The no massage approach for single-tracer sentinel lymph node biopsy in breast cancer: a retrospective cohort study comparing identification rate and long-term oncologic outcomes to the traditional massage technique

Chayanee Sae-Lim[1]^, Mawin Vongsaisuwon[1]^, Phuphat Vongwattanakit[1]^, Sikrit Denariyakoon[2]^, Sarun Thongvitokomarn[2]^, Nuanphan Polchai[2]^, Sopark Manasnayakorn[1]^

[1]Department of Surgery, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand; [2]Queen Sirikit Centre for Breast Cancer, King Chulalongkorn Memorial Hospital, Chulalongkorn University, Bangkok, Thailand

Contributions: (I) Conception and design: S Manasnayakorn; (II) Administrative support: N Polchai; (III) Provision of study materials or patients: M Vongsaisuwon; (IV) Collection and assembly of data: P Vongwattanakit; (V) Data analysis and interpretation: C Sae-Lim; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Sopark Manasnayakorn, MD, PhD. Department of Surgery, Faculty of Medicine, Chulalongkorn University, Rattanawittayapat Building, 13th Floor, 1873, Rama 4 Road, Pathumwan District, Bangkok 10330, Thailand. Email: sopark.m@chula.ac.th.

Background: Sentinel lymph node biopsy (SLNB) in breast cancer is traditionally performed with breast massage to improve node detection. However, with the widespread use of wire localization in breast conserving surgery (BCS), breast massage is often avoided to prevent wire displacement. This study aimed to evaluate the efficacy and oncologic safety of SLNB using blue dye without massage.

Methods: We retrospectively analyzed primary operable breast cancer patients who received SLNB using isosulfan blue dye with or without breast massage from January 2008 to December 2021 at a tertiary center in Bangkok, Thailand. The rates of sentinel lymph node (SLN) identification and oncological results were compared between the no massage and massage groups.

Results: Among 458 patients, 199 (43.4%) were in the no massage group and 259 (56.6%) in the massage group. The SLN identification rates were similar (98.5% *vs.* 97.7%, P=0.54), and the median number of harvested SLNs was three in both groups (P=0.48). Positive non-sentinel nodes were found in 3 cases (2.8%) in the massage group only. After a median follow-up of 87 months, the Kaplan-Meier curves showed no significant differences in the invasive recurrence-free survival (RFS) (P=0.30), breast cancer-specific survival (BCSS) (P=0.70), and overall survival (OS) (P=0.88) between groups.

Conclusions: The no massage approach for SLNB in breast cancer shows comparable SLN identification and survival outcomes compared to the traditional massage procedure.

Keywords: Axillary lymph node (ALN); blue dye; breast cancer; sentinel lymph node biopsy (SLNB); survival analysis

Submitted Nov 30, 2025. Accepted for publication Mar 02, 2026. Published online Apr 26, 2026.
doi: 10.21037/gs-2025-1-558
View this article at: https://dx.doi.org/10.21037/gs-2025-1-558

^ ORCID: Chayanee Sae-Lim, 0009-0001-1991-8802; Mawin Vongsaisuwon, 0000-0003-1343-0651; Phuphat Vongwattanakit, 0000-0001-6281-8578; Sikrit Denariyakoon, 0000-0002-1785-8420; Sarun Thongvitokomarn, 0000-0002-3519-3290; Nuanphan Polchai, 0000-0002-5496-3844; Sopark Manasnayakorn, 0000-0002-8145-9555.

Introduction

Sentinel lymph node biopsy (SLNB) is the standard approach for axillary staging in breast cancer patients with clinically negative node (cN0), offering equivalent survival outcomes to axillary lymph node dissection (ALND) while minimizing morbidity (1-5). In landmark SLNB trials such as NSABP B-32 (1) and ALMANAC (6), gentle massage around the blue dye injection site was recommended to facilitate lymphatic drainage and improve sentinel node identification. Subsequent cohort studies (7-9) have supported the use of breast and axillary massage to enhance sentinel lymph node (SLN) detection rates.

However, with the increasing adoption of breast conserving surgery (BCS) for early-stage breast cancer, the wire localization has become a standard approach for non-palpable tumors (10,11). In such cases, intraoperative breast massage has raised concerns regarding the potential risk of wire displacement. Moreover, an initial study suggested that breast massage might cause the benign mechanical transport of epithelial cells to the SLN (12), however, this hypothesis remains controversial (13).

This study investigates the performance and oncological outcomes of the SLNB using blue dye alone performed without massage, compared with the conventional technique incorporating breast massage, at a tertiary hospital in Thailand. We present this article in accordance with the TREND reporting checklist (available at https://gs.amegroups.com/article/view/10.21037/gs-2025-1-558/rc).

Highlight box

Key findings

- The no massage approach for sentinel lymph node biopsy (SLNB) in breast cancer shows comparable sentinel lymph node (SLN) identification and survival outcomes compared to the traditional massage procedure.

What is known and what is new?

- Breast massage in SLNB is impractical due to wire displacement risk in the breast conserving surgery (BCS).
- A comparable SLN identification rate of 98% was achieved without massage.
- The no massage SLNB yields the median of 3 nodes comparable to the massage.
- Comparable recurrence and survival outcomes were observed in both approaches.

What is the implication, and what should change now?

- SLNB without massage offers comparable efficacy and oncologic safety to the traditional massage approach.
- This no massage technique is suggested when the wire localization is used in the BCS.

Methods

Patients

This retrospective study evaluated the efficacy and oncological outcomes of SLNB using 1% isosulfan blue dye with or without breast massage in patients with primary operable breast cancer. Eligible patients were those who underwent SLNB performed by a single surgeon (S.M.) at King Chulalongkorn Memorial Hospital (KCMH), Bangkok, Thailand, between January 2008 and December 2021. Patients who received SLNB following neoadjuvant systemic therapy were excluded. Clinicopathologic data—including demographic information, clinical stage, type of breast surgery, histopathology, axillary nodal extracapsular extension, molecular subtype, and neoadjuvant and adjuvant treatments—along with perioperative and oncological outcomes were obtained from electronic medical records. Patients were categorized into "no massage" and "massage" groups according to whether manual massage was applied after blue dye injection, and direct comparisons were performed between the two groups.

At our institution, when SLNB was initially introduced in January 2008 to July 2016, the principal investigator (S.M.) performed SLNB with manual breast massage and backup ALND due to limited experience and concern over potential mapping failure. As experience with the technique increased and the use of wire localization became increasingly adopted for BCS, the practice of massage was discontinued in subsequent years to prevent potential displacement of the localization needle.

The study was conducted in accordance with the Declaration of Helsinki and its subsequent amendments. Ethical approval was granted by the Institutional Review Board of the Faculty of Medicine, Chulalongkorn University (IRB 819/67) and individual consent for this retrospective analysis was waived. The study flow diagram is shown in *Figure 1*.

Outcomes

The primary outcome of this study was the SLN identification rate, defined as the proportion of patients in whom at least one SLN was successfully identified intraoperatively. Secondary outcomes included the number of harvested SLNs, SLN pathological findings, the rate

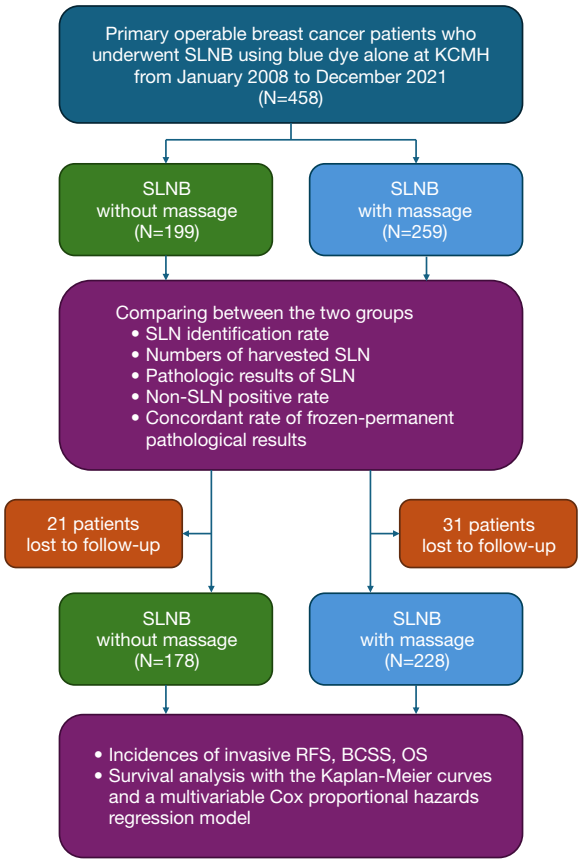

Figure 1 The flowchart demonstrating the study design and patient enrollment. BCSS, breast cancer-specific survival; KCMH, King Chulalongkorn Memorial Hospital; OS, overall survival; RFS, recurrence-free survival; SLN, sentinel lymph node; SLNB, sentinel lymph node biopsy.

of positive non-SLNs, the concordance between frozen-section and permanent pathological evaluations, and oncological outcomes. SLNB results were determined based on the axillary status reported in permanent pathological assessments, categorized as negative or positive for micrometastasis or macrometastasis. The rate of positive non-SLNs was defined as the proportion of patients with metastatic involvement in any axillary lymph node (ALN) other than the SLNs; this analysis was restricted to patients who underwent completion ALND.

Survival outcomes were analyzed using Kaplan-Meier estimates and multivariable Cox proportional hazards regression models. Invasive recurrence-free survival (RFS) was defined as the interval from the date of surgery to the first occurrence of invasive regional recurrence, distant recurrence, or death from any cause (14). Overall survival (OS) was defined as the time from surgery to death from any cause (14), while breast cancer-specific survival (BCSS) was defined as the time to death attributable to breast cancer (14). Recurrence and survival data were censored at the most recent follow-up, which concluded on 31 March 2025.

Surgical procedures

Patients were assessed for eligibility for upfront breast cancer surgery and SLNB using preoperative breast ultrasonography, mammography, and/or breast magnetic resonance imaging. Additional staging investigations—liver ultrasonography, chest radiography, and whole-body bone scintigraphy—were performed when necessary to exclude distant metastasis. SLNB was indicated for patients with no palpable ALNs at diagnosis or with ≤2 suspicious ALNs on preoperative imaging (15). Contraindications included palpable movable ALN with the positive needle aspiration result, palpable matted ALNs, or multiple suspicious ALNs on imaging (15).

For SLN localization, 1% isosulfan blue dye was injected intradermally into the periareolar region before scrubbing and draping, approximately 10 minutes prior to skin incision. In the massage group, an additional 5 minutes of manual massage was performed after dye injection. Following anesthesia induction, patients were positioned supine with the ipsilateral arm abducted to 90°. The SLNB incision site depended on the type of breast procedure: a separate axillary incision was used for BCS, whereas the mastectomy incision was utilized for total mastectomy. ALNs that were stained with blue dye or appeared morphologically suspicious were excised and submitted for permanent pathological evaluation. Frozen section assessment was selectively employed for patients with a higher likelihood of axillary metastasis, such as those with suspicious ALNs on preoperative ultrasonography. If macrometastasis was detected on frozen section and criteria for completing ALND were met, a conventional ALND was performed.

Statistical analyses

Continuous variables with a median and interquartile range (IQR) and analyzed using the Mann-Whitney U test. Categorical variables were compared using the χ^2 test. A P value <0.05 was considered statistically significant. Kaplan-Meier curves were generated to estimate survival outcomes, and comparisons between groups were performed using the log-rank test. Multivariable Cox proportional hazards regression models were used to calculate adjusted hazard ratios (aHRs) and 95% confidence intervals (CIs) for RFS, BCSS, and OS. Covariates included type of breast surgery, type of axillary surgery, tumor subtype, and receipt of adjuvant chemotherapy and radiation therapy. All analyses were two-sided and conducted using StataNow version 18.5 (StataCorp LLC, Texas, USA).

Results

Characteristics of patients

Between January 2008 and December 2021, a total of 458 patients with primary operable breast cancer underwent SLNB performed by a single surgeon and were included in the analysis. Among these, 199 patients (43.4%) received SLNB without breast massage after dye injection (no massage group), while 259 patients (56.6%) received the standard massage technique (massage group). No patients were excluded after enrollment, and all cases were available for SLNB outcome evaluation (*Figure 1*). The median age at diagnosis in the no massage group was significantly higher [56 years (IQR: 48–66 years)] compared to the massage group [53 years (IQR: 45–64 years), P=0.01; *Table 1*]. The median sonographic tumor size was 18 mm (IQR: 12–26 mm), with no statistically significant difference observed between the groups (P=0.22). Non-palpable node (cN0) was present in 84.5% (387/458) and palpable ALN but negative needle aspiration in 15.5% (71/458), with comparable distributions between groups (P=0.46).

Regarding surgical treatment, mastectomy (53.3% *vs.* 71.4%, P<0.001) and completion ALND (16.6% *vs.* 28.2%, P=0.004) were performed less frequently in the no massage group. In contrast, extracapsular extension (8.5% *vs.* 2.3%, P=0.002), estrogen receptor (ER) positivity (81.4% *vs.* 68.7%, P=0.002), and progesterone receptor (PR) positivity (69.3% *vs.* 52.9%, P<0.001) were more prevalent in the no massage group. The use of adjuvant chemotherapy was lower (47.2% *vs.* 58.5%, P=0.02), whereas adjuvant hormonal therapy (71.9% *vs.* 63.2%, P=0.05) and radiotherapy (56.3% *vs.* 46.1%, P=0.03) were more frequently administered in the no massage group. Detailed characteristics are summarized in *Table 1*.

Results of the SLNB

The SLN identification rate did not significantly differ between groups [98.5% (196/199) *vs.* 97.7% (253/259), P=0.54; *Table 2*]. The median number of harvested SLNs was 3 (IQR: 2–5) in both groups (P=0.48). Positive SLNs were identified in 20.6% (41/199) of patients in the no massage group and 20.5% (53/259) in the massage group (P=0.97). Among 106 patients who underwent completion ALND, positive non-SLN metastasis was found in 3 patients (2.8%), all within the massage cohort. Concordance between frozen section and permanent pathological findings for SLNs was high and comparable: 99.4% (172/173) in the no massage group and 99.6% (224/225) in the massage group (P=0.85). SLNB outcomes are summarized in *Table 2*.

Oncological outcomes and survival analysis

At the survival analysis cutoff (31 March 2025), 406 patients (88.6%) remained under follow-up. The overall median follow-up duration was 87 months (IQR: 64–117 months). Follow-up time differed significantly between groups, with a shorter duration in the no massage group [median 69 months

Table 1 Characteristics of patients receiving SLNB

Patient characteristics	All (N=458)	No massage (N=199)	Massage (N=259)	P value*
Age (years)	55 [46, 65]	56 [48, 66]	53 [45, 64]	0.01*
Sonographic tumor, cm	1.8 [1.2, 2.6]	1.8 [1.1, 2.6]	1.8 [1.2, 2.7]	0.22
Clinical T staging (NA =4)				0.31
0	36 (7.9)	17 (8.6)	19 (7.4)	
I	269 (59.3)	126 (63.3)	143 (56.1)	
II	140 (30.9)	53 (26.6)	87 (34.1)	
III	7 (1.5)	3 (1.5)	4 (1.6)	
IV	2 (0.4)	0	2 (0.8)	
Clinical N staging				0.46
0	38 (84.5)	171 (85.9)	216 (83.4)	
I	71 (15.5)	28 (14.1)	43 (16.6)	
Breast surgery				<0.001*
Breast conserving surgery	167 (36.5)	93 (46.7)	74 (28.6)	
Mastectomy[†]	291 (63.5)	106 (53.3)	185 (71.4)	
Axillary surgery				0.004*
SLNB	352 (76.9)	166 (83.4)	186 (71.8)	
SLNB and ALND	106 (23.1)	33 (16.6)	73 (28.2)	
Pathology				0.007*
IDC	368 (80.4)	146 (73.4)	222 (85.7)	
ILC	17 (3.7)	12 (6.0)	5 (1.9)	
DCIS	39 (8.5)	21 (10.6)	18 (7.0)	
Others[‡]	34 (7.4)	20 (10.0)	14 (5.4)	
Pathological N staging				0.84
0	355 (77.5)	157 (78.9)	198 (76.4)	
Imi	11 (2.4)	5 (2.5)	6 (2.3)	
I	61 (13.3)	25 (12.6)	36 (13.9)	
II	20 (4.4)	9 (4.5)	11 (4.3)	
III	11 (2.4)	3 (1.5)	8 (3.1)	
Extracapsular extension	23 (5.0)	17 (8.5)	6 (2.3)	0.002*
ER				0.002*
Positive	340 (74.2)	162 (81.4)	178 (68.7)	
Negative	118 (25.8)	37 (18.6)	81 (31.3)	
PR				<0.001*
Positive	275 (60.0)	138 (69.3)	137 (52.9)	
Negative	183 (40.0)	61 (30.7)	122 (47.1)	

Table 1 *(continued)*

Table 1 *(continued)*

Patient characteristics	All (N=458)	No massage (N=199)	Massage (N=259)	P value*
HER-2				0.37
Positive	109 (23.8)	49 (24.6)	60 (21.2)	
Negative	320 (69.9)	142 (70.9)	179 (69.1)	
Equivocal	29 (6.3)	9 (4.5)	20 (7.7)	
Ki-67 (NA =2)				0.61
≤20	285 (62.5)	127 (63.8)	158 (61.5)	
>20	171 (37.5)	72 (36.2)	99 (38.5)	
Adjuvant treatments (NA =1)				
Adjuvant hormonal therapy	306 (67.0)	143 (71.9)	163 (63.2)	0.05*
Adjuvant chemotherapy	245 (53.6)	94 (47.2)	151 (58.5)	0.02*
Adjuvant radiation therapy	231 (50.6)	112 (56.3)	119 (46.1)	0.03*

Data are presented as number (%) or median [interquartile range]. *, P value ≤0.05 determining statistical significance, which were calculated by independent *t*-test for continuous variables and χ^2 test for categorical variables. †, mastectomy included simple mastectomy, skin sparing mastectomy, and nipple sparing mastectomy; ‡, other pathology included invasive papillary carcinoma, medullary carcinoma, metaplastic carcinoma, mucinous carcinoma, tubular carcinoma. ALND, axillary lymph node dissection; DCIS, ductal carcinoma in situ; ER, estrogen receptor; HER-2, human epidermal growth factor receptor-2; IDC, invasive ductal carcinoma; ILC, invasive lobular carcinoma; Imi, micrometastases (tumor deposits larger than 0.2 mm but not exceeding 2.0 mm, approximately ≥200 cells); NA, not available; PR, progesterone receptor; SLNB, sentinel lymph node biopsy.

Table 2 Outcomes of SLNB with or without massage

Outcomes of SLNB	All (N=458)	No massage (N=199)	Massage (N=259)	P value*
SLN identification rate	449 (98.0)	196 (98.5)	253 (97.7)	0.54
Harvested SLNs, nodes	3 [2, 5]	3 [2, 5]	3 [2, 5]	0.48
Positive SLNs	94 (20.5)	41 (20.6)	53 (20.5)	0.97
Macrometastasis	81 (17.7)	36 (18.1)	45 (17.4)	0.84
Micrometastasis	13 (2.8)	5 (2.5)	8 (3.1)	0.71
Positive non-SLN†	3/106 (2.8)	0/33 (0.0)	3/73 (4.1)	0.24
Concordant frozen-permanent pathological results	396/398 (99.5)	172/173 (99.4)	224/225 (99.6)	0.85

Data are presented as number (%) or median [interquartile range]. *, P value ≤0.05 determining statistical significance, which were calculated by independent *t*-test for continuous variables and χ^2 test for categorical variables. †, positive non-sentinel lymph node was assessed only in patients who underwent completion ALND. ALND, axillary lymph node dissection; SLN, sentinel lymph node; SLNB, sentinel lymph node biopsy.

(IQR: 58–84 months)] compared with the massage group [113 months (IQR: 94–134 months); *Table 2*].

Kaplan-Meier survival analyses demonstrated no significant differences between the groups in invasive RFS (log-rank P=0.30; *Figure 2A*), BCSS (log-rank P=0.70; *Figure 2B*), or OS (log-rank P=0.88; *Figure 2C*).

Multivariable Cox regression analysis also revealed no significant differences in invasive RFS, BCSS, or OS after adjusting for breast and axillary surgery type, tumor subtype, and adjuvant therapies. The estimated 10-year invasive RFS was 90.2% in the no massage group and 87.8% in the massage group (aHR 0.932; 95% CI: 0.492–1.767; P=0.83). The estimated 10-year BCSS was 99.9% in both groups (aHR 1.126; 95% CI: 0.267–4.755; P=0.87), and the estimated 10-year OS was 99.9% in both groups (aHR 1.169; 95% CI: 0.394–3.469; P=0.78).

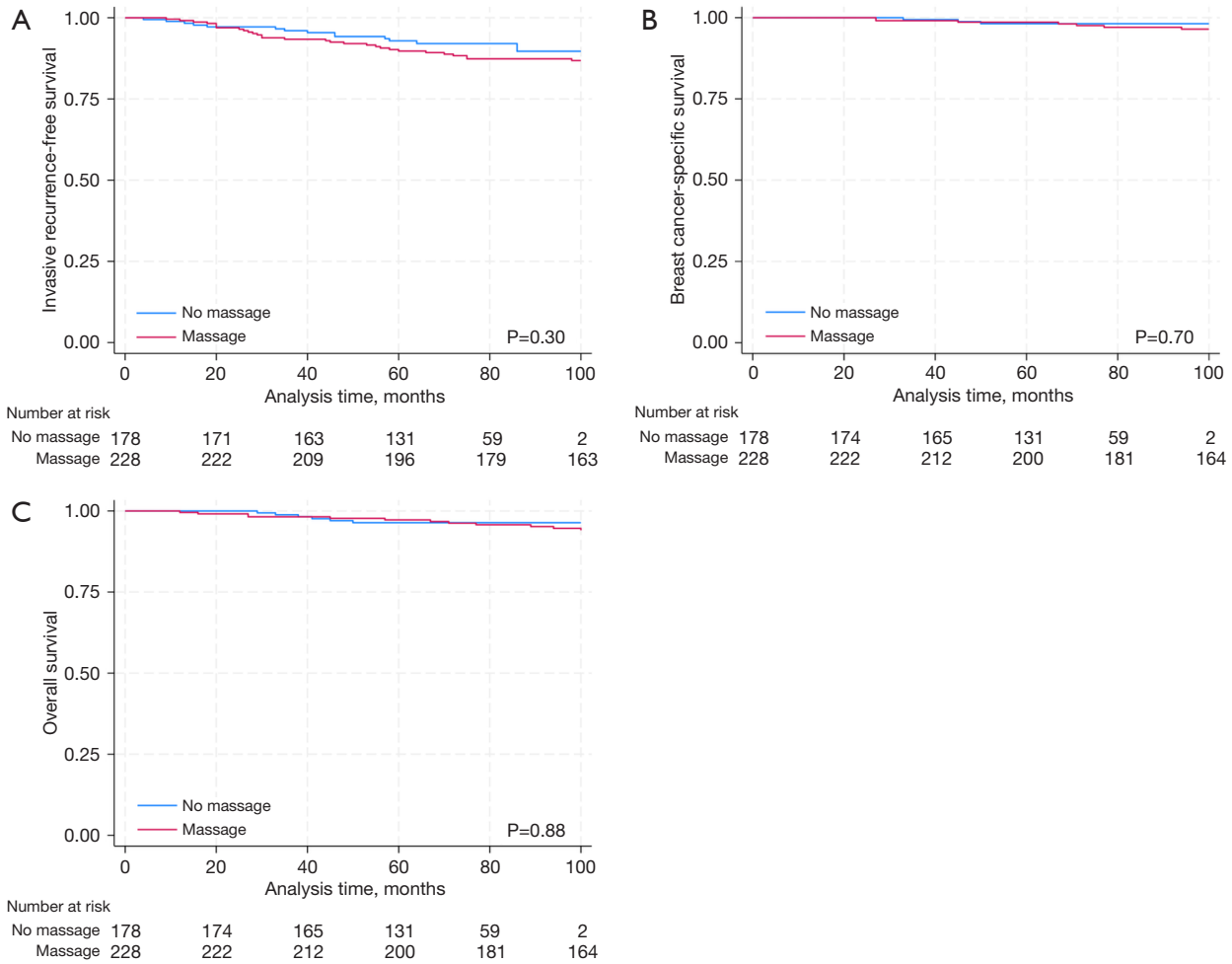

Figure 2 The Kaplan-Meier curves demonstrating (A) the invasive RFS, (B) BCSS, and (C) OS of breast cancer patients undergoing sentinel lymph node biopsy with or without massage. BCSS, breast cancer-specific survival; OS, overall survival; RFS, recurrence-free survival.

Discussion

Early landmark trials of SLNB (1,6-8) recommended gentle breast massage around the blue dye injection site to improve SLN identification. However, it has become impractical due to the risk of wire displacement during BCS and might affect the SLN result (12). This study evaluated the efficacy and oncological outcomes of SLNB using 1% isosulfan blue dye alone, comparing procedures performed with and without massage in operable breast cancer patients. A total of 458 breast cancer patients who underwent SLNB by a single surgeon (S.M.) at KCMH, Bangkok, Thailand, between January 2008 and December 2021 were retrospectively analyzed. Our results demonstrate that the no massage approach achieves comparable SLN identification rate and does not compromise locoregional control, distant recurrence, or survival, supporting its feasibility and safety in current surgical practice.

Our findings demonstrate a high SLN identification rate using single-agent isosulfan blue dye, with or without massage, ranging from 97.7% to 98.5%, which is consistent with the landmark studies (2-5). The results demonstrated no significant difference between the no massage and the massage groups (*Table 2*). Notably, the SLN identification rate in our study is relatively higher than in earlier studies using blue dye alone (16,17). This may be attributed to our technique of intradermal dye injection, which has been shown in some reports to yield higher success rates and require shorter waiting intervals compared to subcutaneous or intraparenchymal injection methods (18-21).

Both groups demonstrated a median retrieval of three SLNs (*Table 2*), a yield regarded as sufficient to ensure

reliable axillary staging in SLNB (1-3). Moreover, during the early adoption of SLNB, simultaneous ALND was performed in 33 patients in the no massage group and 73 patients in the massage group, among whom only 4 patients in the massage group (4.1%, 3/73) were reported to have positive non-SLNs. This non-SLN positivity was also reported in the ACOSOG Z0011 (2), AMAROS (3) and SENOMAC (4,5) trials with comparable numbers, suggesting that the massage procedure was not the factor associated with this finding. In addition, the use of massage had no impact on the concordance between frozen and permanent pathology (P=0.85, *Table 2*). These findings suggests that the no massage approach is feasible for the adequate SLNB.

Regarding oncological outcomes, previous studies have not evaluated differences between the no massage and the massage approaches. In our study, with a median follow-up of 87 months, Kaplan-Meier survival analyses demonstrated no significant differences in invasive RFS, BCSS, or OS between the two groups (*Figure 2*). Furthermore, our multivariate Cox regression analysis revealed that variations in breast and axillary surgical approaches, tumor subtypes, and the use of adjuvant chemotherapy and radiation—which differed significantly between groups—did not independently impact the survival outcomes of SLNB performed with or without massage. These findings support the oncological safety of the no massage SLNB using blue dye alone.

While our study offers valuable insights, several limitations must be acknowledged. First, the retrospective design introduces potential selection bias, and the non-randomized nature of group allocation may affect comparability. There is also a risk of chronological bias, as the massage technique was used during the early phase of SLNB adoption, whereas the no massage approach was implemented later. This difference in surgeon experience over time may have influenced the SLN identification rate and the number of harvested nodes. However, to minimize the inter-surgeon variability, the data in this study was collected from procedures performed by a single surgeon. Additionally, patient characteristics and surgical practices differed between groups. The massage group had a higher rate of mastectomy and completion ALND, reflecting earlier surgical trends and initial unfamiliarity with the SLNB adoption from the landmark trials (2-5). Differences in tumor subtypes, extracapsular extension, and adjuvant treatments were also present but could not be controlled in this retrospective design. To minimize the impact of these confounding factors, we performed a multivariate Cox regression analysis, which demonstrated that these variables did not significantly affect invasive RFS, BCSS, or OS. Despite these limitations, our study demonstrates that the no massage approach achieves comparable SLN identification and does not compromise oncological outcomes in breast cancer patients. Despite these limitations, this single-center retrospective study suggests that a no massage approach showed comparable SLN identification without apparent compromise in 8-year oncological outcomes in breast cancer patients. However, further prospective multicenter studies are suggested to support the results of this study.

Conclusions

Our results demonstrate the comparable SLN identification and survival outcomes of the no massage approach for SLNB in breast cancer, compared to the traditional massage technique. Further prospective multicenter studies are suggested to validate these findings.

Acknowledgments

The authors would like to thank Dr. Yuda Chongpison, Ph.D., M.S., Mrs. Pannipa Lertpiyasiripong, and Ms. Supannee Seedang for their assistance in this study.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Gland Surgery* for the series "Transformative Approaches in Breast Surgery: Cutting-Edge Innovation, and Practice: Recent Glaucoma Surgeries". The article has undergone external peer review.

Reporting Checklist: The authors have completed the TREND reporting checklist. Available at https://gs.amegroups.com/article/view/10.21037/gs-2025-1-558/rc

Data Sharing Statement: Available at https://gs.amegroups.com/article/view/10.21037/gs-2025-1-558/dss

Peer Review File: Available at https://gs.amegroups.com/article/view/10.21037/gs-2025-1-558/prf

Funding: None.

Conflicts of Interest: All authors have completed the ICMJE

uniform disclosure form (available at https://gs.amegroups.com/article/view/10.21037/gs-2025-1-558/coif). The series "Transformative Approaches in Breast Surgery: Cutting-Edge Innovation, and Practice: Recent Glaucoma Surgeries" was commissioned by the editorial office without any funding or sponsorship. C.S.L. served as the unpaid Guest Editor of the series. The authors have no other conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki and its subsequent amendments. This study was approved by the Institutional Review Board of the Faculty of Medicine, Chulalongkorn University (IRB 819/67) and individual consent for this retrospective analysis was waived.

References

1. Krag DN, Anderson SJ, Julian TB, et al. Sentinel-lymph-node resection compared with conventional axillary-lymph-node dissection in clinically node-negative patients with breast cancer: overall survival findings from the NSABP B-32 randomised phase 3 trial. Lancet Oncol 2010;11:927-33.
2. Giuliano AE, Ballman KV, McCall L, et al. Effect of Axillary Dissection vs No Axillary Dissection on 10-Year Overall Survival Among Women With Invasive Breast Cancer and Sentinel Node Metastasis: The ACOSOG Z0011 (Alliance) Randomized Clinical Trial. JAMA 2017;318:918-26.
3. Bartels SAL, Donker M, Poncet C, et al. Radiotherapy or Surgery of the Axilla After a Positive Sentinel Node in Breast Cancer: 10-Year Results of the Randomized Controlled EORTC 10981-22023 AMAROS Trial. J Clin Oncol 2023;41:2159-65.
4. de Boniface J, Filtenborg Tvedskov T, Rydén L, et al. Omitting Axillary Dissection in Breast Cancer with Sentinel-Node Metastases. N Engl J Med 2024;390:1163-75.
5. Appelgren M, Sackey H, Wengström Y, et al. Patient-reported outcomes one year after positive sentinel lymph node biopsy with or without axillary lymph node dissection in the randomized SENOMAC trial. Breast 2022;63:16-23.
6. Mansel RE, Fallowfield L, Kissin M, et al. Randomized multicenter trial of sentinel node biopsy versus standard axillary treatment in operable breast cancer: the ALMANAC Trial. J Natl Cancer Inst 2006;98:599-609.
7. Haynes G, Garske D, Case D, et al. Effect of massage technique on sentinel lymph node mapping for cancer of the breast. Am Surg 2003;69:520-2.
8. Kirby RM, Basit A, Nguyen QT, et al. Three stage axillary lymphatic massage optimizes sentinel lymph node localisation using blue dye. Int Semin Surg Oncol 2007;4:30.
9. Bass SS, Cox CE, Salud CJ, et al. The effects of postinjection massage on the sensitivity of lymphatic mapping in breast cancer. J Am Coll Surg 2001;192:9-16.
10. Frank HA, Hall FM, Steer ML. Preoperative localization of nonpalpable breast lesions demonstrated by mammography. N Engl J Med 1976;295:259-60.
11. Kapoor MM, Patel MM, Scoggins ME. The Wire and Beyond: Recent Advances in Breast Imaging Preoperative Needle Localization. Radiographics 2019;39:1886-906.
12. Diaz NM, Cox CE, Ebert M, et al. Benign mechanical transport of breast epithelial cells to sentinel lymph nodes. Am J Surg Pathol 2004;28:1641-5.
13. Turner R, Giuliano AE. Does breast massage push tumor cells into sentinel nodes? Am J Surg Pathol 2005;29:1254-5; author reply 1255-6.
14. Tolaney SM, Garrett-Mayer E, White J, et al. Updated Standardized Definitions for Efficacy End Points (STEEP) in Adjuvant Breast Cancer Clinical Trials: STEEP Version 2.0. J Clin Oncol 2021;39:2720-31.
15. Breast Cancer, Version 2.2026: NCCN Clinical Practice Guidelines in Oncology. 2026. Available online: https://www.nccn.org/guidelines/category_1
16. Kedrzycki MS, Leiloglou M, Ashrafian H, et al. Meta-analysis Comparing Fluorescence Imaging with Radioisotope and Blue Dye-Guided Sentinel Node Identification for Breast Cancer Surgery. Ann Surg Oncol 2021;28:3738-48.
17. Li J, Chen X, Qi M, et al. Sentinel lymph node biopsy

mapped with methylene blue dye alone in patients with breast cancer: A systematic review and meta-analysis. PLoS One 2018;13:e0204364.
18. Povoski SP, Olsen JO, Young DC, et al. Prospective randomized clinical trial comparing intradermal, intraparenchymal, and subareolar injection routes for sentinel lymph node mapping and biopsy in breast cancer. Ann Surg Oncol 2006;13:1412-21.
19. Kersey TW, Van Eyk J, Lannin DR, et al. Comparison of intradermal and subcutaneous injections in lymphatic mapping. J Surg Res 2001;96:255-9.
20. Lin KM, Patel TH, Ray A, et al. Intradermal radioisotope is superior to peritumoral blue dye or radioisotope in identifying breast cancer sentinel nodes. J Am Coll Surg 2004;199:561-6.
21. Martin RC, Derossis AM, Fey J, et al. Intradermal isotope injection is superior to intramammary in sentinel node biopsy for breast cancer. Surgery 2001;130:432-8.

Cite this article as: Sae-Lim C, Vongsaisuwon M, Vongwattanakit P, Denariyakoon S, Thongvitokomarn S, Polchai N, Manasnayakorn S. The no massage approach for single-tracer sentinel lymph node biopsy in breast cancer: a retrospective cohort study comparing identification rate and long-term oncologic outcomes to the traditional massage technique. Gland Surg 2026;15(4):93. doi: 10.21037/gs-2025-1-558