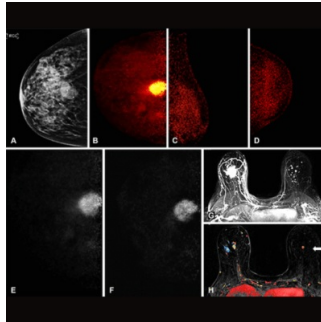


## Breast Cancer: Low-Dose PEM Alongside MRI Could Improve Detection and Reduce Healthcare Costs



Detecting breast cancer early is vital for improving survival rates, and mammography is the primary screening method due to its proven effectiveness. However, it can be challenging to detect nonpalpable lesions, especially in women with dense breast tissue, where mammography sensitivity is reduced. A recent study published in [Radiology: Imaging Cancer](#) investigated how additional imaging modalities such as MRI, contrast-enhanced mammography, and molecular breast imaging (MBI) play a crucial role in overcoming this limitation.

### Low-dose PEM alongside MRI could reduce radiation doses

Research demonstrates that MBI, including positron emission mammography (PEM), can significantly enhance cancer detection rates in women with dense breasts. Studies comparing MBI with mammography have shown an incremental increase in cancer detection rates, highlighting the potential of MBI as a supplemental screening tool. PEM, a type of MBI, shows promise for achieving higher specificity compared to MRI, which could reduce false-positive rates and associated patient anxiety and healthcare costs. Despite initial concerns about radiation exposure associated with MBI, recent advancements have addressed these issues. Newer MBI systems utilize reduced radiation doses, improving the risk-benefit profile of the technique. However, challenges remain in reducing radiation exposure further while maintaining diagnostic accuracy. A new organ-targeted PET system has been developed to address these challenges, offering low radiation doses comparable to mammography. Researchers investigated the feasibility of using low-dose PEM alongside MRI for the identification of breast cancer and assessment of its local extent. This combined approach aims to improve the accuracy of breast cancer detection, particularly in women with dense breast tissue, potentially leading to earlier diagnosis and improved outcomes.

### First feasibility study shows promising results

A single-centre prospective clinical trial, approved by the University Health Network institutional review board and registered at ClinicalTrials.gov, recruited participants from December 2019 to August 2022. The trial included individuals with newly diagnosed breast cancer who underwent baseline positron emission mammography (PEM) and MRI scans without treatment in between. Participants were assigned to undergo PEM at different doses of fluorine 18-labelled fluorodeoxyglucose using an organ-targeted PET system. The study aimed to assess the feasibility of detecting breast cancer with lower doses of PEM compared to current standards. Breast MRI, although not standard for newly diagnosed breast cancer patients, was included for descriptive comparison. Exclusion criteria comprised individuals without breast cancer, those receiving neoadjuvant chemotherapy during PEM acquisition, non-completers of the study, and those without previous MRI scans.

Out of 36 participants initially enrolled, 25 (69%) met the inclusion criteria for the study. Exclusions were due to various reasons, including incomplete study participation, receiving neoadjuvant chemotherapy during imaging, absence of breast malignancy, or lack of previous MRI scans. The study cohort consisted entirely of female individuals, with a median age of 52 years. Nearly half of the participants were considered high-risk for breast cancer due to genetic mutations or family history. Most were peri- or postmenopausal, with a significant portion diagnosed with invasive ductal carcinoma. Participants received different doses of 18F-FDG for PEM imaging, with no adverse events observed. The median time interval between PEM imaging and surgery was 20 days. Age and histologic types of breast cancer varied across the three dosage groups. Despite differences in injected doses, comparable diagnostic accuracy was observed in PEM images acquired at different times. PEM detected 96% of known index malignant lesions, with the lowest dose showing slightly lower sensitivity. However, MRI had a 100% detection rate for index lesions. Additional lesions were identified by both PEM and MRI, with MRI detecting more additional lesions overall. False-positive rates were lower with PEM compared to MRI, with fewer false positives identified upon subsequent pathological examination. Additional lesions detected by both PEM and MRI were confirmed benign through follow-up or pathological examination.

### Better detection, reduced costs, improved patient experience

The dose of the radiotracer 18F-FDG used in PEM imaging was successfully reduced to 37–185 MBq without compromising the detection of invasive disease. This reduction translated to a decrease in radiation exposure, making the low-dose PEM comparable to other imaging modalities associated with ionizing radiation, such as full-field digital mammography (FFDM) and digital breast tomosynthesis. While low-grade in

situ disease affected PEM sensitivity, similar uncertainties have been observed with MRI, potentially indicating overdiagnosis. In terms of detecting additional lesions, PEM showed a lower rate of false positives compared to MRI, suggesting a potential added benefit in reducing patient anxiety and healthcare costs associated with additional imaging workups.

Although the study has limitations due to sample size, further prospective studies with larger cohorts are needed to validate these findings. Additionally to reduced healthcare costs and lower patient anxiety, PEM offers the advantage of shorter acquisition time compared to full MRI protocols, which could improve patient comfort and workflow efficiency.

Source & Image Credit: [Radiology: Imaging Cancer](#)

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