INVITED COMMENTARY

One Step Forward

Man cannot predict the future, he can invent it.

—Dennis Gabor

The sensitivity of mammography in detecting breast abnormalities is close to 90%; the specificity in detecting breast cancer is, conversely, as low as 50%. In current clinical practice, these statistics lead to an elevated number of unnecessary breast biopsies in patients with benign lesions. Thus, a more proper selection of lesions requiring biopsy is needed.

In this setting, scintimammography with ^{99m}Tc-sestamibi has been proposed because of its elevated accuracy (>80%), as shown in large series of more than 2,500 women (*1–3*). Furthermore, the elevated negative predictive value of scintimammography is the most important clinical outcome of its use as a complement to mammography (*3*). These studies also showed that the sensitivity of scintimammography significantly differs between palpable and nonpalpable breast lesions. Lesion size seems to be a major factor affecting these figures (*1–3*).

To overcome such limitations, dedicated breast imagers have been designed following different strategies and then produced and tested (*4–6*). In particular, the study presented by Brem et al. (*6*) in this issue of *The Journal of Nuclear Medicine* evaluated the results of scintimammography with ^{99m}Tc-sestamibi performed using a prototype high-resolution breast-specific gamma camera on a series of 58 women with small lesions not clearly defined by mammography. The prototype has an array of 3 × 3 × 10 mm NaI (Tl-activated) crystals separated by a 0.3-mm septum instead of the single crystal commonly used in conventional Anger cameras. Therefore, the prototype high-resolution breast-specific gamma camera allows use of the entire field of view, eliminating the edge effects of the single-crystal systems. Photomultipliers are optically coupled to the crystal array. The detector is in contact with the breast, which is mildly compressed by a graded, shielded plate. This enables craniocaudal and mediolateral views of the breast to be acquired with the patient seated.

High-resolution breast-specific gamma cameras should ameliorate the sensitivity of conventional scintimammography, improving the intrinsic spatial resolution and the accessibility to posterior and medial areas of the breast, reducing the contribution of scatter radiation from adjacent organs and the distance between breast and detector, and allowing mild breast compression. To verify these advantages, Brem et al. (*6*) performed scintimammography using a conventional gamma camera and procedure before scintimammography using the high-resolution breast-specific gamma camera. A comparative analysis of these 2 methods would have added value to this study. However, the study design precluded such an evaluation. In fact, scintimammography by high-resolution breast-specific gamma camera was systematically performed 1.5 h after ^{99m}Tc-sestamibi injection. Such a long interval might have negatively influenced the rate of lesion detection. Accumulation of ^{99m}Tc-sestamibi in breast lesions significantly decreases 1 h after intravenous administration. Registration of high-resolution breast-specific gamma camera images at the proper time (10 min after injection) would have better delineated the real possibilities of this technology. Furthermore, of great interest would have been a verification of whether performing studies by dedicated breast gamma imager at the proper time after injection yields firmer criteria on the positivity of ^{99m}Tc-sestamibi scintimammography.

Nevertheless, from a clinical point of view, the results obtained are encouraging and deserve some consideration. Sensitivity was 64.3% (18/28 malignant lesions detected) for conventional scintimammography but 78.6% (22/28) for the high-resolution breast-specific gamma camera, despite the suboptimal acquisition time. Specificity was stable (93.3%). Among the lesions detected by the high-resolution breast-specific gamma camera but missed by conventional scintimammography, 3 were nonpalpable and 1 was palpable. Furthermore, 3 cases of cancer that were occult by mammography were detected by the high-resolution breast-specific gamma camera. This result is extremely supportive of the use of the high-resolution breast-specific gamma camera for scintimammography. In fact, sonography, which is often applied as a second-line procedure for imaging of breast cancer, rarely provides further information because the sonographic examination is of specific districts of the breast as directed by the mammographic reports.

On the basis of this evidence, the patients who might greatly benefit from scintimammography using the high-resolution breast-specific gamma camera are those with screening-detected abnormalities that are indeterminate or of low suspicion, those with indeterminate but palpable findings, and those who are otherwise at high risk (such as those with prior surgery, lobular cancer in situ, Paget's disease, or a strong family history of breast cancer). In other words, scintimammography by high-resolution breast-specific gamma camera would be of particular clinical value in those cases

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classified by mammography as category III, or probably benign findings (using the Breast Imaging Reporting and Data System of the American College of Radiology), for which the prevalence of cancer does not exceed 2%. Negative scintimammographic findings allow one to perform a short-term survey by mammography every 6 mo, whereas positive findings are a strong indication for biopsy.

There is in the current literature a trend indicating that tumor size may not affect the rate of detection by scintimammography, likely because of differences in the biologic mechanisms of ^{99m}Tc-sestamibi in cancer cells (*3*,*7*). In this light, the results from Brem et al. (*6*) probably better define the edges of the problem. Lesion size is a factor. Use of an imaging method such as the high-resolution breast-specific gamma camera allows systematic detection of lesions $<$ 10 mm. Although the use of conventional and high-resolution breast-specific gamma camera scintimammography for imaging nonpalpable breast lesions could not be statistically compared in this series because of the limited number of recruited cases, clear evidence of advantages to using the high-resolution breast-specific gamma camera came out.

Nuclear medicine physicians specializing in breast cancer diagnosis have long desired the introduction of breast-dedicated imagers. This desire stems from the need to have breast projections similar to those commonly obtained by mammography (craniocaudal, mediolateral, lateral, and oblique), to have mild but sufficient breast compression, to reduce the field of view to the target organ, and to place the camera directly against the breast. These needs are not trivial. For a referring physician, use of a mammography-type format for scintimammographic images increases their familiarity and makes them simpler and easier to read.

Finally, the cost and extended use of these devices in nuclear medicine laboratories deserve general consideration. Probably, acquisition of a gamma imager dedicated exclusively to breast imaging would not be justifiable in most nuclear medicine units because of the small annual number of scintimammographic examinations. Conversely, acquisition of a gamma imager may be justified if it can be used for more than just breast imaging (e.g., thyroid or parathyroid imaging, imaging of skeletal details, or nuclear cardiology examinations in the emergency room).

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