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Simplified Lymphatic venous Anastomosis for the Prevention of Breast Cancer-Related Lymphedema: A Two-Patient Case Series

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Abstract

Breast cancer-related lymphedema (BCRL) remains a significant complication following breast cancer treatment, particularly after axillary lymph node dissection (ALND), which can disrupt upper-extremity lymphatic drainage and substantially impair patients' quality of life. Immediate lymphatic reconstruction, including the Simplified Lymphatic Microsurgical Preventing Healing Approach (S-LYMPHA), has emerged as a promising preventive strategy to reduce the risk of BCRL. This study aimed to describe the technical feasibility, operative characteristics, and early clinical outcomes of S-LYMPHA performed immediately following ALND in patients with locally advanced breast cancer. A descriptive case series was conducted involving two women with locally advanced breast cancer who underwent modified radical mastectomy with ALND, followed immediately by S-LYMPHA at Dr. Hasan Sadikin General Hospital, Bandung, Indonesia. Clinical data, surgical procedures, additional operative time, postoperative complications, and early lymphedema-related outcomes were evaluated through medical record reviews and postoperative follow-up assessments. The procedure was successfully performed by intussuscepting multiple lymphatic vessels into a single branch of the thoracodorsal vein under surgical loupe magnification. The additional operative time required was 35 minutes for the first patient and 40 minutes for the second patient. During the three- and four-month follow-up periods, respectively, neither patient demonstrated clinical evidence of upper-extremity lymphedema, significant interlimb circumference differences, or subjective symptoms of arm heaviness. Postoperative complications included seroma formation and mastectomy skin-flap necrosis, both of which were managed appropriately. In conclusion, S-LYMPHA employing a multiple-lymphatic-vessel-to-single-vein anastomosis technique is technically feasible and may represent an accessible and effective preventive approach for reducing the risk of BCRL following ALND. Nevertheless, prospective studies involving larger patient cohorts, longer follow-up durations, and objective lymphatic function assessment methods are warranted to confirm its long-term safety and effectiveness.

INTRODUCTION

Breast cancer-related lymphedema (BCRL) is a potentially chronic complication of breast cancer treatment, particularly following axillary lymph node dissection (ALND). A systematic review and meta-analysis found that approximately one in five breast cancer survivors developed arm lymphedema, with a substantially higher incidence following ALND than after sentinel lymph node biopsy (DiSipio et al., 2013). BCRL may manifest as upper-extremity swelling, heaviness, discomfort, reduced range of motion, recurrent infection, functional impairment, and deterioration in quality of life. Because established lymphedema often requires long-term management, strategies aimed at preventing lymphatic dysfunction at the time of axillary surgery are clinically important (McEvoy et al., 2022; McLaughlin et al., 2017; Presno Rubin & Chen, 2025).

During ALND, disruption of the lymphatic channels draining the upper extremity may impair lymphatic outflow and contribute to postoperative lymphedema (Kataru et al., 2019).

Immediate lymphatic reconstruction (ILR) aims to preserve lymphatic drainage by connecting transected arm-draining lymphatic channels to a suitable recipient vein within the operative field. The Lymphatic Microsurgical Preventive Healing Approach (LYMPHA), initially described as a preventive procedure performed during axillary surgery, has demonstrated promising results in reducing the incidence of BCRL (Boccardo et al., 2011). Subsequent systematic reviews and meta-analyses have also suggested a preventive benefit of ILR, although variations in patient selection, operative techniques, diagnostic criteria, and follow-up duration remain important limitations (Cook et al., 2022).

Simplified LYMPHA (S-LYMPHA), formally termed the Simplified Lymphatic Microsurgical Preventing Healing Approach, combines axillary reverse mapping with a simplified lymphatic venous anastomosis (Pons et al., 2025; Schwarz et al., 2019). Arm-draining lymphatic channels are identified using lymphatic mapping and intussuscepted into a suitable recipient vein using fine nonabsorbable sutures. Unlike the conventional LYMPHA technique, S-LYMPHA can be performed under surgical loupe magnification without requiring an operating microscope. In a comparative study with long-term follow-up, Ozmen et al. reported a significantly lower incidence of lymphedema among patients who underwent S-LYMPHA than among those who underwent ALND alone. This simplified approach may expand access to immediate lymphatic reconstruction, particularly in settings where super microsurgical expertise and equipment are limited (Kadle & Skoracki, 2024; Sung et al., 2024).

We report two patients with locally advanced breast cancer who underwent modified radical mastectomy and ALND followed immediately by S-LYMPHA using multiple lymphatic-to-single-vein intussusception under surgical loupe magnification. This case series describes the operative technique, additional operative time, postoperative complications, and early clinical outcomes related to upper-extremity lymphedema (Garza III et al., 2017; Kim & Moon, 2021).

To overcome these limitations, the Simplified Lymphatic Microsurgical Preventing Healing Approach (S-LYMPHA) was introduced as a technically simplified modification of conventional LYMPHA. S-LYMPHA combines lymphatic mapping through axillary reverse mapping with lymphatic venous anastomosis using surgical loupe magnification rather than an operating microscope. This approach may improve accessibility because it allows breast surgeons to perform preventive lymphatic reconstruction without requiring extensive super microsurgical resources. Ozmen et al. (2022) evaluated S-LYMPHA using bioimpedance spectroscopy and reported a lower incidence of BCRL among patients receiving S-LYMPHA compared with those undergoing ALND alone. Their findings suggested that S-LYMPHA could represent a practical alternative for institutions with limited microsurgical infrastructure.

Despite promising findings, several limitations remain in existing research regarding S-LYMPHA implementation. Previous studies have primarily evaluated larger patient cohorts or retrospective comparative designs, while evidence regarding technical feasibility in different surgical settings remains limited (Marcus et al., 2024; Salib et al., 2026). Additionally, variations exist regarding the optimal configuration of lymphaticovenous anastomosis, recipient vessel selection, operative duration, and applicability among patients with locally advanced breast cancer requiring extensive axillary surgery. The available literature also lacks sufficient reports from developing healthcare systems where access to advanced microsurgical facilities may be restricted. Therefore, further clinical descriptions are needed to demonstrate

whether simplified techniques such as multiple lymphatic-to-single-vein intussusception can be safely incorporated into routine breast cancer surgery.

The present study addresses this research gap by reporting a two-patient case series evaluating the feasibility and early clinical outcomes of S-LYMPHA performed immediately after modified radical mastectomy with ALND in patients with locally advanced breast cancer. Unlike previous approaches that emphasize complex microsurgical reconstruction, this study highlights the application of multiple lymphatic channels connected to a single recipient vein under surgical loupe magnification. The novelty of this research lies in demonstrating a simplified operative strategy that potentially reduces technical barriers while maintaining the preventive objective of restoring lymphatic drainage. By documenting operative time, technical procedures, postoperative complications, and early lymphedema-related outcomes, this study contributes practical evidence regarding the implementation of preventive lymphatic reconstruction in real-world surgical settings.

The urgency of this research is supported by the increasing importance of survivorship-focused oncology care. As improvements in breast cancer treatment continue to increase patient survival, healthcare systems must address not only cancer eradication but also preservation of long-term physical function and quality of life. Preventing BCRL may reduce the burden of chronic rehabilitation, healthcare costs, and psychological consequences experienced by survivors. Therefore, identifying feasible, reproducible, and resource-conscious preventive interventions is particularly relevant for hospitals where advanced microsurgical resources remain limited. S-LYMPHA may provide an opportunity to expand preventive strategies beyond specialized centers and improve equitable access to quality breast cancer care.

The objective of this study is to describe the technical feasibility, additional operative time, postoperative complications, and early clinical outcomes of S-LYMPHA performed following ALND in patients with locally advanced breast cancer. Specifically, this research aims to evaluate whether multiple lymphatic channels can be successfully incorporated into a single venous recipient using simplified microsurgical techniques and whether early postoperative assessments demonstrate evidence of lymphatic preservation. The study does not aim to establish definitive treatment effectiveness due to its limited sample size but rather to provide preliminary clinical observations that can support future prospective investigations.

This research contributes to the field of surgical oncology by providing additional evidence regarding preventive lymphatic reconstruction through a simplified and potentially more accessible technique. The findings may benefit surgeons, healthcare institutions, and breast cancer patients by offering insights into alternative approaches for reducing treatment-related morbidity. Furthermore, this study establishes a foundation for future larger-scale prospective studies involving standardized lymphedema assessment tools, longer follow-up periods, objective lymphatic imaging, and comparative control groups. Ultimately, the implementation of effective preventive strategies such as S-LYMPHA may contribute to improving survivorship outcomes and enhancing the overall quality of breast cancer management.

METHOD

Study Design and Patient Selection

This descriptive case series included two women with locally advanced breast cancer who underwent modified radical mastectomy with axillary lymph node dissection (ALND), immediately followed by Simplified Lymphatic Microsurgical Preventing Healing Approach (S-LYMPHA), at Dr. Hasan Sadikin General Hospital, Bandung, Indonesia, during 2026. Both patients had histologically confirmed invasive carcinoma of no special type, luminal B, HER2-negative subtype, and demonstrated a partial response following neoadjuvant chemotherapy.

Clinical, pathological, and operative data were retrospectively obtained from the patients' electronic medical records. Postoperative outcomes were assessed through ongoing follow-up at the surgical oncology outpatient clinic. Patients were selected for S-LYMPHA because they required ALND and were therefore considered at increased risk of developing breast cancer-related lymphedema. All patient identifiers were removed to maintain confidentiality.

Surgical Procedure

Both procedures were performed under general anesthesia with the patient in the supine position. A unilateral modified radical mastectomy with ALND was performed according to the standard institutional procedure.

Approximately 10 minutes before axillary dissection, 1 mL of 0.5% methylene blue was injected sub dermally at a single point in the anterior brachial region of the ipsilateral upper extremity to facilitate intraoperative identification of arm-draining lymphatic channels.

Following completion of ALND, methylene blue-stained lymphatic channels draining the ipsilateral upper extremity were identified within the axillary operative field. A suitable branch of the ipsilateral thoracodorsal vein was selected as the recipient vessel. Under surgical loupe magnification, the identified lymphatic channels were intussuscepted into the recipient vein and secured using 7-0 polypropylene sutures.

In Patient 1, two lymphatic channels were intussuscepted into a single branch of the left thoracodorsal vein. In Patient 2, three lymphatic channels were intussuscepted into a single branch of the right thoracodorsal vein. After completion of the anastomosis, a surgical drain was placed, and the operative wound was closed in layers.

The additional operative time required for S-LYMPHA was recorded from the initiation of lymphatic identification until completion of the lymphatic venous anastomosis. The procedure required an additional 35 minutes in patient 1 and 40 minutes in patient 2.

Arm Circumference Assessment

Bilateral upper-arm circumference was measured preoperatively and during postoperative follow-up using a non-elastic cloth measuring tape. Measurements were obtained with the patient in the supine position, both arms fully extended and abducted 90° from the trunk, and the forearms supinated with the palms facing upward.

The measurement point was located midway between the glenohumeral joint and the cubital region. Each measurement was performed once by the same examiner. The contralateral arm served as an internal reference for assessing postoperative interlimb circumference differences.

Postoperative Follow-up and Outcome Assessment

Both patients underwent ongoing postoperative follow-up at the surgical oncology outpatient clinic. At each assessment, the patients were asked whether the arm on the operated side felt larger or heavier than the contralateral arm. Clinical examination was performed to identify visible swelling or other clinical evidence of ipsilateral upper-extremity lymphedema.

Bilateral upper-arm circumference measurements were compared with the respective preoperative measurements and with the contralateral arm. The outcomes assessed included patient-reported arm enlargement or heaviness, clinical evidence of lymphedema, postoperative interlimb circumference differences, additional operative time required for S-LYMPHA, and postoperative complications.

At the time of the present report, Patient 1 had completed three months of follow-up, whereas Patient 2 had completed four months of follow-up. Postoperative complications and their management were obtained from the medical records and outpatient follow-up documentation.

Case Presentation

Patient 1

A 60-year-old woman was diagnosed with grade II invasive carcinoma of no special type of the left breast, luminal B, HER2-negative subtype, with a clinical stage of cT4bN0M0 (stage IIIB). She received six cycles of neoadjuvant docetaxel and cyclophosphamide, resulting in a partial clinical response.

The patient subsequently underwent a left modified radical mastectomy with axillary lymph node dissection, immediately followed by S-LYMPHA. Following completion of the axillary dissection, two methylene blue-stained lymphatic channels draining the ipsilateral upper extremity were identified. Both lymphatic channels were intussuscepted into a single branch of the left thoracodorsal vein under surgical loupe magnification and secured using 7-0 polypropylene sutures. The S-LYMPHA procedure required an additional operative time of approximately 35 minutes.

Postoperatively, the patient developed a seroma, which was managed by aspiration during an outpatient visit. Before surgery, the upper-arm circumference measured 35 cm bilaterally. At three months of follow-up, it measured 34 cm bilaterally, with no interlimb circumference difference. The patient did not report that the ipsilateral arm felt larger or heavier, and clinical examination showed no evidence of upper-extremity lymphedema.

Patient 2

A 64-year-old woman was diagnosed with grade III invasive carcinoma of no special type of the right breast, luminal B, HER2-negative subtype, with a clinical stage of cT4cN3M0 (stage IIIC). She received four cycles of neoadjuvant doxorubicin and cyclophosphamide, resulting in a partial clinical response.

The patient subsequently underwent a right modified radical mastectomy with axillary lymph node dissection, immediately followed by S-LYMPHA. Following completion of the axillary dissection, three methylene blue-stained lymphatic channels draining the ipsilateral upper extremity were identified. All three lymphatic channels were intussuscepted into a single branch of the right thoracodorsal vein under surgical loupe magnification and secured using 7-0 polypropylene sutures. The S-LYMPHA procedure required an additional operative time of approximately 40 minutes.

Postoperatively, the patient developed mastectomy skin-flap necrosis, which was managed by debridement followed by secondary wound healing. Before surgery, the upper-arm circumference measured 38 cm bilaterally. At four months of follow-up, it measured 39 cm bilaterally. The increase was symmetrical, with no interlimb circumference difference. The patient did not report that the ipsilateral arm felt larger or heavier, and clinical examination showed no evidence of upper-extremity lymphedema.

RESULTS AND DISCUSSION

This two-patient case series demonstrates the technical feasibility of performing S-LYMPHA immediately following axillary lymph node dissection in patients with locally advanced breast cancer. Multiple lymphatic channels draining the ipsilateral upper extremity were successfully intussuscepted into a single branch of the thoracodorsal vein under surgical loupe magnification. The procedure required an additional operative time of 35 minutes in patient 1 and 40 minutes in patient 2. During early postoperative follow-up, neither patient reported that the ipsilateral arm felt larger or heavier, and no clinical evidence or interlimb circumference difference suggestive of lymphedema was identified.

Disruption of arm-draining lymphatic channels during ALND is an important mechanism contributing to the development of breast cancer-related lymphedema. Immediate lymphatic reconstruction was developed to redirect the flow from transected lymphatic channels into the venous circulation at the time of axillary surgery. Previous systematic reviews and meta-analyses have demonstrated a consistent signal suggesting that immediate lymphatic reconstruction may reduce the incidence of BCRL. Hill et al. (2022) reported that 24 of 417 patients (5.7%) developed BCRL following immediate lymphatic reconstruction. In the controlled studies included in their meta-analysis, lymphedema occurred in 6.7% of patients undergoing immediate lymphatic reconstruction compared with 34% of patients in the control group.

Preliminary evidence from a randomized controlled trial also supports the potential preventive benefit of immediate lymphatic reconstruction. Coriddi et al. reported a cumulative BCRL incidence of 9.5% in patients who underwent immediate lymphatic reconstruction compared with 32% in the control group. Patients in the immediate lymphatic reconstruction group also demonstrated lower bioimpedance values, reduced use of compression garments, better lymphatic function on indocyanine green lymphography, and better patient-reported outcomes (Coriddi et al., 2023). Nevertheless, conventional immediate lymphatic reconstruction commonly requires microsurgical expertise, an operating microscope, and coordination between breast and reconstructive microsurgery teams, which may limit its wider implementation.

S-LYMPHA was developed as a simplified approach that combines arm lymphatic mapping with intussusception of the identified lymphatic channels into an adjacent recipient vein. The technique may be performed by the operating breast surgeon using surgical loupe magnification and fine nonabsorbable sutures without requiring an operating microscope. Ozmen et al. (2022) evaluated S-LYMPHA using bioimpedance spectroscopy and reported a significantly lower incidence of lymphedema among patients undergoing S-LYMPHA than among those undergoing ALND alone after a mean follow-up of approximately 47 months (16% versus 32%). These findings suggest that S-LYMPHA may provide a more accessible

approach to immediate lymphatic reconstruction, particularly in institutions where super microsurgical equipment or expertise is not routinely available.

In the present case series, two lymphatic channels were intussuscepted into one branch of the thoracodorsal vein in patient 1, whereas three lymphatic channels were intussuscepted into one thoracodorsal venous branch in patient 2. The use of a multiple-lymphatic-to-single-vein configuration allowed several transected arm-draining lymphatic channels to be incorporated into one recipient vessel. Both procedures were completed under surgical loupe magnification using 7-0 polypropylene sutures, with an additional operative time of less than 45 minutes. These observations support the practical feasibility of incorporating S-LYMPHA into the operative workflow following ALND.

During follow-up, neither patient demonstrated a circumference difference between the operated and contralateral arms. In Patient 1, bilateral upper-arm circumference decreased from 35 to 34 cm, whereas in patient 2, it increased from 38 to 39 cm bilaterally. Because these changes occurred symmetrically, they did not indicate unilateral swelling of the operated extremity. Furthermore, neither patient perceived the ipsilateral arm as larger or heavier, and no clinical signs of lymphedema were detected. However, follow-up was limited to three months in patient 1 and four months in patient 2. Therefore, the findings should be interpreted as early postoperative outcomes and not as evidence that S-LYMPHA definitively prevented BCRL, which may develop later after breast cancer treatment.

Postoperative complications consisted of seroma requiring outpatient aspiration in patient 1 and mastectomy skin-flap necrosis requiring debridement and secondary wound healing in patient 2. Seroma and skin-flap necrosis are recognized complications of mastectomy and axillary surgery. Given the small number of patients and absence of a comparison group, a causal relationship between these complications and S-LYMPHA cannot be determined. Neither complication was accompanied by subjective or clinical evidence of ipsilateral upper-extremity lymphedema during the available follow-up.

This case series has several limitations. First, the inclusion of only two patients precludes conclusions regarding the effectiveness or safety of S-LYMPHA. Second, the follow-up duration was insufficient to evaluate delayed-onset lymphedema. Third, circumference was assessed at only one upper-arm location, and each measurement was performed once, which may have introduced measurement variability. Fourth, more objective assessment methods, including serial limb-volume calculation, pyrometry, bioimpedance spectroscopy, and indocyanine green lymphography, were unavailable. Fifth, body mass index and perioperative changes in body weight were not recorded. Finally, there was no control group for comparison.

Despite these limitations, the present report demonstrates that S-LYMPHA using multiple lymphatic-to-single-vein intussusception can be incorporated into ALND using surgical loupe magnification with limited additional operative time. A prospective study involving a larger number of patients, standardized bilateral measurements at multiple anatomical locations, validated patient-reported outcome measures, objective lymphatic assessment, and longer follow-up is required to evaluate its preventive effectiveness.

CONCLUSION

Based on the research findings, S-LYMPHA performed immediately after axillary lymph node dissection (ALND) in patients with locally advanced breast cancer demonstrated technical

feasibility and favourable early postoperative outcomes. The procedure successfully connected multiple arm-draining lymphatic channels into a single thoracodorsal vein branch using surgical loupe magnification, with additional operative times of less than 45 minutes. During the available follow-up period, both patients showed no clinical evidence of breast cancer-related lymphedema (BCRL), with no interlimb circumference differences and no subjective complaints of arm heaviness or enlargement. These findings indicate that S-LYMPHA may serve as a practical preventive lymphatic reconstruction approach, particularly in settings where conventional super microsurgical techniques requiring advanced equipment and specialized expertise are not readily available. However, the results should be interpreted cautiously because this study represents a small two-patient case series with limited follow-up duration and does not provide sufficient evidence to confirm the long-term effectiveness of S-LYMPHA in preventing BCRL. Future research should focus on conducting prospective studies with larger sample sizes, longer follow-up periods, and comparative control groups to establish the clinical effectiveness and safety profile of S-LYMPHA. Further investigations should incorporate standardized and objective assessment methods, including bioimpedance spectroscopy, indocyanine green lymphography, volumetric limb measurements, and validated patient-reported outcome instruments to evaluate lymphatic function more comprehensively. Additionally, future studies should examine variations in surgical techniques, patient selection criteria, recipient vessel characteristics, and long-term functional outcomes to determine the optimal implementation strategy for S-LYMPHA across different healthcare settings. Such evidence will be essential to support broader adoption of preventive lymphatic reconstruction as part of comprehensive breast cancer survivorship care and to improve quality of life among patients undergoing axillary surgery.

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