

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

Short running title: Breast Traction on Lymphoscintigraphy

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Abstract

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 injection site, especially on anterior view. Also, breast tissue may cause attenuation to prevent sentinel node visualization. Repeat images during medial traction of breast by patient is an effective technique to improve visualization of sentinel lymph nodes in axillary region.

Key Words: breast lymphoscintigraphy, lymphoscintigraphy techniques, sentinel node, medial traction

Introduction

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

Imaging Technique

In our routine protocol, we administer approximately 15 MBq (0.5 mCi) of ^{99m}Tc -tilmanocept for same day surgery, approximately 35 MBq (1.0 mCi) for next day surgery at 12 o'clock location of the periareolar breast intradermally using aseptic technique, followed by gentle massage to improve drainage of radiotracer. At our center, we obtain anterior and lateral dynamic images immediately after injection of 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 Cobalt-57 flood source to demonstrate body contour.

In the cases where 1) a sentinel lymph node is visualized on one view but not the other view (Figures 1, 2) or 2) a sentinel lymph node is either not visualized or inadequately visualized by

one hour after injection (Figure 3), we repeat anterior and lateral views during medial traction of breast performed by patient (Figure 4).

Discussion

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

Imaging in standing (upright) position was demonstrated to improve visualization of the sentinel nodes (6,7). Image acquisition when patient's arm is 90 degrees from the long axis of the patient to simulate surgical position has been discussed. Because of the impracticality of obtaining lateral view, arm angles between 135 and 180° has been suggested as a compromise (8).

However, this is also not the native position of the surgery. Oblique camera views (45° from anterior views) with the arm in a 90-degree position may be obtained. Modified oblique view of the axilla when arm was abducted and elevated using a foam wedge elevating ipsilateral shoulder has been described and demonstrated improved identification of axillary sentinel nodes (9).

However, it is not practical for image acquisition in two different views using a dual head camera. Also, oblique images may be more difficult to interpret (8). Image acquisition in a prone position with the breast hanging down in a special pad with cutouts has been described to move the injection site away from axilla. This method require 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). Those maneuvers include taping the breast or using breast holder. In our practice, we have found medial breast traction technique performed by patient to be especially useful. SPECT/ CT is an excellent modality for evaluation of sentinel node location. Unfortunately, it has a limited use due to high cost and additional radiation dose to the patient from CT portion of the examination. Total effective dose from low dose CT of SPECT/CT is approximately 3 mSv as compared with the radiation dose from ^{57}Co flood source in the order of μSv (12).

We use Co-57 flood source for transmission images. Gadolinium-153 flood source which has primary photon emissions significantly below the $^{99\text{m}}\text{Tc}$ 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 of post processing.

Conclusion

Breast lymphoscintigraphy require coordination with the referring surgeon, patient preadmission and the operating room, especially for same day procedures. It is important to complete studies in a timely manner. At the same time, necessary information needs to be provided to the surgeon. Therefore, patient scheduling, injection technique and imaging protocol needs 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 conflicts of interest relevant to this article exist.

Key Points

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

Pertinent Findings: Repeat images during medial traction of 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 nodes can help the surgeon determine its location during surgery.

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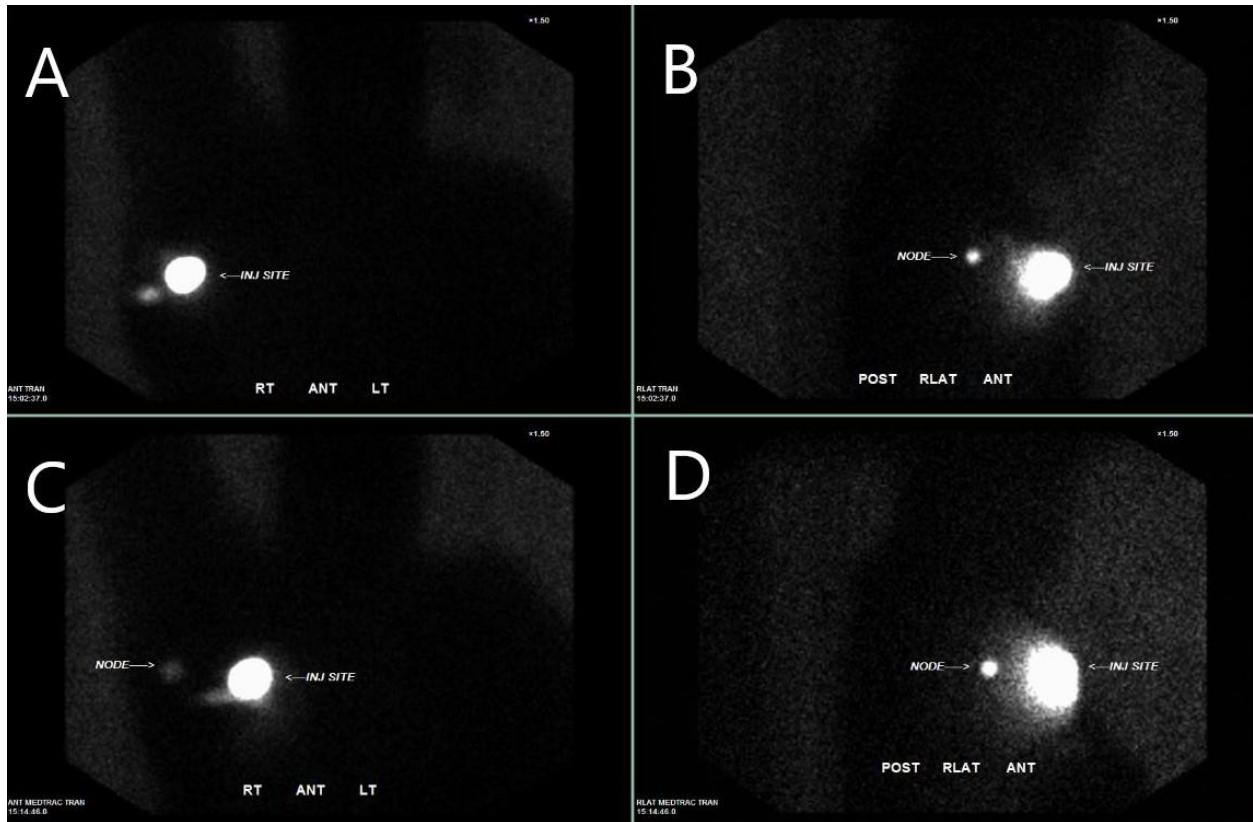


FIGURE 1. Anterior (A) and lateral (B) transmission images demonstrate a focal area of increased uptake superior and posterior to the injection site on the lateral view. A focal uptake inferolateral to the injection site on anterior view is in lower position than the uptake on lateral view in relation to injection site, suggesting it may not correspond to the uptake on lateral view. Repeat anterior (C) and lateral (D) images during medial breast traction by the patient displaces superimposed injection site medially and clearly demonstrate the sentinel node in the axillary region on anterior view. The focal uptake inferolateral to the injection site on anterior view is likely secondary to contamination.

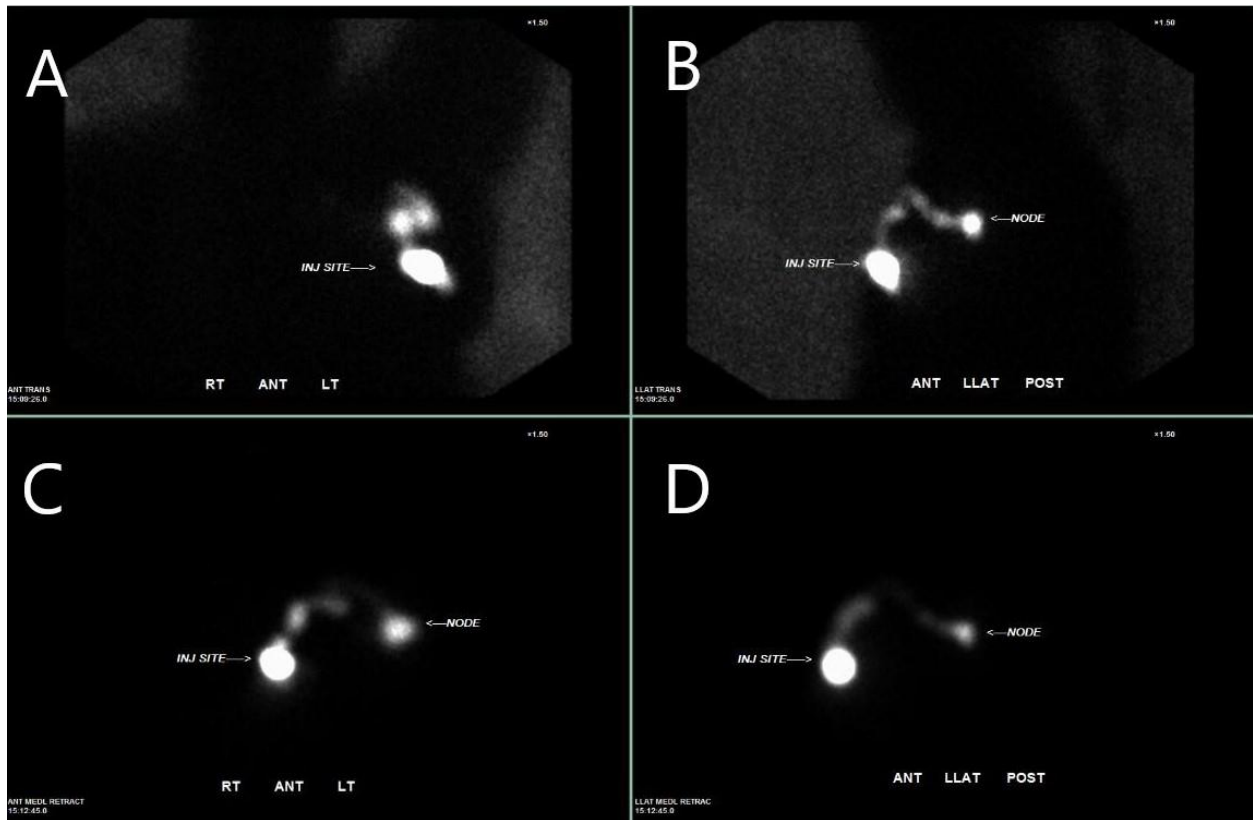


FIGURE 2. Anterior (A) image demonstrates focal areas of increased uptake superior to the injection site. Sentinel node is not clearly identified. Lateral image (B) demonstrates lymph channels and sentinel node. Repeat anterior (C) and lateral (D) images during medial breast traction demonstrate marked improvement of visualization of lymph channels and sentinel node on anterior view.

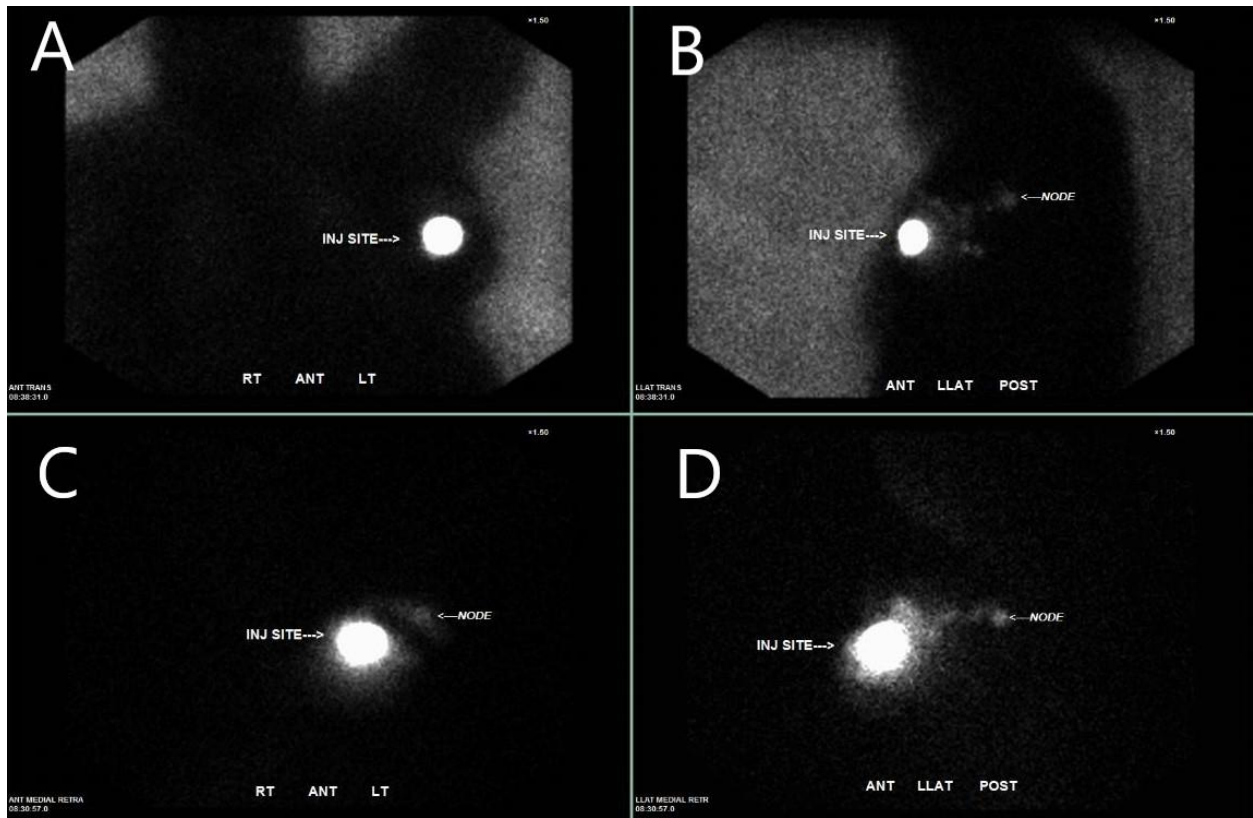
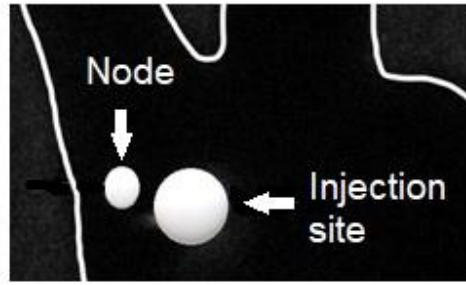
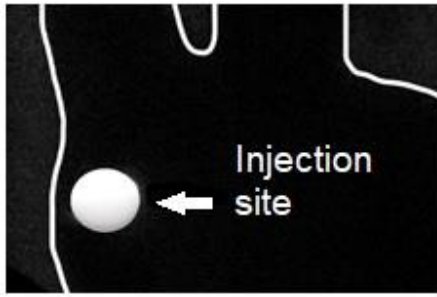


FIGURE 3. Anterior (A) and lateral (B) images demonstrate focal areas of increased uptake superior and posterior to the injection site, which likely represent lymph channels and axillary sentinel node. Repeat anterior (C) and lateral (D) images during medial breast traction demonstrate marked improvement of visualization of lymph channels and sentinel node on anterior and lateral views.



Obscured



Visible

MEDIAL BREAST TRACTION

Graphical Abstract