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20 FEBRUARY 2023

Departments and research

# Fingerprint breakthrough in breast cancer detection

- A team of scientists from Sheffield Hallam University has successfully developed a pioneering non-invasive method for detecting breast cancer from fingerprints, with 98% accuracy
- The researchers found that technology called Matrix Assisted Laser Desorption Ionisation Mass Spectrometry (MALDI MS) can be applied to enhanced fingerprints for the detection of breast cancer. The technology is normally used to map drugs, pharmaceuticals and biological molecules within tissue sections.
- A cohort of women with benign, early or metastatic breast cancer was recruited from Doncaster Royal Infirmary's Jasmine Breast Unit, with fingertip smears taken from each patient either at diagnosis or during active treatment. Subsequent machine learning was applied, predicting the correct category of cancer with 97.8% accuracy.
- Breast cancer annually affects 2.3 million people across the world and causes more than 600,000 deaths. It is the most common cancer in British women. NHS figures have revealed that 1.2 million women — 37 per cent of those invited — did not turn up for breast cancer screening in England last year. The latest developments have potential to increase uptake in breast cancer screenings and help reduce NHS backlog.

- Traditional methods of screening and detection, such as mammography and biopsy, are effective but can expose individuals to radiation, have limitations to specificity and can cause discomfort.
- Some patients also find existing screening painful or culturally unacceptable, with mammograms requiring a patient to expose their breasts.
- The research team is led by Sheffield Hallam's Professor Simona Francese and includes Lynda Wyld, Professor of Surgical Oncology at the University of Sheffield and consultant oncoplastic surgeon at Doncaster Royal Infirmary, Dr Cristina Russo from Middlesex University, Dr Charles Bury from Medicines Discovery Catapult, Dr Cameron Heaton from Foster+Freeman, and Dr Laura Cole and Dr Marjory Da Costa-Abreu from Sheffield Hallam University.
- Professor Francese said: "This proof-of-concept study is at the interface of forensic science and clinical diagnostics and shows that fingerprints are valuable not only to obtain intelligence to profile criminal offenders but also to diagnose pathologies. At a time where the NHS is understaffed and with considerable backlogs, a painless, quick and non-invasive method to screen for breast cancer collecting the sample in the comfort of the home is highly desirable.
- "These are exciting findings and, given the potential impact, we must pursue validation for a future rollout. It would be reckless not to fund this follow-up work."
- Professor Wyld said: "This novel technique is still at an early stage in its development but the results are very promising. We plan to undertake some more research to confirm these findings on a large group of women but if the findings are confirmed the technique holds great potential both for the screening and diagnosis of breast cancer but also for monitoring how well treatments such as chemotherapy are working. This would potentially save women having regular CT body scans every few months. The fact that the technique only requires a finger tip smears, which are easy to transport and perform, may also make breast screening and diagnosis more accessible."
- It is the latest development from Sheffield Hallam University's Centre for Mass Spectrometry Imaging, Biomolecular Sciences Research Centre, which, amongst other, is carrying out ongoing research into how fingerprint technology can provide crime investigators with additional biometric information about a criminal's activities prior to committing a crime.

Perspective > Medscape Ob/Gyn > Manson on Women's Health

COMMENTARY

## Exercise and CVD: Timing Isn't Everything

JoAnn E. Manson, MD, DrPH

DISCLOSURES | August 22, 2023

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### Recommendation

The Year In Medicine 2023  
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Chronic Co

- This is Dr JoAnn Manson, professor of medicine at Harvard Medical School and Brigham and Women's Hospital. I'd like to talk with you about a [recent report](#) in *JAMA* on exercise and cardiovascular disease (CVD), trying to disentangle the role of the total amount or volume of moderate to vigorous physical activity weekly vs the frequency or pattern of activity. The latter means whether the activity is equally distributed across the week or tends to occur on only 1-2 days, such as a "weekend warrior" pattern.
- This was a very large study done in the UK Biobank, including 90,000 men and women with a mean age of 62 years. An objective measure of physical activity was done through accelerometers for 1 week, and then they looked at the incidence CVD events over about 6 years. They classified the participants as either meeting the guidelines for moderate to vigorous physical activity of at least 2.5 hours per week, or being physically inactive. They further subdivided the physically active group into those who had an equal distribution of their activity throughout the week vs those whose activity was concentrated into 1-2 days of the week.
- They found that both of the active groups, whether they had fairly equal distribution of activity across the week or tended to concentrate their activity into 1-2 days during the week, had similar reductions in CVD. The CVD reductions were quite substantial for [myocardial infarction](#); close to 30% reduction for [heart failure](#), a 35%-40% lower risk for [atrial fibrillation](#), and about a 20% reduction in [stroke](#). The numbers were very similar in the two active groups compared with the inactive groups.

- They also did a separate analysis using a threshold for moderate to vigorous activity of 4 hours per week instead of 2.5 hours per week, with very similar results. Another important finding was that the women in the study tended to be much less active than the men. The percentages of women who were classified as inactive or not meeting activity guidelines was about 40% compared with 26% of the men.
- The message that being active only 1-2 days of the week (and not necessarily spread out evenly across the week) is very helpful. It's important for cardiovascular health and should be highlighted with women in particular, because women often have greater challenges finding the time to exercise regularly throughout the week.
- We know that exercise is as close to a magic bullet as we've found in modern medicine, and this study focused on CVD. But other studies have documented that physical activity is linked to lower risk for [type 2 diabetes](#), [osteoporosis](#), several forms of cancer, and even cognitive decline. So this is a very important message for patients — that exercising has major benefits, even if it can't be done every day of the week, as long as they are meeting the guidelines for total amount of moderate to vigorous physical activity. It seems to be fine if it's concentrated in only 1-2 days of the week. This message can provide more flexibility for patients in achieving physical

IMAGING INFORMATICS | ADVANCED VISUALIZATION | IMAGE PROCESSING

# ISCT 2023: Quantitative CT: Not just for bone scanning

Kate Madden Yee

Sep 12, 2023



- Quantitative CT is increasingly being used in applications beyond diagnosing and tracking osteoporosis, according to a presentation on September 8 at the International Society of Computed Tomography (ISCT) 2023 meeting in San Diego.
- "The terminology of 'quantitative CT' has greatly broadened in recent years to include measurement of many other properties on CT images, including physiologic processes that occur over time," said presenter Andrew Smith, MD, PhD, of University of Alabama at Birmingham.
- Interpretation of radiologic images, including CT, has largely been based on subjective observations -- which are prone to interobserver variability and can be inaccurate, Smith told *AuntMinnie.com*.
- "The field of radiology is moving more toward objective measures, which improves accuracy, precision, and interobserver agreement," he said.

- Smith offered session attendees an overview of how data obtained from quantitative CT imaging can contribute to patient care:

-AI body composition analysis as the result of opportunistic screening. Identifying cardiomegaly, emphysema, or interstitial lung disease from CT scans patients undergo for other indications.

-Natural language processing or large language model quantification from CT reports. For example, managing abdominal aortic aneurysm and quantifying adrenal nodules.

-Functional CT. Using the modality to study dynamic physiologic processes in the body such as stroke perfusion (quickly identifying ischemia, differentiating core from penumbra, assessing collateral flow); cardiac strain (assessing myocardial mass, wall thickness, and wall motion); and coronary CT angiography fractional flow reserve (determining the hemodynamic significance of coronary artery stenosis, assessing patient risk of disease, and reducing the use of invasive coronary angiography).

-Assessing disease severity. Evaluating ischemic stroke, staging chronic liver disease (including the severity of cirrhosis and identifying portal hypertension), and staging pulmonary fibrosis.

-AI lesion detection and quantification. Quantifying lung nodules (incidental, those identified on lung cancer screening, and metastatic disease).

-AI quantification of advanced cancer tumor burden. Producing fully automated, standardized reports quickly, with higher accuracy, interobserver agreement, and the elimination of data transfer errors.

Because objective measurements are better than subjective, quantitative CT improves patient care, Smith said.

- "CT imaging is becoming more quantitative due to advances in image processing, including new techniques [such as] photon-counting CT that were not previously possible," he concluded. "In addition, image-processing techniques such as AI have advanced and allowed us to measure things that could not have previously been measured."

CLINICAL NEWS

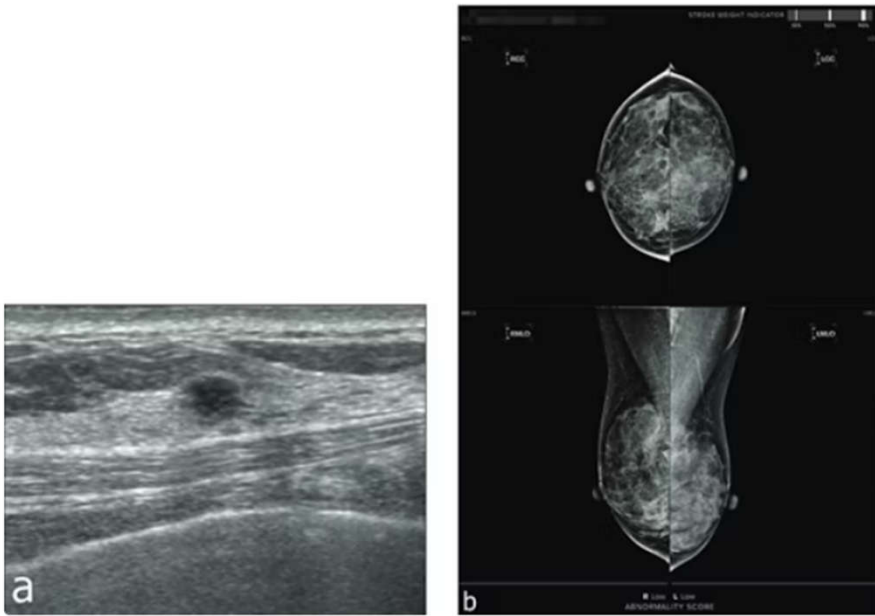
# AI doesn't improve breast cancer screening in dense breasts

Amerigo Allegretto

Jul 25, 2023



- When it comes to screening of women with dense breasts, AI doesn't yield an improvement in performance over the combination of mammography and ultrasound without AI, according to research published July 26 in the *American Journal of Roentgenology*.
- A team led by Si Eun Lee, MD, from Yonsei University in Yongin-si, South Korea, found that mammography with supplementary breast ultrasound had higher accuracy and specificity, as well as lower recall rate compared to mammography with AI and mammography with both ultrasound and AI.
- "The findings fail to show a benefit of AI when performed in addition to supplementary ultrasound in patients with dense breasts undergoing screening mammography," Lee and co-authors wrote.
- Standard mammography alone is not enough to definitively find breast cancer in women with dense breasts. For these women, supplementary imaging methods are used following mammography, with ultrasound being the most commonly used modality.
- Previous research suggests that in the breast imaging setting, AI can aid radiologists in an adjunct role by helping with diagnosis. However, the researchers noted that results vary depending on the AI platform used.
- For their current study, Lee and colleagues wanted to compare the performances of screening mammography, AI, and supplementary ultrasound by themselves as well as in combination with one another. It included retrospective data from 1,325 women with an average age of 53 years and who have dense breasts. The women underwent both mammography and ultrasound within a one-month interval in 2017. The team also used a commercially available AI tool (Insight version 1.1.0.0, Lunit) to assess the mammography exams.



Images show results for a 57-year-old woman with dense breasts. Screening mammography (not shown) was assessed as BI-RADS category 2. (A) Supplementary screening breast ultrasound performed on same day as the mammogram shows a 4-mm round hypoechoic mass with angular margins in the right upper medial breast. (B) A screenshot shows the output of an AI tool, which assigned an abnormality score of "low" in each breast. Ultrasound-guided core biopsy and surgery showed an invasive ductal carcinoma, not otherwise specified (Luminal A, histologic grade I). This case represents a false-negative AI result. Image courtesy of ARRS.

The researchers reported that 12 cancers were diagnosed, including six invasive ductal carcinomas and six ductal carcinomas in situ (DCIS).

For standalone performance among the three methods, mammography demonstrated the highest accuracy (95.9%), specificity (96.2%), and sensitivity (96.2%). It also had the lowest recall rate at 4.4%. While AI had the highest cancer detection rate at 6.8 per 1,000 women, it also had the highest recall rate among the three methods at 11.9%.

When evaluating different combinations of the three methods, the researchers found that mammography with ultrasound outperformed other combinations.

Performance comparisons for combinations of mammography, ultrasound, and AI

	Mammography with AI and ultrasound	Mammography with AI	Mammography with ultrasound
Cancer detection rate	9.1	7.5	9.1
Recall rate	21.4	14.9	11.7
Sensitivity	100%	83.3%	100%
Specificity	79.4%	85.8%	89.1%
Accuracy	79.5%	85.7%	89.2%

*\*All data achieved statistical significance, except for recall rate and sensitivity (both  $p > 0.05$ ).*

The researchers also reported that while ultrasound showed significantly improved measures over AI alone in women over the age of 50, these results were not significantly different in women under the age of 50. Additionally, mammography with AI and mammography with ultrasound showed no significant differences in recall rate, specificity, or accuracy in women under 50 years old.

The study authors wrote that this may be because younger women have denser breasts than older women, which usually changes the breast echotexture on ultrasound and adds to the challenge of interpreting breast images in these women.

However, AI did have its wins in the study. Although overall sensitivity between mammography and AI was not significantly different, AI detected one invasive ductal carcinoma and one DCIS that were missed on mammography. The researchers reported that one of these missed cancers was visible on mammography in a retrospective review.

AI, however, also missed three cancers, including one DCIS that showed grouped microcalcifications on mammography and two cancers deemed to be occult retrospective mammographic review but visible as masses on ultrasound.

The study authors suggested that based on their findings, the inclusion of AI is not an added benefit for breast cancer screening for women with dense breasts.

CLINICAL NEWS

## **AI model uses diverse data to predict breast cancer**

Amerigo Allegretto

Jul 25, 2023

- A deep-learning model trained on mammography data from an ethnically diverse population can predict a women's future risk of breast cancer better than existing methods, according to research published July 26 in *Radiology: Artificial Intelligence*.
- A team led by Hiroyuki Abe, MD, PhD, and Dezheng Huo, MD, PhD, from the University of Chicago found that its model showed discriminatory ability for predicting low- and intermediate-grade versus high-grade breast cancers.
- "The model performed well in breast cancer risk prediction, and our results suggest that precancerous changes may represent an important factor driving model performance," the team wrote.
- While previous studies suggest AI's potential in breast imaging settings, including cancer detection and triaging, the researchers pointed out a lack of data on near- and long-term cancer prediction based on imaging data. More specifically, they noted that the technology's potential hasn't been well assessed on independent external testing in prospectively selected, racially diverse, high-risk populations of women.
- Mirai is a deep-learning model that uses data from mammograms to predict breast cancer risk at multiple time points. It was trained on about 211,000 screening mammograms acquired at Massachusetts General Hospital to predict breast cancer risk from one to five years. One report suggested that it is superior to the Tyrer-Cuzick model.
- The Chicago-based researchers wanted to test Mirai on the Chicago Multi-Ethnic Breast Cancer Cohort (ChiMEC). This included having the model evaluate self-reported data such as race, age, breast density, and BI-RADS categories and compare its performance with that of radiology-reported BI-RADS and breast density. The researchers also tested the model's performance in predicting specific breast cancer molecular subtypes.



- The team included retrospective data from 6,266 screening mammograms acquired from 2,043 women, with a median age of 56.4 years. Of these women, 910 were Black and 853 were white, and 46.4% of mammograms included were from Black women. They were enrolled in ChiMEC between 2006 and 2020.
- The team found that Mirai achieved area under the curve (AUC) values of 0.71 for one-year prediction and 0.65 for five-year prediction, respectively. It also achieved AUCs of 0.72 for nondense breasts and 0.58 for dense breasts ( $p = 0.1$ ).
- The researchers also found no significant differences between Mirai and standard BI-RADS when it came to near-term discrimination performance, with one-year AUCs of 0.68 and 0.73, respectively ( $p = 0.34$ ). However, Mirai outperformed BI-RADS when it came to long-term prediction of two to five years, with an AUC of 0.63 versus 0.54 ( $p < 0.001$ ).
- The team also reported that the discriminatory performance of Mirai was reduced when only images of the unaffected breast were used for comparison ( $p < 0.001$  at all time points). It wrote that this suggests the model's predictions are "likely" dependent on detecting ipsilateral premalignant patterns.
- The study authors also wrote that they found no evidence of differences in Mirai's performance across racial or age groups.
- The researchers also tested the model in mirroring situations. For positive mirroring, they replaced images of unaffected breasts with mirror images of the affected breast. For negative mirroring, they replaced images of the affected breasts with mirror images of the unaffected breasts.
- The researchers found that Mirai was unaffected by positive mirroring, but negative mirroring did cause a significant drop in performance across all time points ( $p < 0.001$ ). This included AUC values of 0.51 for one-year prediction and 0.56 for five-year prediction, respectively.
- "Results from selective mirroring, along with better performance of the... model for near-versus longer-term prediction, suggests that [Mirai] may detect premalignant or early malignant changes before they become apparent," the study authors wrote.
- They also suggested that with a larger prospective study population, the model can be adjusted to give absolute risk estimates based on incident cancer cases seen on breast imaging exams.

CLINICAL NEWS

## **Male and female obese patients may respond differently to fasting**

Will Morton  
Jul 27, 2023

- A dual-energy x-ray absorptiometry (DEXA) study in obese patients with obstructive sleep apnea has revealed that men may respond more than women to fasting, according to a study published July 22 in *Clinical Nutrition*.
- A group led by Kaitlin Day, PhD, of the University of Melbourne in Australia, performed DEXA scans in obese patients with obstructive sleep apnea before and after they underwent a six-month fasting intervention and found that average fat mass changed and visceral adipose tissue decreased in men only.
- "Females may exhibit different OSA pathophysiology and may require different treatment approaches," the group wrote.
- Approximately one billion adults worldwide now live with obstructive sleep apnea, which causes frequent upper airway collapse and leads to fragmented sleep, intermittent hypoxic episodes, and excessive daytime sleepiness. Obese people are at higher risk for the condition, with males 1.5 times more likely to be at risk than females, according to the authors.
- Regional body composition changes that occur with weight loss interventions in obese patients with moderate to severe cases of sleep apnea have been rarely investigated, they added.
- To that end, the researchers analyzed data from 47 obese patients (mean body mass index [BMI] 34.1 kg/m<sup>2</sup>) who were newly diagnosed with sleep apnea and who participated in a six-month weight loss program. DEXA was used to measure regional body composition immediately before starting and after completing the intervention.
- According to the findings, average fat mass changed by -5.27 kg and visceral adipose tissue by -0.63 kg in males only, according to the results. Conversely, women (n = 12) had significant decreases in waist circumference (mean -3.36 cm), android lean (-0.12 kg) and android total mass (-0.28 kg) only.

- In addition, regional body composition changes in males were positively associated with improvements in obstructive sleep apnea severity ( $p < 0.01$ ) but not symptoms, the researchers reported.
- "The small number of females in the study appear to respond differently to the lifestyle intervention with only waist circumference, android lean, and fat mass significantly reduced, but not their overall weight," the authors wrote.
- Ultimately, females may exhibit different pathophysiology arising in obstructive sleep apnea and therefore may require different treatment approaches, including types of dietary interventions, the authors suggested.
- "A larger study with more female participants would be needed to confirm this," the group concluded.

PRACTICE MANAGEMENT

# **DBT doesn't improve screening metrics in breast cancer survivors**

Amerigo Allegretto

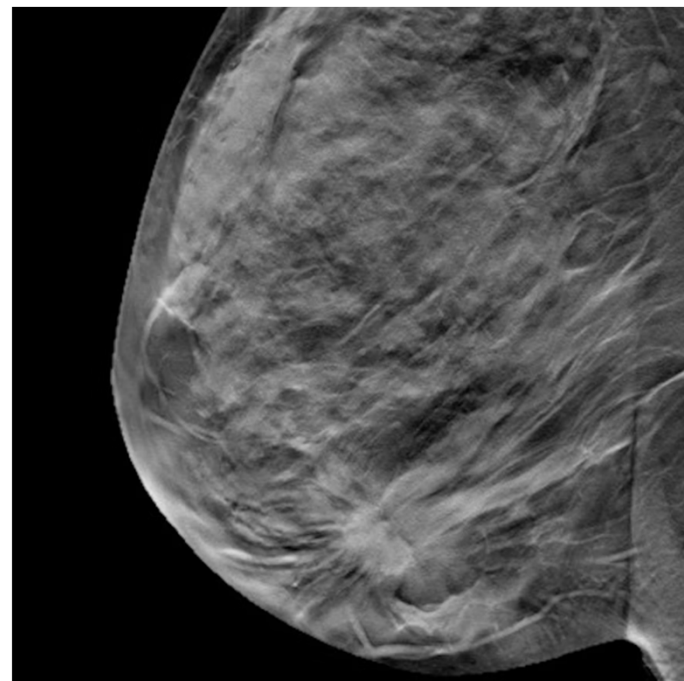
Aug 13, 2023

Adding digital breast tomosynthesis (DBT) to full-field digital mammography doesn't improve cancer detection metrics in asymptomatic women who are breast cancer survivors, a study published August 11 in *Radiography* found.

A team led by Emily Nia, MD, from the University of Texas MD Anderson Cancer Center in Houston found no evidence that the addition of DBT improves cancer detection rate, recall rate, or positive predictive value (PPV) in these women. The group also found no evidence of improvement when data were separated by age, race, and laterality. "In general, although the imaging surveillance for asymptomatic women with a history of breast cancer is imperative, the addition of DBT ... does not statistically improve breast imaging metrics," Nia and co-authors wrote.

DBT continues to show promise in breast cancer imaging, with studies suggesting it outperforms conventional digital mammography and improves metrics such as cancer detection rate and recall rate. However, the researchers noted a lack of data in DBT's performance in breast cancer survivors. The few studies that have been published in this area reported that adding DBT to annual mammography screenings improves performance metrics.

Nia and colleagues wanted to compare the performance of 2D full-field digital mammography alone to full-field digital mammography plus DBT in surveillance imaging of asymptomatic patients with a history of breast cancer.



- In their retrospective study, the researchers included data from 20,210 breast imaging exams. Of these, 7,235 were 2D studies and 12,975 were DBT (3D) studies.
- The team found no statistically significant differences in cancer detection rate (CDR) ( $p = 0.38$ ), recall rate ( $p = 0.087$ ), or PPV ( $p = 0.74$ ) between 2D and 3D exams. This trend was also seen when the data was stratified, with p-values exceeding 0.05 when exams were compared for fatty and dense breast tissue.
- The researchers also found no significant differences in recall rate or PPV when data was stratified based on age. However, they found that cancer detection rate significantly increased in the 2D group (1.2%) compared with the 3D group (0.6%) for women ages 60 to 69 ( $p = 0.021$ ).
- The team also reported no significant differences in recall rate or PPV between the two groups when data were stratified by race. However, the 2D group experienced a higher cancer detection rate in white women compared with the 3D group, 6.7% versus 5% ( $p = 0.036$ ).
- Finally, the researchers found that the 2D group also experienced a significantly higher cancer detection rate when it came to unilateral studies, 0.7% versus 0.4% ( $p = 0.009$ ). However, they did not find any significant differences in recall rate or PPV when data was stratified by laterality.
- The study authors suggested that these results may be due to the work environment that the breast radiologists in the study practice in.
- "We practice in a large tertiary cancer center where the majority of our patients are actively being staged for breast cancer or are survivors screened for their annual surveillance," they wrote. "Frequently imaging a patient population with complex pathology has resulted in radiologists with greater depth of experience and may potentially improve the overall ability to detect malignancy no matter the type of imaging utilized."

CLINICAL NEWS

## **Abbreviated MRI shows promise, CEM has tradeoffs in breast imaging**

Amerigo Allegretto

Aug 15, 2023



Abbreviated MRI is on par with standard breast MRI while contrast-enhanced mammography (CEM) has its share of tradeoffs in breast cancer screening, a study published August 15 in *Radiology* found.

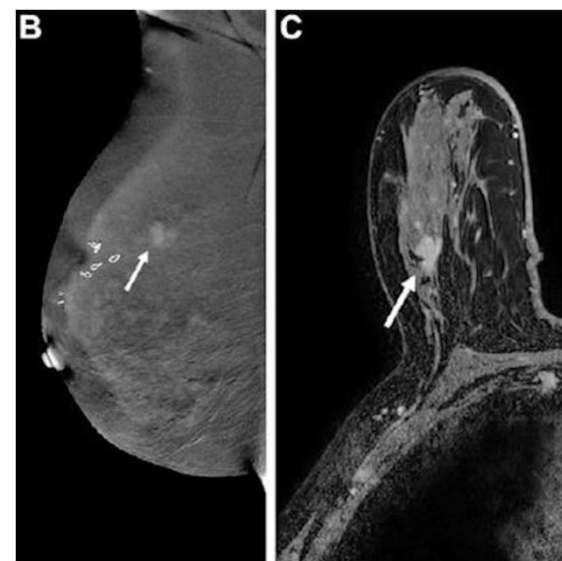
A team led by Marissa Lawson, MD, from the University of Washington in Seattle found that abbreviated breast MRI had comparable performance to standard MRI. Meanwhile, CEM had lower recall and higher specificity compared to both MRI methods but also had lower cancer detection rate and sensitivity.

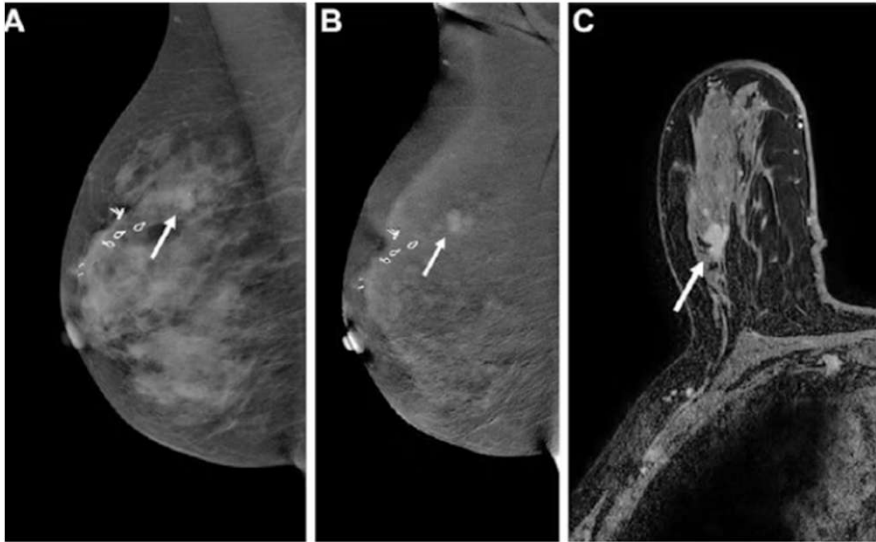
"Our study results found no statistically significant difference between abbreviated breast MRI and standard MRI protocols, suggesting that abbreviated breast MRI may be a comparable alternative for high-risk screening, with the benefit of increased efficiency and potentially lower cost compared with standard MRI," Lawson and colleagues wrote.

When it comes to supplemental breast imaging to confirm suspicious mammography findings, MRI has been heralded for its high sensitivity in detecting malignancies.

However, breast MRI is also less accessible than other imaging modalities in this area, owing to longer image acquisition and interpretation times, higher cost, and lower patient tolerance. This has led to breast imagers seeking alternatives to standard MRI in this area.

While the performances of abbreviated breast MRI and CEM have been investigated, Lawson et al pointed out a lack of data on direct comparative performances between the two, as well as against standard breast MRI. They wanted to evaluate the comparative diagnostic performance of the three modalities based on American College of Radiology (ACR) accreditation standards.





CEM images (A, B) and an MRI scan (C) show true-positive findings in a 73-year-old woman with a personal history of right breast ductal carcinoma in situ (DCIS) treated with lumpectomy and newly diagnosed left breast invasive lobular carcinoma (not shown), who presented for contralateral right breast screening. (A) Mediolateral oblique low-energy and (B) mediolateral oblique recombined CEMs of the right breast show an irregular contrast-enhanced mass with irregular margins in the upper outer quadrant (arrows). (C) Axial contrast-enhanced breast MRI sequence shows an irregular contrast-enhanced mass with irregular margins that is suspicious for cancer in the upper outer quadrant of the right breast (arrow). Pathology revealed recurrent invasive ductal carcinoma and DCIS, Nottingham grade I, that was estrogen receptor positive, progesterone receptor positive, and human epidermal growth factor receptor 2 (HER2) receptor negative. Images courtesy of RSNA.

In their single-institution, prospective, blinded reader study, the researchers included women who were referred for breast MRI between 2018 and 2021. CEM was performed within 14 days of standard MRI, while abbreviated MR images were produced from standard MR images. Two readers independently interpreted each CEM and abbreviated MR image after a washout period.

In total, the team included 492 paired CEM and abbreviated MRI interpretations from 246 women with a median age of 51 years. It also reported that on 49 MRI scans with lesions recommended for biopsy, nine lesions showed malignant pathology.

The researchers found that while abbreviated MRI showed no significant differences in performance metrics with standard MRI, CEM varied in performance.

Comparative performance between MRI, abbreviated MRI, and CEM

Parameter	Standard MRI	Abbreviated MRI	CEM
Recall rate	22.8%	26.6%	14%
Cancer detection rate per 1,000 exams	36.6	32.5	22.41
Biopsy recommendation rate per 1,000 exams	162.6	180.9	65
Positive predictive value	18.41	14.4	22
Sensitivity	100%	88.9%	61.1%
Specificity	80.2%	75.7%	87.8%

The researchers also found that four women who participated in the study and were administered an intravenous iodinated contrast agent experienced adverse reactions. Their reactions were reported to be mild based on ACR categorization, limited to rash and hives that did not require treatment.

The study authors highlighted that although their research "may have been underpowered" to find small differences in performance metrics, their results are consistent with meta-analyses evaluating the performance of abbreviated MRI versus standard MRI.

Additionally, the authors wrote that while their meta-analyses did not report lesion characteristics, these may have impacted CEM's sensitivity in their study.

They called for future studies with larger sample sizes to investigate CEM's tradeoffs, as well as patient acceptance.

"In addition, our MRI protocol has spatial resolution that exceeds [ACR] accreditation standards, which likely facilitates superior depiction of lesions compared with CEM," the authors wrote.

The study can be found in its entirety [here](#).

In an [accompanying editorial](#), Jung Min Chang, MD, PhD, from Seoul National University Hospital in South Korea wrote that while test performance among modalities is important, it is not the only factor that determines which is best for certain women. She wrote that choosing supplemental screening method varies based on the healthcare environment, characteristics of the target women, and cancer prevalence.

"Despite having lower cancer detection rates than standard MRI or abbreviated breast MRI, CEM may be beneficial for patients in whom MRI is not readily available, making it a valuable addition to the radiologic arsenal," Chang wrote.

CLINICAL NEWS

# **CCTA helps predict risk of plaque-related major adverse cardiac events**

Kate Madden Yee

Aug 23, 2023

- Coronary CT angiography (CCTA) helps predict risk of major adverse cardiac events in patients with non-ST segment elevation (NSTEMI) acute coronary syndrome (ACS) -- in part by its ability to quantify lipid-rich plaque, a study published August 22 in *Radiology* has found.
- The research suggests that CCTA shows promise as an effective and less invasive tool than other forms of intravascular imaging for this purpose -- specifically invasive coronary angiography (ICA) -- wrote a team led by Zhong-Fei Lu, PhD, of Fuwai Hospital in Beijing, China.
- "CCTA and ICA have equivalent ability to predict long-term risk through assessment of the severity and extent of obstructive coronary artery disease," the group noted. "Additionally, CCTA could be used to reduce the rates of ICA and has emerged as an important technique in the visualization of coronary plaque characteristics, allowing for a fast, noninvasive quantitative evaluation of plaque burden and composition."
- Fatty plaques are associated with adverse cardiac events in patients with NSTEMI, and patients presenting with the condition are typically worked up with invasive coronary angiography (ICA). CCTA can better assess plaque composition than ICA, but its prognostic performance for this indication remains unclear.
- To address the knowledge gap, Lu's team investigated whether there are quantitative variables on CCTA imaging that reflect lipid content in nonrevascularized plaques in individuals with NSTEMI ACS -- and whether these variables could help predict ensuing plaque-related major adverse cardiovascular events.
- The study included 342 patients diagnosed with NSTEMI acute coronary syndrome and was conducted between November 2017 and January 2019. All participants underwent CCTA before invasive coronary angiography within a day of presenting with cardiac symptoms. Median follow-up for the participant cohort was four years.
- The investigators found a nonrevascularized plaque-related major adverse cardiac event rate of 23.9%. They also found that higher lipid core burden ( $\geq 2.8\%$ ) was an independent predictor of higher risk of these events at the participant level (hazard ratio, 12.6, with 1 as reference) and that lipid core burden and volume was an independent predictor of higher risk of these events at the plaque level (hazard ratio, 12.1 and 11, respectively).

CCTA findings in patients without and with nonrevascularized plaque-related major adverse cardiovascular events\*

Variable	Overall	Cohort without nonrevascularized plaque-related major adverse cardiovascular events	Cohort with nonrevascularized plaque-related major adverse cardiovascular events
<b>Participant level</b>			
Total plaque volume	105.1 mm <sup>3</sup>	83.1 mm <sup>3</sup>	265.3 mm <sup>3</sup>
Lipid core volume	11.3 mm <sup>3</sup>	7.3 mm <sup>3</sup>	37.6 mm <sup>3</sup>
Plaque burden	37.1%	33%	46.5%
Lipid core burden	5.6%	3.8%	12.8%
<b>Plaque level</b>			
Total plaque volume	53.7 mm <sup>3</sup>	48.1 mm <sup>3</sup>	101.2 mm <sup>3</sup>
Lipid core volume	3.6 mm <sup>3</sup>	2.7 mm <sup>3</sup>	18.3 mm <sup>3</sup>
Plaque burden	39.6%	37.5%	52.7%
Lipid core burden	3.9%	2.8%	17.7%

*\*All results statistically significant*

"Participants with a high lipid core burden [of more than 2.8%] were nearly 13 times more likely to develop nonrevascularized plaque-related major adverse cardiovascular events ... than participants with a lipid core burden of less than 2.8%," the team reported.

The study makes a significant contribution to the literature, but more research is needed, wrote Sina Tavakoli, MD, PhD, and Emrah Duman, MD, both of the University of Pittsburgh, in an accompanying commentary.

"To improve patient outcomes, further research and validation are necessary to assess the clinical utility and impact of a comprehensive approach to risk stratification and plaque characterization by combining systemic medical therapies with plaque-specific interventions," they

CLINICAL NEWS

## **Could CEM help downgrade BI-RADS 4 lesions?**

Amerigo Allegretto

Aug 23, 2023

- Contrast-enhanced mammography (CEM) may help accurately downgrade BI-RADS 4 breast lesions, a study published August 23 in the *European Journal of Radiology* has found.
- A team led by Anna Grażyńska, MD, from the Medical University of Silesia in Katowice reported that CEM had high negative predictive value (NPV) when it came to assessing both mass and nonmass lesions and that its use led to avoiding about 60% of unnecessary core needle biopsies.
- "The use of CEM may significantly minimize the number of invasive procedures such as core needle biopsy and thus reduce diagnostic costs and improve patient comfort," Grażyńska and colleagues wrote.
- CEM helps show the development of new blood vessels from a pre-existing vasculature that are linked to breast malignancies. This modality also provides morphological information on the lesions, as standard mammography does, and allows areas and lesions to be visualized that show the uptake of contrast media.
- Overlapping features of benign and malignant lesions make it challenging to differentiate between the two in low-energy CEM images. This leads to a BI-RADS 4 categorization, meaning core needle biopsy is recommended for further analysis. Current guidelines for CEM in this area are "indecisive," the researchers noted.
- Grażyńska and co-authors sought to analyze breast lesions classified into the BI-RADS 4 category, as well as find out whether and which lesions that are not enhanced on recombinant CEM images could be downgraded. They included data from 528 women who underwent a core needle biopsy performed between 2017 and 2022 due to a breast lesion classified as BI-RADS 4 on CEM.



- The researchers found that the NPV for the entire cohort was 93.9%. They also found NPVs for the following: mass lesions, 100%; nonmass lesions, 97.8%; and microcalcifications, 87.9%.
- The team reported that 230 out of 383 benign lesions included in the study were not contrast-enhancing, indicating that 60.1% of unnecessary core needle biopsies would have been correctly avoided.
- Finally, the researchers found that CEM sensitivity was lower for lesions less than 20 mm (86.6%) than for lesions 20 mm or larger (94.6%).
- The study authors suggested that based on their results, CEM shows high sensitivity in detecting malignant lesions with mass and nonmass morphologies.
- "The high NPV for recombinant images suggests that in the case of mass and non-mass lesions, the absence of enhancement indicates the benign nature of the lesion and may lead to a reduction of the BI-RADS 4 to BI-RADS 3 category," the authors wrote.