

Sentinel Lymph Node - its imaging and detection in Breast Carcinoma

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Sentinel lymph node is the first lymph node encountered by lymphatic vessels draining a tumor¹. Its status may accurately determine the status of the whole nodal area. The concept of sentinel lymph node biopsy relates to that fact that tumor drains in a logical way through the lymphatic system. Hence sentinel lymph node will be most likely to be first to be affected by metastasis². Determination of tumor status of this node by performing a histological evaluation should predict accurately the histological status of regional lymphatic basin draining the tumor - a sentinel node free from tumor metastasis would exclude tumor spread to the at-risk regional lymphatic basin². Though metastatic involvement of second tier node in absence of involvement of sentinel node is theoretically possible, this is a rare occurrence particularly in early stage of tumor.

In patients with breast cancer status of the axillary lymph nodes has been shown to be one of the primary prognostic indicators³. This help in selecting patients who may benefit from the adjuvant treatment and is currently determined by pathological examination of lymph nodes following axillary lymph node dissection. Conventional axillary node dissection surgery suffers from sampling error and can be complicated by significant patient morbidity (e.g. lymphedema in the ipsilateral arm, numbness and restriction of shoulder movement)⁴. It would be beneficial to obtain this information with a procedure without this significant morbidity. An alternative technique is sentinel lymph node biopsy. The absence of tumor in the sentinel node is felt to be strongly indicative of the absence of metastatic disease to other nodes in the regional basin, Thus, patients could be spared extensive node dissection surgery if the 'sentinel node' could be identified, examined, and found to be free of tumor. Further axillary dissection could be performed only in patients with positive findings for malignancy in the sentinel node. The introduction of sentinel-lymph-node biopsy has brought new impetus to the early staging of cancer in general, and breast cancer in particular. Whereas biopsy of sentinel node is already a standard of care for patients with melanoma, its utility in patients with early carcinoma breast is still subject to debate.

Two main techniques are in current use for the intraoperative detection of sentinel lymph node. These make use of a blue dye⁵ or lymphoscintigraphy using radiolabelled colloid particles⁶- both with its own advantages and disadvantages. While the blue dye technique is performed at the time of surgery, lymphoscintigraphy could be carried out with or without imaging before or on the day of surgery. Blue dye technique is cost effective, safe, rapid and involves no radiation. However its disadvantages include absence of pre-operative localization which may necessitate larger surgical flaps, tattooing, learning curve and allergies in few patients. Lymphoscintigraphy enables preoperative localization for improved surgical planning, detection of non-axillary lymph nodes and channels, detection of nodes in unsuspected sites and highest sensitivity for the detection of sentinel lymph node⁷. The node is localized per-operatively using a gamma probe. Disadvantages of lymphoscintigraphy include requirement of a multidisciplinary team, a definite learning curve and issues relating to radiation detection and protection⁷.

In articles published during last couple of years, the success rate of lymphoscintigraphy in localizing sentinel node during breast cancer surgery is reported to range between 94-97% for studies involving more than 100 patients⁸⁻¹². In a multi-center validation study, 8% of sentinel nodes found in 443 patients were outside the axilla and 3% of these were involved with carcinoma⁸. Without sentinel node

biopsy these nodes would have been missed on axillary node dissection. The blue dye technique has much lower success rate when used alone. However using blue dye and preoperative lymphoscintigraphy followed by per-operative detection by gamma probe yields best results with highest sensitivity⁸. The good results notwithstanding, there are numerous issues pertaining lymphoscintigraphy that are subject to controversy and lack consensus. These include technique employed with variables like type of radiopharmaceutical, size of the colloid particles, site of injection and volume of injection¹³.

The principal risk of relying on sentinel lymph node biopsy for predicting axillary lymph node status is that of false negative results which ranges from 0-12.5% in various reports¹³. This may be related to biology of disease causing skip metastasis or the ability of surgeon to successfully identify the sentinel node.

One crucial factor concerning sentinel node biopsy is its impact on long-term clinical outcome of patients. A recent study in which patients who were spared of axillary dissection if sentinel lymph node biopsy was negative, reported no local or axillary recurrence in 39 months of follow-up period¹⁴. Likewise none of the patients with T1 breast cancer and negative sentinel node in European Institute of Oncology study developed recurrence on 2-4 years of follow-up¹². Based on these observations, views about the role of sentinel lymph node biopsy in selection of patients for axillary lymph node dissection is changing and more experience with longer follow-up is needed before it is accepted as a routine procedure.

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