

Evaluation of Ductal Carcinoma in-Situ With Breast Specific Gamma Imaging Using a High Resolution Gamma Camera

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BACKGROUND

Mammography is the gold standard for breast cancer screening, reducing mortality by up to 44% (1). However, mammography is an imperfect examination with 10-15% of breast cancers not visible (2). Therefore adjunct imaging modalities are being developed. As new modalities are increasingly being utilized it is especially important to evaluate their ability to detect those cancers that are more challenging to identify. Ductal Carcinoma in-Situ, which generally manifests mammographically as microcalcifications, can be far more extensive than is evident mammographically. Furthermore, MRI, which has a sensitivity of greater than 90% for invasive cancers, is less sensitive in the detection of DCIS with a sensitivity of 64% (3). Molecular Breast Imaging or Breast-Specific Gamma Imaging using a high resolution, breast-specific gamma camera (BSGI) is a physiologic approach to breast cancer diagnosis. BSGI utilizes a radiotracer and images breast cancer by its increased metabolic activity and blood flow. Recently BSGI has been shown to be a powerful and important modality for improving breast cancer diagnosis (4) as well as for screening high-risk women with normal mammograms and physical examination (5). We wanted to explore the sensitivity of BSGI in detection of those cancers that are more difficult to image with MRI and mammography. Therefore we chose to evaluate the sensitivity of BSGI in Ductal Carcinoma in-Situ.

PURPOSE

To evaluate the ability of BSGI to detect Ductal Carcinoma in-Situ using a high-resolution, small field of view, breast specific gamma camera.

MATERIALS AND METHODS

117 women over age 18 who were not pregnant were included in this study. All women had breast lesions warranting biopsy (BIRADS 4 or 5) as detected by mammography or ultrasound. Patients underwent BSGI using 25-30 mCi of Technetium 99m sestamibi with a high resolution, small field of view, breast specific gamma camera (Dilon 6800, Dilon Technologies, Newport News, VA) in the cranio-caudal and mediolateral oblique views. The acquisition time for each image was less than 10 minutes. BSGI images were prospectively classified using a 1-5 scale: 1) normal; 2) benign with minimal patchy physiological uptake; 3) probably benign with scattered patchy uptake; 4) probably abnormal, with mild focal radiotracer uptake; and 5) abnormal with marked focal radiotracer uptake.

RESULTS

Of the 117 women, 13 (11.1%) had pure Ductal Carcinoma in-Situ with no evidence of invasion. Mean pathologic DCIS size was 8.8mm (1-22mm). Of the 13 DCIS, 12 were positive with BSGI. The sensitivity of BSGI for the detection of DCIS is 92.3%.

CONCLUSIONS

BSGI, a physiologic approach to breast cancer diagnosis, has a high sensitivity for the detection of DCIS (92.3%). This is higher than the reported sensitivity of DCIS using MRI. BSGI appears to be a highly sensitive imaging modality in detecting DCIS, even when the cancer is sub-centimeter in size.



A

The Dilon 6800: High Resolution Breast-Specific Gamma Camera:
A: The Camera
B: Patient imaged in the medio-lateral oblique projection
C: Patient imaged in the cranio-caudal projection

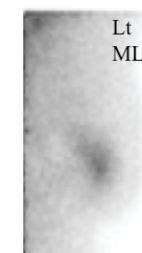


B



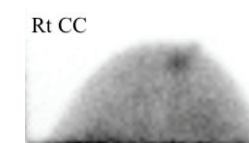
C

CASE 1:



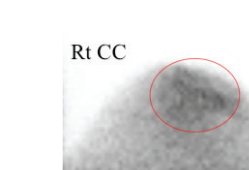
72 yr. old with 22 mm intermediate grade DCIS

CASE 2:



69 yr. old with 2 mm intermediate grade DCIS with surrounding LCIS

CASE 3:



77 yr. old with 19 mm high grade DCIS

REFERENCES:

1. American Cancer Society. *Cancer Facts & Figures 2006*. Atlanta, Ga: American Cancer Society, 2006
2. Bird, RE, Wallace TW, Yankaskas BC. Analysis of cancers missed at screening mammography. *Radiology* 1992;184:613-617
3. Mendell JH, Morris EA, Dershaw DD, Abramson AF, Brogi E, Liberman L. Determination of the presence and extent of pure ductal carcinoma in situ by mammography and magnetic resonance imaging. *Breast J.* 2005 Nov-Dec;11(6):382-90.4.
4. Brem RF, Schoonjans JM, Kieper DA, Majewski S, Goodman S, Civelek C. High-resolution scintimammography: a pilot study. *J Nucl Med.* 2002 Jul;43(7):909-15.5.
5. Brem RF, Rapelyea JA, Zisman G, Mohtashemi K, Raub J, Teal CB, Majewski S, Welch BL. Occult breast cancer: scintimammography with high-resolution breast-specific gamma camera in women at high risk for breast cancer. *Radiology.* 2005 Oct;237(1):274-80.