

Researchers developing new approach for imaging dense breasts for abnormalities

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This photo shows an overview of the MRI/near-infrared spectroscopy (NIRS) system. The NIRS system is housed in the MRI control room (a) and light is piped into the MRI suite for patient imaging using fiber optic cables (b). A combined MRI/NIRS breast coil (c) makes simultaneous MRI and NIRS imaging possible. Credit: Photo courtesy of Norris Cotton Cancer Center

Dartmouth engineers and radiologists are developing new approaches for an emerging technique in diagnostic imaging for breast cancer—MRI with near-infrared spectroscopy (NIRS) as reported in the journal *Academic Radiology*, February 2014.



Combined MRI/NIRS may benefit women whose mammogram showed an abnormality and requires further testing to rule out cancer. The test would be conducted before an invasive biopsy to look for tumors. For the new method to work successfully in routine patient care, MRI/NIRS must adapt to an individual's body size as well as accommodate a range of cup sizes. The equipment must also mobilize and maintain contact with the <u>breast</u>.

An MRI/NIRS may offer specific advantages to women with <u>dense</u> <u>breasts</u>, who are more likely to develop and die from <u>breast cancer</u>. A dense breast is harder for a radiologist to "see through" when using traditional imaging equipment, which lacks the sensitivity to penetrate the dense tissue. Standard <u>breast screening</u> is effective 77-97 percent of the time in a normal breast, but when a breast is dense precision falls to 63-89 percent.

Prior approaches for MRI/NIRS used parallel plates and relied on custom breast molds for each patient. Biomedical engineers from the Thayer School of Engineering at Dartmouth developed a new, more flexible, convenient, and comfortable approach. They designed a set of eight light transmitting cables that can be adjusted to surround the breast with light tension. A woman lies on her stomach and the breast hangs pendant through the holes of the MRI/NIRS breast coil. The procedure is nearly identical to clinical MRI.

Eight women participated in a trial of the new design. "We found that the new interface allowed us to target lesions more effectively than ever before, said Michael Mastanduno, corresponding author of the study. "Set up time was faster and images were of higher quality."

The Dartmouth MRI/NIRS offers increased coverage of the chest, giving providers improved visibility for " hard to see" areas, such as the outside area of the breast near the armpit.



"This work is a huge improvement on previous designs of MRI/NIRS systems. All breast sizes and lesion locations can now be effectively imaged. Though there is more work to be done, this technology is promising for improving MRI's ability to distinguish cancer from benign abnormalities," said Mastanduno.

As a next step Dartmouth researchers will test MRI/NIRS in women with suspicious lesions.

Provided by The Geisel School of Medicine at Dartmouth

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