SENTINEL LYMPH NODE SCINTIGRAPHY IN BREAST CARCINOMA- COMPARISON OF TWO VERSUS FOUR INJECTION TECHNIQUE

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Abstract
Purpose: Sentinel lymph node is the first regional node that drains lymph from the primary tumour and receives seeding of metastatic cells. Axillary node dissection remains the most reliable predictor of disease outcome. Controversies still exist about several aspects of lymphatic mapping and sentinel lymph node biopsy for breast cancer, including number of radioisotope injection. Purpose of this study is to evaluate the success rate of different number of injection sites in the detection of sentinel lymph nodes (SLN) in breast cancer.

Methods: One hundred twenty consecutive breast cancer patients were divided into two groups. Group A (60 patients) received four intradermal periareolar injections. Group B (60 patients) received two intradermal periareolar injections. Imaging was carried out at 45 minutes post injection. A gamma probe was used to explore the SLNs during surgery.

Results: In Group A, 60 females with mean age 50.77 years were included. 34(56%) patients had single SLN. 25(41.7%) had SLN with second tier. 1 (1.7%) was negative.
Group B included 60 patients (59 females, 1 male) with mean age 51.9 years. In 30(50%) patients single SLN was detected. 29(48.3%) had SLN with second tier. 1 (1.7%) was negative.

Conclusion: Sentinel lymph node mapping with 2 periareolar intradermal injections carries less radiation dose and less pain as compared to the four injections with equal sensitivity for the visualization of sentinel lymph nodes.

Keywords Sentinel lymph node, breast cancer, intradermal injection, Tc⁹⁹ Human serum albumin

Introduction:
Breast Cancer is the commonest malignancy of females all over the world and second leading cause of death due to cancer among females. Approximately one in every nine Pakistani women is likely to suffer from breast cancer. This is one of the highest incidence rates in Asia [1]. Sentinel lymph node is the first regional lymph node that drains the lymph from the primary tumour [2]. It is potentially the first node to receive the seeding of lymph-borne metastatic cells. Axillary lymph node dissection remains one of the mainstays of breast cancer because clinical, imaging or laboratory methods are insufficient to define nodal status, the most reliable predictor of disease outcome [3]. Sentinel lymph node biopsy is a standard practice in most centers.

The morbidity associated with an axillary procedure includes arm swelling, sensory disturbance, infection, shoulder stiffness and impaired shoulder movement [4]. The ideal situation, therefore, would be to stage the axilla with no or minimal intervention. Sentinel lymph node scintigraphy allows the surgeon to easily identify and biopsy the sentinel lymph node and it can be performed under local anesthesia in an attempt to reduce the risks of general anesthetics. Currently detection of SLN is highly accurate in context of carcinoma breast and there is rapidly increasing...
Sentinel Lymph Node Mapping (SLNM) is a technique in which a radioactive tracer is injected into the breast and a molecular imaging scan is performed to provide a ‘road map’ of lymphatic drainage from the tumour [5]. However, there are still ongoing controversies about several aspects of lymphatic mapping and sentinel lymph node biopsy for breast cancer, including number of injection sites of radioisotope [6]. This study aims to evaluate the success rate of different number of intradermal peri-areolar injection sites in the detection of sentinel lymph nodes (SLN) in breast cancer. No such study has been carried out in the Pakistani population.

MATERIAL AND METHODS

Retrospective data collection was done over a period of 6 months from October 2013 to March 2014. One hundred and twenty consecutive patients were enrolled. Patients of any gender and any age with biopsy proven breast carcinoma and no clinically palpable axillary lymph nodes were included. Patients with primary tumour larger than 5cm, local recurrence and pre-operative chemotherapy/ radiotherapy were excluded from the study. Breast lymphoscintigraphy for SLN localization was performed in the evening prior to surgery. Radiopharmaceutical used was 99mTc-labelled human albumin colloid particles (99mTc-HSA nano colloids) 20 MBq/injection site, in a volume of 0.2 ml. The patients were divided into two groups by simple random sampling. Aseptic technique was used for injection. Group A (60 patients) received four intradermal periareolar (ID-PA) injections at 3, 6, 9 and 12’0 clock positions. Group B (60 patients) received two intradermal periareolar (ID-PA) injections at 6 and 12’0 clock positions. Scintigraphic images were acquired 45 min and 16 hour post-injection (p.i.) by a gamma camera (Infinia; GE Medical Systems, Milwaukee, WI, USA) equipped with a low-Energy General Purpose (LEGP) collimator with energy window set at 140 KeV. Static left/right anterior, oblique (30 degree) and lateral views were performed (128x128matrix, zoom 1.0) on a time based (2 min each view) study. Delayed imaging was done next morning prior to surgery, but not later than 18 hours post injection. The first lymph node to be visualized on gamma camera scan is referred to as sentinel lymph node. The node receiving radiotracer from other node is referred to as second tier node. A surgical gamma probe was used to explore the SLNs during surgery along with blue dye injection intraoperatively.

STATISTICAL ANALYSIS:

All data was entered and assessed by using computer based Statistical Package for Social Sciences (SPSS) version 19. The mean ± SD was calculated for quantitative variables like age. Qualitative variables like gender and detection of SLN are presented in percentages and frequency. Chi-square test was used to compare the detection of SLN in both groups. P-value ≤0.05 was considered as statically significant.

RESULTS:

Demographic Parameters

Group A:
In group A, total 60 patients were included. All of them were females with mean age 50.77 years and the age range was 31-80 years (Std. Deviation ±11.8)

Group B:
Group B included total 60 patients out of which only 1 (1.6%) was male while the remaining 59(98.4%) were females. Mean age was 51.90 years and the age range was 30-80 years (Std. Deviation ±10.3)

Sentinel node localization in Group A & B

GROUP A:
In 34(56%) patients single SLN was detected and in 25(41.7%) SLN with second tier was visualized. In 1 patient (1.7%) no SLN was visualized. (Figure 1)

GROUP B:
In 30(50%) patients single SLN was detected and in 29(48.3%) SLN with second tier was visualized. In 1 patient (1.7%) no SLN was visualized. (Figure 1)

Comparison of Sentinel node localization in Group A & B
There was no statistically significant difference between the results of two injection techniques (p=0.761).

DISCUSSION

Breast Cancer is the most common malignancy among females and second leading cause of cancer related deaths. Pakistan has one of the highest incident rates in Asia with every ninth women likely to suffer from breast cancer [1]. The first lymph node in the lymphatic basin draining the primary tumour is called the sentinel lymph node [7]. It reflects the histological characteristics of the rest of the nodes in the chain. The metastases to lymph node are not a random phenomenon and can be determined by identifying the lymph flow from tumour to primary lymph draining node.

Satisfactory results are obtained with SLNB despite significant variations in the methodology. Some centers use blue dye only, others use radiocolloid (Tc99-sulphur colloid) only but most of the center use combination of two for detection of SLNB. All three methods had reliable results in experienced hands. Many authors demonstrated best results with combination techniques proving that this hypothesis is true. Of 39 studies, using radioisotopes (16 studies) or blue dye (11 studies) or a combination of both (12 studies) identified SLN in 92%, 81% and 93% respectively [8].

Different injection techniques are applied for injection of radiotracer and blue dye in patients with primary breast lesion for SLNB. Peritumoral or intratumoral injection technique were used in initial studies of SLNB for following reasons; first, the lymphatic drainage of the skin of the breast and glandular tissue were thought to be different, second, the injection distant from tumour may not represent true sentinel lymph node [9,10]. Many recent studies use intradermal (ID), subdermal (SD) and subareolar (SA) [11-13]. Several authors demonstrated that visualization of axillary lymph nodes by ID or SA injection is faster than with peritumoral PT injection [13-16]. Most of the studies reported, sentinel lymph node identification > 95% in appropriately selected patients [17-20]. The detection rate in both the groups of this study is 98.33% which is in line with the meta-analysis of previous literature [17-20]. Also noted is the fact that there is no significant difference (P-value = 0.546) in the frequency of detection of sentinel lymph nodes in both groups with different number of radiotracer injections. Hence the frequency of detection of sentinel lymph node using two-injection technique is comparable four injection technique in patients with breast carcinoma. Also, more number of second tier nodes is identified in the 2 injection technique as compared to the 4 injections, which signifies that the visualization of second tier nodes is not related to the number of injection sites. However, it is of clinical importance that the radiation dose as well as the pain is less in case of two injections (Group B) as opposed to four injections (Group A).

Many factors can affect visualization of the sentinel node during lymphoscintigraphy. In advanced breast cancer, lymphatics become progressively infiltrated with tumour cells and do not allow the passage of radionuclides [21]. Cancerous involvement of the lymphatic system may influence the drainage pattern.
Completely invaded nodes may lead to unsuccessful axillary node detection due to a lack of ability of tracer uptake in the leading node. Heuser et al. reported 5 cases in which no axillary SN could be detected and consecutive axillary surgery revealed a positive nodal status in 4 of these patients with unsuccessful mapping [22]. The two patients in our study with negative sentinel scan underwent surgery after blue dye labelling. One out of these patients had nodal involvement by the tumour while the other had nodes negative for malignancy.

It has previously been reported that age of the patient and tumour size may influence sentinel node detection rates [23]. Furthermore, the radiopharmaceutical used, the dose of the pharmaceutical, the particle size of the pharmaceutical, and the injection-to-imaging time may all influence visualization of the sentinel node during lymphoscintigraphy [24]. The site of pharmaceutical injection (whether intratumoral vs. extratumoral, intradermal vs. subdermal, or lateral vs. medial to a previous breast scar) can also affect visualization of the sentinel node during lymphoscintigraphy [25].

LIMITATIONS:
There are few limitations and possible biases in our study.

- As in any other cross-sectional study, we could not exclude the possibility of referral bias that influenced our study.
- The study was conducted over a short period of time. Further studies with larger sample size may be conducted.
- Difference in expertise level of injecting physician may also be a cause of variability in results.

CONCLUSION:
Sentinel lymph node mapping with 2 periareolar intradermal injections carries less radiation dose and less pain as compared to the four injections with equal sensitivity for the visualization of sentinel lymph nodes.

References:


