

# A Practical Technique to Improve Visualization of Sentinel Nodes in the Axillary Region on Breast Lymphoscintigraphy: Medial Breast Traction by Patient

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**Methods:** A standard method of performing breast lymphoscintigraphy is to obtain anterior and lateral views after periareolar intradermal injection of a radiotracer. However, a sentinel lymph node may be obscured by the activity at the injection site, especially on anterior views. Also, breast tissue may cause attenuation to prevent sentinel node visualization. In cases in which a sentinel lymph node is visualized on one view but not the other view or a sentinel lymph node is either not visualized or inadequately visualized, we repeat anterior and lateral views during medial traction of the breast performed by the patient. **Results:** We have found the medial breast traction technique performed by the patient to be especially useful for identification of axillary sentinel nodes. **Conclusion:** Repeat images during medial traction of the breast by the patient is an effective technique to improve visualization of sentinel lymph nodes in the axillary region.

**Key Words:** breast lymphoscintigraphy; lymphoscintigraphy techniques; sentinel node; medial traction

**J Nucl Med Technol 2022; 50:115–118**

DOI: 10.2967/jnmt.121.262994

**B**reast lymphoscintigraphy is an established method in primary staging of patients with invasive breast cancer without a palpable or needle biopsy-proven lymph node. If a sentinel node biopsy is negative, complete axillary dissection is associated with an increased risk of short- and long-term complications such as lymphedema with no benefit in overall survival, disease-free survival, or regional control (1,2). Frequently, the procedure needs to be completed in a timely manner to comply with the operating room schedule. Depending on the location of the lymph node and positioning of the breast, activity at the injection site may obscure the sentinel lymph node. Repeat anterior and lateral planar views during medial traction of the breast by the patient is a simple and effective technique to improve visualization of

lymph nodes. Demonstration of the sentinel node in 2 planes can help the surgeon determine its location.

## MATERIALS AND METHODS

In our routine protocol, we administer approximately 15 MBq (0.5 mCi) of <sup>99m</sup>Tc-tilmanocept for same-day surgery, and approximately 35 MBq (1.0 mCi) for next-day surgery, at the 12-o'clock location of the periareolar breast intradermally using aseptic technique, followed by gentle massage to improve drainage of the radiotracer. At our center, we obtain anterior and lateral dynamic images immediately after injection of the tracer, followed by anterior and lateral planar images using a dual-head  $\gamma$ -camera. When the sentinel lymph node is visualized, transmission images are obtained using a <sup>57</sup>Co flood source to demonstrate the body contour.

In cases in which, first, a sentinel lymph node is visualized on one view but not the other view (Figs. 1 and 2) or, second, a sentinel lymph node is either not visualized or inadequately visualized by 1 h after injection (Fig. 3), we repeat anterior and lateral views during medial traction of the breast performed by the patient (Fig. 4).

## RESULTS

We have found the medial breast traction technique performed by the patient to be especially useful.

## DISCUSSION

Since the introduction of breast lymphoscintigraphy, various techniques have been used, including intratumor and peritumor injection, subcutaneous or intradermal injection to the quadrant of the breast where the tumor is located, or combinations of injection techniques (3,4). The periareolar injection technique is simple, with a high success rate in sentinel lymph node detection (5). The relatively high activity level at the injection site may obscure the sentinel node in the axillary region, especially on the anterior view.

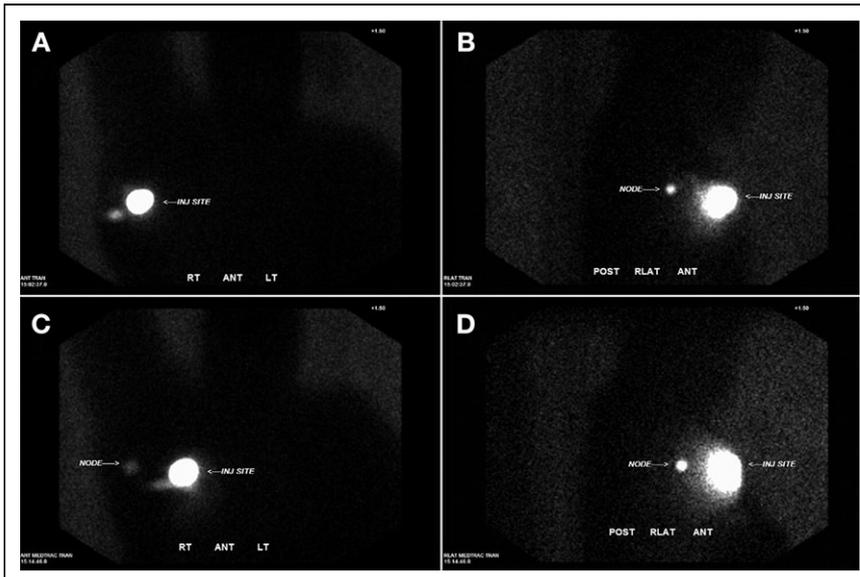
Imaging in the standing (upright) position was demonstrated to improve visualization of the sentinel nodes (6,7). Image acquisition when the patient's arm is 90° from the long axis of the patient to simulate the surgical position has been discussed. Because of the impracticality

Received Aug. 4, 2021; revision accepted Sep. 21, 2021.

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Published online Nov. 8, 2021.

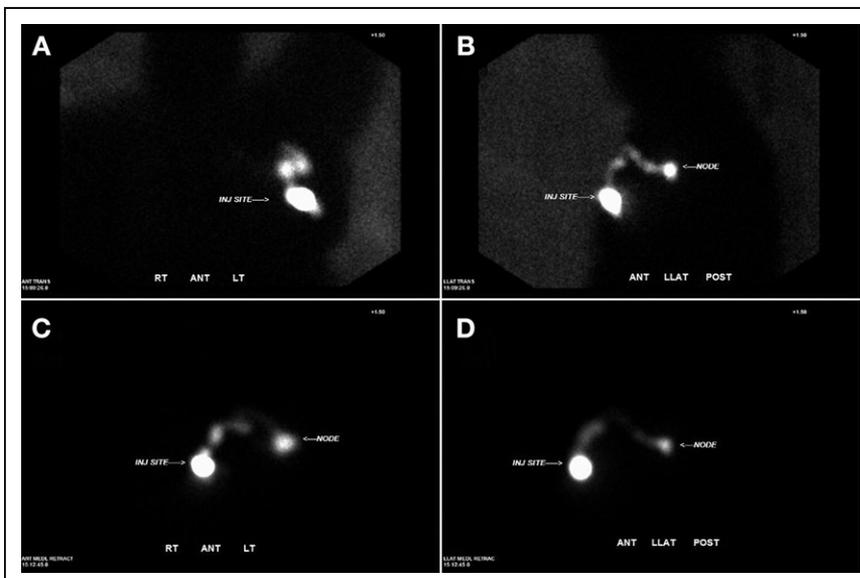
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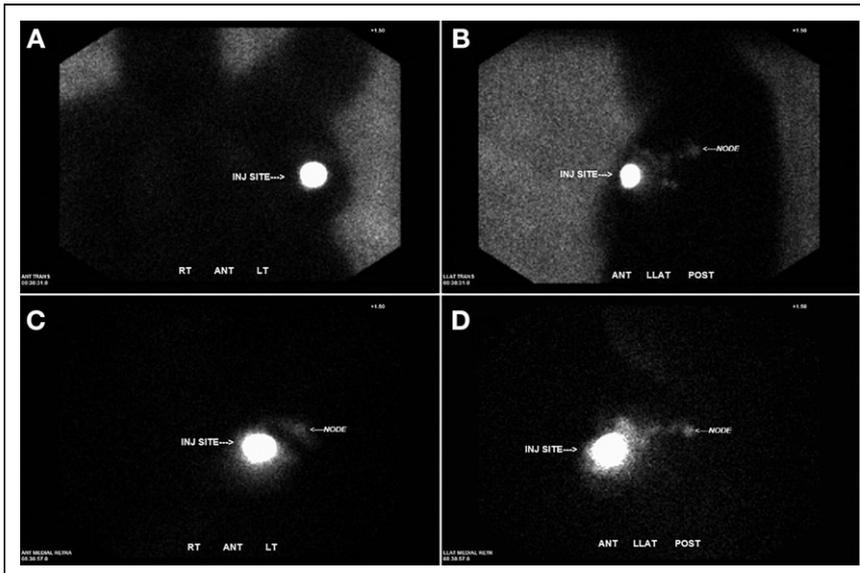
**FIGURE 1.** (A and B) Anterior (A) and lateral (B)  $^{99m}\text{Tc}$ -tilmanocept lymphoscintigraphy transmission images demonstrate focal area of increased uptake superior and posterior to injection site on lateral view. Focus of uptake inferolateral to injection site on anterior view is in lower position than uptake on lateral view in relation to injection site, suggesting it may not correspond to uptake on lateral view. (C and D) Repeat anterior (C) and lateral (D) images during medial breast traction by patient displaces superimposed injection site medially and clearly demonstrate sentinel node in axillary region on anterior view. Focal uptake inferolateral to injection site on anterior view is likely secondary to contamination.

of obtaining lateral views, arm angles of between  $135^\circ$  and  $180^\circ$  have been suggested as a compromise (8). However, this is also not the native position of the surgery. Oblique camera views ( $45^\circ$  from anterior views) with the arm in a  $90^\circ$  position may be obtained. A modified

oblique view of the axilla when the arm was abducted and elevated using a foam wedge elevating the ipsilateral shoulder has been described and demonstrated improved identification of axillary sentinel nodes (9). However, this positioning is not practical for image acquisitions in 2



**FIGURE 2.** (A) Anterior  $^{99m}\text{Tc}$ -tilmanocept lymphoscintigraphy image demonstrates focal areas of increased uptake superior to injection site. Sentinel node is not clearly identified. (B) Lateral image demonstrates lymph channels and sentinel node. (C and D) Repeat anterior (C) and lateral (D) images during medial breast traction demonstrate marked improvement of visualization of lymph channels and sentinel node on anterior view.



**FIGURE 3.** (A and B) Anterior (A) and lateral (B)  $^{99m}\text{Tc}$ -tilmanocept lymphoscintigraphy images demonstrate focal areas of increased uptake superior and posterior to injection site, which likely represent lymph channels and axillary sentinel node. (C and D) Repeat anterior (C) and lateral (D) images during medial breast traction demonstrate marked improvement of visualization of lymph channels and sentinel node on anterior and lateral views.

different views using a dual-head camera. Also, oblique images may be more difficult to interpret (8). Image acquisitions in a prone position with the breast hanging using a special pad with cutouts to move the injection site away from the axilla has been described. This method requires an additional position and maneuvering of the patient and is different from the position during surgery (10). Breast displacement maneuvers have been suggested (8,10,11). These maneuvers include taping the breast or using a breast holder. In our practice, we have found a medial breast traction technique performed by the patient to be especially useful. SPECT/CT is an excellent modality for evaluation of the sentinel node location. Unfortunately, it has limited use because of its high cost and the additional radiation dose to the

patient from the CT portion of the examination. The total effective dose from the low-dose CT portion of SPECT/CT is approximately 3 mSv, as compared with the radiation dose from a  $^{57}\text{Co}$  flood source, which is on the order of microsieverts (12).

We use a  $^{57}\text{Co}$  flood source for transmission images. A  $^{153}\text{Gd}$  flood source, which has primary photon emissions significantly below the  $^{99m}\text{Tc}$  emission window, has been suggested. This method may improve image quality because of the reduced crosstalk and increase signal-to-noise ratio (13). However, the images need to be acquired in a separate window and fused, requiring additional time for postprocessing.

## CONCLUSION

Breast lymphoscintigraphy requires coordination with the referring surgeon, the patient preadmission staff, and the operating room staff, especially for same-day procedures. It is important to complete studies in a timely manner. Necessary information needs to be provided to the surgeon. Therefore, patient scheduling, injection technique, and imaging protocol need to be tailored to meet the demand. Repeat imaging during medial breast traction by the patient is a fast, inexpensive, and practical technique to improve visualization of sentinel lymph nodes.

## DISCLOSURE

No potential conflict of interest relevant to this article was reported.



**FIGURE 4.** Photograph shows medial breast traction during acquisition of anterior and lateral images.

## KEY POINTS

**QUESTION:** Can medial breast traction by the patient improve visualization of sentinel lymph nodes in the axillary region?

**PERTINENT FINDINGS:** Repeat images during medial traction of the breast by the patient is an effective technique to improve visualization of the sentinel lymph nodes.

**IMPLICATIONS FOR PATIENT CARE:** Improved visualization of the sentinel lymph node can help the surgeon determine its location during surgery.

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