New MRI technique could mean fewer breast biopsies in high-risk women

June 29 2009

A University of Wisconsin-Madison biomedical engineer and colleagues have developed a method that, applied in MRI scans of the breast, could spare some women with increased breast cancer risk the pain and stress of having to endure a biopsy of a questionable lump or lesion.

The universal technology will give radiologists greater confidence in visually classifying a lesion as malignant or benign.

The American Cancer Society recommends that women with certain breast cancer risk factors — including inherited genetic mutations, family or personal history of breast cancer, or previous radiation therapy to the chest — receive an annual MRI screening in addition to their yearly mammogram.

During a breast MRI, which lasts about a half hour, the technician injects a contrast agent into a vein in the patient's arm. Over time, the contrast agent flows throughout the body, including the breasts. Because they are growing quickly, cancerous lesions often have immature vasculature, and the contrast agent flows in and "leaks" out quickly. Conversely, benign lesions show more gradual in and out flow.

"The tricky ones are the ones that enhance quickly and then fall off more slowly," says Wally Block, a UW-Madison associate professor of biomedical engineering and medical physics. "Many of these lesions turn out to be difficult to classify and lead to biopsy."

Yet, it turns out that with the right kind of MRI scan, radiologists can visually identify a cancerous lesion based on characteristics about its shape. For example, breaks or interruptions in a lesion can indicate a benign fibroadenoma. Lumps with smooth edges often are benign, while those with jagged edges can signal cancer.

To generate the kind of crisp, three-dimensional images necessary for such a diagnosis, Block, UW-Madison radiology associate professor Fred Kelcz and graduate student Catherine Moran are capitalizing on their unique MRI data-acquisition method.

An MR image is made up of thousands of smaller pieces of information. The conventional data-acquisition method gathers that information slowly, and it's designed to be viewed from a single imaging plane. "What people do now is they compromise," says Block. "They don't get resolution in the other planes to make it a reasonable scan time. We found a way around that."

With the team's powerful technique, an MRI machine acquires data radially and generates a high-resolution, three-dimensional image that radiologists can turn, slice and view from many perspectives — enabling them to study a lesion's physical characteristics more carefully. Machines equipped with the technique also acquire more data in less time.

In addition, the method also makes it possible for radiologists to view fat images and water images separately, which is particularly useful because fat composes a large portion of the breast. "Rarely is disease associated with fat," says Block. "Most of the time radiologists are concentrating on water images, but sometimes our fat images of the breast are also useful. The boundaries of a lesion often stand out very clearly when embedded in fat."

Block and his colleagues currently are gathering data on the efficacy of the technique. They have tested the method on 20 patients at the University of Wisconsin Hospital and have shared it with colleagues at the University of Toronto for additional assessment. They also are working with Michigan State University researchers to test the technique.

Collaborating with Scott Reeder, a UW-Madison assistant professor of biomedical engineering and radiology, Block and colleagues also are refining ways to image both breasts simultaneously — a development that could slash scan time and free valuable MRI space for additional patients. "If you have a screening procedure that you want people to participate in regularly, you want to make it convenient for them," says Block.

Source: University of Wisconsin-Madison (news : web)