

# Breast cancer: PET and MR predict chemotherapy's ability to prolong life

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For patients with advanced breast cancer, positron emission tomography (PET) and magnetic resonance (MR) imaging can improve quality of life and survival by providing physicians with information on the effectiveness of chemotherapy prior to surgery, say researchers presenting at the 2013 Annual Meeting of the Society of Nuclear Medicine and Molecular Imaging.

Researchers combined separate imaging systems—PET, MR and CT—to map the course of chemotherapy before surgery, otherwise known as [neoadjuvant chemotherapy](#). These different imaging systems provide complementary information, both physiological and structural, about how chemotherapy will be distributed in the body to kill breast cancer and [metastatic tumors](#). In this study, scientists used a specialized molecular imaging agent called F-18 fluorodeoxyglucose (FDG) that acts as a [biomarker](#) for [cellular metabolism](#) with PET in order to pick up on areas of cancer proliferation.

"Previous studies have shown that, separately, FDG PET and dynamic enhanced MR imaging can provide a prediction of how patients will respond to neoadjuvant treatment, but we have improved upon this concept by combining the two techniques side by side," said Sang Moo Lim, MD, current director of the department of nuclear medicine, and until 2006, director of the National Radiation Emergency Medical Center of the Korea Institute of Radiological and Medical Sciences in Seoul, Korea. "Using both FDG PET and MR imaging to predict [cancer progression](#)-free survival allows us to apply more aggressive therapies

that could potentially halt patients' cancers and extend their lives."

This study evaluating survival after chemotherapy included a patient population of 44 women with [advanced breast cancer](#). All underwent three cycles of neoadjuvant chemotherapy and sequential whole-body FDG PET/CT, breast MR and delayed breast PET/CT a total of four times—once prior to the first course of chemotherapy, again after the first course, following the second course and one more time prior to surgery to predict and confirm disease-free survival. Results of the study indicated that patient survival with no recurrence of cancer after neoadjuvant chemotherapy was anywhere from just under three months to about three years for a median of 661 days.

"Additionally, this study demonstrates the collective potential of these imaging systems, which provides evidence that fused PET/MR utilizing both metabolic and vascular perfusion imaging can benefit patients," said Lim. "Together these techniques can help clinicians classify patients and provide risk stratification to not only predict cancer recurrence after treatment but also avoid chemotherapy for those who probably would benefit more from an alternative treatment."

This research using combined, sequential PET and MR imaging provides additional proof of the potential benefit of simultaneous PET/[MR imaging](#), an emerging molecular imaging technology.

"This extends beyond just breast cancer," Lim added. "We could potentially apply these technologies to other malignancies and develop some brilliant methods to improve clinical outcomes. Considering the results of our research, we now need to further develop the technology—not just imaging systems, but tracers and biomarkers—to advance our field. Research and development in nuclear medicine and [molecular imaging](#) can satisfy these demands for the future."

Breast cancer is the world's leading cancer among women—accounting for 16 percent of cancers in females, according to the World Health Organization. The American Cancer Society estimates that one out of every eight American women will develop invasive breast cancer at some point in their lives. According to 2013 statistics, approximately 232,340 new cases of invasive [breast cancer](#) are expected to be diagnosed in women in the United States and as many as 39,620 American women are expected to die from the disease this year.

Provided by Society of Nuclear Medicine

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