Lymphatic-Sparing Sentinel Lymph Node Biopsy to Prevent Breast Cancer-Related Lymphedema

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Abstract

- **Background:** Breast cancer-related lymphedema (BCRL) remains a significant morbidity following axillary surgery.
- **Problem:** Even with sentinel lymph node biopsy (SLNB), BCRL occurs in 5–7% of patients.
- **Goal:** Develop a feasible, lymphatic-preserving surgical approach to reduce BCRL risk.
- **Approach:** The lymphatic-sparing sentinel lymph node biopsy (LSSNBX) technique preserves and reapproximates lymphatic channels after node excision.
- **Outcome:** In early institutional results, LSSNBX was feasible, added minimal operative time, and showed no BCRL at 3-month follow-up.

Introduction

- **Clinical context:** Axillary surgery remains a cornerstone of breast cancer staging, but postoperative lymphedema continues to impact quality of life.
- **Shift in practice:** Modern surgical oncology prioritizes minimizing morbidity—supported by trials like **SOUND** and **INSEMA**, which validate axillary de-escalation.
- For patients who still require SLNB, surgical refinements that preserve lymphatic drainage are critical.
- **Objective:** Introduce a simple, scalable approach (LSSNBX) to maintain lymphatic continuity and potentially prevent BCRL.

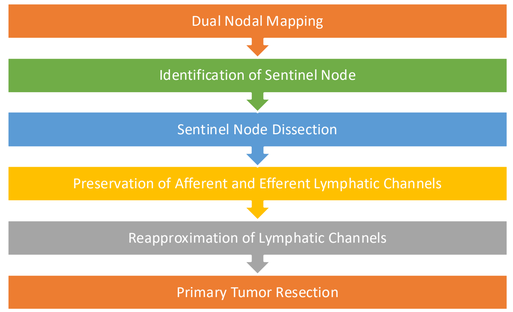
Methods and Materials

- Retrospective review of patients who underwent lumpectomy or mastectomy with lymphatic-sparing SLNB and non-lymphatic-sparing SLNB between 1/2017-1/2024
- Arm volume was measured non-invasively using bioimpedance spectroscopy (BIS) using the SOZO® device
  - Preoperative and 3-months postoperative SOZO® scores were collected and compared
  - BCRL was defined as a SOZO® score >10 and increase >6.5 from baseline.
- **Study Population:**
  - 103 patients total
  - *LSSNBX group:* 52 patients
  - *Standard SLNB group:* 51 patients
- **Surgical Technique:**
  - Dual-agent mapping (Technetium-99m ± indocyanine green or blue dye).
  - Axillary crease incision to access sentinel node.
  - Preservation of afferent/efferent lymphatic channels during excision.
  - Reapproximation of channels with fine absorbable suture.
  - No need for axillary reverse mapping (ARM) or specialized tools.

Results

- **Lymphedema outcome:**
  - No BCRL observed at 3-month SOZO® bioimpedance follow-up in either group.
- **Operative efficiency:**
  - LSSNBX added minimal operative time.
  - Required no special equipment.
- **Feasibility:**
  - Easily incorporated into standard workflow and reproducible in general surgical practice.

Operative Steps



Discussion

- LSSNBX focuses on physical preservation and reconnection of lymphatic channels rather than additional mapping procedures.
- ARM requires extra dye mapping and variable success rates. LSSNBX achieves similar preservation goals with simpler, universal technique.
- **Implications:**
  - Supports morbidity reduction without sacrificing oncologic accuracy.
  - Compatible with the broader movement toward less invasive axillary management.
- **Limitations:**
  - Single-institution experience.
  - Short-term follow-up period (3 months).

Conclusions

- **Summary:** LSSNBX is a simple modification of standard SLNB that prioritizes lymphatic preservation.
- **Benefits:**
  - Safe, cost-effective, and scalable.
  - Minimizes postoperative morbidity and aligns with modern surgical oncology principles.
- **Next steps:**
  - Larger, multicenter studies.
  - Longer follow-up for BCRL outcomes and oncologic safety validation.

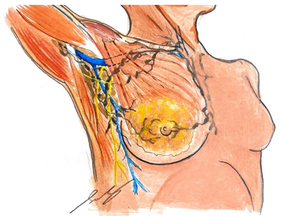


Figure 1. Lymphatics of the Breast

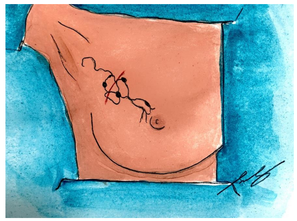


Figure 2. Dual Nodal Mapping

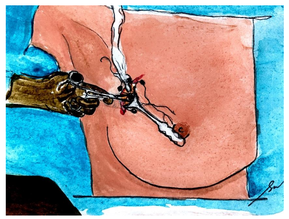


Figure 3. Identification of Sentinel Node



Figure 4. Sentinel Node Dissection



Figure 5. Preservation of Afferent and Efferent Lymphatics Channels

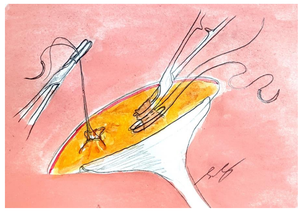


Figure 6. Reapproximation of Lymphatic Bundles



Figure 7. After reapproximation

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