MRI may be noninvasive method to measure breast cancer prognosis

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Quantitative magnetic resonance imaging measures were associated with prognostic tumor markers, demonstrating the potential of magnetic resonance imaging for prediction of disease prognosis and stratification of patients to appropriate therapies, according to preliminary data presented at the 2011 CTRC-AACR San Antonio Breast Cancer Symposium, held Dec. 6-10, 2011.

"Breast cancers are heterogeneous, and different subtypes of breast cancer will respond differently to therapy," said Sana Parsian, M.D., a research assistant in the department of radiology at the University of Washington in Seattle. "Every patient with breast cancer must undergo biopsy to be evaluated for the type of breast cancer they have. Based on that, adjuvant medical therapies are prescribed for them."

Parsian and her colleagues hypothesized that some quantitative magnetic resonance imaging (MRI) measures, such as diffusion-weighted MRI (DWI) and dynamic contrast-enhanced MRI (DCE), would correlate with histopathological markers by enabling the researchers to measure the tumor's cellularity and vascularity.

In DWI, the diffusion of fluids along a field gradient reduces the MRI signal, so it can determine cellularity of the tumor by measuring the degree of water mobility. DCE enables viewers to see more information about tumor vascularity. A malignant cell group needs a blood supply to grow, and those vascular changes cause tumors to appear differently on DCE compared with normal tissue, Parsian said. The enhancement

pattern seen on an MRI is called kinetics.

Researchers evaluated correlations between DWI and DCE kinetics and histopathologic markers of breast cancer determined from biopsy, such as estrogen receptor (ER), progesterone receptor, HER2, p53 and the ki67 proliferation marker, in 41 invasive cancers among 36 patients. They found statistically significant correlations between MRI measures and all markers, except ER, which was only marginally associated with one of the DCE measures. Each of the DCE kinetics parameters significantly discriminated grade III tumors from grades I and II and luminal A from luminal B and basal-like intrinsic subtypes.

"When we looked at these measures, we realized there was a correlation with biomarkers," Parsian said.

Although these are preliminary data, she hopes that someday MRI might provide valuable noninvasive information about tumor biology for selecting and guiding targeted therapies.

Parsian said larger prospective studies are needed to confirm these results and that MRI may complement biopsy to sample the whole tumor and reflect tumor heterogeneity.

"I think the final goal of radiology is to get more information while doing the least amount of intervention possible for the patient," she said. "It would be great if we could improve our understanding of breast cancer biology and predict response to different therapies with imaging. Our study suggests MRI may play a valuable role in this process."

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