

Saturated Fatty Acids Linked to Breast Cancer in Postmenopausal Women

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At A Glance

- High levels of saturated fatty acids in the breast are associated with cancer in postmenopausal women.
- Researchers examined 89 patients using a new MRI method to measure fatty acids in breast tissue.
- The findings showed no correlation between BMI and fatty acid fractions in breast tissue, suggesting that the composition of fat in the breast tissue is an independent risk factor.

OAK BROOK, Ill. — Fatty acids in the breast may be useful indicators of cancer in postmenopausal women, according to a new study published online in the journal *Radiology*. The results may help researchers determine the underlying mechanisms behind breast cancer development in some patients.

The role of fat in breast cancer development and growth has been studied extensively using body mass index (BMI) and dietary fat intake.

"BMI is an important risk factor for breast cancer development," said Sungheon G. Kim, Ph.D., from the NYU Langone Medical Center. "While increased BMI may provide a protective effect for premenopausal women, postmenopausal women have an increased risk of developing breast cancer with increasing BMI."

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Melanie Freed, Ph.D.

The exact mechanism behind the increased risk in postmenopausal women with higher BMI is not fully understood. One possibility is the increased production of estrogen and/or adipokines, which are cell-signaling proteins secreted by adipose, or fat, tissue, but there have been few studies specifically looking at the role of breast fat in cancer development.

"Using a new method, we were able to directly measure the tissue where breast cancer begins in the hopes of understanding how fatty tissue correlates with cancer," said Melanie Freed, Ph.D., lead researcher of the study.

Researchers at the NYU Langone Medical Center developed a novel MRI method called gradient-echo spectroscopic imaging that can estimate fractions of different types of fat in breast adipose tissue as a part of clinical breast MRI exam.

Eighty-nine patients were included in the final analysis. Each patient's height and weight was measured at the time of the exam and their BMI was calculated. Fifty-eight women were premenopausal and 31 were postmenopausal. Breast cancer status was determined by a review of the patients' electronic medical record including any follow up procedures. Forty-nine patients had benign breast tissue, 12 had ductal carcinoma in situ, and 28 had invasive ductal carcinoma.

The results showed that a greater proportion of saturated fatty acids and a lower proportion of monounsaturated fatty acids were present in the breast tissue of postmenopausal women with invasive ductal carcinoma than in postmenopausal women with benign breast tissue.

Among the women with benign lesions, postmenopausal women had significantly higher polyunsaturated fatty acids and lower saturated fatty acids in their breasts than premenopausal women.

Research showed no correlation between BMI and fatty acid fractions in breast tissue, suggesting that the type of fat that makes up fatty breast tissue gives new information beyond the amount of overall body fat.

"Our research is ongoing," Dr. Kim said. "We need to investigate these higher levels of saturated fat and their direct correlation with tissue estrogen levels and cancer development. The results may point to a new risk factor for breast cancer."

"Evaluation of Breast Lipid Composition in Patients with Benign Tissue and Cancer by Using Multiple Gradient-Echo MR Imaging." Collaborating with Drs. Kim and Freed were Pippa Storey, Ph.D., Alana Amarosa Lewin, M.D., James Babb, Ph.D., Melanie Moccaldi, R.T., and Linda Moy, M.D.

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For patient-friendly information on breast MRI, visit RadiologyInfo.org.

Images (JPG, TIF):

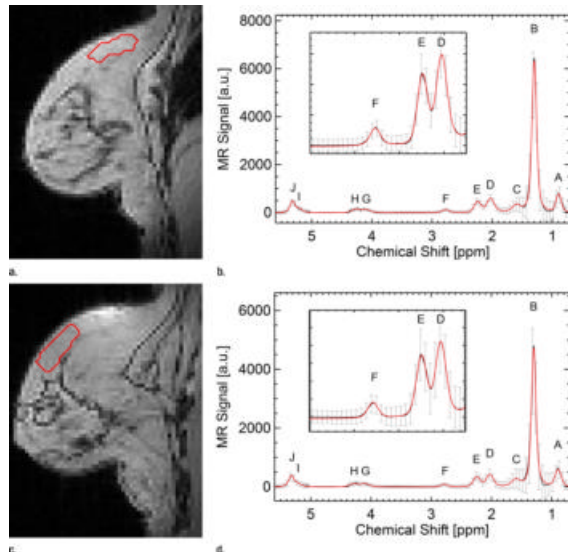


Figure 1. Example analysis for two patient cases: (a, b) a 62-year-old postmenopausal woman with a benign lesion and (c, d) a 67-year-old postmenopausal woman with invasive ductal carcinoma. For each case, an example image (first echo) with user-drawn region of interest (a, c) is shown as well as an example spectrum with the fit shown in red (b, d). The inset provides a zoomed view of lines D, E, and F, which are used to estimate the fatty acid composition. *Ppm* = parts per million

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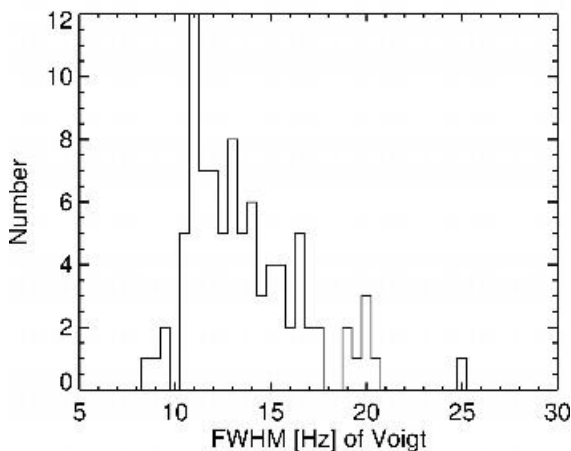


Figure 2. Distribution of line widths for all patients. Line widths are the full width at half maximum (FWHM) of the Voigt profile fit to line B in Figure 1. *Number* = number of patients

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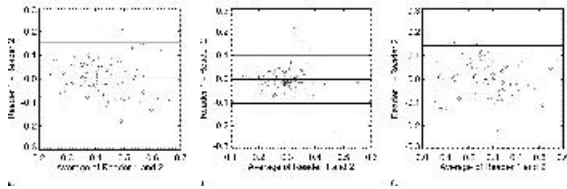


Figure 3. Bland-Altman plot of reader agreement for (a) monounsaturated fatty acid, (b) polyunsaturated fatty acid, and (c) saturated fatty acid. Mean and 95 percent limits of agreement are shown.

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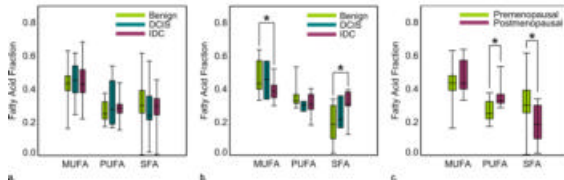


Figure 4. Fatty acid composition comparison between diagnostic groups for (a) premenopausal women, (b) for postmenopausal women, and (c) between diagnostic groups with benign tissue. Values displayed are unadjusted values for reader 1. * = Statistically significant difference between adjusted values for both readers. *DCIS* = ductal carcinoma in situ, *IDC* = invasive ductal carcinoma.

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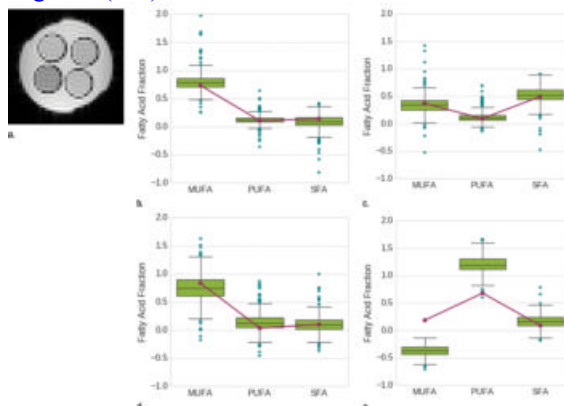


Figure 5. Phantom study. (a) Oil phantom with four different oils; flaxseed oil (upper left), olive oil (lower left), high oleic sunflower oil (upper right), and palm oil (lower right). Box plots represent fatty acid fractions measured by using our spectroscopic technique in voxels within the regions of interest for (b) olive oil, (c) palm oil, (d) sunflower oil, and (e) flaxseed oil. The purple lines are fatty acid fractions from the U.S. Department of Agriculture. For flaxseed oil, diunsaturated fatty acid composes about 21 percent of polyunsaturated fatty acid (PUFA), whereas it is 93 percent for olive, 98 percent for palm, and 95 percent for sunflower. The proposed method works well when diunsaturated fatty acid is the major component of PUFA, which is the case for olive, sunflower, and palm oil, but not for flaxseed oil.

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Resources:

[Study abstract](#)