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# Occult Breast Cancer Detection with Technetium-99m-Sestamibi: A Case Report

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A 74-y-old woman with a 4-y history of left arm lymphedema and multiple negative mammography studies presented to her physician with a palpable subcutaneous nodule in the left upper arm. After biopsy the nodule was read pathologically as secondary breast carcinoma. We report a finding of a positive <sup>99m</sup>Tc-sestamibi scintimammography in the presence of an unremarkable mammogram. The study also revealed a positive uptake in a metastatic lesion in the manubrium of the sternum.

**Key Words:** technetium-99m-sestamibi; lymphedema; breast cancer

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This patient was a 74-y-old woman who presented to her physician with left arm lymphedema, with an unknown etiology, as well as pericardial/pleural effusion. It is unusual for a patient to present with lymphedema without a clinical history of a primary cancer site and/or lymphatic dissection. The incidence of lymphedema is unclear, but studies have shown that up to 38% of women with breast cancer develop arm swelling (1).

## CASE STUDY

The patient developed edema of the left arm in 1995 while traveling. On returning home, she visited her physician who requested an MRI to determine the etiology of the swelling. The MRI of the brachial plexus demonstrated no mass in the brachial plexus on the left side, but suggested the possibility of a pericardial effusion versus pericardial fat.

Bilateral mammography, in the craniocaudal and mediolateral oblique projections using a dedicated mammography unit and dated December 1997, was read in comparison with a mammography dated September 1996. Both mammographies were performed at an outside mammography suite. The 1997 mammogram was read as moderately prominent residual glandular pattern, with a few scattered benign calcifications in each

breast. No dominant spiculated masses or worrisome calcifications were observed. There were no impressions of malignancy or significant interval change. Classification was ACR Category 1, normal study.

Since the MRI findings did not correlate to the left arm edema, and the mammography was read as normal in comparison with previous findings, the attending physician opted to perform a biopsy on the subcutaneous nodule in the left upper arm.

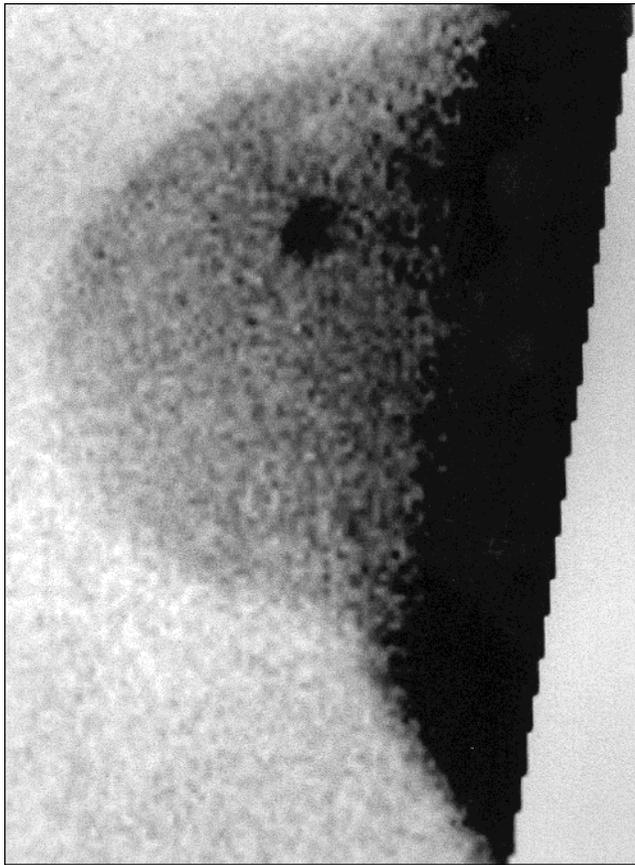
The biopsy included the left arm nodule and 2 other sites of suspected melanoma. The pathology report identified a secondary carcinoma of skin and subcutaneous tissue, associated with the axillary node carcinoma of undetermined origin, favoring a breast primary. The other 2 areas presented as lipoma with fat necrosis.

The physician then requested a breast imaging study with <sup>99m</sup>Tc-sestamibi to localize a primary breast lesion. Since the left axilla was reported as secondary carcinoma, it was suspected that the left breast would be the primary source. Twenty millicuries (740 MBq) <sup>99m</sup>Tc-sestamibi were administered through the dorsalis pedis vein, as both breasts were imaged (2). The patient was imaged at 5 min postinjection with a single, rectangular detector and a low-energy, high-resolution collimator. The energy peak was centered at 140 keV with a 10% window. A 256 × 256 matrix was used to maximize resolution (3–5). The patient was placed in the prone position on an imaging pad affixed to the imaging table. Each breast was imaged independently in a pendulous condition. Bilateral images, of 10 min duration were obtained, starting with the left lateral image at 5 min postinjection (2,3). The left breast demonstrated a focal uptake of sestamibi in the upper third of the left breast, measuring about 2.5 cm in diameter (Fig. 1).

A target-to-nontarget ratio was determined by region of interest analysis. Uptake in the suspected lesion was compared to a corresponding region in the contralateral breast. A ratio of 1.8 was obtained, which is considered positive, using a guideline of a ratio of  $\geq 1.4$  as a positive result (4). The region of interest drawn around the suspected tumor was compared to normal breast tissue in the same breast, where a ratio of 2.0 was

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**FIGURE 1.** Left lateral breast image demonstrating a focal uptake of  $^{99m}\text{Tc}$ -sestamibi in the upper third of the left breast.

obtained which is considered a positive finding. The right breast presented as normal, without any suspicious findings.

An anterior image was obtained for 10 min with the patient supine, arms raised over her head to localize the primary tumor and visualize both axillae (2,6). The anterior image demonstrated unusual uptake of sestamibi in the manubrium of the sternum (Fig. 2).

A  $^{99m}\text{Tc}$ -MDP bone scan was scheduled 2 d after the breast imaging study to rule out further metastatic spread. It demonstrated only the lesion in the manubrium of the sternum (Fig. 3). The only significant difference was that the uptake of  $^{99m}\text{Tc}$ -MDP demonstrated with a central area of necrosis in the lesion which could not be identified on the scintimammography.

Because of the patient's age and the extent of metastatic disease in the axillary lymph node and the sternum, it was determined that this patient would not undergo any type of surgical procedure at this time. Instead conservative treatment with chemotherapy was considered to be most suitable.

#### DISCUSSION

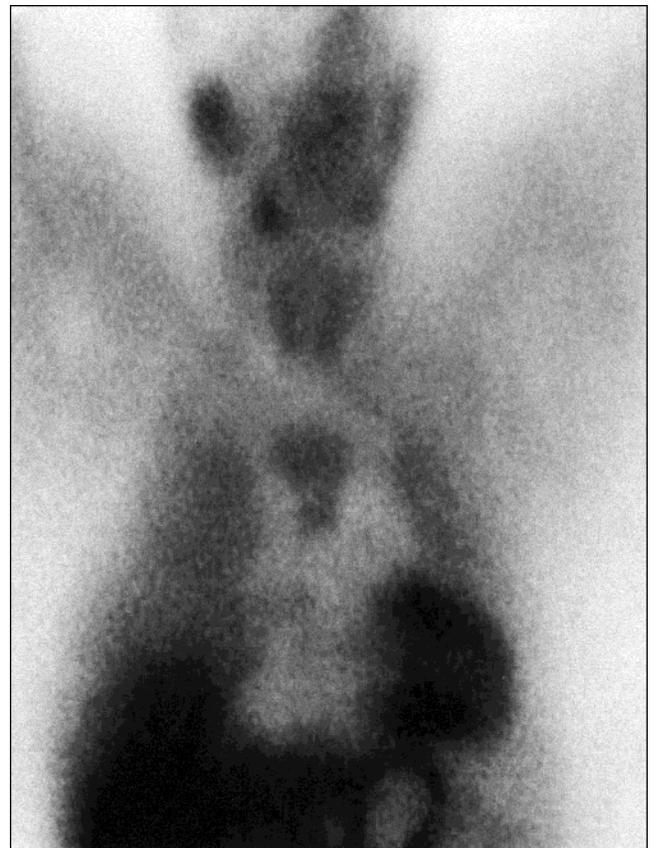
After the positive sestamibi scan, the mammograms of 1996 and 1997 were reviewed by several radiologists to determine if something was missed. A mammographer's notation with the 1997 films indicated that the left breast required 3 times greater penetration with 400+ MAS, while the right breast only required 157 MAS. The increased density of the left breast

probably could have been designated as an ACR Category 3, probably benign, with a short interval follow-up suggested. Since mammography is less reliable for detecting lesions in dense breasts (3,6,7), this would have been the expected outcome after the mammography. Technetium-99m-sestamibi was not available as an option at the time of the 1996 mammography, therefore a reading of Category 3 on the mammography would not have made that much difference in the patient's overall outcome.

The increased uptake of  $^{99m}\text{Tc}$ -sestamibi in the sternum, seen on anterior image of the breast study, may be due to the  $^{99m}\text{Tc}$ -sestamibi uptake in the bone marrow. Recent studies have indicated that sestamibi has demonstrated bone marrow extension in patients with osteosarcomas. Technetium-99m-sestamibi, like  $^{201}\text{Tl}$ , has demonstrated good correlation in identifying metastatic lesions to bone from breast cancer, and has shown promise in evaluating therapy response (8).

#### CONCLUSION

The breast lesion may have been present for several years, although it was never palpable, nor was it visible on any of the mammography studies. The recent development of breast imaging with  $^{99m}\text{Tc}$ -sestamibi has provided additional information for detecting breast lesions. Had this study been available years earlier, it is possible that the breast lesion in this woman could have been detected before the carcinoma spread to the axilla, the subcutaneous area of the arm, and the bone.



**FIGURE 2.** Anterior image with unexpected uptake of  $^{99m}\text{Tc}$ -sestamibi in the manubrium of the sternum.



**FIGURE 3.** Anterior bone scan of the chest with increased  $^{99m}\text{Tc}$ -MDP in the manubrium of the sternum which correlates to the uptake in the anterior breast image.

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