Stereo Imaging Enhances Breast Cancer Detection

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CHICAGO — A novel mammography system called stereoscopic digital mammography dramatically improved the accuracy of lesion detection in breast cancer screening, according to interim data from an ongoing trial in 1,093 women at high risk for developing breast cancer.

Stereoscopic full-field digital mammography significantly reduced the number of false-positive lesion detections by 49% and false-negative findings by 40%, compared with standard full-field digital mammography, David Getty, Ph.D., and his associates reported at the annual meeting of the Radiological Society of North America.

"Stereoscopic mammography is reducing false-positive reports by nearly one-half, and the implication would be that many fewer women would be recalled unnecessarily for diagnostic work-up, resulting in reduced health care costs and patient anxiety," he said. "It is also reducing false-negative readings, especially for clustered calcifications, with the implication that detecting more true lesions will result in earlier detection of those that turn out to be cancer."

A stereoscopic mammogram is created by acquiring two digital x-ray images separated by a rotation of the x-ray tube of about 6-10 degrees between the two acquisitions while the breast remains fixed in a compressed position. Dr. Getty compared the experience of reading a stereoscopic mammogram to watching 3-D movies while wearing red and green glasses.

The two images are presented simultaneously with crossed polarization on two LCD monitors separated by a sheet of glass coated with a material that is 50% reflective and 50% transmissive. This means the image presented on the lower, vertical monitor is transmitted through the glass and the image from the upper, angled monitor is reflected off the top surface of the glass plate. To view the two images, the radiologist wears passive polarized glasses with crosspolarized lenses so that the radiologist's left eye sees only the image on the lower monitor and the right eye sees only the image being reflected off the glass.

The 3-D display monitor used in the study was developed by Planar Systems Inc., Beaverton, Ore., and uses control software developed by Dr. Getty, a division scientist at BBN Technologies, Cambridge, Mass.

The stereoscopic system allows the radiologist to see the internal structure of the breast directly, in depth, which helps overcome the three main problems associated with standard mammography: masking of lesions, mimicry of lesions, and limited volumetric information. Normal breast tissue is separated away from the lesion in depth, thus increasing the lesion's conspicuousness. False positives are reduced because the elements of normal tissue aligned along the line of sight can be seen lying at different depths within the breast, so they don't mimic a focal abnormality. Finally, volumetric information is increased because the radiologist can directly view the 3-D structure of tissue and calcifications within the breast.

DAVID GETTY PH.D./BBN TECHNOLOGIES

David Getty, Ph.D., wears cross-polarized lenses to view the 3-D image.

Women in the study, at Emory University's Breast Imaging Center in Atlanta, had a standard screening full-field digital exam then a stereoscopic exam consisting of the cranial-caudal and mediolateral oblique screening views. The exams were read independently by different radiologists.

So far, 259 abnormal findings have been identified by one or both modalities, with further clinical work-up exams showing 109 were true lesions and 150 were false positives. Standard mammography missed 40 of the 109 lesions, and stereoscopic mammography failed to detect 24, a 40% reduction in false-negative readings. Of calcified lesions, standard mammography missed nearly half (20 of 41), compared with 4 missed by stereoscopic mammography, a highly significant reduction. For specificity of lesion detection, standard mammography reported 103 of 150 false positives and stereoscopic mammography just 53, a highly significant 49% reduction. ■

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