New breast CT scanner rivals mammography

November 28 2006

At the Radiological Society of North America meeting in Chicago on November 27, researchers will unveil a new imaging system developed at the University of Rochester that showed in a pilot study it could capture images equal to or, in a few cases, better than mammography.

The Cone Beam Breast Computed Tomography (CBBCT) scanner takes 360-degree views of breast anatomy, without having to compress the sensitive tissue. It produces three-dimensional pictures, which are designed to distinguish benign lesions and calcifications from tiny cancers that are sometimes hidden within dense tissue. Also, the CBBCT system clearly displays tissue around the ribs and outer breast toward the armpit, where 50 percent of cancers are found. Getting the tissue on the outer edges of the breast to show up on a conventional mammogram film is one reason why technologists must pull and flatten the breast.

The pilot study is producing exciting results.

"We have one case in which a cancer shows up phenomenally well using this new imaging system, whereas when you look at the same lesion on a mammogram it is hard to detect," said Avice O'Connell, M.D., director of women's imaging for the University of Rochester Medical Center and co-principal investigator on the study.

The University is conducting its first clinical trial to evaluate the CBBCT against conventional mammography, which is the best technology currently available and universally accessible to women, but is only 85 percent accurate in most cases.

Researchers began by screening 20 volunteers, who had normal mammograms. The goal was to simply demonstrate whether the CBBCT could adequately image the breast. An additional group of women were scanned because they had either palpable masses or suspicious mammograms. In those cases, researchers compared the CBBCT to the typical diagnostic imaging workup, to assess cancerous and benign abnormalities before a biopsy was done. In this group, researchers discovered that the CBBCT images could delineate breast disease as well as mammography.

The pilot study will continue until 60 participants are enrolled. A larger clinical trial is planned for 2007.

"Snowman in a Snowstorm"

The race to replace mammography is all about finding hard-to-detect cancers more consistently. Much of the research focuses on digital film or on better follow-up testing once a conventional mammogram raises questions. The biggest challenge for radiologists is to see lesions that are less than one centimeter (when cancer is more curable) within dense breast tissue. But even larger tumors can hide in dense tissue, which is common among pre-menopausal women (under age 50), thin women, and those who are genetically predisposed to dense breasts.

Breasts with fatty tissue are easier to screen because normal, healthy fat shows up black on a mammogram. Lesions usually stand out plainly as white spots with jagged borders or tentacles, or as white dots that characterize calcifications. If there is any question about whether a white spot is a tumor or a cyst, an ultrasound can usually settle it before a biopsy provides the official diagnosis.

But when doctors analyze a breast with dense tissue on mammography film, the image looks cloudy. White blotches and spidery white streaks

known as fibro glandular densities permeate the image, hiding small tumors in some cases. "It's like trying to find a snowman in a snowstorm," O'Connell said.

Breast cancer is the most common (non-skin) cancer in American women, with an estimated 270,000 new cases expected to be diagnosed this year. Early detection is important to survival. When a malignant tumor grows to a certain size, it is more likely that cancer cells have broken away and spread to other sites. A key advantage of the CBBCT scanner, researchers said, is the ability to produce three-dimensional images that radiologists can pull up on a computer screen and then manipulate – like spinning a globe – to view tissue from many different angles. This allows them to look deep within the breast and beyond the tangle of fibro glandular streaks.

By comparison, interpreting a mammogram is like looking at an x-ray; it cannot be manipulated to observe tissue overlays or the back of the breasts near the chest wall. Digital mammography has a wider range of capture data and gives more information about dense tissue, but it still only provides two-dimensional images.

Comfort is extra benefit

The CBBCT system consists of a cushioned exam table with a cutout in the middle. A woman lies on her belly, suspending her breasts one at a time through the opening. The CBBCT takes 300 images by circling the breasts for about 10 seconds, emitting a radiation dose that's comparable to mammography. The x-ray source is positioned to avoid radiation exposure to the chest tissue beyond the breast.

The University of Rochester holds several patents on the Cone Beam system, which was invented by Ruola Ning, Ph.D., professor of Radiology at the University of Rochester Medical Center and founder of

the Rochester, N.Y.-based imaging start-up company, Koning Corporation. www.koningcorporation.com

The University licensed the technology to Koning Corporation to make, use and sell Cone Beam scanners. Koning expects to have a commercial scanner on the market soon, once the FDA approves the device, said John Neugebauer, CEO of Koning.

Source: University of Rochester Medical Center