

Original article

# Reproducibility of lymphoscintigraphy before and after excisional biopsy of primary breast lesions: A study using superficial peri-areolar injection of the radiotracer

M. Asadi<sup>a</sup>, H. Shobeiri<sup>a</sup>, M. Aliakbarian<sup>a</sup>, A. Jangjoo<sup>a</sup>, V.R. Dabbagh Kakhki<sup>b</sup>, R. Sadeghi<sup>b,\*</sup>, M. Keshtgar<sup>c</sup>

<sup>a</sup> Surgical Oncology Research Center, Imam Reza Hospital, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

<sup>b</sup> Nuclear Medicine Research Center, Imam Reza Hospital, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

<sup>c</sup> Royal Free Hospital and University College London, London, United Kingdom

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## ABSTRACT

**Objective:** A major controversial issue in the sentinel node biopsy of the breast is the applicability of sentinel node mapping in patients with the history of previous excisional biopsy of the breast lesions. In the current study, we evaluated the reproducibility of lymphoscintigraphy before and after excisional biopsy of the primary breast lesions using superficial peri-areolar injection of the radiotracer.

**Material and methods:** Eighteen patients scheduled for excisional biopsy of breast lesions were included into the study. The patients received intra-dermal injection of the radiotracer in the peri-areolar area of the index quadrant 1 to 2 h before surgery. Imaging was performed the day after surgery. Immediately after completion of the first imaging, the patients received another injection of the radiotracer with the same technique, dose, and location. Other sets of lymphoscintigraphy imaging were taken immediately and 4 h post second injection. The two sets of lymphoscintigraphy images were compared.

**Results:** In 2 patients, sentinel node could not be identified in either set of images. In the remaining 16 patients, one sentinel node was detected in both lymphoscintigraphy image sets. The sentinel nodes of the second image sets were all in the same location of the first sets with at least 5 times higher count.

**Conclusions:** Excisional biopsy of the primary breast lesions does not seem to change the superficial lymphatic drainage pattern from the areola of the breast and sentinel node mapping can be performed after this procedure using superficial periareolar technique.

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## Reproducibilidad de la linfogammagrafía antes y después de la biopsia excisional de las lesiones primarias de mama: estudio utilizando la inyección periareolar superficial del radiotrazador

## RESUMEN

**Objetivo:** Una cuestión de gran controversia en la biopsia del ganglio centinela de la mama es la aplicabilidad del estudio del ganglio centinela en pacientes con historia previa de biopsia excisional de las lesiones de la mama. En el presente estudio, evaluamos la reproducibilidad de la linfogammagrafía antes y después de la biopsia excisional de las lesiones primarias de mama utilizando la inyección periareolar superficial del radiotrazador.

**Material y métodos:** Se incluyó en el estudio a 18 pacientes programadas para biopsia excisional de lesiones de mama. A las pacientes se les administró una inyección intradérmica del radiotrazador en el área periareolar del cuadrante con tumor, con 1 o 2 h antes de la cirugía. La imagen se obtuvo el día posterior a la operación. Inmediatamente tras la primera imagen, a las pacientes se les administró otra inyección del radiotrazador con la misma técnica, dosis y localización. Se realizaron inmediatamente otras series de imágenes de linfogammagrafía, y a las 4 h después de la segunda inyección. Se compararon las 2 series de imágenes de linfogammagrafía.

**Resultados:** En 2 pacientes no se pudo identificar el ganglio centinela en ninguna de las series de imágenes. En las 16 pacientes restantes se detectó un ganglio centinela en ambas series de imágenes de linfogammagrafía. Los ganglios centinela de las segundas series de imágenes se detectaron en la misma localización que las primeras series de imágenes, con un conteo al menos 5 veces superior.

**Conclusiones:** La biopsia excisional de las lesiones primarias de mama no parece modificar el patrón del drenaje linfático superficial desde la areola de la mama, pudiendo realizarse el estudio del ganglio centinela tras esta intervención, utilizando la técnica periareolar superficial.

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### Palabras clave:

Cáncer de mama

Biopsia excisional

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Inyección intradérmica

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Modificación del drenaje linfático

\* Corresponding author.

E-mail addresses: sadeghir@mums.ac.ir, raminsadeghi1355@yahoo.com (R. Sadeghi).

## Introduction

Sentinel node biopsy is considered as the standard of care in staging of early breast cancer.<sup>1</sup> This method has considerably decreased the morbidity of breast cancer treatment, since patients with pathologically negative sentinel nodes can be spared unnecessary axillary lymph node dissection.<sup>2,3</sup>

Despite widespread acceptance, many aspects of sentinel node mapping in breast cancer patients are still under debate.<sup>4,5</sup> A major controversial issue is the applicability of sentinel node mapping in patients with the history of previous excisional biopsy of the breast lesions. Although many researchers do not consider excisional biopsy as a contra-indication for sentinel node biopsy,<sup>6</sup> the bulk of evidence has come from the studies comparing detection and false negative rates in patients with and without history of excisional biopsy.<sup>7,8</sup> These studies have indirectly evaluated the effect of excisional biopsy on the accuracy of sentinel node mapping and the possible change of lymphatic drainage pattern after excisional biopsy of the primary breast lesion is still debatable.<sup>9,10</sup>

In the current study, we evaluated the reproducibility of sentinel node imaging (or lymphoscintigraphy) before and after excisional biopsy of the primary breast lesions using superficial peri-areolar injection of the radiotracer.

## Material and methods

Eighteen patients who were scheduled for excisional biopsy of breast lesions with the suspicion of malignancy were included into the study. None of the patients underwent any axillary or breast surgery procedure. No patient had previous history of radiotherapy or chemotherapy.

The study was approved by the local ethical committee of our institution, and all the patients gave their written informed consent before inclusion into the study.

One to two hours before surgery patients were sent to the nuclear medicine department for lymphoscintigraphy. The procedure has been explained elsewhere.<sup>11,12</sup> In brief, the patients received intra-dermal injection of 37 MBq in 0.2 mL <sup>99m</sup>Tc-Antimony sulfide colloid in the peri-areolar area of the index quadrant. In case of malignant pathological result of the excisional biopsy, the patients would be referred to the nuclear medicine department for imaging and second injection of the radiotracer. Imaging was performed the day after surgery using a dual head variable angle gamma camera (E.CAM Siemens) equipped with low-energy high resolution collimators in anterior and lateral projections (128 × 128 matrix, 5 min/projection). Immediately after completion of the first lymphoscintigraphy imaging, the patients received another injection of <sup>99m</sup>Tc-Antimony sulfide colloid (of the same batch of radioactive material as the first injection) with the same technique, dose, and location. Other sets of lymphoscintigraphy imaging were taken immediately (dynamic imaging 10 s/frame for 20 min), and 4 h post second injection with the exact same protocol as the first images. Patients with malignant tumor of the breast underwent definite surgery for breast cancer the same day of the second radiotracer injection alongside sentinel node detection. In case of positive frozen section of the sentinel node, axillary dissection would be performed.

The two sets of lymphoscintigraphy images were evaluated by two expert nuclear medicine specialists. The location and number of sentinel nodes and semi-quantitative evaluation (using ROIs over the sentinel nodes) of the sentinel node counts were used for comparison between the pre and post excision images. Concordance between two images was defined as increase in the sentinel node counts of the first image set after second injection. Discordance was

defined as any new sentinel node visualized after second injection or no increase in the sentinel node count.

## Results

The characteristics of the patients are presented in Table 1. Biopsy results of all patients were invasive carcinoma. In two patients (number 2 and 4), sentinel node could not be identified in either set of images. In the remaining 16 patients, one sentinel node was detected in both lymphoscintigraphy image sets. The sentinel nodes of the second image sets were all in the same location of the first sets with at least 5 times higher count. Fig. 1 shows images of patient 7 of our study.

## Discussion

Despite widespread acceptance of sentinel node biopsy in the management of breast cancer patients, many technical aspects of this procedure is under debate.<sup>10</sup> One of the controversial issues is the impact of excisional biopsy of the breast lesions on the accuracy of sentinel node biopsy. Many studies reported comparable results in patients with and without history of excisional biopsy and others reported quite the opposite.<sup>6,7</sup> A recent meta-analysis showed that surgical biopsy of the primary breast lesions does not affect the detection rate. However, false negative rate seems to be slightly (clinically insignificant) higher in patients with the history of excisional biopsy.<sup>6</sup>

However, none of the above-mentioned studies directly evaluated the possible change of lymphatic drainage after excisional biopsy. To our knowledge only one study reported the reproducibility of lymphoscintigraphy imaging before and after excisional biopsy of the primary breast lesions. In this study, Estourgie et al. reported axillary drainage reproducibility of only 32%. Eleven out of 25 patients showed altered axillary lymph node drainage (in 7 no axillary nodes was detected on the post-excisional biopsy images) and 10 out of 13 patients with internal mammary drainage before excisional biopsy showed altered drainage into this basin after excision.<sup>9</sup> The results of our study were in complete contrast to Estourgie et al. as we found 100% reproducibility in the lymphoscintigraphies before and after excisional biopsy of the breast lesions. This difference can be explained by different injection technique we used in our study. We used intradermal injection of the radiotracer in the peri-areolar region which has more efficient and faster migration in the lymphatic system compared to the intra-tumoral method as Estourgie et al. used in their studies.<sup>13–15</sup> Sluggish movement of the radiotracer in the lymphatic system (due to edema and inflammation post excisional biopsy) has been shown to decrease sentinel node detection rate using deep injections of the radiotracer,<sup>16</sup> which is what occurred in 7 patients of Estourgie et al. study with pre and post excisional biopsy lymphoscintigraphy axillary discrepancy. On the other hand, excisional biopsy does not have any considerable effect on the axillary sentinel node detection rate using intra-dermal injection of the radiotracer<sup>6,17</sup> and this can explain the high detection rate post-excision in our study. Another aspects of our study were also different from Estourgie et al. such as particle size (which is smaller by <sup>99m</sup>Tc-Antimony sulfide colloid compared to <sup>99m</sup>Tc-Nanocolloid), and the time interval between the first and second imaging (which was much longer in the Estourgie et al. study). These differences can also contribute to the disparity between the results of our study and Estourgie et al. study. It is also worth mentioning that internal mammary nodes are not usually visualized by intra-dermal injection of the radiotracer<sup>11</sup> and we could not evaluate the change in drainage pattern in this location as Estourgie et al. did.

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