Selected Scientific Publications on Breast Tomosynthesis

2014


* Key Point: Variability in performance among radiologists using 2D mammography was also reflected in variability with the addition of 3D mammography, however there was less variability in true positive reads using 3D mammography. The authors conclude that the addition of tomosynthesis to 2D conventional mammography either reduced the false positive rate or improved the cancer detection rate, with most readers achieving both improvements.


Key Point: The authors conclude that the addition of breast tomosynthesis to digital mammography significantly reduced the recall rate by ~63%.


* Key Point: The authors conclude that the addition of digital mammography to 2D mammography demonstrated an increase in cancer detection rate and a decrease in the recall rate.


Key Point: The authors concluded that patients screened with combined 2D/3D digital breast tomosynthesis resulted in increases in cancer detection rate (for cancer overall and for invasive cancers) and also resulted in decreases in the recall rate. The results also demonstrated a significantly higher positive predictive value for recalls.


* Key Point: Combined 2D/3D-mammography was found to offer significantly higher cancer detection than 2D mammography using either single or double reading.


Key Point: Breast tomosynthesis can visualize architectural distortions (ADs) better than digital mammography (DM), and also can detect ADs that are hidden on DM, thus increasing the cancer detection rate.


* Key Point: The authors conclude that the addition of one-view tomosynthesis to digital mammography improved the diagnostic accuracy and reduced the recall rate. However, the addition of two-view tomosynthesis to digital mammography resulted in twice the diagnostic performance gain at the same time further reducing the recall rate.


* Key Point: The authors conclude that the use of generated 2D images constituted an average dose reduction of 45% while not resulting in any clinically meaningful differences in diagnostic accuracy.


* Key Point: The authors conclude that the use of synthetic mammogram whether alone or in combination with tomosynthesis has similar diagnostic accuracy and may eliminate the need for FFDM in a routine clinical study. The authors also conclude that the use of synthetic mammogram reduces the radiation dose in patients that are undergoing tomosynthesis-based screening mammography.

2013


* Key Point: The study results demonstrated that obtaining both views is necessary to ensure that a cancer will be optimally visualized and derive the greatest potential benefit from tomosynthesis.

* Key Point: The authors conclude that DBT offers similar sensitivity and specificity compared to conventional digital mammography for the evaluation of noncalcified findings recalled from screening mammography. The authors also concluded that for more than 90% of the findings, two-view DBT was sufficient for further mammographic evaluation, and can replace conventional diagnostic mammography.


* Key Point: Tomosynthesis finds lesions occult on 2D mammography from screening, in diagnostic workup, or evaluation of palpable masses. Tomosynthesis can also be used for preoperative localization for obtaining a histologic diagnosis.


* Key Point: ~70% non-calced breast cancers are visualized only or better on tomosynthesis imaging in women with scattered and heterogeneously dense breasts. Cancers are visualized equally well on tomosynthesis and 2D mammography in women with fatty and extremely dense breasts.


* Key Point: Although DR is equivalent to SFM for breast screening among women aged 50–74 years, the cancer detection rate was significantly lower for DR making CR 21% less effective among all screening examinations. Screening programs should monitor the performance of CR separately and may consider informing women of the potentially lower cancer detection rates.


* Key Point: This large screening study results demonstrated that the addition of tomosynthesis resulted in reduction in recall rate with an increase in cancer detection rates. The authors further conclude that in this large prospective population, the screening outcomes significantly improved for 5 of 6 readers as measured by PPV1 and remained stable for 1 reader.


* Key Point: The study results demonstrated that combined 2D/3D mammography improves the cancer detection by 51% and also reduces the false-positive recall rates by 17%.


* Key Point: The authors conclude that cancers presenting with architectural distortion were detected significantly better with tomosynthesis as compared to digital mammography. Similar effect was observed in characterizing cancer morphology.


* Key Point: The authors conclude that 30% more cancers are detected by the addition of tomosynthesis to FFDM in their screening program. They also conclude that biopsy PPV3 improved with the addition of tomosynthesis to their practice.


* Key Point: The study concludes that the cancer detection rate increased by 12% after the addition of breast tomosynthesis to digital mammography.


* Key Point: The study results demonstrated a significant reduction in recall rates (~30%, the greatest reductions seen for women younger than 50 years old and in women with dense breasts) along with an increase in the cancer detection rate (9.5% overall) after the introduction of tomosynthesis in the clinical practice.


* Key Point: The study results show that digital breast tomosynthesis has a higher diagnostic accuracy of breast cancers compared to FFDM and Ultrasound, especially for parenchymal distortion and asymmetric density.


* Key Point: The authors conclude that screening with tomosynthesis demonstrates greater cost-effectiveness especially in younger women and women with dense breasts. The overall cost reduction of unnecessary diagnostic workups was ~17%.


* Key Point: The study results demonstrated an increase in the sensitivity and diagnostic accuracy in the detection of ILC using digital breast tomosynthesis. The effect was more pronounced in women with dense breasts.

* Key Point: The additional breast cancers detected by DBT show different radiological presentation and histology than breast cancers detected with DM, most commonly architectural distortions and tubular breast cancers.


* Key Point: The study concludes that the addition of DBT to conventional 2D screening mammography increases the cancer detection rate by 61%.


* Key Point: The authors conclude that the addition of tomosynthesis resulted in a lower number of images per diagnostic case that resulted in the faster patient diagnostic workup and so better patient throughput and resource utilization.


* Key Point: Radiologist performance for diagnostic accuracy and recall rate significantly improved for with the addition of tomosynthesis to digital mammography.


* Key Point: The authors conclude that the number of patients categorized as BI-RAD3 needing follow-up will be reduced with the use of tomosynthesis in diagnostic mammography.


* Key Point: The study results demonstrated a significant reduction in recall rates (~37%) along with an increase in the cancer detection rate (35% overall, 54% for invasive cancers) after the introduction of tomosynthesis in the clinical practice.


* Key Point: In a screening study involving over 12,000 women, the addition of tomosynthesis to digital mammography resulted in a 40% increase in the cancer detection rate for invasive cancers, and a simultaneous significant decrease in false-positive rate. The increase was observed across all breast densities.


* Key Point: The authors conclude that addition of tomosynthesis increases the interpretation time, but that the time is acceptable for high-volume screening. This time decreases with increasing experience, increasing the interpretation time by approximately 40% compared to FFDM.


* Key Point: Tomosynthesis significantly improved diagnostic accuracy for non-calcified lesions compared to supplemental mammographic views.

2012


* Key Point: At initial implementation, acquisition time and the reading time increased with the addition of tomosynthesis to digital mammography, and this was associated with the increase in screening accuracy.


* Key Point: Tomosynthesis demonstrates its capability to improve breast screening specificity and to reduce recall rates.


* Key Point: Tomosynthesis is superior to non-contrast CBCT for the identification and classification of non-calculated breast lesions, both malignant and benign. Additionally, readers were more confident characterizing lesions using tomosynthesis compared to CBCT.

Clinical Articles are highlighted in Bold. 

* Disclaimer: This is for informational purposes only and may or may not contain all the findings of the study.
(AB) Brandt K, Craig D, Henrichsen T, Bendel E, Brandt S. Tomosynthesis Compared to Diagnostic Mammography When Evaluating Abnormalities Identified at Screening Mammography. Presented at the ARRS 2012, Breast Imaging. 

* Key Point: Tomosynthesis had excellent agreement with digital mammography in the evaluation of abnormalities, without calcifications, identified at screening mammography, and showed the potential for a reduction in the number of required x-rays.


* Key Point: Screening with DBT may offer an opportunity to reduce cost, lower radiation dose, and improve workflow in the diagnostic breast imaging environment.


* Key Point: Digital breast tomosynthesis may offer improvements in sensitivity and specificity; however, larger prospective studies are warranted to improve power and generalizability of the possible benefits.


* Key Point: The 2D/3D breast tomosynthesis group showed significantly lower recall rates despite increased risk factors compared to the FFDM group, with additional cancers found.


* Key Point: DBT allows for more accurate tumor measurement compared to 2D. In addition, DBT measurement including tumor spicules more closely reflects final pathology measurements than measurement without tumor spicules.


* Key Point: In evaluating focal mammographic asymmetry, DBT had a better diagnostic performance than CC in terms of lesion visibility, nature and morphologic assessment. DBT also significantly increased the reader’s confidence with less need to proceed to US and mammography.


* Key Point: With experience, tomosynthesis-guided needle localization is a feasible and accurate method for histologic sampling of suspicious areas of tomosynthesis detected, mammographically and sonographically occult architectural distortion.


* Key Point: Tomosynthesis had excellent agreement with digital mammography in the evaluation of abnormalities, without calcifications, identified at screening mammography. The authors also suggest considering tomosynthesis in the diagnostic setting.


* Key Point: The authors conclude that tomosynthesis provides additional information compared to FFDM that allows the radiologist to classify the mammographic features and probabilities of malignancies more accurately.


* Key Point: Combined DBT and FFDM compared to FFDM resulted in near doubling of the interpretation time for all breast densities with the exception of extremely dense.


* Key Point: Combined DBT had a direct cost savings of $10,185 per 1,000 women screened resulting from decreased callback rates. Given that there also appears to be a trend for improved cancer detection rate, combined DBT appears to be preferable to FFDM alone for screening mammography.


* Key Point: Results show that adding Tomosynthesis increases the detection rate per 1000 from 1.5% to 2.33% - an increase of 55% and there are not significant differences among the three ACR density patterns 2, 3 and 4.


* Key Point: Tomosynthesis increases cancer detection rate not just in dense breasts but also in BI-RADS density 2 breasts.


* Key Point: The addition of tomosynthesis improved the diagnostic accuracy in the assessment of screen detected soft tissue lesions compared to full-field digital mammography and film-screen mammography combined and film-screen mammography alone.

* Key Point: Tomosynthesis reduces the recall rate by more than 40% when combined with 2D mammography than 2D mammography alone.


* Key Point: CEMRI is more accurate in determining local disease extent than DBT. On average CEMRI detects 3x as many additional lesions as DBT. A similar proportion of the additional lesions detected by each modality reflects atypical or malignant histology and results in a similar proportional change in management. DBT is more acceptable to patients than CEMRI.

(AB) Raghavan B, Rajmohan M, Sivaramalingam G. Role of breast tomosynthesis in the morphological analysis of breast lesions. Presented at ECR 2012, SS 602 Tomosynthesis and FFDM.

* Key Point: Tomosynthesis correlated more accurately than 2D digital mammograms with BI-RADS categorization from histopathological examinations; tomosynthesis also useful for morphological analysis of breast lesions.

(AB) Raghavan B, Selvakumar D. Role of Tomosynthesis in assessing the size of the breast lesion. Presented at ECR 2012, C-1045 Scientific exhibit.

* Key Point: This is a preliminary study that shows 3D mammography to be as reliable as 2D in predicting tumor size especially in stellate lesions and dense breast parenchyma, if it is measurable.


* Key Point: Adding tomosynthesis to FFDM reduced recall rates in a routine screening population by approximately 35%.


* Key Point: These preliminary results demonstrate that cancer detection increased while recall rates decreased after the introduction of breast tomosynthesis combined with full field digital mammography. In addition the positive predictive values for both recalls and biopsies increased.


* Key Point: Sensitivity was high for DBT alone. DBT + US mode decreased false positive biopsy recommendations; DBT + US mode improved accuracy over DBT alone for the less experienced reader, but was not statistically significant. Mean time for characterization of a mass with DBT and US for an experienced reader was about 2 minutes.


* Key Point: Additional TS in oblique mediolateral view after normal mammograms increases the detection rate from 1.96% to 2.42%. It can be useful not only in dense patterns (3&4), but also in scattered fibroglandular densities (pattern 2).


* Key Point: The authors conclude that there is the potential for increasing sensitivity using tomosynthesis, especially for cancers manifesting as spiculated masses and distortions.


* Key Point: We find that 2D + 3D provides higher diagnostic value compared with 2D alone. Mutual information analysis can specify the relative value of diagnostic information and is complementary to AUC analysis.

(AB) Zuley M. Diagnostic Accuracy of Tomosynthesis vs Mammographic Supplemental Views: Impact of Lesion Shape Perception. Presented at RSNA 2012, SSE02-08 Breast Imaging (Digital Breast Tomosynthesis).

* Key Point: Tomosynthesis enables improved diagnostic performance for non-calcified lesions in part but not entirely due to improved perception of lesion shape.

2011


* Key Point: Tomosynthesis reduces the recall rate by improving the detection and characterization of benign lesions.


* Key Point: Tomosynthesis plus FFDM could result in better performance.
(AB) Morel J, Iqbal A, Peacock C, Evans D, Wasan R, Rahim R, *Disclaimer: This is for informational purposes only and may or may not contain all the findings of the study.

Clinical Articles are highlighted in Bold. 
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2009


2008


2007


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2006

Mainprize JG, Bloomquist AK, Kempton MP, Yaffe MJ. Resolution at oblique incidence angles of a flat panel imager for breast tomosynthesis. Med Phys. 2006 Sep;33(9):3159-64.


2005


2004


2000

1998

1997