluation in a risk assessment clinic result in subsequent clinical evaluation and supplemental screening?

Materials and Methods: All patients presenting for screening or diagnostic mammography who were identified by the Gail risk assessment model as having a lifetime risk for developing breast cancer of greater than or equal to 20% were assessed. Intra- and inter-observer variability of radiologist assignment of risk assessment clinic recommendations was evaluated. The 2011 mammography reports, prior to the initiation of standardized reporting, were compared with 2013 mammography reports, after the standardized recommendation for risk notification was instituted. The number of patients who were seen in subsequent consultation by a high-risk provider and who underwent supplemental breast cancer screening with a magnetic resonance imaging (MRI) exam were analyzed.

Results: 173 patients in the year 2011 and 241 patients in the year 2013 seen for screening or diagnostic mammography had a greater than or equal to 20% lifetime risk of developing breast cancer. 40.5% of patients were given a high risk recommendation in 2011 and 75.5% patients were given a high risk recommendation in 2013. However, only a modest increase in attendance at our risk assessment clinic from 11.4% to 14.3% was seen between 2011 and 2013.

Conclusions: Although there was a modest increase in referrals to our risk assessment clinic after the institution of a standardized reporting recommendation, over 85% of the high risk patients in the year 2013 were not seen in consultation by a high risk provider for their elevated lifetime risk of developing breast cancer. Additional research is necessary to address limitations of successful recruitment of this subset of high-risk women so that they can receive supplemental screening and preventative treatment.

Clinical Relevance: Over 85% of our high-risk population in the year 2013 were not seen in consultation by a high-risk health care provider. Additional research is necessary to address limitations of successful recruitment of women at high-risk for breast cancer so that they can receive supplemental screening and preventative treatment.

Scientific Session (Exhibit Hall Posters)

Adding Breast Ultrasound to Annual Mammography and Clinical Physical Examination for Early Detection of Locoregional Recurrence A Survival Impact Study

Authors

Presenting: Wanchen Tsai (Koo Foundation Sun Yat-Sen Cancer Center)

Wanchen Tsai (Koo Foundation Sun Yat-Sen Cancer Center), Hungkuang Wei (Koo Foundation Sun Yat-Sen Cancer Center)

Purpose: Purpose of this study was to identify the impact of adding ultrasound (US) to annual mammography and clinical breast exam (CBE) on early detection of clinical occult locoregional recurrence in breast cancer patients.

Materials and Methods: Of the 4796 stage 0-III breast cancer patients having breast conserving surgery or mastectomy in our institution (2000 -2009), 161 patients with locoregional recurrence (LRR) were enrolled in this study. The mean follow up interval was 77.2 months (11-167 months). The methods of LRR detection included in this study were US, mammography, PE (physical examination palpable). Sites of LRR and recurring time from the primary surgery date (disease free survival), time of distant metastasis, and overall survival were examined.

Results: The 5-year overall survival rate of LRR by detection types of US (n=69), PE (n=78), and mammography (n=8) were 71.5%, 50.6%, and 100%, respectively; and 58.5%, 38.1% and 100%, respectively, for the 8-year overall survival with significant difference (p=0.0004).

Conclusion: Ultrasound may be more effective for early detection of non-palpable locoregional recurrent breast cancer with better overall survival benefit when compared with the late symptomatic detection by clinical palpation.

Scientific Session (Exhibit Hall Posters)

A retrospective study for sensitivity analysis of contrast enhanced spectral mammography (CESM) compared to breast MRI (BMRI) in breast cancer detection.

Authors

Presenting: Elizabeth Tinney (Cooper Breast Imaging Center, MD Anderson Cancer Center at Cooper)

Luna Li (Cooper Breast Imaging Center, MD Anderson Cancer Center at Cooper), Pauline Germaine (Cooper Breast Imaging Center, MD Anderson Cancer Center at Cooper), Elizabeth Tinney (Cooper Breast Imaging Center, MD Anderson Cancer Center at Cooper), Lydia Liao (Cooper Breast Imaging Center, MD Anderson Cancer Center at Cooper)

Purpose: The purpose of the current study is to analyze the sensitivity and the positive predictive value (PPV, an indicator for specificity) of CESM in comparison to BMRI. The second objective is to define the role of CESM in workflow management of breast cancer detection.

Materials and Methods: This study involved 50 malignant breasts in 49 women retrospectively chosen from of 960 patients in our institution during the period of October 2012 to March 2014. Both CESM and BMRI were done for each patient within 30 days. The cancer diagnoses were confirmed by tissue diagnoses. The size of lesions was classified into three categories based on standard of breast cancer stages. The enhancement intensity of both lesions and background has been quantified based on a scale of 0-3. Statistical significance was analyzed using T test for mean size of index cancer and mean score of enhancement intensity of background and lesions on CESM and BMRI. Sensitivity and PPV were calculated for both CESM and BMRI.

Results: Both CESM and BMRI have sensitivity of 100% for breast cancer detection. No statistical significance was identified on the mean size of index cancer. The enhancement intensity of breast parenchyma is significantly lower on CESM than on BMRI ($p < 0.01$). The mean score of enhancement intensity of index lesions on CESM was significantly less than that for BMRI ($p < 0.01$). The smallest cancer can be detected by both CESM and BMRI is less than 0.5 cm. Morphology consistence was 50/50 (100%). CESM has a higher PPV than BMRI (98.0% versus 92.6%). The average test time for CESM is significantly shorter than BMRI (10 minutes versus 25 minutes).

Conclusions: Our study indicates that CESM and BMRI have comparable high sensitivity on breast cancer detection. CESM has a higher PPV than BMRI that may indicate a better specificity. Significantly less background enhancement intensity on CESM than on BMRI reflect an increased specificity. More studies need to be conducted for further evaluation.

Clinical Relevance: CESM has comparable high sensitivity as BMRI on breast cancer detection. Besides its cost effectiveness, easy accessibility and feasibility for easy application, CESM is ideal for many women as a triage test in the diagnostic work flow management before MRI is recommended.

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Scientific Session (Exhibit Hall Posters)

Artifacts in Contrast Enhanced Spectral Mammography (CESM)

Authors

Presenting: Pauline Germaine (Cooper Breast Imaging Center, MD Anderson Cancer Center at Cooper)

Pauline Germaine (Cooper Breast Imaging Center, MD Anderson Cancer Center at Cooper), Luna Li (Cooper Breast Imaging Center, MD Anderson Cancer Center at Cooper), Elizabeth Tinney (Cooper Breast Imaging Center, MD Anderson Cancer Center at Cooper), Lydia Liao (Cooper Breast Imaging Center, MD Anderson Cancer Center at Cooper)

Purpose: CESM is a new tool in breast imaging armamentarium. It incorporates digital mammography and intravenous contrast utilization. Modality specific artifacts may reduce image quality, limiting evaluation and precluding accurate interpretation. The purpose of this study was to analyze different types of artifacts on CESM images and their frequency and disturbance levels so that it will help radiologists to recognize and differentiate the artifacts from the real breast lesions.

Materials and Methods: Retrospectively, 1000 CESM studies for 1000 patients (age range 32 to 76 years old) in the period of January 2013 to June 2014 were analyzed for artifacts. A written informed consent was acquired explaining technique, alternatives and possible complications prior to CESM. GE Senographe Essential Full Field Digital System (SenoBright) was utilized for CESM studies. Both low and high energy images were obtained after intravenous 75-100cc Isovue 370 administration at flow rate of 1.5-2cc per second. Both low energy and subtracted images were reviewed on GE Centricity Imagecast on 5 megapigxel monitor. Frequency of each artifact is evaluated as well as its influence on study interpretation, based on severity of image disturbance/degradation.

Results: Analysis included 1000 CESM studies in the Women's imaging center. There were 15 different types of artifacts identified with the frequency and disturbance levels on CESM images. Three categories of artifacts have been identified according to their mechanisms: subject-related artifacts, hardware or software related ones, and unknown mechanism artifacts. The three most commonly encountered artifacts with disturbance from CESM are breast-within-breast (58.8% frequency and disturbance level of 2), halo (27% frequency and disturbance level of 3), and ripple (34.4% frequency and disturbance level of 3). Halo and ripple artifacts can mimic or obscure breast lesions and significantly affect sensitivity.

Conclusion: Digital mammography artifacts are common and need to be readily identified. 3D CESM may be helpful to minimize breast-within-breast and halo artifacts. Effective solutions should be investigated for minimizing these artifacts.

Clinical Relevance: Modality specific artifacts may reduce image quality, limiting evaluation and precluding accurate interpretation. It is critical for radiologist to be familiar with the types and presentations of artifacts.

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Scientific Session (Exhibit Hall Posters)

Improving access to quantitative breast density analysis using open source cloud computing

Authors

Presenting: Jason Balkman (Dartmouth-Hitchcock Medical Center)

Purpose: Breast density analysis software is currently dominated by two commercial products, VolparaTM and QuantraTM. These tools quantify density for research and clinical purposes, but are only used by a relatively small number of institutions. Universal access to such software would broaden participation in this area of breast research. Additionally, objective measures of breast density should be made freely available to institutions where states mandate density reporting. The purpose of this project is to develop and validate a public breast density quantification tool using open source cloud computing.

Methods: An institutional review board exemption was obtained. Python computer vision software was used to develop fully automated methods for volumetric fibroglandular tissue (FGT) quantification. Algorithms included difference of Gaussian calculations for CC and MLO view mammograms. Total variation denoising along with a binary clustering algorithm were utilized for 3-D quantification of density in axial T1 fat-saturated (FS) breast MRI sequences. Software validation was performed using 50 patients with recent breast MRI's and mammograms. Comparisons were made between the MRI and mammogram calculated values using Pearson correlation, and between computed and categorically reported densities using Spearman rank correlation. The software was successfully deployed to a cloud server and made publicly available via a zero footprint web application, QADense.com.

Results: Computer-generated quantification of breast density on mammography and MRI positively correlated with reader categorical assignments of these studies (Spearman's rho = +0.71 and +0.74, respectively; p-value < 0.001). Positive correlation was also demonstrated between computed results for same patient CC view mammograms and axial T1FS breast MRI's (Pearson's r-value = +0.81; p-value < 0.001). The publicly available web application processed individual mammograms in under one minute and MRI stacks at a rate of five seconds per slice, displaying results in both visual and table format, without the need for downloadable software.

Conclusion: Breast density may be estimated using free, shareable software. Preliminary validation of the described open source tool demonstrates positive correlation between same patient breast MRI's and mammograms, as well as between calculated percentages and reader categorizations. A cloud platform was used to make the tool freely available via a zero footprint web application.

Clinical Relevance: Universal access to breast density software would (1) provide a free and objective means for institutions to comply with state mandated density reporting, (2) enable broad participation in breast density related research, and (3) serve to further validate the motivation and methods behind breast density quantification.

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Scientific Session (Exhibit Hall Posters)

Fully automated open source measurement of background parenchymal enhancement

Authors

Purpose: Background parenchymal enhancement (BPE) is part of the standardized breast MR reporting template, is of current interest as a potential biomarker for breast cancer, and is categorized by subjective visual assessment. At present, there is no standard, automated method for quantifying BPE. The purpose of this work is to use open source software to create a fully automated system for BPE measurement that can be shared across institutions.

Methods: An institutional review board waiver was obtained. Python open source software was used to develop automated methods for three-dimensional fibroglandular tissue segmentation and subsequent quantification of BPE. Breast MRI's from 54 patients were collected. Breast segmentation was performed on axial T1 fat-saturated (FS) MRI slices using Canny edge detection. Field inhomogeneity was compensated for using Gaussian low pass filtering and total variation denoising. Fibroglandular segmentation was performed using a binarization algorithm that minimizes intraclass variance. Subtraction images were calculated from raw data using axial T1FS pre-contrast images and the first post-contrast image stack. Non-fibroglandular tissue signal on subtracted images was used to threshold for enhancing tissue. Computed measurements were correlated with radiologist assessment of BPE using Spearman's rank correlation coefficient. The developed algorithms were made freely available within an existing public web application, QADense.com. The application was configured to process a single, combined stack of pre and post-contrast axial T1FS images in either TIFF or DICOM format for BPE quantification.

Results: Radiologists assessed 54 breast MR exams as having minimal (18), mild (16), moderate (9), and marked (11) BPE. The automated software generated BPE percentages ranging from 4% to 91% with a mean and standard deviation of 28% and 20%, respectively. Correlation between radiologist categorical assignment of BPE and computed continuous values was +0.49 (p-value < 0.001). Pre and post-contrast breast MR image data processed by the web application returned BPE results to a web browser window in both table and visual format.

Conclusion: An automated method for measuring BPE positively correlated with radiologist categorical assessments, suggesting its potential to help standardize BPE quantification. The use of open source software enabled deployment of the described algorithms as part of a free web application that can be used remotely by research institutions.

Clinical Relevance: Automated quantification of BPE provides a standard and objective measure of this biomarker. The use of open source software to develop these algorithms enables sharing of a BPE tool across institutions through an existing, free web application.

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Scientific Session (Exhibit Hall Posters)

MRI Detected High Risk Breast Lesions in High Risk Patients: A Retrospective Study

Authors

Michelle Ricketts-Shastry (University of Western), Belinda Curpen (University of Toronto)

Introduction: In breast imaging, there is an established role for the surgical treatment of breast malignancy in improving outcomes. However, there is no general consensus on the appropriate management of high risk breast lesions which includes: atypical ductal hyperplasia (ADH), lobular neoplasias (atypical lobular hyperplasia [ALH] and lobular carcinoma in situ [LCIS]), benign papillary lesions, radial scars and flat epithelial atypia. There is a tendency to err on the side of caution in patients at increased risk of cancer by opting for the surgical management of high risk lesions. However, there is no current literature supporting or opposing invasive therapeutic approaches in this population. The goal of this study is to determine the frequency of high risk breast lesions in patient's who have an increased risk of breast cancer by evaluating the high risk OBSP population screened annually with MRI and mammography and to determine the concordance/discordance rates after surgery. In addition, our goal is to evaluate whether there are particular MRI features that could be used to identify high risk lesions.

Materials and Methods: A retrospective review of the radiology department database and electronic patient records was performed to determine high-risk OBSP screening patients between 2011 and 2014 who had a MRI detected high risk breast lesion. The upgrade rates to malignancy were determined for patients who were managed surgically and for those who were managed conservatively with follow up MRI imaging from 1-3 years after initial biopsy.

Results: 3% (30 out of 960) of the OBSP high risk patients were diagnosed with an MRI detected high risk breast lesion. 77% of the lesions were managed surgically. The remainder underwent surveillance by MRI imaging. 93% (28 out of 30 patients) were not associated with an upgrade to malignancy after surgery or imaging follow up. The 2 patients upgraded at final surgical pathology were diagnosed with coexistent low grade DCIS. No characteristic MRI features were identified that could be used to identify such lesions.

Conclusion: This study provides support that biopsy proven high risk breast lesions detected on MRI in high risk patients are unlikely to be upgraded to malignancy after surgery. We advocate for MRI follow up rather than surgery in the management of these lesions to minimize the risks and morbidity associated with unnecessary breast surgeries.

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Scientific Session (Exhibit Hall Posters)

A novel simulation exercise combining communication skills and ultrasound-guided breast biopsy training: Assessment of feasibility and utility in resident education

Authors

Presenting: Vika Bandari (Albany Medical Center) Corresponding: James Toby (Albany Medical Center)

Vika Bandari (Albany Medical Center), James Toby (Albany Medical Center), Catherine Wells (Albany Medical Center) patients, and practiced ultrasound guided biopsies with breast phantoms.

Purpose: Simulation-based training methods are increasingly valuable in medical education. In breast imaging, communication with patients is as important as strong procedural skills. Providing radiology residents with training in both areas is difficult given the unique combination of patient anxiety and expectations in breast imaging. We hypothesized that providing simulated communication training in tandem with simulated procedure training would be beneficial to residents. This pilot study was conducted to determine the feasibility and utility of providing combined simulation training.

Materials and Methods: Nine senior radiology residents participated in a combination simulation workshop including obtaining informed consent for a breast biopsy from a standardized patient and ultrasound guided breast-phantom biopsy. Prior to the workshop, didactic instruction was provided on both topics.

The simulation exercise occurred in the formal simulation training facility for the medical school and residency programs at our institution. Each resident met with a standardized patient to review breast imaging findings and obtain informed consent for an ultrasound guided biopsy. Residents received immediate feedback from the actors. Encounters were recorded for later review by breast imaging attendings.

In small groups, residents also observed ultrasound-guided biopsy of a breast phantom (jello and metamucil containing pimento stuffed olives). After instruction, each resident undertook individual practice, with guided feedback from a breast imaging radiologist.

After the exercise, residents evaluated the utility of the workshop with six questions each using a numerical score from 1-5 (5 being most useful), and an open-ended written evaluation.

Results: Evaluation scores averaged 4.8 overall, indicating that residents felt the combined workshop was useful to their training. Feedback from the patient encounters was noted to be particularly helpful in improving communication skills. Residents reported increased confidence in their ability to perform procedures and discuss imaging findings with patients.

Conclusions: A novel simulation exercise combining communication skills and ultrasound-guided biopsy training was helpful to residents learning breast imaging, while limiting exposure of patients to inexperienced residents. This method may provide more comprehensive training in breast imaging, where communication is a critical and routine part of daily practice but is less commonly learned in radiology residency.

Clinical Relevance: Training residents in Breast Imaging is challenging due to patient anxiety and gravity of the diagnosis. A unique simulation provided comprehensive training in both communication and procedure skills, where residents reviewed imaging findings and obtained informed consent from standardized

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Scientific Session (Exhibit Hall Posters)

Imaging Practices and Patient Dose in Screening Mammography at an Academic Medical Center

Authors

Presenting: Lashonda Soma (Medical University of South Carolina)

Lashonda Soma (Medical University of South Carolina), Walter Huda (Huda's Physics In Medicine), Laura Isley (Medical University of South Carolina), Jacqueline Bernard (Medical University of South Carolina), Amy Campbell (Georgetown University), Eugene Mah (Medical University of South Carolina)

Purpose: Assessment of imaging parameters and patient dose in screening mammography at an academic medical center.

Materials and Methods: Patient demographics and x-ray techniques were collected for 126 patients undergoing screening mammography at our institution over one week. Information included patient age, compression thickness, compression force, and radiographic technique. The mean glandular dose (MGD), as generated by the vendor, was collected for each exposure, as well as the number of images performed on each patient, from which the mean patient dose for a screening examination was calculated. Mammography phantom doses on our digital mammography units were also collected. For each parameter investigated we determined the median value (M) with the 10th and 90th percentiles which are reported as M [10th; 90th].

Results: The median patient age was 56 years (42 years; 71 years) and the median compressed breast thickness was 63 mm (47 mm; 83mm). The median compression force of 80 N (49 N; 129N) showed no correlation with compression thickness ($r^2 < 0.01$), x-ray tube voltage ($r^2 < 0.01$) or exposure time ($r^2 < 0.01$). The median phantom dose was 1.7 mGy [1.2 mGy; 2.2 mGy]. The median glandular dose per image obtained with Mo and Rh filters were 1.35 mGy [0.72 mGy; 2.04 mGy] and 1.18 mGy [0.61 mGy; 1.94 mGy], respectively. The median number of images obtained per patient was 6.0 [4.0; 8.0] and the median patient glandular dose was 3.8 mGy [1.7 mGy; 7.0 mGy].

Conclusion: There is a five fold variation in compression force used in screening mammography at our facility, which appears to be independent of breast thickness or composition. The median glandular dose per image was lower than the phantom doses (1.3 mGy vs 1.7 mGy). Median patient doses, however, were higher than those predicted from phantom dose measurements (3.8 mGy vs 3.4 mGy). This was attributed to an average of 6 images per patient, and not the standard 4, in our screening examinations.

Clinical Relevance Statement: Little correlation of compression force as a function of compressed breast thickness suggests that force could be reduced without compromising image quality. The benefit of decreased MGD is offset by increased mean patient dose attributable to the increased number of images, likely secondary to large breast size of our patients.

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Scientific Session (Exhibit Hall Posters)

Results of High Risk Hereditary Breast Cancer Screening Implementation in a Community Based Breast Center

Authors

Presenting: Anne Kushwaha (Medical University of South Carolina)

Lashonda Soma (Medical University of South Carolina), Walter Huda (Huda's Physics In Medicine), Laura Isley (Medical University of South Carolina), Jacqueline Bernard (Medical University of South Carolina), Amy Campbell (Georgetown University), Eugene Mah (Medical University of South Carolina)

Purpose: To develop a program that identifies patients that may be high risk for Hereditary Breast and Ovarian Cancer (HBOC) syndromes during their annual screening mammogram and refer them to genetic counseling.

Materials and Methods: Review of our hospital system's breast history questionnaire initially revealed that we were not asking the appropriate questions to identify patients needing possible genetic counseling as recommended by National Comprehensive Cancer Center Network (NCCN) for Hereditary Breast and/or Ovarian Syndromes (HBOC). NCCN guidelines were streamlined to reveal 8 "red flag" questions needed to identify possible high-risk patients. Our breast center flow was then process-mapped and a program was developed to identify patients during their annual screen. An additional history questionnaire was added to our intake forms. Trained breast radiologists analyzed the history forms and flagged the patients. Our nurse navigator attempted to contact each patient by phone, reviewed her information for accuracy, and scheduled genetic counseling appointments if indicated. The genetic counselor completed extensive family histories, ran BRCApro, Tyrer-Cusick and Gail models and recommended genetic testing when appropriate.

Results: From August 2012-May 2014, 33,169 screening mammograms were performed at our breast center. 935 women (2.8%) were identified as possible high risk by interpreting radiologists. 261 women scheduled and 150 women received genetic counseling. Of the 113 tested for BRCA genes, 6 were positive and 3 variants were found. 62 women were determined high risk by established risk models. 42 women qualified for chemoprevention per Gail risk assessment model. 36 women qualified for annual screening breast MRI by Tyrer-Cuzick risk assessment model.

Conclusion: Breast radiologists can provide identification of high-risk patients and make genetic counseling referrals to patients during their annual screening mammograms. 2.8% of patients entering our community breast center were identified as needing further risk assessment for HBOC syndromes. Of the patients who received genetic counseling, 41% either tested positive for a HBOC gene, qualified for chemoprevention or qualified for annual screening breast MRI.

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Scientific Session (Exhibit Hall Posters)

Cultural Perceptions of Breast Pain

Authors

Presenting: Kim Clarkin (Rutgers)

Kim Clarkin (Rutgers), Marianne Kim (Rutgers), Basil Hubbi (R), Magdalena Salvador (Rutgers)

Purpose: Breast pain is a common symptom for women presenting for mammography. Many women presenting with breast pain are fearful that breast pain may be a sign of cancer. We sought to find out how many women had the misperception that breast pain in general was more worrisome for breast cancer than a painless mass. We also sought to discover if culture played a role in this misperception.

Materials & Methods: An IRB approved study was conducted over a 2 month period at a Women's imaging center within an urban academic institution. A 9-question survey was voluntarily taken by women presenting to the breast center. Data was collected and analyzed using SPSS software.

Results: A total of 468 women were surveyed over a 2-month period. The demographics of those surveyed was 11% White, 45% African American, 36% Hispanic, 5% Asian, and 3% other. The average age of the women surveyed was 53.7 yrs (SD 10, min 16, max 81). When asked which is more worrisome, a painless mass or breast pain in general, 43% responded that breast pain in general was a more worrisome symptom. Whites were less likely to have this misperception (28.5%) compared to African Americans (48.9%) (p-value<0.01), Hispanics (40.1%) and Asians (36.3%). Hispanics reported having had breast pain more often in the past (49%), compared with African Americans (26.8%) (p-value <0.01) and Whites (34%).

Conclusion: Overall, 43% of women presenting to a women's imaging center suffered from the misperception that breast pain in general was more worrisome for cancer than a painless mass. Whites were less likely to have this misperception. Hispanics were more likely to report a history of breast pain, while African Americans were the least likely to report breast pain.

Clinical Relevance: Many women present with breast pain fearful that this may represent cancer, which is a common misperception. Education regarding breast cancer and its relationship to pain may help to reduce patient anxiety and imaging utilization, and may potentially decrease healthcare costs.

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Scientific Session (Exhibit Hall Posters)

Dense breast notification and supplemental screening: a survey of current strategies and sentiments.

Authors

Presenting: Santo Maimone (Mayo Clinic Florida)

Santo Maimone (Mayo Clinic Florida), Michelle McDonough (Mayo Clinic Florida)

Purpose: Dense breast parenchyma obscures breast lesions and has been shown to be an independent risk factor for development of breast cancer. Nineteen states have approved laws requiring patient notification of dense breast tissue. Reviews of supplemental screening imaging modalities are available, but there is no consensus and little discussion regarding what practices are actually doing to manage patients with dense breasts. Our goal was to survey breast imagers facing these issues in an effort to simplify dense breast management.

Materials and Methods: A logic-based, multi-tiered survey was administered via email to the Society of Breast Imaging member directory, designed to collect information regarding current practices in dense breast notification and supplemental screening. Survey responses were gathered over a 30-day period.

Results: 223 surveys were completed to entirety. 38% of respondents did not practice in states requiring dense breast notification; of these, 44% had not yet discussed plans to adapt and 60% felt as though they lacked adequate resources to potentially offer supplemental screening. Of the 62% of respondents practicing in states that passed legislation, 51% felt that they lacked adequate resources while only 12% claimed to be “very satisfied” with their current system. 59% of respondents offered supplemental screening based on unique patient/risk factors while 41% offered it to every dense breast patient. 34% of respondents offered the same initial supplemental modality, while 66% tailored their initial choice based on unique factors. Types of modalities offered also differed considerably (Image). The person responsible for discussing breast density/screening with patients was variable, including the primary care provider (or ordering physician) in 60%, a radiology representative in 20%, and no dedicated liaison in 20%. Of those offered supplemental screening, the return rate for follow-up imaging was estimated at <25% by 67% of respondents. When asked about their confidence in referring providers’ understanding of their role in the supplemental screening process, 2% of respondents were “very confident” (63% not confident, 35% moderately confident).

Conclusion: Strategizing optimal imaging approaches and algorithms to handle dense breast management issues is important to maintain efficiency in breast imaging departments. Sharing current ideas and practices may facilitate a smoother workflow in dense breast reporting and supplemental imaging follow-up, allowing breast imagers to correct or prevent systems-based flaws.

Clinical Relevance: This study aims to share existing practice experiences with dense breast notification and supplemental screening, to improve upon current strategies and simplify a framework for states with newly approved legislation.

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Diagnostic Performance of Diffusion-Weighted Imaging of Breast Lesions : Comparison with Dynamic Enhanced MR Imaging

Authors

Presenting: Keumwon Kim (Konyang University Hospital)

Keumwon Kim (Konyang University Hospital), Jae Young Seo (Konyang University Hospital), Young Joong Kim (Konyang University Hospital), (), Hyung Sik Yoo (Konyang University Hospital), Cherie Kuzmiak (University of North Carolina)

Purpose: To compare the accuracy of diffusion-weighted imaging (DWI) with consideration of apparent diffusion coefficient (ADC) with that of dynamic contrast enhanced (DCE) MRI for the characterization of breast lesions.

Materials and Methods: A total of sixty breast lesions in 29 patients (all women; age range, 31-70 years; mean age, 48.6 years), who underwent subsequent core needle biopsy or surgical excision were prospectively evaluated. T2-weighted turbo spin-echo(TSE) image with fat suppression, DCE-MRI after contrast injection and DWI using b values of 1000 s/mm2were acquired. The ADCs of all lesions were measured. The images were divided into two sets: the DCE-MRI set (pre- and post-contrast dynamic enhanced T1-weighted images) and the DWI set (T2-weighted TSE with fat suppression and DWI). The lesions were sorted according to the confidence levels for characterization into five grades. Accuracy of characterization as calculated for the DCE-MRI set and the DWI set for the same set of lesions were performed. The ROC curve (Az) was calculated for each imaging sets.

Results: Of the 60 breast lesions, 27 were benign and 33 were malignant (8 DCIS and 25 IDC). Sensitivity of DCE-MRI was higher than that of DWI set for all breast lesions (93.9% vs. 72.7%) ($p<0.05$). Specificity and PPV of DWI set were higher than those of DCE-MRI set for all breast lesions (specificity of 81.5% vs 51.8%) (PPV of 82.85 vs. 70.5%) ($p<0.05$). The characterization accuracy with the DWI set (Az=0.903) was higher than that the DCE-MRI set (Az=0.764) for all breast lesions ($p< 0.05$). The mean ADCs of the invasive ductal carcinoma (0.86± 0.19 x 10-3 mm2/s) and DCIS/LCIS (1.04 ± 0.27 x 10-3 mm2/s) were significantly lower than those of the benign lesions (1.35± 0.23x10-3 mm2/s). The ADC cutoff value of 1.1875x 10-3 mm2/s allowed discrimination between malignant and benign lesions (sensitivity: 85.2%, specificity: 87.9%).

Conclusion: DWI with ADC provided a higher accuracy for differentiation between benign and malignant breast lesions than DCE-MRI.

Scientific Session (Exhibit Hall Posters)

Patient controlled compression – Impact and feasibility on the screening mammography experience with breast tomosynthesis

Authors

Presenting: Yiming Gao (Nassau Radiology Medical Associates)

Yiming Gao (Nassau Radiology Medical Associates), Mansi Saksena (Massachusetts General Hospital), Elizabeth Rafferty (Massachusetts General Hospital)

Purpose: To assess if patient controlled compression in screening mammography using breast tomosynthesis improves patient experience while preserving image quality and maintaining clinical workflow.

Method and Materials: Between Feb-May 2014, this IRB approved HIPPA compliant study recruited 285 women (age 36-88) undergoing screening mammography using breast tomosynthesis. Pre and post mammogram questionnaires were completed. During the mammogram, each patient was allowed to control compression of one breast (following technologist controlled compression of the contralateral breast; n=268) in CC and MLO projections. Unilateral mastectomy patients controlled compression of one of two standard views of the one breast (n=17). If patient compression was inadequate, the amount of pressure was recorded and the technologist optimized compression for exposure. Compression adequacy, force, and patient comfort level were recorded. Exam durations and technical recall rates were compared to matched control groups.

Results: 92% women with prior mammograms reported previously experiencing discomfort. Significantly more women (42%) found patient controlled compression (PCC) to be more comfortable than technologist controlled compression (18%) ($p<0.0001$). The remainder found no difference (40%). Many more (74%) considered having control of the exam to be a positive experience than merely finding PCC to be more comfortable (42%), favoring having a choice. The majority of patients (77%) compressed adequately at least on one view. There was no significant increase in number of studies recalled for technical inadequacy, and no significant increase in the average exam acquisition time from baseline.

Conclusion: Patient controlled compression reduces discomfort and improves experience without compromising imaging quality or workflow during screening mammography using tomosynthesis.

Effect of Apparent Diffusion Coefficient in Contralateral Normal Breast by Neoadjuvant Chemotherapy

Authors

Presenting: Yuan Jiang (Peking University First Hospital)

Yuan Jiang (Peking University First Hospital), Naishan Qin (Peking University First Hospital), Yan Fang (Beijing Union Medical College Hospital)

Purpose: To investigate the change of apparent diffusion coefficient(ADC) value at magnetic resonance diffusion weight imaging(DWI) in the contralateral normal breast of patients after neoadjuvant chemotherapy (NAC).

Materials and Methods: Sixteen patients with pathologically confirmed locally advanced breast cancer treated with NAC protocol (paclitaxel and adriamycin, TA) were enrolled in this study. They all finished four courses of NAC and underwent preoperative breast MRI for three times (before chemotherapy, after two and four cycles of NAC respectively). Each time the ADC value of the cancer and contralateral normal breast tissue were measured, and paired t-test and linear regression analysis were used for statistical analysis.

Results: The average ADC values of the normal breasts were (1.56±0.35)×10-3 mm2/s before chemotherapy, (1.64±0.35)×10-3 mm2/s after two cycles of NAC and (1.75±0.33)×10-3 mm2/s after four cycles of NAC. The ADC values after four cycles of NAC were significantly higher than before NAC and after two cycles ($P<0.05$), while the ADC values after two cycles did not significantly increase. Furthermore, linear regression analysis showed the slope rate was positive (0.0978).

Conclusion: After four cycles of neoadjuvant chemotherapy, the ADC value of the normal breast contralateral to the cancer side will increase, and the effects might be more significant if more cycles were taken.

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Scientific Session (Exhibit Hall Posters)

Is Quality Our Image Everyday? A retrospective review of screening mammography standards at a dedicated breast imaging practice.

Authors

Presenting: Kalie Adler (University of Missouri-Kansas City School of Medicine)

Benjamin Haverkamp (University of Missouri-Kansas City School of Medicine), Kalie Adler (University of Missouri-Kansas City School of Medicine), Shane Rassman (University of Missouri-Kansas City School of Medicine), George Cyriac (University of Missouri-Kansas City School of Medicine), Muhammad Riaz (University of Missouri-Kansas City School of Medicine)

Purpose: Breast cancer is the most common noncutaneous cancer in US women with 40,430 deaths expected in 2014, according to the National Cancer Institute. Mammography has been a key screening tool for the early identification of breast cancer. The purpose of this study is to evaluate breast positioning at a single image center to assess quality standards. Cancer detection (sensitivity) is highest in patients with proper breast positioning (84%), with sensitivity falling to 66.3% when images fail the set positioning measures.

Materials and Methods: For this study, a random sampling of 100 patients was chosen. The right breast was arbitrarily selected from each patient. Mediolateral oblique view and craniocaudal imaging for each patient were assessed using requirements set by the Mammography Quality Standards Act (MSQA) for image quality control. A score from zero to nine was established based on the fulfillment of each criterion from the image set. Based upon this result, a grade of Unacceptable (0-2), Poor (3-5), Marginally Acceptable (6-8), and Acceptable (9) was given for each set.

Results: See attached table.

Conclusion: Breast cancer is the most common noncutaneous cancer in US women. Screening mammography has become the key to early detection. Breast positioning is an important factor in determining the quality of the mammogram that will be produced. In this study, only 4% of the image sets that were examined achieved the maximum score, fulfilling the requirements set by the MSQA in mammography for breast positioning. The majority of images received a score of marginally acceptable, demonstrating that there is significant room for image quality improvement.

Clinical Relevance: To ensure the highest success in breast cancer identification, a reproducible, high standard of quality must be required for each mammogram performed.

Scientific Session (Exhibit Hall Posters)

Comparison between Contrast-enhanced spectral mammography and MRI in the assessment of breast cancer size

Authors

Presenting: Yuan Jiang (Peking University First Hospital)

Yuan Jiang (Peking University First Hospital), Naishan Qin (Peking University First Hospital), Yufeng Xu (Peking University First Hospital)

Purpose: To compare the accuracy of contrast-enhanced spectral mammography (CESM) and magnetic resonance imaging (MRI) in the size estimation of breast cancers by using postoperative histology as the gold standard.

Materials and Methods: After ethical approval, 10 women with newly diagnosed breast cancer underwent preoperative CESM and MRI examinations. CESM was reviewed by an independent experienced radiologist, and the maximum dimension of suspicious lesions was measured and recorded. For MRI, the maximum dimension of suspicious lesions was measured at dynamic contrast enhanced MRI. Results of each imaging technique and histological size estimation were compared by Kruskal-Wallis H test. The mean difference of tumor sizes between CESM and histology and between MRI and histology were compared by Mann-Whitney U test.

Results: Ten women aged between 35-58 years (mean age, 46 ± 11 years) with histological proven invasive ductal/lobular carcinomas were included in the study. Breast cancer was visible in 10/10 CESM and 10/10 MRI examinations. Average lesion largest dimension was 22.65 mm (SD 3.81) in CESM, and 21.72 mm (SD 3.56) in MRI versus 20.80 mm (SD 2.64) in postoperative histology. No significant difference was found between lesion size measurement on MRI and CESM compared with histopathology (P=0.650). Mean difference of tumor sizes was 1.71 mm (7.55%) between CESM and histology and 0.92 mm (4.24%) between MRI and histology. No significant difference was found between the mean difference of tumor sizes between CESM and histology and between MRI and histology (P=0.694).

Conclusion: Our initial results show a good accuracy of CESM and MRI with postoperative histology in size assessment. And there is no significant difference found between CESM and MRI in breast cancer size measurement.

Scientific Session (Exhibit Hall Posters)

High fidelity ultrasound-guided breast biopsy simulation: The future of breast biopsy training

Authors

Presenting: Ryan Woods (University of Wisconsin School of Medicine and Public Health)

Ryan Woods (University of Wisconsin School of Medicine and Public Health), Philip Di Carlo (Johns Hopkins University), Susan Harvey (Johns Hopkins University)

Purpose: Historically, radiology trainees have used practice on live patients, as well as on task trainers to learn the techniques of ultrasound-guided breast biopsy. Methods of learning other than practice on patients bear little resemblance to the performance of procedures in a clinical setting. The purpose of this study was to design a high fidelity partial task trainer and to evaluate residents' performance in a simulated clinic environment.

Materials and Methods: The authors asked trainees to complete three separate components during this HIPAA-compliant study: a pre-training simulation, a training exercise, and a post-training simulation.

To simulate the performance of an ultrasound-guided breast biopsy, we developed a high fidelity partial task trainer by modifying a CPR mannequin to facilitate placement of a breast biopsy model (containing multiple sonographically visible lesions) in an anatomically accurate location. The mannequin was appropriately clothed and situated in a simulated clinic environment as if prepared for a breast biopsy.

During the pre- and post-training simulations, we evaluated each trainee using a 21-point procedure checklist and a brief questionnaire that included a confidence level 100-mm visual analogue scale (VAS). The training exercise included a comprehensive 45-minute didactic session followed by a hands-on practical session. The trainees were again evaluated using the same checklist and VAS after participating in the training exercise. We calculated descriptive and pre- and post-training statistics on the sample.

Results: Twenty-one residents from all levels completed the pre- and post- training simulation. Mean time to completion of the simulation decreased from 15:48 (mm:ss) to 12:36 after training ($p<0.0001$), while the mean confidence level on the VAS increased from 42.4 to 68.7 after training ($p<0.0001$). The average total procedural checklist score increased from 10.7 to 14.8 items correct after training ($p<0.0001$).

Conclusion: Using high fidelity ultrasound guided breast biopsy simulation, statistically significant improvement was shown in residents' procedure efficiency, confidence level, and competency. The results of this study demonstrate that high fidelity simulation can effectively be used as part of radiology resident procedure education.

Clinical Relevance: High fidelity simulation has the potential to improve resident confidence and knowledge without compromising patient safety or clinical care.

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On-Site Availability of Advanced Breast Imaging Modalities at Screening Facilities Serving Vulnerable Populations

Authors

Presenting: Jessica Germino (University of Washington)

Jessica Germino (University of Washington), Andrew Bogart (Group Health Research Institute), Tracy Onega (Dartmouth College), L. Elizabeth Goldman (University of California San Francisco), Rebecca Hubbard (Group Health Research Institute), Jennifer Haas (Brigham And Women's Hospital/Harvard Medical School), Deirdre Hill (University of New Mexico), Anna Tosteson (Dartmouth College), Jennifer Alford-Teaster (Dartmouth College), Wendy DeMartini (University of Wisconsin), Constance D. Lehman (University of Washington), Christoph Lee (University of Washington)

Purpose: To compare on-site availability of advanced breast imaging services (ultrasound (US), magnetic resonance imaging (MRI), and image-guided biopsy) between facilities serving vulnerable patient populations and those serving non-vulnerable populations.

Materials and Methods: We analyzed data from a national sample of 73 screening mammography facilities across five Breast Cancer Surveillance Consortium regional registries. We collected facility-reported data from calendar year 2012 regarding profit status, academic status, practice type and location, and on-site availability of advanced breast imaging services. We assigned vulnerability indices to each facility according to the populations served and the proportion of mammograms performed on women with lower educational attainment, lower median income, racial/ethnic minority status, and rural residence. A threshold value for each vulnerability index was determined by taking one standard deviation from the mean of each continuous vulnerability measure. Facilities were defined as serving vulnerable populations if threshold values for one or more indices were met. We modeled the relative risk of offering various advanced imaging services for facilities serving vulnerable populations compared to those serving non-vulnerable populations using multivariate logistic regression.

Results: The majority of facilities were not-for-profit (77%, 43/73), hospital-based (64%, 47/73), full diagnostic radiology practices (55%, 40/73), and not academically affiliated (92%, 67/73). Breast US was offered at 75% (55/73) and breast MRI at 42% (30/71) of all facilities. Stereotactic biopsy was offered at 39% (28/73), US-guided biopsy at 57% (41/72), and MRI-guided biopsy at 29% (21/72) of facilities. Overall, 45% (33/73) of facilities served a vulnerable population based on at least one of the derived indices. Facilities with vulnerable populations were as or more likely to offer advanced imaging services on-site as those serving non-vulnerable populations (RR for US = 1.38 [95% CI 1.09, 1.74]; RR for US-guided biopsy = 1.67 [1.30, 2.14]; RR for MRI = 0.71 [95% CI 0.42, 1.19]; RR for MRI-guided biopsy = 1.07 [0.61, 1.90]; RR for stereotactic biopsy = 1.18 [0.75, 1.85]).

Conclusion: In a national sample of facilities performing screening mammography, there were no disparities regarding on-site availability of advanced breast imaging services at facilities serving more vulnerable populations.

Clinical Relevance: Unequal access to advanced breast imaging may lead to delays in cancer diagnosis and increased morbidity. Our analysis suggests that advanced imaging services are available to women of lower income or education or those in rural residences, but does not address whether referral patterns or insurance coverage might limit use.

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Scientific Session (Exhibit Hall Posters)

Retrospective Comparison of Results from Abbreviated Protocol Using Maximum Intensity Projection and First Postcontrast Substracted Images vs Full Diagnostic MRI Breast Scan on 3T Magnet

Authors

Presenting: Melinda Coker (University of Toledo Medical Center)

Melinda Coker (University of Toledo Medical Center), Haitham Elsamaloty (University of Toledo Medical Center), Jacob Bieszczad (University of Toledo Medical Center), Tatyana Bombard (University of Toledo Medical Center), Eugenia Payne (University of Toledo Medical Center), Lena Gowharji (Ochsner Clinic Foundation), Turki Dhayihi (University of Toledo Medical Center), Terrence Lewis (University of Toledo Medical Center)

Purpose: This study evaluated whether an abbreviated protocol (AP) breast MRI FAST scan using only precontrast and first pass post contrast subtracted sequences and maximum intensity projection (MIP) sequences could be used to accurately detect breast cancer as well as a full diagnostic protocol (FDP) breast MRI.

Materials and Methods: In this pilot study of 36 patients, we conducted a retrospective evaluation of diagnostic breast MRIs with both benign and malignant biopsy proven pathology. Blinded expert radiologists with combined 20 years of experience interpretated a FAST scan, which included the reconstructed pre-contrast and first pass post contrast subtracted sequences, and the MIP sequences were evaluated separately. A BIRADS classification was assigned, and background parenchymal enhancement and any suspicious lesion morphology was evaluated. Results were compared to the pathology results and the full diagnostic MRI results.

Results: MRI acquisition time was decreased from approximately 30 minutes for FDP to 3 minutes for AP. Radiologist interpretation time was decreased to 20 seconds and 5 seconds for subtracted sequences and MIP, respectively. The AP with First Pass Subtraction and MIP readings yielded a positive predictive value (PPV) of 82% and negative predictive value (NPV) of 88%. Sensitivity and specificity of AP was 92% and 75%. Breast background parenchymal enhancement was influential in patients with marked enhancement as it decreased sensitivity for evaluation of suspicious lesions. Reader discrepancy was also noted in patients who were status post biopsy or with fat necrosis.

Conclusion: With diagnostic accuracy for detecting breast cancers similar to FDP, an AP offers decreased acquisition time and radiologist interpretation time. This new protocol may be suitable for screening purposes as well. In breasts with marked background parenchymal enhancement, status post biopsy, and those with fat necrosis, inter-reader variability in interpretation can be expected.

Clinical Relevance Statement: With diagnostic accuracy for detecting breast cancers similar to Full Diagnostic Protocol, an Abbreviated Protocol with Maximum Intensity Projection and First Postcontrast Subtracted Images offers decreased acquisition time and radiologist interpretation time, which will hopefully decrease study costs to patients and allow more patients to utilize MRI as a breast cancer screening option. Inter-reader variability is found in breasts with fat necrosis, post biopsy changes, and marked background parenchymal enhancement.

Scientific Session (Exhibit Hall Posters)

MRI-Guided Core Needle Breast Biopsies Resulting in High Risk Histopathology: Upstage Frequency and Lesion Characteristics

Authors

Presenting: Robert Weinfurtner (Moffitt Cancer Center)

Robert Weinfurtner (Moffitt Cancer Center), Bhavika Patel (Moffitt Cancer Center), Shannon Falcon (Moffitt Cancer Center), Blaise Mooney (Moffitt Cancer Center), Christine Laronga (Moffitt Cancer Center), Marie Catherine Lee (Moffitt Cancer Center), Binglin Yue (Moffitt Cancer Center), Jennifer Drukteinis (Moffitt Cancer Center)

Objectives: The purpose of this study is to determine the malignancy upstage rates and imaging features of high-risk histopathology resulting from MRI-guided core needle biopsies including atypical ductal hyperplasia (ADH), atypical lobular hyperplasia (ALH), flat epithelial atypia (FEA), and lobular carcinoma in situ (LCIS).

Materials and Methods: An IRB and HIPAA compliant retrospective chart review was performed on all MRI-guided core needle breast biopsies at a single institution between 1/1/2007 and 12/1/2013. Biopsies yielding high-risk histopathology were included in the study. Patient demographics, lesion characteristics at MRI, histopathology, and upstage rates to malignancy at surgical excision were recorded and analyzed using Fisher's exact test.

Results: A total of 257 MRI-guided biopsies were performed on 247 patients. Fifty of 257 biopsies (19%) yielded high-risk histopathology. Correlation between the biopsied high-risk lesion site and pathology at surgical excision could be confirmed for 29/50 lesions (58%). Four of 29 lesions (14%) were upstaged: 1 case of invasive ductal carcinoma (IDC) and 3 cases of ductal carcinoma in situ (DCIS). All four upstaged lesions were related to ADH, and 3/4 were mixed ADH/ALH. Of the high-risk lesions, ADH alone had an overall upstage rate of 7% (1/14), mixed ADH/ALH 75% (3/4), ALH alone or with LCIS 0% (0/7), and FEA 0% (0/4). Of these, only mixed ADH/ALH had a statistically significant upstage rate to malignancy when compared to the other high risk histopathology subtypes combined. No specific imaging characteristics on MRI were associated with upstage to malignancy on statistical analysis.

Conclusion: MRI-guided breast biopsies yielding high-risk histopathology are associated with an overall upstage to malignancy rate of 14% at surgical excision. All upstaged lesions were associated with ADH. FEA and ALH alone or with LCIS were not associated with upstage to malignancy.

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Scientific Session (Exhibit Hall Posters)

Geographic Differences in Breast Magnetic Resonance Imaging Utilization: Analysis of Recently Released CMS Provider Billing Data

Authors

Presenting: Jessica Galandak (University of Maryland Medical Center)

Jessica Galandak (University of Maryland Medical Center), Jigar Patel (Veterans Affairs Maryland Healthcare System), Andrew Steven (University of Maryland Medical Center), Jiachen Zhuo (University of Maryland Medical Center)

Purpose: Magnetic resonance imaging is widely used in the diagnosis and management of breast disease. However, there are considerable variations in patterns of breast MRI use between practitioners. The Centers for Medicare & Medicaid Services (CMS) provider billing data from 2012, recently publicly released by the federal government, details a large portion of medical expenditures in the United States. The purpose of this project was to examine variations in breast MRI utilization for Medicare patients between different states through analysis of CMS data.

Materials and Methods: The CMS CY2012 National Claims History Standard Analytic Files were used as a primary data source. These files contain approximately 100 percent of Medicare final action claims for beneficiaries who are enrolled in the fee for service program. This was downloaded from the CMS website and analyzed in Microsoft Excel 2010. The data was filtered by Current Procedural Terminology codes to quantify the number of breast MRI examinations and screening mammograms billed to CMS. The data was further filtered by individual state to determine the rate of breast MRI examinations per 1000 women undergoing screening mammography in each state, and variance was calculated.

Results: CMS was billed for a total of 50,246 breast MRI exams in 2012. There was a substantial variation in breast MRI utilization between the states, with rates of breast MRI exams ranging from 1.2 to 24.9 per 1,000 screening mammograms (CV= 0.912.) The five states with the highest rates of MRI utilization were Oklahoma, District of Columbia, New Mexico, New York and Arizona. The lowest rates were identified in Montana, Wisconsin, Mississippi, Iowa and North Dakota.

Conclusion: Although Medicare data is not unconditionally generalizable, it does point to considerable variation in breast MRI utilization with greater than 20-fold differences between some states. With the exception of Wisconsin, states with the lowest rates of breast MRI exams tended to be among the least densely populated. However, there is no clear correlation between high rates of breast MRI utilization and population density, per capita income or region. The reasons for these differences in practice and potential effects on patient outcome warrant further investigation.

Clinical Relevance: Breast imaging is continually evolving. Increasing use of breast MRI, tomosynthesis and different approaches to supplemental screening contribute to heterogeneity in practice patterns. Data describing differences in practice can be useful to individual clinicians for self-assessment and to leaders in breast imaging in developing practice guidelines.

Scientific Session (Exhibit Hall Posters)

Barriers to implementation of digital breast tomosynthesis: A patient's perspective

Authors

Presenting: Whitney Morgan (Wake Forest University School of Medicine)

Whitney Morgan (Wake Forest University School of Medicine), Lauren Golding (Wake Forest University School of Medicine)

Purpose: Several large clinical trials have shown that digital breast tomosynthesis (DBT) increases the sensitivity and specificity of mammography, however the availability of DBT remains limited. Other authors have identified barriers to implementation of DBT from a resource/supply perspective. Our study seeks to better understand the barriers of implementation from a patient's perspective by investigating the reasons why women undergoing screening mammography elect or decline DBT.

Materials and Methods: Two facilities at our institution offer the option of DBT at screening mammography for a $40 out-of-pocket fee. All women undergoing screening mammography at these sites were invited to complete an anonymous survey over a 6-week period. Survey results were then analyzed.

Results: 236 women completed the survey. 190 underwent DBT (80.5%) while 46 declined (19.5%).

For women who chose DBT, many listed multiple reasons with 362 total responses. The most frequent reason cited was that DBT is better at detecting cancer (36.7%). Other reasons include: dense breast tissue (20.2%), paid for by insurance (15.7%), decreased number of recalls (13.5%), DBT recommended by their doctor (7.5%), and various other reasons (6.4%).

For women who declined DBT, the most frequent reason cited was the expense (30 of 60 total responses; 50.0%). Other reasons include: concern about additional radiation (11.7%), breast tissue not dense (11.7%), belief that there is no additional benefit from DBT (6.7%), and various other reasons (20.0%). 69.6% of patients indicated that they would have opted for DBT if there were no out-of-pocket expense.

Conclusion: Women undergoing screening mammography have various reasons for electing or declining DBT. The most common reason patients opt for DBT is because they believe it better detects cancer. Most women who decline DBT do so because of the expense, and many of these patients would have opted for DBT if there were no out-of-pocket fee. These findings suggest that as insurance companies begin reimbursing for DBT and cost to individuals decreases or is eliminated, many more women may choose DBT. Reducing the number of recalls, an important benefit of DBT, seems to be undervalued by patients and serves as a potential topic for patient education.

Clinical Relevance: A major barrier to widespread implementation of DBT is limited availability. As availability expands, patients will increasingly be offered the choice of DBT. Patients' attitudes about DBT are not well documented. A better understanding of the patient's perspective will help breast imagers address additional barriers to DBT.

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Should mammographic density play a role in deciding which patients should undergo preoperative MR after a new diagnosis of breast cancer?

Authors

Presenting: Haydee Ojeda-Fournier (University of California, San Diego)

Kim Youn Jeong (Inha University Hospital), Jade De Guzman (University of California, San Diego), Yvette Quattro (University of California, San Diego), Sarah Blair (University of California, San Diego), Haydee Ojeda-Fournier (University of California, San Diego)

Purpose: Controversy continues regarding the benefit of preoperative breast MR following a new diagnosis of breast cancer. False positives deter surgeons from ordering preoperative breast MR. The purpose of this study is to identify if patients with mammographically dense breasts benefit more from preoperative breast MR compared to non dense patients.

Materials and Methods: A retrospective review at a single institution was performed on all patients with a new diagnosis who had undergone preoperative breast MR, mammogram and biopsy for their lesions from 2011-2013 were retrospectively reviewed. Patients who had previous surgery for breast cancer in the same breast or MRI cases after surgery were excluded. The following data was collected: mammographic breast density (BD), fibroglandular tissue (FGT) and breast parenchymal enhancement (BPE) on MRI, menstrual period at the time of their imaging study and lesion characteristics.

Results: 248 cases from 209 patients, 39 of which had bilateral lesions (mean age: 51.7 years). Pathology: 31 benign and 217 malignant lesions. 29 cases had no surgery (benign 17, malignant 12 (lost to follow up, progression of disease). Mean size of the lesion 2.22±2.13 cm on mammography, 2.19±2.59 cm on MRI and 2.79±2.63 cm on surgical pathology. BD was well-correlated with FGT (kappa value=0.631, p=0.000) and menstrual period including menopause (p=0.001) but had no relation with BPE. 39 cases were detected by MRI alone and 6 cases were occult on imaging. 4 out of 7 (57%) of these lesions were malignant in the non dense patients (fatty + scattered fibroglandular) v. 20 of 32 (63%) lesions were malignant in the dense patients (hetero + extremely). More lesions were detected as BD (p=0.017) and FGT (p=0.011) increased and were also more likely to be palpable and negative for ER, PR and HER2. Benign lesions (15/19, 78.9%) were less likely to be detected by MRI, compared to malignant (24/26, 92.3%). 9 of 15 cases not detected by MRI (5 benign, 10 malignant) were detected on mammography, all cases showed calcifications.

Conclusion: Regardless of BD or FGT, patients with a new diagnosis of breast cancer benefit form preoperative breast MR. There was a tendency to detect additional lesions by MR in patients with increased BD and increased FGT. Lesions detected by MRI were more likely to be malignant.

Non dense breasts (fatty + scattered) should not be excluded from MRI in the setting of a new diagnosis of breast cancer.

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Scientific Session (Exhibit Hall Posters)

Heterogeneity of Intratumoral Fractional Anisotropy Values Before and After Gadolinium Contrast in a Mouse Model of Breast Cancer

Authors

Presenting: Eun Langman (Duke University Department of Radiology)

Eun Langman (Duke University Department of Radiology), John Nouls (Duke University Department of Radiology), Ergys Subashi (Duke University), G. Allan Johnson (Duke University Department of Radiology)

Purpose: Recent improvements in spatial and temporal resolution of MRI allow for detailed characterization of tumor heterogeneity and insight into tumor microenvironment. Fractional anisotropy (FA) measurements have shown promise in distinguishing benign and malignant masses from normal breast tissue. This study characterizes FA measurements in a mouse model of breast cancer before and after gadolinium contrast, and correlates these findings with dynamic contrast-enhanced (DCE) MRI and ex vivo histology.

Materials and Methods: MCF7 tumors implanted into nude mice were imaged with diffusion tensor imaging (DTI) before and after injection of gadolinium-based contrast. DCE MRI sequences were acquired between DTI sequences. Imaging was performed on a Bruker 7T MRI system with 150-micron pixel resolution. Ex vivo histology was then performed on each tumor.

Results: Overall, post-contrast fractional anisotropy values were increased in tumors compared to pre-contrast values, with mean tumor FA values of 0.49 ± 0.07 post-contrast compared with 0.38 ± 0.05 pre-contrast ($p<0.001$). When correlating with dynamic contrast imaging and histology, the greatest increase in FA values were observed in cellularly dense and poorly perfused regions of tumor surrounding necrotic tissue.

Conclusion: Fractional anisotropy values are affected by administration of gadolinium agents, though the mechanism for this effect is unknown. The differential increase in FA measurements following contrast may provide insight into the tumor microenvironment by outlining cellularly dense and poorly perfused regions, and providing complementary information in conjunction with DCE MRI.

Clinical Relevance: Dynamic contrasted MRI is the standard method to evaluate breast lesions, and adding diffusion tensor imaging may help distinguish benign from malignant lesions. Effects of intravenous gadolinium agents on DTI measurements are unknown. This study investigates contrast effects on fractional anisotropy of tumors in a preclinical mouse breast cancer model.

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Scientific Session (Exhibit Hall Posters)

Digital Breast Tomosynthesis: A new diagnostic modality for mass-like lesions in dense breasts

Authors

Presenting: Qing Lin (The Affiliated Hospital of Qingdao University)

Qing Lin (The Affiliated Hospital of Qingdao University), Tiantian Bian (The Affiliated Hospital of Qingdao University)

Purpose: To compare the detection rates and diagnostic accuracy for mass-like lesions of digital breast tomosynthesis to those of conventional mammography in dense breasts.

Materials and Methods: Mediolateral and craniocaudal images of digital breast tomosynthesis for the affected breast and conventional mammography for both breasts from 631 enrolled women with dense breasts were collected from our hospital. Three radiologists with various experiences in breast imaging read these images independently. The detection rate and the diagnostic accuracy rate of masses□the sensitivity and the specificity of diagnosis, the false negative rate, the recall rate, the display of characteristics, particularly margins and spicules, which can be calculated by assessing Breast Imaging Reporting and Data System□BI-RADS) score to compare these two techniques.

Results: For all cases, average detection rate increased from 77.3% to 84.3% with an increase of 9.1% □P□.01□ by using DBT; with DBT, the overall average diagnostic accuracy rate increased from 73.4% to 82.3% (P□.01). Compared with CDM, the sensitivity and the specificity of DBT increased by 15.8%, 9.8%, respectively; the false negative rate and the recall rate decreased by 33.5%, 31%, respectively. More clear and detail margins were seen on tomosynthesis and there was a significant statistical difference □P□0.01□ for benign cases, for malignant masses, the detection rate of spicules increased from 34.8% for conventional views to 55.0% for tomosynthesis views. Using tomosynthesis, more malignant lesions were classified as higher BI-RADS category□P□0.05□ P=0.025, there was no significant difference in BI-RADS classification for benign cases□P>0.05□.

Conclusion: Tomosynthesis improved the detection rate and diagnostic accuracy significantly and it had substantial advantage in reducing recall rate and analyzing the margins of breast masses in dense breasts compared with conventional digital mammography. Tomosynthesis increased the frequency of higher BI-RADS category for probability-of-malignancy cases, but there was no statistical advantage between these two methods for the BI-RADS category of benign lesions. Digital breast tomosynthesis is a new diagnostic modality for mass-like lesions in dense breasts.

□Keywords□: digital breast tomosynthesis, mammography, breast, dense breast

Scientific Session (Exhibit Hall Posters)

Screening mammograms with no concerning findings: Are outside priors necessary?

Authors

Presenting: Clark Rogers (Indiana University School of Medicine/Department of Radiology and Imaging Sciences)

Clark Rogers (Indiana University School of Medicine/Department of Radiology and Imaging Sciences), Shadie Majidi (Indiana University School of Medicine/Department of Radiology and Imaging Sciences)

Purpose: To determine if obtaining prior outside mammograms has an effect on interpretation or clinical management of screening mammograms with no concerning findings.

Materials and Methods: The institutional review board approved this retrospective study. A database search of studies read at our institution from January 2003 through December 2014 was performed to identify all screening mammograms for which outside prior mammograms were requested in the absence of concerning findings. Only screening mammograms designated BI-RADS 0: Incomplete, need prior mammograms for comparison were included. Reports with impressions suggesting that priors were requested to evaluate masses, asymmetries, microcalcifications, lumpectomy site, prior surgery, and implants were excluded. Diagnostic mammograms were excluded. Studies were evaluated to determine if priors were obtained and if final BI-RADS designation or clinical management was affected.

Results: 729 screening mammograms meeting the criteria were identified for which prior mammograms had been requested. Prior exams were obtained in 648 (648/729, 88.9 %) cases. Of these, 34 exams (34/648, 5.2%) were designated BI-RADS 0 after comparison with priors, requiring additional diagnostic work-up. In total, 646 of 648 (99.7%) cases were ultimately designated BI-RADS 1 or 2. Two cases were interpreted as BI-RADS 3 (2/648, 0.3%); however, in both the radiologist stated that it was for precautionary purposes. No biopsies resulted or cancers were detected (0/648) after comparison to priors.

Conclusion: Comparison examinations from an outside institution provide little to no value for screening mammograms with no concerning findings.

Clinical Relevance: At our institution and others, a significant amount of time and resources are directed to obtain prior outside exams for screening mammograms. Not only does this practice delay interpretation, our study shows that it also provides little to no value for screening mammograms with no concerning findings.

Scientific Session (Exhibit Hall Posters)

Management of core biopsy-confirmed benign papilloma without atypia : surgical excision or ultrasound-guided directional vacuum-assisted removal

Authors

Presenting: Ja Yoon Jang (Seoul National University Bundang Hospital)

Ja Yoon Jang (Seoul National University Bundang Hospital), Sun Mi Kim (Seoul National University Bundang Hospital), Bo La Yun (Seoul National University Bundang Hospital), Mijung Jang (Seoul National University Bundang Hospital), Jong Yoon Lee (Seoul National University Bundang Hospital), Hye Young Choi (Gyeongsang National University Hospital)

Purpose: To compare upgrade rates after surgery and ultrasound-guided directional vacuum-assisted removal (US-DVAR) of benign papilloma without atypia diagnosed by US-guided 14-gauge core biopsy (CB) and to evaluate the follow-up results after US-DVAR.

Materials and Methods: We performed US-CB for 5581 breast lesions; 315 were benign papilloma without atypia. We offer surgery or US-DVAR for benign papilloma. Eighty-one lesions were excised (76 patients), 159 lesions (138 patients) underwent US-DVAR and 75 underwent no further biopsy. We reviewed the clinical and pathological findings, checked for histologic upgrades after excision and US-DVAR, and determined if residual lesion was detected on follow-up imaging.

Results: Excision revealed benign papilloma in 68 lesions, no residual lesion in 4, atypical ductal hyperplasia in 5, flat epithelial atypia in 1, and lobular and ductal carcinoma in situ in 1 and 2 cases, respectively. US-DVAR revealed benign papilloma in 136 lesions, no residual lesion in 20, atypical ductal hyperplasia in 1, intraductal solid papillary carcinoma in 1, and invasive ductal carcinoma in 1. Upgrade rates from intraductal papilloma to atypia and malignancy were 7.4% and 2.5% after surgery and 0.6% and 1.3% after US-DVAR.

Of lesions that underwent US-DVAR, 111 had follow-up imaging (range, 6–80 months; mean, 34.9 months): 108 (97.3%) showed no US-visible residual lesion; 1 case exhibited residual lesion on initial follow-up US (6 months), but no residual papilloma was identified after subsequent excision; 1 case showed an interval change at the biopsy site and was confirmed as recurrent papilloma on follow up (52 months); and 1 case showed residual lesion, but serial follow-up US evidenced no change in size (48 months).

Conclusion: The upgrade rate to malignancy determined by surgery was 2.5% (2/81) and by US-DVAR was 1.3% (2/159) for US-guided core needle biopsy-confirmed benign papilloma. Follow-up imaging revealed 97.3% (108/111) were successfully removed by DVAR. US-guided DVAR may prove an alternative to excision in the diagnosis and management of benign papilloma of the breast.

Clinical Relevance: US-guided DVAR may prove a valuable alternative to surgical excision in the appropriate management of benign papilloma of the breast.

Scientific Session (Exhibit Hall Posters)

Female Patient Gender Preference for Breast Imaging Care Providers.

Authors

Presenting: Rifat Wahab (Vanderbilt University Medical Center)

Rifat Wahab (Vanderbilt University Medical Center), Lucy Spalluto (Vanderbilt University Medical Center), Shaun Wahab (Vanderbilt University Medical Center), Hakmook Kang (Vanderbilt University Medical Center)

Purpose: The purpose of this study is to investigate female patient preference regarding the gender of her mammography technologist, sonographer, and radiologist when undergoing diagnostic mammography and breast ultrasound. We hypothesized that patient preference would be most strongly influenced by four factors: race, education, age, and income.

Materials and Methods: This study is IRB approved and HIPAA compliant. Surveys were distributed at our institution's breast center for a two month time period from August 2014 - September 2014. The survey included questions to elicit demographic information and determine patients' preferences in regards to the gender of their breast imaging care providers. A total of 256 surveys were collected and analyzed using the Chi square and two proportions tests.

Results: Patients' gender preference for a mammography technologist was overwhelmingly female regardless of demographic factors ($P<0.001$). The majority of patients also preferred a female sonographer, although this was not statistically significant ($P=0.48$). There were no statistically significant demographic factors affecting patients' decision making for the preference of the gender of a mammography technologist or sonographer (Table 1). Patients indicated no preference for the gender of their radiologist ($P<0.001$). The demographic factors (Table 1) with statistical significance affecting patients' decision making in regards to having no preference for the gender of their radiologist included income ($P=0.04$) and education ($P=0.01$).

Conclusion: Age, race, education, and income were not statistically significant demographic factors influencing patients' overall strong female gender preference for their mammography technologist or sonographer. Education and income were statistically significant factors influencing patients' lack of gender preference for a radiologist.

Clinical Relevance Statement: Female patients undergoing diagnostic mammography and breast ultrasound are a vulnerable population. This study aims to gain an understanding of patient preference in regards to the gender of their breast imaging care providers in order to provide improved patient care.

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Scientific Session (Exhibit Hall Posters)

Risk of malignancy at surgical excision or progression at follow up of pure flat epithelial atypia

Authors

Presenting: Amanda Beer (University of Virginia Health System)

Amanda Beer (University of Virginia Health System), Heather Peppard (University of Virginia Health System), Kristen Atkins (University of Virginia Health System), Carrie Rochman (University of Virginia Health System), Jennifer Harvey (University of Virginia Health System), Brandi Nicholson (University of Virginia Health System)

Purpose: Cancer upgrade rates from core needle biopsy (CNB) showing pure flat epithelial atypia (FEA) have been reported from 0% to 15%. Imaging appearance does not predict cancer risk at excision. We reviewed cases of pure FEA on CNB for malignancy at excision in our institution.

Materials and Methods: IRB and HIPAA compliant retrospective review of all image-guided breast biopsies from July 1, 2006 to June 30, 2013 with result of pure FEA. Demographics included age, breast density, prior breast biopsy (Pbx), personal history of breast cancer (Phx) or prior atypia, family history of breast cancer (Fhx), modality of detection, imaging finding (calcifications, mass, or nonmass enhancement (NME)), and results at surgical excision. Follow up regarding cancer diagnosis was obtained from the medical records. Patients were excluded if they did not undergo surgical excision.

Results: 5,285 CNB were performed. 23 patients had pure FEA on CNB (0.4% of biopsies). One was lost to follow up. 22 patients with pure FEA on CNB underwent surgical excision. FEA was discovered on mammography in 18 patients (82%, 15 calcifications and 3 masses), on magnetic resonance imaging in three (14%, 2 NME and 1 mass) and on ultrasound in one (4%). Two (9%) patients who underwent stereotactic biopsy for calcifications, both with Fhx, had ductal carcinoma in-situ at excision. A third patient (5%), without Phx or Fhx, developed invasive lobular carcinoma 35 months later near the site of FEA.

Conclusion: While rare, pure FEA on CNB was associated with a risk of malignancy in 14% of patients at excision or at follow up. Imaging findings and history of breast cancer do not predict risk of upgrade. Surgical excision should be considered when CNB reveals pure FEA, especially if there is a family history of breast cancer.

Clinical Relevance: Management of high risk lesions like FEA varies by institution. Studies have mixed data about risk of malignancy in FEA. Our study supports surgical excision of FEA diagnosed on CNB.

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Scientific Session (Exhibit Hall Posters)

Contributing Factors of Marker Migration During Stereotactic Core Needle Breast Biopsies.

Authors

Presenting: Ashali Jain (Boston University)

Ashali Jain (Boston University), Karen Buch (Boston University School of Medicine), Mustafa Qureshi (Boston), Carl Jaffe (Boston University School of Medicine), Dianne Georgian-Smith (Brigham and Women's Hospital, Harvard Medical School), B. Nicolas Bloch (Boston University School of Medicine)

Purpose: To evaluate the incidence and to access facilitating factors of fast migration and displacement of biopsy markers in a large, randomized patient population.

Methods & Materials: A total of 268 stereotactic biopsy clips were placed in 264 patients undergoing uncomplicated stereotactic biopsies using a 9-gauge vacuum-assisted device from August 2010 to July 2013. Immediate post-procedure mammograms were performed immediately after biopsy to confirm marker localization and used to measure the distance of marker migration. Migration was correlated with number of core samples, breast density, lesion pathology, biopsy approach, biopsy location, marker type and shape, and extent of hematoma. Basic descriptive statistics were calculated.

Results: Of the 268 stereotactic biopsy clips, 35 (13%) had migrated at least 1 cm from the intended biopsy cavity. The range of marker migration was 1-6 cm with a mean (± standard deviation) of 2.40 (± 1.25) cm. There was no difference in the amount of migration in the right versus left breast, (P=0.513). The number of biopsy specimens obtained and lesion pathology had no significant correlation with migration. Migration occurred significantly more often, and to a greater extent in fatty breasts (P = 0.025). The marker type and shape, biopsy location (the inner aspect of the breast) and using the medial needle approach were associated with more migration (P = 0.017).

Conclusion: A significant number (35/268; 13%) of markers had migrated at least 1 cm from the original biopsy site. Biopsy location within the breast, biopsy approach and breast density and marker shape are factors influencing migration.

Clinical Relevance: A high incidence of substantial displacement of breast biopsy markers due to fast migration during stereotactic core biopsies leads to serious challenges in treatment planning and follow-up studies. Knowledge of contributing factors will help reduce marker migration.

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Scientific Session (Exhibit Hall Posters)

A Prospective Comparative Study to Evaluate the Displacement of Four Commercially Available Breast Biopsy Site Markers

Authors

Presenting: Mirek Mychajlowycz (Wayne State University School of Medicine)

David Pinkney (Henry Ford Hospital), Mirek Mychajlowycz (Wayne State University School of Medicine), Biren Shah (Henry Ford Hospital)

Purpose: Stereotactic core needle breast biopsy is considered the standard of care in the workup of clinically and sonographic occult mammogram abnormalities. Radiopaque markers are commonly deployed at the biopsy site to indicate the location of the lesion should there be a need for future localization and surgical excision. A commonly encountered complication is the immediate displacement of these markers. The primary mechanism of displacement is thought to occur when breast compression is released at the completion of the procedure, the so-called “accordion effect.” This investigational study compares the degree of displacement among four commercially available breast biopsy markers.

Materials and Methods: At the conclusion of the study, 80 patients (20 per marker group) will be enrolled from three breast center sites. The markers include: the HydroMARKTM, MammoMARKTM, MammoStarTM, and SecurMARKTM. Each marker was composed of a radiopaque metallic or ceramic core with a unique polymeric encasing component. Standard post-procedure mammograms were obtained and the degree of marker displacement from the biopsy cavity was measured.

Results: Analysis of preliminary data from 70 of the 80 anticipated patients showed that the MammoMark(TM) exhibited the greatest mean net displacement, followed by the HydroMARK(TM), MammoStar(TM), and SecurMARK(TM) (1.64 cm, 0.86 cm, 0.52 cm, and 0.43 cm, respectively). However, these differences did not reach statistical significance ($p = 0.123$) when a Kruskal-Wallis one-way analysis was performed. Additionally, the median net displacement in all four groups was 0 cm, indicating that most of the markers did not displace at all. Markers that did displace tended to along the same plane as the biopsy track.

Conclusion: Marker displacement was infrequent among the four markers, which may be related to improvements in marker technology. Increased physician awareness in the slow release of breast compression following marker deployment may also be a contributing factor. Though the mean displacement of the biopsy markers ranged from 0.43 to 1.64 cm, these differences did not reach statistical significance. This suggests that other factors such as multimodality imaging visibility, physician preference, and unit cost are more pertinent considerations when choosing appropriate breast biopsy markers.

Clinical Relevance: Displacement of biopsy site markers is a known complication of stereotactic core needle breast biopsies and has the potential to cause erroneous localization of lesions prior to surgical excision. The intent of this study is to help guide radiology practices in choosing reliable and accurate breast biopsy markers.

Scientific Session (Exhibit Hall Posters)

Exploring the Role of Contrast Enhanced Spectral Mammography with Breast MRI in Patients with Known Biopsy Proven Breast Cancer.

Authors

Presenting: Leena Tekchandani (UCLA)

Leena Tekchandani (UCLA), Guita Rahbar (UCLA), Esha Gupta (Los Angeles County), mariam thomas (Los Angeles County), Antoinette Roth (Los Angeles County), Denise Andrews-tang (Los Angeles County)

Purpose: To explore the role of the emerging technology of Contrast Enhanced Spectral Mammography (CESM) in patients with known biopsy proven breast cancer.

Materials and Methods: After obtaining IRB approval, a retrospective review of imaging studies and clinical information was performed on all of the patients who had undergone CESM at Olive View Medical Center, which dated back to April, 2014. The data collected included demographic information (age, risk factors, presenting symptoms), initial diagnostic mammography and ultrasound findings, MRI findings, CESM findings, other relevant imaging findings (such as second-look ultrasound), biopsy pathology, and surgical pathology.

We then compared the findings of CESM with that of MRI and correlated these to pathology and/or second look ultrasound findings.

Results: Since April, 2014, Olive View Medical Center has performed CESM examinations on 31 patients. Twenty two of these patients had known biopsy proven breast cancer, and 20 of these patients also had contrast enhanced MRI to evaluate extent of disease.

All of our patients were female, with an average age of 50.8 years (range 29-63 years). Of the 20 patients with both MRI and CESM studies to evaluate extent of disease, two patients were lost to follow-up. Two patients had no additional disease on both imaging modalities, and therefore a second-look ultrasound and/or additional biopsies were not performed.

Eleven patients had an MRI showing questionable synchronous disease, a negative CESM, and a negative second look ultrasound and/or negative biopsy to confirm that the MRI finding was in fact a false positive finding. Two patients had no findings on MRI to suggest synchronous disease, but positive findings on CESM; these patients had no synchronous disease on pathology and/or second look ultrasound. Three patients had positive findings for synchronous disease on both MRI and CESM, however, only 1 patient had pathology proving synchronous disease.

Conclusion: There were no cases in which MRI found a synchronous cancer but CESM did not. The one patient with pathology proven synchronous disease had positive findings on both CESM and MRI. MRI had 13 false positive results for synchronous disease, where as CESM had 4 false positive findings.

Clinical Relevance: Although we have a small number of patients, this study suggests that CESM has a higher specificity for extent of disease compared to MRI. Therefore, CESM may be useful in evaluating questionable findings on MRI and can be considered for evaluation of synchronous disease in patients who cannot undergo MRI.

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Scientific Session (Exhibit Hall Posters)

Diagnostic Breast Imaging Evaluation of Incidental Breast and Axillary Lesions Identified on Chest CT

Authors

Presenting: Sonya Bhole (Northwestern University, Feinberg School of Medicine, Department of Radiology)

Iram Azam (Chicago Medical School), Sonya Bhole (Northwestern University, Feinberg School of Medicine, Department of Radiology), Erin Neuschler (Northwestern University, Feinberg School of Medicine, Department of Radiology)

Purpose: In recent years, the number of CTs performed for diagnostic purposes has increased and, consequently, there has been a significant rise in the detection of incidental findings. One example is the incidental detection of breast and axillary lesions on chest CT; however, little is known about the frequency that follow-up diagnostic imaging is performed in this patient population. We seek to investigate the frequency that incidentally detected breast lesions on chest CT are followed up at our institution and yield a positive cancer diagnosis.

Methods: This is an IRB approved, retrospective study of 3851 chest CT exams that were performed in women between January 1, 2009 and May 30, 2009 at Northwestern Memorial Hospital. Patients were included who had incidentally detected breast or axillary findings and were recommended to have additional diagnostic breast imaging. Patients with a personal history of breast cancer presenting with a new contralateral finding were included in the study, while those with an ipsilateral finding were excluded. Data was collected from the patient's electronic medical record regarding clinical history, pertinent breast findings, imaging characteristics on diagnostic work up and final excisional biopsy pathology, when applicable.

Results: Retrospective review identified 53 patients with a total of 54 lesions that were recommended to have further diagnostic breast imaging. 16 (30.2%) patients received additional breast imaging, of which, three (18.8%) were recommended for a biopsy based upon the additional imaging findings. Tissue sampling yielded a cancer diagnosis in 66.7% (2/3), with one case of grade 3 invasive ductal carcinoma of the breast and one case of follicular lymphoma. Therefore, two out of the 16 patients (12.5%) that had additional breast imaging were found to have malignancy. The remainder of the breast imaging workups revealed no finding requiring biopsy. For 37 (69.8%) patients, there was no documented follow up at our institution.

Conclusion: Approximately 70% of patients who were recommended for diagnostic breast imaging after chest CT did not undergo follow up. Given that 12.5% of those patients that underwent the additional imaging were found to have malignancy, this study emphasizes that proper follow up is needed for incidental breast and axillary lesions identified on CT.

Clinical Relevance: A centralized process should be created to ensure proper referral, tracking, and management of patients with incidental breast and axillary lesions on chest CT.

Background parenchymal enhancement on breast magnetic resonance imaging in women who receive chest radiotherapy for childhood Hodgkin's lymphoma

Authors

Presenting: Liang Zeng (University of Toronto)

Liang Zeng (University of Toronto), Hadas Moshonov (University Health Network), Pavel Crystal (University Health Network)

Purpose: To evaluate the long-term effect of chest radiation therapy for childhood Hodgkin's Lymphoma on background parenchymal enhancement (BPE) in asymptomatic survivors undergoing screening breast MRI.

Methods: A departmental database was reviewed to identify women undergoing annual breast MRI screening between 2009 and 2013. Patients who received chest radiotherapy for Hodgkin's lymphoma were selected if known to be cancer free for at minimum two years after the MRI used for analysis. Patients without prior history of radiotherapy and cancer, were matched by age to each case patient, as a control. Breast MRI studies were analyzed using a fully automated computerized method (MultiView MR Breast, HOLOGIC® USA) to calculate BPE and breast density. An independent samples t-test was used to compare differences in background enhancement, density, and age, in cases and controls. Pearson correlation was used to assess the relationship between BPE and years since radiotherapy. A p-value of <0.05 was considered statistically significant.

Results: A total of 61 case patients were identified and matched to controls. The average age of case-patients was 41.6 years (± 6.75 standard deviations [SD]) and controls was 40.8 years (± 6.99 SD). 38 women (62.3%) were pre-menopausal and 23 (37.7%) were in menopause. On average, patients were evaluated 19.0 years (+/- 7.43 SD) post-radiotherapy. BPE was significantly higher in patients who received chest radiotherapy for Hodgkin's lymphoma at 1-minute (mean: 47.5% vs. 36.9%, $t=3.286$, $p=0.0013$), 2-minutes (50.0% vs. 48.5%, $t=3.618$, $p=0.00045$), and 6-minutes (46.4% vs. 38.1%, $t=2.797$, $p=0.0060$) post-contrast. BPE was significantly higher at 1-minute ($r=0.311$; $p=0.016$), 2-minutes ($r=0.392$; $p=0.003$) and 6-minutes ($r=0.294$; $p=0.024$) post-contrast with increased number of years post-radiotherapy. Breast density was not significantly different between groups ($p=0.120$).

Conclusion: Background enhancement is significantly greater in women who receive chest radiotherapy for childhood Hodgkin's lymphoma comparing to aged-matched controls.

Clinical Relevance: Increased BPE may hinder interpretation of breast MRI and dedicated protocols may be needed to optimize breast cancer screening in these women.

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Scientific Session (Exhibit Hall Posters)

Lobular Neoplasia associated with Fibroadenoma: Retrospective review

Authors

Presenting: Priyanka Grover (Mount Sinai medical center miami beach)

Stuart Kaplan (Mount Sinai Medical Center, Miami Beach), Priyanka Grover (Mount Sinai medical center miami beach), Robert Poppiti (Mount Sinai Medical Center, Miami Beach), Liset Pelaez (Mount Sinai Medical Center, Miami Beach), Cara Swintelski (Mount Sinai Beth Israel Medical Center)

Introduction: Fibroadenomas are the most common benign tumor in the female breast and the second most common breast pathology occurring in young women under the age of 35 years old. Lobular carcinoma in situ (LCIS) of the breast is commonly identified as an incidental finding in breast biopsies performed because of either a mammographic abnormality or a palpable mass. Lobular neoplasia (LN) includes atypical lobular hyperplasia (ALH) and LCIS.

Methods: A retrospective review of biopsy proven fibroadenomas at Mount Sinai Medical Center from 2000-2013 was performed. Several cases of LN within fibroadenomas were identified. Demographics, radiological features, and follow up of these cases were analyzed.

Results: 3940 fibroadenoma cases were diagnosed in 2560 women at our institution from 2000-2013. Sixteen of these lesions in 17 women harbored LN within the fibroadenomas. The median age was 58 years (range 42-81).

Twelve out of 16 cases had findings on mammography. A mass was seen on the mammogram in the 6/16 cases. The size range was 0.5 cm-2.5 cm. Shapes were Oval (2/6), Round (1/6), and Irregular (3/6). Margins were Indistinct (5/6), and Spiculated (1/6). Calcifications were associated with the mass in 2 of 6 cases. Suspicious calcifications without an associated mass were present in 6 out of 16 cases. The calcifications were coarse heterogeneous (3/6), clustered/grouped (5/6) and amorphous (1/6). Focal asymmetry was seen in 2 cases.

A mass was seen on ultrasound in 8 out of 16 cases. The size range was 0.4 cm-2.6 cm. Shapes were Oval (5/8), and Irregular (3/8). Margins were Indistinct (5/8), Microlobulated (2/8), and Spiculated (1/8). All the masses were hypoechoic.

Three cases out of 16 had a finding of an enhancing mass on the contrast enhanced MRI. Two had enhancement with plateau kinetics and one of them had persistent kinetics.

Two cases were found incidentally after mastectomy. Retrospectively, one case had a focal asymmetry seen on the mammogram without associated calcifications.

Ten of the sixteen women had lobular neoplasia in the adjacent breast tissue as well as within the fibroadenoma. In two of these, lobular neoplasia was present in the contralateral breast. Six of the sixteen women had infiltrating carcinoma, four of which were duct cell type and two were lobular.

Conclusions: In our study patients diagnosed with fibroadenoma harboring lobular neoplasia, 71% had at least LN outside of the fibroadenoma, and 43% had infiltrating carcinoma. Local excision was the treatment of choice.

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Scientific Session (Exhibit Hall Posters)

Canadian Radiologists Do Not Support Canadian Task Force on Preventive Health Care (CTFPHC) Screening Mammography Guidelines. Canadian radiologists' perspectives regarding screening mammography for others and for themselves

Authors

Presenting: Jean Seely (The Ottawa Hospital and University of Ottawa)

Jean Seely (The Ottawa Hospital and University of Ottawa), Jiyon Lee MD (New York University), Paula Gordon (University of British Columbia), Gary Whitman (MD Anderson)

Purpose: To determine the screening mammography recommendations that radiologists in Canada promote to average risk patients and family/friends, and do or would do for themselves.

Materials and Methods: IRB-exempt, voluntary, and anonymous survey was delivered online from February to March 2014, in English and in French. Radiologists were recruited by email from provincial radiology organizations. Data included radiologists' personal and practice background; their recommendations to others for mammography, and clinical and self-breast exam; and their personal screening habits based on respondent gender. The three study cohorts were women ≥40 years of age (group 1); women < 40 years (group 2); and men (group 3). The distribution of responses for each question was summarized, and proportions for the entire group and individual cohorts computed.

Results: 398 surveys were collected from 9 Canadian provinces, 120 (30%) in French and 278 (70%) in English. These comprise the entire study set. 2.3% (7/313) radiologists recommended mammography for patients every 2-3 years for women 50-74 years of age; 33.5% (105/313) recommended biennial mammography for women 50-74 years of age and 62% (194/313) recommended mammography every 1-2 years for women over 40 years of age. The recommendations of radiologists were similar for family and friends: 1.7% (5/301) recommended screening every 2-3 years, 30.6% (92/301) recommended biennial screening for women 50-74 years, and 65% (197/301) recommend screening every 1-2 years for women 40 years and older. In group 1, 82% (37/45) underwent screening every 1-2 years. In group 2, 47% (18/38) will undergo screening ≥40 years while 53% (20/38) will do so ≥ 50 years. In group 3, 98% (164/168) would undergo screening every 1-2 years, 77% (130/168) ≥40 years and 21% (35/168) ≥ 50 years.

Conclusion: The majority of Canadian radiologists recommend mammography every 1-2 years for average risk women aged ≥40 years, whether they are patients or family and friends. Most radiologists are consistent in that they do or anticipate that they would "practice what they preach."

Clinical Relevance: The fact that Canadian radiologists do not follow CTFPHC guidelines is reassuring, and a step in the right direction.

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Scientific Session (Exhibit Hall Posters)

Atypical Ductal Hyperplasia at MIR-Guided Biopsy: Morphologic Features and Upgrade Rate

Authors

Presenting: Sandra Brennan (Memorial SLoan Kettering Cancer Center)

Sandra Brennan (Memorial SLoan Kettering Cancer Center), Manuela Durando (Memorial SLoan Kettering Cancer Center), Adriana Dionigi Corben (Memorial SLoan Kettering Cancer Center), Elizabeth Morris (Memorial SLoan Kettering Cancer Center)

Purpose: The aims of this study were to evaluate the rate of upgrade to cancer of atypical ductal hyperplasia (ADH) diagnosed at MRI guided vacuum-assisted biopsy (MRI-VAB) and to assess the correlated MRI morphologic or kinetic features.

Materials and Methods: A HIPAA compliant retrospective review was performed on 1964 MRI-VABs between January 2003-December 2012. Lesions yielding ADH were collected and classified as ADH associated or not to other high risk lesions (HRL) or bordering DCIS. Patients with incomplete data or with synchronous ipsilateral cancer were excluded. Lesions yielding ADH at VAB and cancer at surgery were defined an upgrade. Statistical analysis was performed ($p<0.05$) and 95% CI were calculated.

Results: 119/1964 (6.1%) MRI-VABs yielded ADH; 5/119 were excluded for incomplete data and 22/119 for synchronous ipsilateral cancer. Of the remaining 92 ADH, 56/92 (60.9%) were pure ADH, 29/92 (31.5%) were associated with other HRL and 7/92 (7.6%) were ADH bordering on DCIS. Patients (mean age 53 years; range: 29-76) were predominantly post-menopausal (47/92, 51.1%), with personal history of breast cancer (43/92, 46.7%) and underwent MRI mainly for screening (61/92, 66.3%). Pure ADH was predominantly T2 hypointense (44/56, 78.6%) and non mass-like enhancement (37/56, 66.1%); pure ADH showed mostly persistent kinetic curve (39/56, 69.6%) instead of ADH bordering on DCIS, that had 6/7 (85.7%) washout kinetic ($p=0.002$). Surgery yielded malignancy of 16/92 (17.4%; CI 95%: 10.3-26.7%): 8/56 of pure ADH (14.3%; CI 95%: 6.4-26.2%) (7 DCIS; 1 invasive cancer); 4/29 (13.8%, CI 95%: 3.9-31.7%) of ADH associated with other HRL (all DCIS) and 4/7 (57.1%, CI 95%: 18.4-90.1%) of ADH bordering on DCIS (all DCIS). The upgrade rate significantly correlated with the presence of ADH reaching DCIS ($p=0.03$), but not with any morphologic or kinetic MRI characteristic. Patient age (older, $p=0.008$) and number of specimens collected ($p=0.038$) were significantly associated with upgrade.

Conclusion: ADH was identified in 6.1% of MRI-VABs and the overall upgrade was 17.4%. Most upgrades were DCIS and not invasive cancers at surgery. Surgical excision of ADH found at MRI-VAB is warranted.

Can we be wiser when advising our patients on treatment for breast abscesses?

Authors

Presenting: Yelena Kozirovsky (Albert Einstein College of Medicine, Jacobi Medical Center)

Yelena Kozirovsky (Albert Einstein College of Medicine, Jacobi Medical Center), Priyanka Handa (Albert Einstein College of Medicine, Jacobi Medical Center), Jessica Rosenblum (Albert Einstein College of Medicine, Jacobi Medical Center), Miriam David (Albert Einstein College of Medicine, Jacobi Medical Center), Maria Castaldi (Albert Einstein College of Medicine, Jacobi Medical Center)

Purpose: Sonographic and clinical features of patients with breast abscesses may correlate with failed primary procedural intervention including needle aspiration, and/or incision and drainage. We define criteria that necessitate prompt radiologic and surgical follow up for repeat procedural interventions for abscess treatment.

Materials and Methods: A quality improvement initiative retrospectively compared the effectiveness of primary needle or incision drainage as the initial treatment modality for patients presenting with breast abscesses. Seventy-nine breast abscesses were identified in sixty-eight patients from 2004-2014 by (1) utilizing key words to identify breast ultrasound (US)-guided needle drainage performed in radiology department in the picture archiving and communication system (PACS) database and (2) outpatient breast clinic follow up patient panel with ICD9 code 675.1. Subgroup analysis was performed of pediatric patients (under age 18), non-puerperal abscesses or multiple recurrences. Clinical chart review recorded: smoking, HIV, Diabetes Mellitus, nipple piercing,antibiotic regimen, and number and types of procedures performed for diagnosis or treatment. PACS US images were reviewed for maximum abscess dimension, location in breast (central or peripheral), maximum rind thickness, multiloculation, doppler flow, and presence of internal debris.

Results: In our study population (N= 79) statistically significant results by Chi squared and Fisher exact tests that predict a change in antibiotic regimen in an unresolved abscess include: diabetes (p= 0.0308), puerperal patients (p = 0.0477), nipple ring piercing(p = 0.0332), and multiloculation (p = 0.0172). Statistically significant results that predict need for additional procedures in unresolved abscesses were found in pediatric patients (p = 0.0261), multiloculated abscesses (p = 0.0235), and right sided abscesses (p = 0.049). Mean maximum dimension of abscess is 3.27 cm. Clinical characteristics of smoking and HIV, and sonographic features of size greater than 3.0 cm, central versus peripheral lesions, and rind thickness greater than 1 mm, did not show statistical significance for requiring a change in antibiotic regimen, or requiring multiple procedures for nonresolution of abscess.

Conclusion: Primary abscess drainage by needle aspiration and/or scalpel, with the above clinical and sonographic features require close surgical follow-up for high likelihood of abscess nonresolution and/or worsening of infection with need for repeat interventions.

Clinical Relevance Statement: Breast abscesses are a benign entity associated with extended morbidity if resolution is prolonged. Through heightened awareness of the imaging findings and clinical factors, patients and physicians can be educated at presentation to reduce patient anxiety and dissatisfaction with prolonged course of treatment.

Scientific Session (Exhibit Hall Posters)

The Usefulness of Short-term Follow-up After Benign Concordant Image-Guided Breast Biopsies

Authors

Presenting: Courtney Garlick (University Hospitals - Case Medical Center)

Courtney Garlick (University Hospitals - Case Medical Center), Niki Constantinou (University Hospitals - Case Medical Center), Cheryl Thompson (Case Western Reserve University), Donna Plecha (University Hospitals - Case Medical Center)

Purpose: To compare biopsy site specific cancer detection rates after benign ultrasound, stereotactic and MRI guided breast biopsies between patients recommended for short term imaging follow-up and those recommended for routine follow-up.

Materials and Methods: A retrospective review was performed to identify all benign concordant core needle breast biopsies performed with stereotactic, ultrasound or MRI guidance from 6/1/2012 to 11/31/2013. Male patients and papillomas were excluded. Lesions that were surgically excised without definite pathologic correlation at site of benign biopsy were also excluded. This yielded a total of 560 lesions in 514 women. Short term follow-up or routine follow-up recommendations were determined by 5 board certified radiologists with 5-20 years experience in breast imaging. Lesion specific imaging or clinical findings at follow-up were then reviewed as well as the pathology results of repeat biopsy or excision of the same lesion. Biopsies were performed with 14, 12 or 9 gauge vacuum assisted biopsy devices.

Results: Of the 560 lesions, 188 (33.6%) were recommended for short-term imaging follow-up at the discretion of the radiologist, 144 (76.6%) of which had subsequent imaging or clinical evaluation documented in the electronic chart. The other 372 (66.4%) of the 560 were recommended for routine follow-up, 267 (71.8%) of which had subsequent imaging or clinical evaluation documented in the electronic chart. In the short-term follow-up group, 3 (1.6%) subsequent cancers were diagnosed at the site of prior benign biopsy compared with 0 in the routine follow-up group ($p = 0.042$). All 3 cancers were found within 6 months of the initial benign biopsy, and in retrospect were missed on the original biopsy.

Conclusion: Comparison of biopsy site specific cancer detection rates between the short-term follow-up group and routine follow-up group demonstrated statistical significance. Concordant benign pathology results after ultrasound, stereotactic or MRI guided breast biopsy with vacuum assisted biopsy devices do not require short term follow-up imaging. Short-term follow-up recommendations at the discretion of the radiologist may help find additional cancers.

Clinical Relevance Statement: Short-term imaging follow-up after a benign image guided biopsy is costly. Our results show that it is not necessary to follow all patients with concordant benign results. Selective short term imaging follow-up can be useful in a subset of cases to detect additional cancers.

Scientific Session (Exhibit Hall Posters)

MRI features associated with surgical re-excision in HER2 overexpressing breast cancers undergoing breast conservation.

Authors

Presenting: Brittany Dashevsky (Department of Radiology, Weill Cornell Medical College, New York)

Brittany Dashevsky (Department of Radiology, Weill Cornell Medical College, New York), Elizabeth Sutton (Department of Radiology, Memorial Sloan-Kettering Cancer Center, New York), Oshaani Abeyakoon (Department of Radiology, Memorial Sloan-Kettering Cancer Center, New York), Elizabeth Morris (Department of Radiology, Memorial Sloan-Kettering Cancer Center, New York)

Purpose: The purpose of this study was to assess among women with HER 2 overexpressing breast cancer undergoing breast conservation therapy the magnetic resonance imaging (MRI) and clinicopathological features associated with surgical re-excision.

Materials and Methods: This retrospective study received institutional review board approval and need for informed consent waived. Between 2002-2013, we identified breast cancer patients who underwent breast conservation with: a) HER2 overexpressing (HER2+) invasive cancer and b) pre-operative breast MRI. Exclusion criteria included patients who received neoadjuvant chemotherapy. Imaging was performed on either 1.5- or 3.0-T whole-body MRI unit (GE Medical Systems, Waukesha, WI) equipped with dedicated surface breast coil. MRI features were extracted and included quantitative measurements, BIRADS descriptors and semi-quantitative kinetic segmentation. Clinical and pathologic data were collected.

Results: 114 women with HER2+ breast cancer with a preoperative breast MRI underwent breast conservation with a mean age of 48 (range 27-79). 44/114 (38.6%) underwent surgical re-excision for positive margins and 70/114 (61.4%) did not. 17/44 (38.6%) who underwent re-excision had multifocal/multicentric disease on MRI versus 18/70 (25.7%) that did not, which was statistically significant with a p-value < 0.05. MRI maximal tumor diameter was 2.6 cm (SD 1.7) for those that underwent re-excision and 2.0 cm (SD 0.78) for those that did not, which was statistically significant with a p-value of 0.02. There was no significant difference is size of the surgical resection specimen between those that underwent re-excision (5.8 cm+/-2.9) and those that did not (5.7 cm+/-2.9). There was no significant difference in tumor grade or axillary lymph node invasion. 5/44 (11.4%) of patients that underwent re-excision recurred versus 3/70 (4.3%).

Conclusion: We were able to leverage MRI features associated with surgical re-excision in HER2 overexpressing breast cancer.

Clinical Relevance: HER2 overexpressing breast cancers are associated with high re-excision rates compared to other breast cancer subtypes. The results support preoperative MRI and the need for effective communication regarding tumor size and extent to our surgical colleagues.

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