Diagnostica per Immagini

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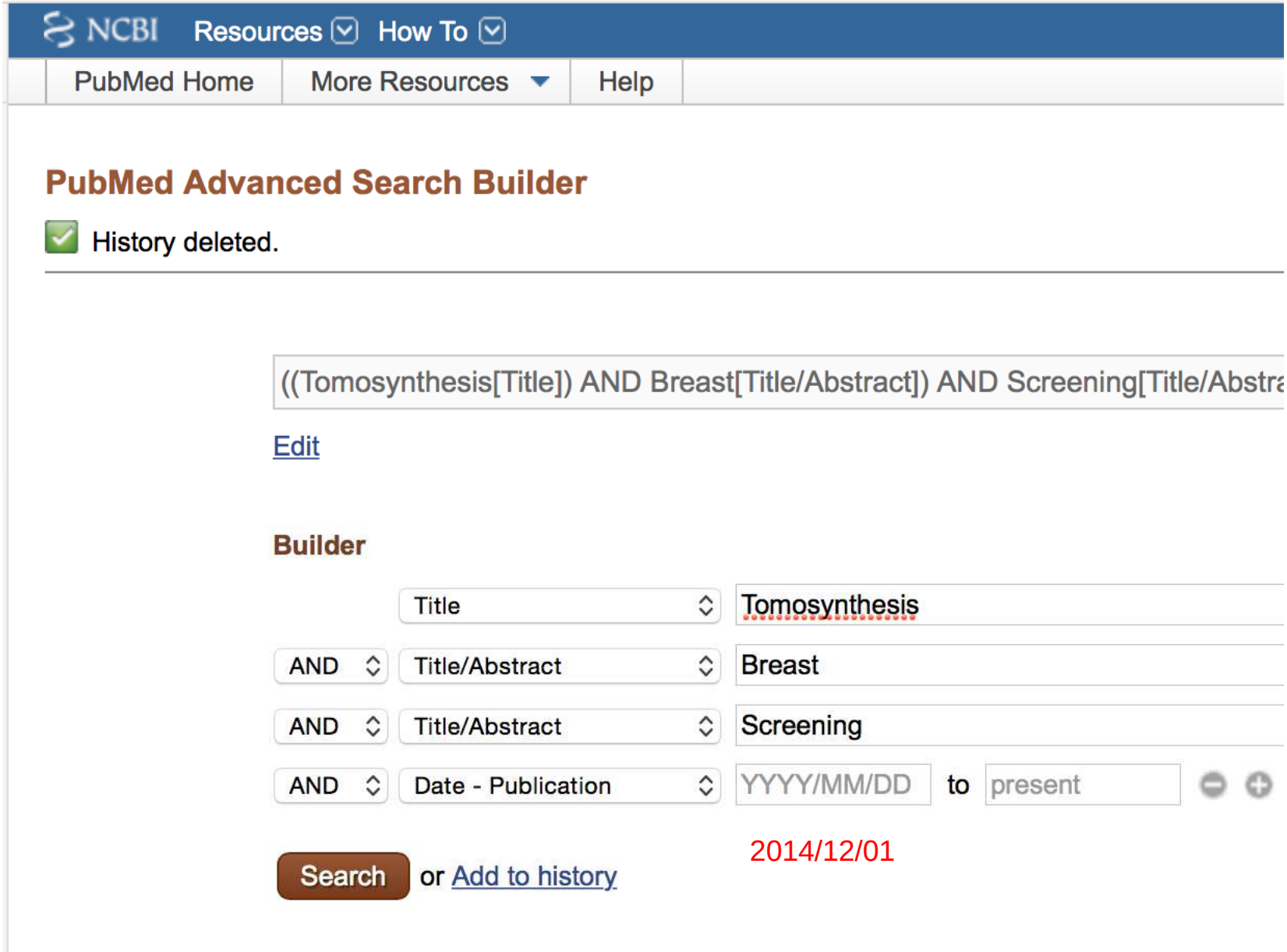
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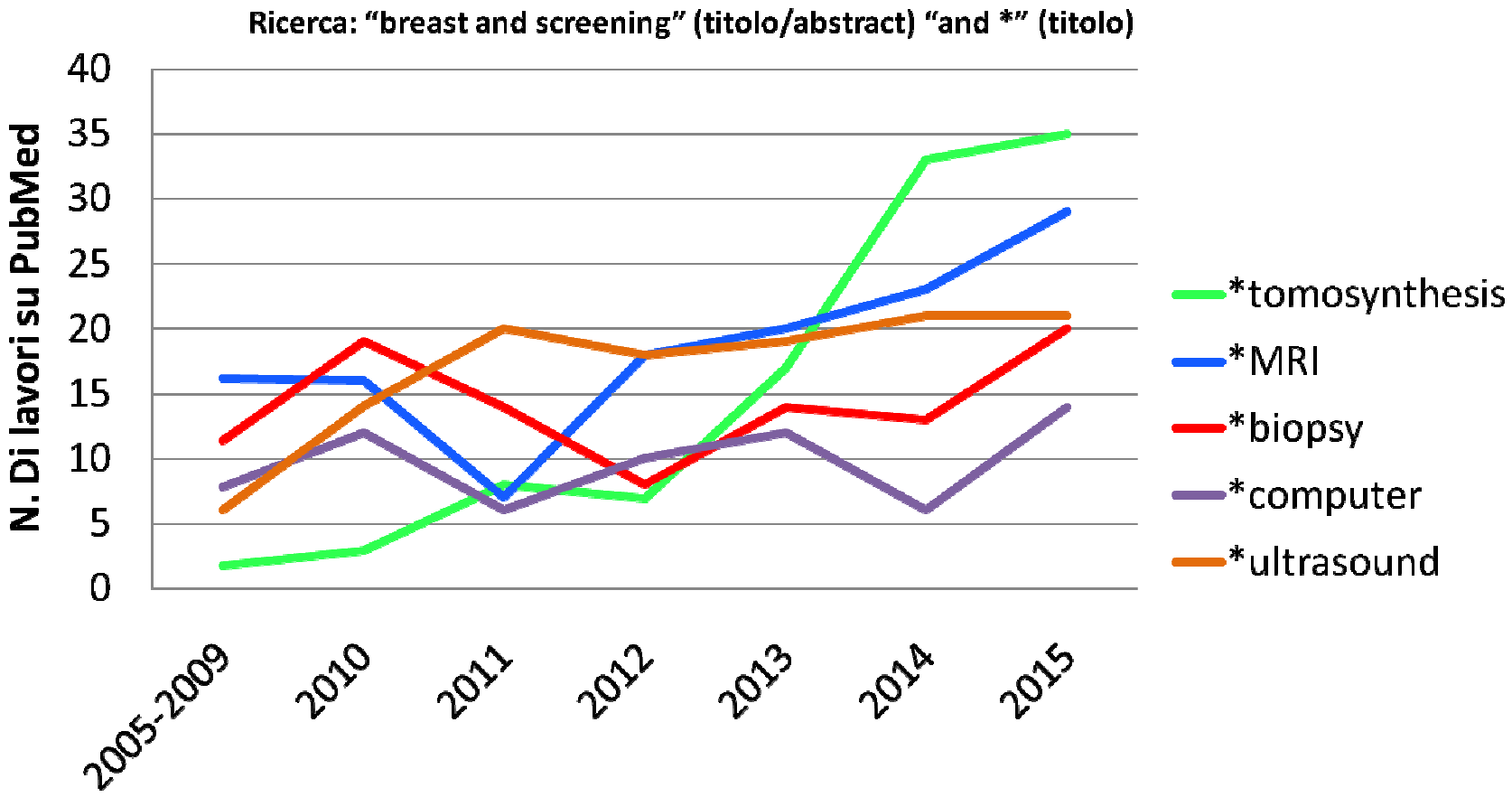

- Tomosintesi
- Risonanza Magnetica
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HEALTH TECHNOLOGY ASSESSMENT

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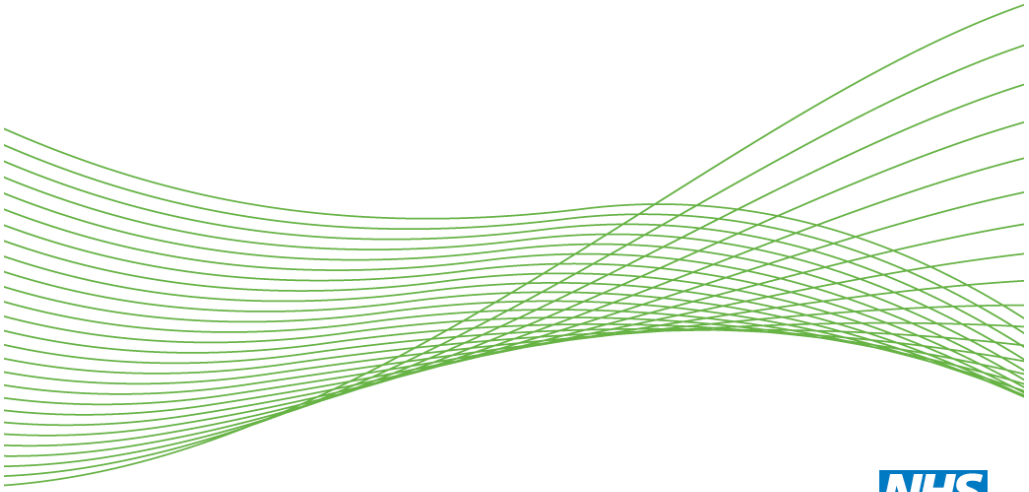
The TOMMY trial: a comparison of TOMosynthesis with digital MammographY in the UK NHS Breast Screening Programme – a multicentre retrospective reading study comparing the diagnostic performance of digital breast tomosynthesis and digital mammography with digital mammography alone

Fiona J Gilbert, Lorraine Tucker, Maureen GC Gillan, Paula Willsher, Julie Cooke, Karen A Duncan, Michael J Michell, Hilary M Dobson, Yit Yoong Lim, Hema Purushothaman, Celia Strudley, Susan M Astley, Oliver Morrish, Kenneth C Young and Stephen W Duffy



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Radiology. 2015 Dec;277(3):697-706. doi: 10.1148/radiol.2015142566. Epub 2015 Jul 15.

Accuracy of Digital Breast Tomosynthesis for Depicting Breast Cancer Subgroups in a UK Retrospective Reading Study (TOMMY Trial).

Gilbert FJ[1], Tucker L[1], Gillan MG[1], Willsher P[1], Cooke J[1], Duncan KA[1], Michell MJ[1], Dobson HM[1], Lim YY[1], Suaris T[1], Astley SM[1], Morrish O[1], Young KC[1], Duffy SW[1].

Author information

Abstract

Purpose To compare the diagnostic performance of two-dimensional (2D) mammography, 2D mammography plus digital breast tomosynthesis (DBT), and synthetic 2D mammography plus DBT in depicting malignant radiographic features. Materials and Methods In this multicenter, multireader, retrospective reading study (the TOMMY trial), after written informed consent was obtained, 8869 women (age range, 29-85 years; mean, 56 years) were recruited from July 2011 to March 2013 in an ethically approved study. From these women, a reading dataset of 7060 cases was randomly allocated for independent blinded review of (a) 2D mammography images, (b) 2D mammography plus DBT images, and (c) synthetic 2D mammography plus DBT images. Reviewers had no access to results of previous examinations. Overall sensitivities and specificities were calculated for younger women and those with dense breasts. Results Overall sensitivity was 87% for 2D mammography, 89% for 2D mammography plus DBT, and 88% for synthetic 2D mammography plus DBT. The addition of DBT was associated with a 34% increase in the odds of depicting cancer (odds ratio [OR] = 1.34, P = .06); however, this level did not achieve significance. For patients aged 50-59 years old, sensitivity was significantly higher (P = .01) for 2D mammography plus DBT than it was for 2D mammography. For those with breast density of 50% or more, sensitivity was 86% for 2D mammography compared with 93% for 2D mammography plus DBT (P = .03). Specificity was 57% for 2D mammography, 70% for 2D mammography plus DBT, and 72% for synthetic 2D mammography plusmDBT. Specificity was significantly higher than 2D mammography (P < .001in both cases) and was observed for all subgroups (P < .001 for all cases). Conclusion The addition of DBT increased the sensitivity of 2D mammography in patients with dense breasts and the specificity of 2D mammography for all subgroups. The use of synthetic 2D DBT demonstrated performance similar to that of standard 2D mammography with DBT. DBT is of potential benefit to screening programs, particularly in younger women with dense breasts. (©) RSNA, 2015.

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DOI 10.1007/s00330-015-3803-3

BREAST

Performance of one-view breast tomosynthesis as a stand-alone breast cancer screening modality: results from the Malmö Breast Tomosynthesis Screening Trial, a population-based study

Kristina Lång[1] · Ingvar Andersson[1] · Aldana Rosso[2] · Anders Tingberg[3] · Pontus Timberg[3] · Sophia Zackrisson[1]

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Abstract

Objective To assess the performance of one-view digital breast tomosynthesis (DBT) in breast cancer screening.

Methods The Malmö Breast Tomosynthesis Screening Trial is a prospective population-based one-arm study with a planned inclusion of 15000 participants; a random sample of women aged 40–74 years eligible for the screening programme. This is an explorative analysis of the first half of the study population (n=7500). Participants underwent one-view DBT and two-view digital mammography (DM), with independent double reading and scoring. Primary outcome measures were detection rate, recall rate and positive predictive value (PPV). McNemar's test with 95 % confidence intervals was used.

Results Breast cancer was found in sixty-eight women. Of these, 46 cases were detected by both modalities, 21 by DBT alone and one by DM alone. The detection rate for one-view DBT was 8.9/1000 screens (95 % CI 6.9 to 11.3) and 6.3/1000 screens (4.6 to 8.3) for two-view DM ($p< 0.0001$). The recall rate after arbitration was 3.8 % (3.3 to 4.2) for DBT and 2.6 % (2.3 to 3.0) for DM ($p<0.0001$). The PPV was 24 % for both DBT and DM.

Conclusion Our results suggest that one-view DBT might be feasible as a stand-alone screening modality.

Key Points

- *One-view DBT as a stand-alone breast cancer screening modality has not been investigated.*
- *One-view DBT increased the cancer detection rate significantly.*
- *The recall rate increased significantly but was still low.*
- *Breast cancer screening with one-view DBT as a stand-alone modality seems feasible.*

Keywords Mammography · Screening · Diagnostic Imaging · Breast Cancer · Women' Health

Introduction

Population-based breast cancer screening with digital mammography (DM) has the potential to reduce breast cancer mortality [1]. Still, 15-30 % of all cancers may be missed, mainly due to the anatomic noise of the breast, i.e., normal breast tissue overlapping and obscuring the lesion of interest [2, 3].

Breast Cancer: Computer-aided Detection with Digital Breast Tomosynthesis[1]

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Purpose: To evaluate a commercial tomosynthesis computer-aided detection (CAD) system in an independent, multicenter dataset.

Materials and Methods: Diagnostic and screening tomosynthesis mammographic examinations (n = 175; cranial caudal and mediolateral oblique) were randomly selected from a previous institutional review board–approved trial. All subjects gave informed consent. Examinations were performed in three centers and included 123 patients, with 132 biopsy-proven screening-detected cancers, and 52 examinations with negative results at 1-year follow-up. One hundred eleven lesions were masses and/or microcalcifications (72 masses, 22 microcalcifications, 17 masses with microcalcifications) and 21 were architectural distortions. Lesions were annotated by radiologists who were aware of all available reports. CAD performance was assessed as per-lesion sensitivity and false-positive results per volume in patients with negative results.

Results: Use of the CAD system showed per-lesion sensitivity of 89% (99 of 111; 95% confidence interval: 81%, 94%), with 2.7 ± 1.8 false-positive rate per view, 62 of 72 lesions detected were masses, 20 of 22 were microcalcification clusters, and 17 of 17 were masses with microcalcifications. Overall, 37 of 39 microcalcification clusters (95% sensitivity, 95% confidence interval: 81%, 99%) and 79 of 89 masses (89% sensitivity, 95% confidence interval: 80%, 94%) were detected with the CAD system. On average, 0.5 false-positive rate per view were microcalcification clusters, 2.1 were masses, and 0.1 were masses and microcalcifications.

Conclusion: A digital breast tomosynthesis CAD system can allow detection of a large percentage (89%, 99 of 111) of breast cancers manifesting as masses and microcalcification clusters, with an acceptable false-positive rate (2.7 per breast view). Further studies with larger datasets acquired with equipment from multiple vendors are needed to replicate the findings and to study the interaction of radiologists and CAD systems.

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Radiology

Radiology

Digital Breast Tomosynthesis:
State of the Art[1]

Srinivasan Vedantham, PhD
Andrew Karellas, PhD
Gopal R. Vijayaraghavan, MD, MPH
Daniel B. Kopans, MD

Online SA-CME
See www.rsna.org/education/search/ry

Learning Objectives:

After reading the article and taking the test, the reader will be able to:

- Discuss the rationale for the use of digital breast

This topical review on digital breast tomosynthesis (DBT) is provided with the intent of describing the state of the art in terms of technology, results from recent clinical studies, advanced applications, and ongoing efforts to develop multimodality imaging systems that include DBT. Particular emphasis is placed on clinical studies. The observations of increase in cancer detection rates, particularly for invasive cancers, and the reduction in false-positive rates with DBT in prospective trials indicate its benefit for breast cancer screening. Retrospective multireader multicase studies show either noninferiority or superiority of DBT compared with mammography. Methods to curtail radiation dose are of importance.

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Digital breast tomosynthesis (3D-mammography) screening: data and implications for population screening

Expert Rev. Med. Devices 12(4), 377–379 (2015)

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The evidence on digital breast tomosynthesis (DBT), or quasi-3D-mammography, for population breast screening has emerged rapidly: two prospective and several retrospective studies provide convincing evidence that mammography with DBT improves screening detection measures compared with standard mammography. Based on population screening studies (which have used various methodologies), adjunct DBT's incremental breast cancer detection is in the range of 0.5–2.7/1000 screens, and the absolute false recall reduction attributed to DBT is in the range of 0.8–3.6%. Randomized controlled trials assessing the impact of DBT on interval cancer rates as a surrogate for screening benefit would provide critical evidence to underpin population screening policy and practice, and could be designed to also address existing evidence gaps including cost–effectiveness of DBT.

28 November 2015

- Tomosintesi
- Risonanza Magnetica
- Biopsie
- Computer/Software
- US/Altro

Eur J Radiol. 2015 Jan;84(1):65-70. doi: 10.1016/j.ejrad.2014.10.004. Epub 2014 Oct 16.

Abbreviated protocol for breast MRI: are multiple sequences needed for cancer detection?

Mango VL[1], Morris EA[2], David Dershaw D[3], Abramson A[4], Fry C[5], Moskowitz CS[6], Hughes M[7], Kaplan J[8], Jochelson MS[9].

Author information

Abstract

OBJECTIVE: To evaluate the ability of an abbreviated breast magnetic resonance imaging (MRI) protocol, consisting of a precontrast T1 weighted (T1W) image and single early post-contrast T1W image, to detect breast carcinoma.

MATERIALS AND METHODS: A HIPAA compliant Institutional Review Board approved review of 100 consecutive breast MRI examinations in patients with biopsy proven unicentric breast carcinoma. 79% were invasive carcinomas and 21% were ductal carcinoma in situ. Four experienced breast radiologists, blinded to carcinoma location, history and prior examinations, assessed the abbreviated protocol evaluating only the first post-contrast T1W image, post-processed subtracted first post-contrast and subtraction maximum intensity projection images. Detection and localization of tumor were compared to the standard full diagnostic examination consisting of 13 pre-contrast, post-contrast and post-processed sequences.

RESULTS: All 100 cancers were visualized on initial reading of the abbreviated protocol by at least one reader. The mean sensitivity for each sequence was 96% for the first post-contrast sequence, 96% for the first post-contrast subtraction sequence and 93% for the subtraction MIP sequence. Within each sequence, there was no significant difference between the sensitivities among the 4 readers (p=0.471, p=0.656, p=0.139). Mean interpretation time was 44s (range 11-167s). The abbreviated imaging protocol could be performed in approximately 10-15 min, compared to 30-40 min for the standard protocol.

CONCLUSION: An abbreviated breast MRI protocol allows detection of breast carcinoma. One pre and post-contrast T1W sequence may be adequate for detecting breast carcinoma. These results support the possibility of refining breast MRI

J Am Coll Radiol. 2015 Oct 27. pii: S1546-1440(15)00832-7. doi: 10.1016/j.jacr.2015.08.015. [Epub ahead of print]

An Abbreviated Protocol for High-Risk Screening Breast MRI Saves Time and Resources.

Harvey SC[1], Di Carlo PA[2], Lee B[2], Obadina E[2], Sippo D[3], Mullen L[2].

Author information

Abstract

PURPOSE: To review the ability of an abbreviated, high-risk, screening, breast MRI protocol to detect cancer and save resources.

METHODS: High-risk screening breast MR images were reviewed, from both an abbreviated protocol and a full diagnostic protocol. Differences in cancer detection, scanner utilization, interpretation times, and need for additional imaging were recorded in an integrated data form, and reviewed and compared.

RESULTS: A total of 568 MRI cases were reviewed, with the abbreviated and full protocols. No difference was found in the number of cancers detected. Scan times were decreased by 18.8 minutes per case, for a total of 10,678 minutes (178 hours). Interpretation time, on average, was 1.55 minutes for the abbreviated protocol, compared with 6.43 minutes for the full protocol. Review of the full protocol led to a significant change in the final BI-RADS® assessment in 12 of 568 (2.1%) cases.

CONCLUSIONS: Abbreviated MRI is as effective as full-protocol MRI for demonstration of cancers in the high-risk screening setting, with only 12 (2.1 %) cases recommended for additional MRI evaluation. The efficiency and resource savings of an abbreviated protocol would be significant, and would allow for opportunities to provide MRI for additional patients, as well as improved radiologist time management and workflow, with the potential to add real-time MRI interpretation or double reading.

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Clin Cancer Res. 2015 Oct 26. pii: clincanres.0459.2015. [Epub ahead of print]

Triple negative versus non-triple negative breast cancers in high-risk women: Phenotype features and survival from the HIBCRIT-1 MRI-including screening study.

Podo F[1], Santoro F[2], Di Leo G[3], Manoukian S[4], De Giacomi C[5], Corcione S[6], Cortesi L[7], Carbonaro LA[3], Trimboli RM[3], Cilotti A[8], Preda L[9], Bonanni B[10], Pensabene M[11], Martincich L[12], Savarese A[13], Contegiacomo A[11], Sardanelli F[14].

Author information

Abstract

PURPOSE: To compare phenotype features and survival of triple negative breast cancers (TNBCs) versus non-TNBCs detected during a multimodal annual screening of high-risk women.

EXPERIMENTAL DESIGN: Analysis of data from asymptomatic high-risk women diagnosed with invasive breast cancer during the HIBCRIT-1 study with median 9.7-year follow-up.

RESULTS: Of 501 enrolled women with BRCA1/2 mutation or strong family history (SFH), 44 were diagnosed with invasive BCs: 20 BRCA1 (45%), 9 BRCA2 (21%), 15 SFH (34%).Magnetic resonance imaging sensitivity (90%) outperformed that of mammography (43%, P<0.001) and ultrasonography (61%, P=0.004). The 44 cases (41 screen-detected; 3 BRCA1-associated interval TNBCs) comprised 14 TNBCs (32%) and 30 non-TNBCs (68%), without significant differences for age at diagnosis, menopausal status, prophylactic oophorectomy, or previous BC. Of 14 TNBC patients, 11 (79%) were BRCA1; of the 20 BRCA1 patients, 11 (55%) had TNBC; of 15 SFH patients, 14 (93%) had non-TNBCs (P=0.007). Invasive ductal carcinomas (IDCs) were 86% for TNBCs versus 43% for non-TNBCs (P=0.010), G3 IDCs 71% versus 23% (P=0.006), size 16±5 mm versus 12±6 mm (P=0.007). TNBC patients had more frequently ipsilateral mastectomy (79% versus 43% for non-TNBCs, P = 0.050), contralateral prophylactic mastectomy (43% versus 10%, P = 0.019) and adjuvant chemotherapy (100% versus 44%, P<0.001). The 5-year overall survival was 86±9% for TNBCs versus 93±5% (P= 0.946) for non-TNBCs; 5-year disease-free survival 77±12% versus 76±8% (P= 0.216).

CONCLUSIONS: In high risk women, combining an MRI-including annual screening with adequate treatment, the usually reported gap in outcome between TNBCs and non-TNBCs could be reduced.

J Med Imaging Radiat Oncol. 2015 Jun;59(3):312-9. doi: 10.1111/1754-9485.12281. Epub 2015 Feb 23.

Mammographically screen-detected asymmetric densities with architectural distortion and normal ultrasound at assessment: Value of MRI as a problem-solving tool.

Price J[1,2], Chen SW[1].

Author information

Abstract

Four cases are presented in which asymptomatic clients from an Australian mammography screening programme (BreastScreen ACT) were recalled for assessment of an asymmetric density with possible architectural distortion. In all four women, mammographic work-up was equivocal and ultrasound showed no suspicious correlate for biopsy. It was then doubtful as to whether any significant lesion was present. In all four cases, MRI revealed the presence of malignancy. Breast MRI can be a useful problem-solving tool in the work-up of such cases.

- Tomosintesi
- Risonanza Magnetica
- Biopsie
- Computer/Software
- US/Altro

Radiology. 2015 Apr;275(1):54-60. doi: 10.1148/radiol.14140036. Epub 2014 Nov 25.

Breast cancer detection with short-interval follow-up compared with return to annual screening in patients with benign stereotactic or US-guided breast biopsy results.

Johnson JM[1], Johnson AK, O'Meara ES, Miglioretti DL, Geller BM, Hotaling EN, Herschorn SD.

Author information

Abstract

PURPOSE: To compare the cancer detection rate and stage after benign stereotactic or ultrasonography (US)-guided core breast biopsy between patients with short-interval follow-up (SIFU) and those who return to annual screening.

MATERIALS AND METHODS: The Breast Cancer Surveillance Consortium (BCSC) registry and the BCSC Statistical Coordinating Center received institutional review board approval for active and passive consent processes and a waiver of consent. All procedures were HIPAA compliant. BCSC data for 1994-2010 were used to compare ipsilateral breast cancer detection rates and tumor characteristics for diagnoses within 3 months after SIFU (3-8 months) versus return to annual screening (RTAS) mammography (9-18 months) after receiving a benign pathology result from image-guided breast biopsy.

RESULTS: In total, 17 631 biopsies with benign findings were identified with SIFU or RTAS imaging. In the SIFU group, 27 ipsilateral breast cancers were diagnosed in 10 715 mammographic examinations (2.5 cancers per 1000 examinations) compared with 16 cancers in 6916 mammographic examinations in the RTAS group (2.3 cancers per 1000 examinations) (P = .88). Sixteen cancers after SIFU (59%; 95% confidence interval [CI]: 39%, 78%) were invasive versus 12 after RTAS (75%; 95% CI: 48%, 93%). The invasive cancer rate was 1.5 per 1000 examinations after SIFU (95% CI: 0.9, 2.4) and 1.7 per 1000 examinations (95% CI: 0.9, 3.0) after RTAS (P = .70). Among invasive cancers, 25% were late stage (stage 2B, 3, or 4) in the SIFU group (95% CI: 7%, 52%) versus 27% in the RTAS group (95% CI: 6%, 61%). Positive lymph nodes were found in seven (44%; 95% CI: 20%, 70%) invasive cancers after SIFU and in three (25%; 95% CI: 5%, 57%) invasive cancers after RTAS.

CONCLUSION: Similar rates of cancer detection were found between SIFU and RTAS after benign breast biopsy with no significant differences in stage, tumor size, or nodal status, although the present study was limited by sample size. These findings suggest that patients with benign radiologic-pathologic-concordant percutaneous breast biopsy results could return to annual screening.

- Tomosintesi
- Risonanza Magnetica
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- Computer/Software
- US/Altro

Eur Radiol
DOI 10.1007/s00330-015-3784-2

BREAST

Mammographic density: Comparison of visual assessment with fully automatic calculation on a multivendor dataset

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Abstract

Objectives To compare breast density (BD) assessment provided by an automated BD evaluator (ABDE) with that provided by a panel of experienced breast radiologists, on a multivendor dataset.

Methods Twenty-one radiologists assessed 613 screening/diagnostic digital mammograms from nine centers and six different vendors, using the BI-RADS *a*, *b*, *c*, and *d* density classification. The same mammograms were also evaluated by an ABDE providing the ratio between fibroglandular and total breast area on a continuous scale and, automatically, the BI-RADS score. A panel majority report (PMR) was used as reference standard. Agreement (κ) and accuracy (proportion of cases correctly classified) were calculated for binary (BI-RADS *a*-*b* versus *c*-*d*) and 4-class classification.

Results While the agreement of individual radiologists with the PMR ranged from κ=0.483 to κ=0.885, the ABDE correctly classified 563/613 mammograms (92 %). A substantial agreement for binary classification was found for individual reader pairs (κ=0.620, standard deviation [SD]=0.140), individual versus PMR (κ=0.736, SD=0.117), and individual versus ABDE (κ=0.674, SD=0.095). Agreement between ABDE and PMR was almost perfect (κ=0.831).

Conclusions The ABDE showed an almost perfect agreement with a 21-radiologist panel in binary BD classification on a multivendor dataset, earning a chance as a reproducible alternative to visual evaluation.

- Tomosintesi
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Med Phys. 2015 Apr;42(4):1498-504. doi: 10.1118/1.4914162.

Computer-aided detection of breast cancers using Haar-like features in automated 3D breast ultrasound.

Tan T[1], Mordang JJ[1], van Zelst J[1], Grivegnée A[2], Gubern-Mérida A[1], Melendez J[1], Mann RM[1], Zhang W[3], Platel B[1], Karssemeijer N[1].

Author information

Abstract

PURPOSE: Automated 3D breast ultrasound (ABUS) has gained interest in breast imaging. Especially for screening women with dense breasts, ABUS appears to be beneficial. However, since the amount of data generated is large, the risk of oversight errors is substantial. Computer aided detection (CADe) may be used as a second reader to prevent oversight errors. When CADe is used in this fashion, it is essential that small cancers are detected, while the number of false positive findings should remain acceptable. In this work, the authors improve their previously developed CADe system in the initial candidate detection stage.

METHODS: The authors use a large number of 2D Haar-like features to differentiate lesion structures from false positives. Using a cascade of GentleBoost classifiers that combines these features, a likelihood score, highly specific for small cancers, can be efficiently computed. The likelihood scores are added to the previously developed voxel features to improve detection.

RESULTS: The method was tested in a dataset of 414 ABUS volumes with 211 cancers. Cancers had a mean size of 14.72 mm. Free-response receiver operating characteristic analysis was performed to evaluate the performance of the algorithm with and without using the aforementioned Haar-like feature likelihood scores. After the initial detection stage, the number of missed cancer was reduced by 18.8% after adding Haar-like feature likelihood scores.

CONCLUSIONS: The proposed technique significantly improves our previously developed CADe system in the initial candidate detection stage.

Grazie per l'Attenzione!

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