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Axillary Single-Incision Burow's Triangle Advancement (ASIBA) Tissue Flap Versus Peripheral Fascial Tissue Flap for Moderate Upper-Quadrant Breast Defects After Breast-Conserving Surgery: A Multicenter Retrospective Study

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Research Article

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Abstract

Background:

Optimal aesthetic outcomes following breast-conserving therapy (BCT) are particularly critical for tumors located in the upper breast quadrants. This study aimed to compare the aesthetic results and safety profiles of two oncoplastic volume-displacement techniques—the Axillary Single-Incision Burow's Triangle Advancement (ASIBA) tissue flap (also referred to as the adjacent rotational tissue flap) and the peripheral fascial tissue flap (FT) technique—for repairing moderate defects in patients with upper-quadrant breast cancer.

Methods:

A multicenter retrospective analysis was conducted on consecutive female patients with primary unilateral breast cancer who underwent BCT at Hubei Provincial Maternal and Child Health Hospital and Xinfeng County Maternal and Child Health Hospital between January 2025 and January 2026. Eligible patients were treated with either the ASIBA tissue flap or the FT technique. Postoperative aesthetic outcomes were assessed by two independent reviewers using the Harvard Breast Aesthetic Rating Scale.

Results:

A total of 48 patients were enrolled, including 21 in the ASIBA group and 27 in the FT group. There were no significant differences between the two groups in age, tumor location, tumor size, lymph node metastasis, or operative time ($p > 0.05$). Postoperative complication rates were similar between groups (all $p > 0.05$, Fisher's exact test). Regarding aesthetic outcomes, the ASIBA group received 36 ratings of “excellent” or “good” (86%), whereas the FT group received only 18 such ratings (33%) ($p < 0.001$). The kappa consistency test confirmed substantial inter-rater agreement ($\kappa = 0.75$, $p < 0.001$).

Conclusion:

For repairing moderate upper-quadrant breast defects after BCT, the ASIBA tissue flap technique is an efficient, minimally invasive, and promising approach that achieves superior aesthetic outcomes. Prospective studies are warranted to confirm these findings.

Introduction

Breast cancer remains the most common malignant tumor among women worldwide and poses a major public health challenge in China [1]. The evolution of breast-conserving surgery (BCS) strategies has improved the prognosis and quality of life for patients with early-stage breast cancer [2, 3]. Long-term

follow-up of landmark trials, including the NSABP B-06 and Milan trials, has confirmed that BCS combined with radiotherapy yields oncological outcomes comparable to those of radical mastectomy [4–6]. As a result, BCS has emerged as the standard of care for early-stage breast cancer, ushering in the “breast-conserving era” and reducing anxiety and depression among patients.

With the widespread adoption of BCS, the repair of local breast defects has gained increasing attention from clinicians. The American Society of Breast Surgeons (ASBrS) classifies oncoplastic breast-conserving surgery (OBCS) into two categories: volume displacement (VD-OBCS) and volume replacement (VR-OBCS) [7, 8]. VD-OBCS redistributes residual breast glandular tissue to fill defects after tumor resection, thereby preserving breast cosmesis, and is categorized into Grade I (< 20% tissue resection) and Grade II (20%–40% tissue resection) [6]. VR-OBCS, reserved for defects involving > 50% of breast tissue resection, relies on autologous flap or implant transfer.

Generally, when the volume of resected breast tissue exceeds 20%, VD-OBCS or VR-OBCS techniques may be employed. Volume displacement often yields suboptimal filling, and to ensure symmetry in nipple position and breast shape, contralateral breast reshaping or reduction is frequently required. In contrast, volume replacement typically necessitates flaps such as intercostal artery perforator flaps [9] from the lateral chest wall or inframammary fold, which require additional incisions for flap harvest, are technically demanding, and carry a risk of flap ischemia. Therefore, this study aimed to achieve satisfactory reconstruction for 20%–40% defects using simple, safe, and reliable volume-displacement methods.

Currently, no standardized VD-OBCS technique exists that balances simplicity, safety, and aesthetic outcomes for upper-quadrant defects. For defects involving 20%–40% of breast volume in the upper-inner, upper-outer, and central/superior quadrants, we developed a modified adjacent rotational tissue flap of the breast that achieves satisfactory filling through simple maneuvers. This study therefore aimed to evaluate the application value of the Axillary Single-Incision Burow's Triangle Advancement (ASIBA) tissue flap—a modified adjacent rotational tissue flap—compared with the conventional peripheral fascial tissue flap (FT) technique in this clinical scenario.

Methods

Study Design and Participants

This multicenter retrospective study was conducted at the Hubei Provincial Maternal and Child Health Hospital and the Xinfeng County Maternal and Child Health Hospital. The study protocol was approved by the Ethics Committees of both institutions and was conducted in strict accordance with the Declaration of Helsinki. We retrospectively analyzed female patients with primary unilateral breast cancer who were consecutively admitted to these two hospitals from January 2025 to January 2026. Patients were treated with either the Axillary Single-Incision Burow's Triangle Advancement (ASIBA) tissue flap (also referred to as the adjacent rotational tissue flap) or the peripheral fascial tissue flap (FT)

technique. Among all eligible cases, patients with tumors located in the superior, superomedial, and superolateral quadrants of the breast (collectively referred to as the “upper quadrant” hereinafter) were included in the analysis cohort.

Ethics and Declarations

The study obtained the data from the Hubei Provincial Maternal and Child Health Hospital and the Xinfeng County Maternal and Child Health Hospital, The ethical number is 2021IECX21056. Written informed consent was obtained from all patients for the study.

Inclusion Criteria

- (1) Newly diagnosed unilateral breast cancer;
- (2) Single-focal or multi-focal lesions with a total volume accounting for < 50% of total breast volume (estimated by measuring resected tissue intraoperatively with a ruler);
- (3) No distant metastasis;
- (4) The tumor was located less than 1 cm from the skin surface (when the tumor was within 1 cm of the skin, a small portion of the overlying skin was also excised and submitted for pathological examination to ensure negative margins).

Exclusion Criteria

- (1) History of previous breast cancer;
- (2) History of neoadjuvant therapy;
- (3) History of active connective tissue disease;
- (4) History of prior ipsilateral breast or chest wall radiotherapy;
- (5) Lesions involving > 50% breast volume;
- (6) Known high genetic susceptibility to breast cancer.

Surgical Techniques

Axillary Single-Incision Burow's Triangle Advancement (ASIBA) Tissue Flap

We developed a modified single-incision volume-displacement technique for breast-conserving surgery in patients with tumors located in the upper-outer, upper-inner, or central quadrants and an anticipated resection volume of 20%–40% of the total breast volume. The entire procedure was performed through a single 3–5 cm axillary incision extending laterally from the sentinel lymph node biopsy (SLNB) site.

Through this incision, SLNB was performed, followed by sharp and blunt excision of a prism-shaped Burow's triangle of axillary subcutaneous fat to release tension and facilitate tissue flap mobilization. The tumor was then resected via a subdermal tunnel; for upper-outer quadrant lesions, direct access was straightforward, whereas for upper-inner and central lesions, a sufficiently wide subdermal tunnel was created to allow direct visualization and instrumentation without endoscopic assistance. After confirming negative margins, extensive mobilization of the subcutaneous fat, superficial fascia, and underlying glandular tissue surrounding the defect was performed in the subdermal plane to create a local adipoglandular tissue flap. The tissue flap was then advanced and rotated into the post-excisional cavity, coapted with absorbable sutures, and fixed to the chest wall to obliterate the dead space. This single-incision approach minimizes breast scarring while achieving effective oncoplastic volume displacement (see Figs. 1 and 2).

Fascial Tissue Flap (FT) Technique

This technique involved sharp and blunt dissection of the local tissue—comprising subcutaneous fat and the superficial fascia—surrounding the defect following tumor excision. The mobilized tissue was then advanced and coapted with sutures to obliterate the residual cavity. It represented a classic volume-displacement approach based on the principle of local tissue rearrangement [10].

Demographic and Clinicopathological Variables

Data collected included age, smoking status, diabetes, body mass index (BMI), tumor location and size, lymph node metastasis, breast defect volume, and operative time. The resected specimen was measured intraoperatively in three dimensions (length, width, and height) using a surgical ruler, and its volume was approximated using the prolate-ellipsoid formula: length × width × height × 0.52 [11]. Preoperative breast volume was estimated using the ellipsoid method, based on breast base radius and height derived from clinical examination and magnetic resonance imaging (MRI). The percentage of breast volume resected was calculated as (resected specimen volume / preoperative estimated breast volume) × 100% [11].

Postoperative Complications

Complications occurring within 30 days postoperatively—including incisional infection, poor wound healing, subcutaneous hematoma, seroma, and fat liquefaction—were diagnosed through clinical examination and imaging. All patients received radiotherapy after surgery and were followed up after completion of radiotherapy.

Aesthetic Outcome Assessment

Aesthetic outcomes were evaluated 6–12 months postoperatively using the Harvard Breast Aesthetic Rating Scale [12, 13], which classifies results into four grades: Excellent, Good, Fair, and Poor. Two

independent reviewers, blinded to the surgical technique, assessed standardized postoperative photographs (frontal view and bilateral 45° oblique views) taken by the attending physicians. Each photograph was rated independently, yielding 42 ratings in the ASIBA group and 54 ratings in the FT group. Inter-rater reliability was evaluated using the kappa consistency test [14, 15].

Statistical Methods

All statistical analyses were performed using SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA). Categorical variables (age group, tumor location, tumor size, lymph node metastasis status, smoking, diabetes, and postoperative complications) were analyzed using the chi-square test or Fisher's exact test when expected frequencies were < 5. Continuous variables (BMI, breast defect volume, and operative time) were analyzed using the Mann–Whitney U test. Inter-rater reliability was assessed using Cohen's kappa. A two-sided p value < 0.05 was considered statistically significant.

Results

Comparison of Basic Clinicopathological Features

During the study period, a total of 48 eligible patients from two centers were enrolled, comprising 21 in the ASIBA group and 27 in the FT group. Baseline characteristics are detailed in Table 1. No significant differences were observed between the two groups in age, tumor location, tumor size, lymph node metastasis status, or operative time (all p > 0.05).

Table 1
Comparison of Basic Clinicopathological Features

Parameter	Total (n = 48)	ASIBA group (n = 21)	FT group (n = 27)	P-value
Age, years				0.288
≤<50	27 (56.3%)	10 (47.6%)	17 (63.0%)	
>50	21 (43.8%)	11 (52.4%)	10 (37.0%)	
Tumor location				0.217
Upper inner	16 (33.3%)	5 (23.8%)	11 (40.7%)	
Upper outer	32 (66.7%)	16 (76.2%)	16 (59.3%)	
Tumor size, mm				0.105
≤20	20 (41.7%)	6 (28.6%)	14 (51.9%)	
>20, ≤ 50	28 (58.3%)	15 (71.4%)	13 (48.1%)	
Lymph node metastasis status				0.912
N0	27 (56.3%)	12 (57.1%)	15 (55.6%)	
N+	21 (43.8%)	9 (42.9%)	12 (44.4%)	
Operation time, min		150 (130–180)	135 (115–155)	0.145

Postoperative Complications

No cases of incisional infection or poor wound healing occurred in either group. The incidences of subcutaneous hematoma, seroma, and fat liquefaction were not significantly different between the two groups (all $p > 0.05$, Fisher's exact test). Of note, fat liquefaction occurred exclusively in the FT group (3/27, 11.1%). Detailed complication data are shown in Table 2.

Table 2
Postoperative Complications

Complication	ASIBA group (n = 21)	FT group (n = 27)	P-value
Incisional infection	0 (0%)	0 (0%)	–
Poor wound healing	0 (0%)	0 (0%)	–
Subcutaneous hematoma	1 (4.8%)	1 (3.7%)	1.000
Seroma	1 (4.8%)	2 (7.4%)	1.000
Fat liquefaction	0 (0%)	3 (11.1%)	0.246

P-values were obtained using Fisher's exact test. "–" indicates not applicable. ASIBA, Axillary Single-Incision Burow's Triangle Advancement tissue flap; FT, peripheral fascial tissue flap.

Aesthetic Outcomes

According to the Harvard Breast Aesthetic Rating Scale, the ASIBA group received 36 ratings of "excellent" or "good" (86%), whereas the FT group received only 18 such ratings (33%) ($p < 0.001$). Detailed aesthetic ratings are presented in Table 3. The kappa consistency test confirmed substantial inter-rater agreement ($\kappa = 0.75$, $p < 0.001$). Figures 3,4 and 5 shows the intraoperative and immediate postoperative images. Figure 6 shows the data at 6 months after the surgery.

Table 3
Aesthetic Outcome Assessment

Cosmetic Rating	ASIBA group (n = 21, 42 ratings)	FT group (n = 27, 54 ratings)
Excellent	27 (64%)	6 (11%)
Good	9 (22%)	12 (22%)
Fair	6 (14%)	16 (30%)
Poor	0 (0%)	20 (37%)
Excellent or Good	**36 (86%)**	**18 (33%)**

The kappa consistency test showed $\kappa = 0.75$ ($p < 0.001$), indicating substantial inter-rater agreement between the two independent reviewers. ASIBA, Axillary Single-Incision Burow's Triangle Advancement tissue flap; FT, peripheral fascial tissue flap.

Discussion

The management of defects following breast-conserving surgery (BCS) has garnered growing interest among surgeons. VD-OBCS has enabled favorable oncological and aesthetic outcomes in the majority of patients, thereby obviating the need for more complex volume replacement. It is associated with reduced surgical trauma and enhanced patient acceptance in clinical practice. For moderate-sized defects in the upper breast quadrants, a straightforward surgical design—the ASIBA tissue flap (adjacent rotational

tissue flap)—can yield satisfactory morphological restoration. This strategy is consistent with the contemporary oncoplastic principle of achieving optimal therapeutic efficacy with minimal invasiveness, which is a key strength of the present study.

For BCS with moderate defects (20%–40%), volume-displacement techniques are commonly employed, such as the Wise-pattern [16] and circumareolar/“round-block” techniques [17]. The Wise-pattern approach offers advantages in cases of moderate-to-severe breast hypertrophy or ptosis and when substantial tissue displacement and reshaping are required; its scar pattern is also cosmetically favorable. However, the technique is more complex, involves translocation of the nipple–areola complex (NAC), and may increase the risk of NAC necrosis. It is not optimal for patients with moderate defects or without ptosis and may exacerbate nipple asymmetry. The circumareolar or “round-block” technique is valuable for centrally or diffusely located lesions and small-volume excisions. Yet, for upper-quadrant defects, the surrounding tissues have limited plasticity, making it difficult to achieve satisfactory volume filling and nipple repositioning. The ASIBA tissue flap technique presented in this study is particularly suitable for a specific subgroup of patients whose tumor is located in the upper quadrant and in close proximity to the skin, in whom a small portion of overlying skin is removed to ensure oncological safety. ASIBA mobilizes the “redundant” soft tissue of the lateral chest wall to fill the defect, completing tumor resection and SLNB through a single incision. This approach provides the tissue flap with a reliable blood supply through relatively simple surgery while effectively maintaining symmetry of the bilateral NAC. The technique serves as a useful complement to the existing surgical repertoire rather than a replacement.

Volume-replacement techniques are also widely employed for breast defects involving 20%–50% of breast volume. These procedures typically use flaps based on intercostal perforator vessels—such as the lateral thoracic flap or the inframammary fold flap—which are elevated and transposed into the defect site [9]. This approach, however, necessitates an additional incision in the lateral, inferior, or inferolateral breast region. Furthermore, meticulous assessment of intercostal vessel integrity is critical, as tissue flap ischemia may occur because of vascular injury during dissection or excessive tissue flap compression; the technical complexity of these procedures also presents a notable challenge. In traditional oncoplastic BCS, the batwing incision [18] is commonly used for upper-quadrant defects; however, it often results in significant NAC malalignment, particularly when the resection volume approaches 50%. For tumors in the upper-outer quadrant, the lollipop incision [19, 20] is employed; although it has aesthetic advantages, its primary limitation is insufficient tissue fill for the defect because of the lack of available adjacent donor sites.

In this study, the tissue sources for the ASIBA tissue flap through a single axillary incision were the lateral chest wall and the upper-quadrant tissues. The amount of tissue in this region is relatively abundant and can adequately compensate for the defect. Moreover, the tissue flap has a rich blood supply; neither ultrasonic Doppler evaluation nor deliberate identification of named vessels was required. Consequently, the risk of vascular compromise was minimal and tissue flap survival was reliable. Through this adjacent rotational tissue-flap technique, the two NACs could be maintained at nearly the same horizontal level, yielding favorable aesthetics. In addition, the technique is relatively

straightforward, does not require additional incisions, and has a high success rate. During follow-up, scars became less conspicuous after radiotherapy and patient satisfaction was high.

Next, we compare the two surgical procedures in detail. Although the FT technique was associated with a modest reduction in median operative time (135 minutes vs. 150 minutes), this difference did not reach statistical significance ($p = 0.145$); therefore, operative time should not be considered a decisive advantage of either technique. In the FT technique, the surrounding tissues must be advanced and coapted to close the defect, which generates a degree of tension. For moderate-volume breast loss, particularly in the upper-inner quadrant, some residual depression may persist. More critically, the FT tissue flap comprises only subcutaneous fat and fascia without a cutaneous component and therefore lacks the rich dermal capillary network, predisposing it to fat liquefaction [10]. Although overall complication rates did not differ significantly between the two groups, fat liquefaction was observed exclusively in the FT group in this study, affecting three patients (all in the FT group) and leading to partial tissue flap atrophy that adversely affected the long-term cosmetic outcome.

Moreover, a pivotal innovation of the ASIBA tissue flap technique is its single-incision design, which integrates the tumor resection and SLNB incisions, thereby obviating the need for a separate axillary incision. This approach may reduce the risk of incision-related complications such as seroma and infection.

Regarding oncological safety, the baseline characteristics of the two groups were well balanced, including age, tumor location and size, lymph node metastasis, and operative time. It is noteworthy that the ASIBA tissue flap technique accommodated resection volumes of up to 50% of breast volume, suggesting that its applicability may not be constrained by defect size and that it may therefore have broader clinical indications. This contrasts with the technique described by Iguchi et al. [21], which was applied to a narrower tumor-size range (8–25 mm). Furthermore, their method relies on Burow's triangles [21, 22] for reconstruction, whereas our approach eliminates this requirement, potentially offering greater procedural simplicity and clinical practicality.

Several limitations of the present study warrant explicit acknowledgment. First, its retrospective design and modest sample size render the analysis vulnerable to selection bias and restrict the generalizability of the conclusions. Second, the lack of long-term follow-up data precludes evaluation of key oncological endpoints, including disease-free survival (DFS) and overall survival (OS), as well as validated patient-reported outcomes (PROs) such as BREAST-Q scores [23, 24], which are critical for capturing holistic treatment impacts. Third, aesthetic outcome assessment relied exclusively on photographic review; although this constitutes standard practice in many centers, it lacks the comprehensiveness afforded by in-person clinical palpation and physical examination, which can detect subtle structural or tactile abnormalities. Future investigations should prioritize large-scale, multicenter prospective studies—including randomized controlled trials (RCTs)—that integrate long-term oncological endpoints, rigorously validated PROs, and cost-effectiveness analyses. Such robust, adequately powered studies are critical

for generating high-quality evidence to standardize the clinical implementation of oncoplastic and reconstructive techniques in BCS.

Conclusions

In conclusion, for the repair of moderate-sized defects in the upper quadrant of the breast, the ASIBA tissue flap technique is an efficient, minimally invasive, and promising surgical method that achieves superior aesthetic outcomes. Future prospective studies are needed to confirm these findings. The incision design reflects the integration of principles from both oncological and plastic surgery, achieving a favorable balance between optimal cosmetic outcome and minimal surgical trauma. ASIBA can therefore be considered an alternative option for defect repair after BCS for upper-quadrant breast cancer.

Declarations

Conflicts of Interest

The authors declare that they have no competing interests.

Author Contribution

Xueli Zhu and Wenliang Lu wrote the main manuscript text , Xueli Zhu prepared figures 1-6 and Wenliang Lu prepared table 1-3. All authors reviewed the manuscript.

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Data Availability

All data generated or analysed during this study are included within this article and its supplementary information files.

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Figures

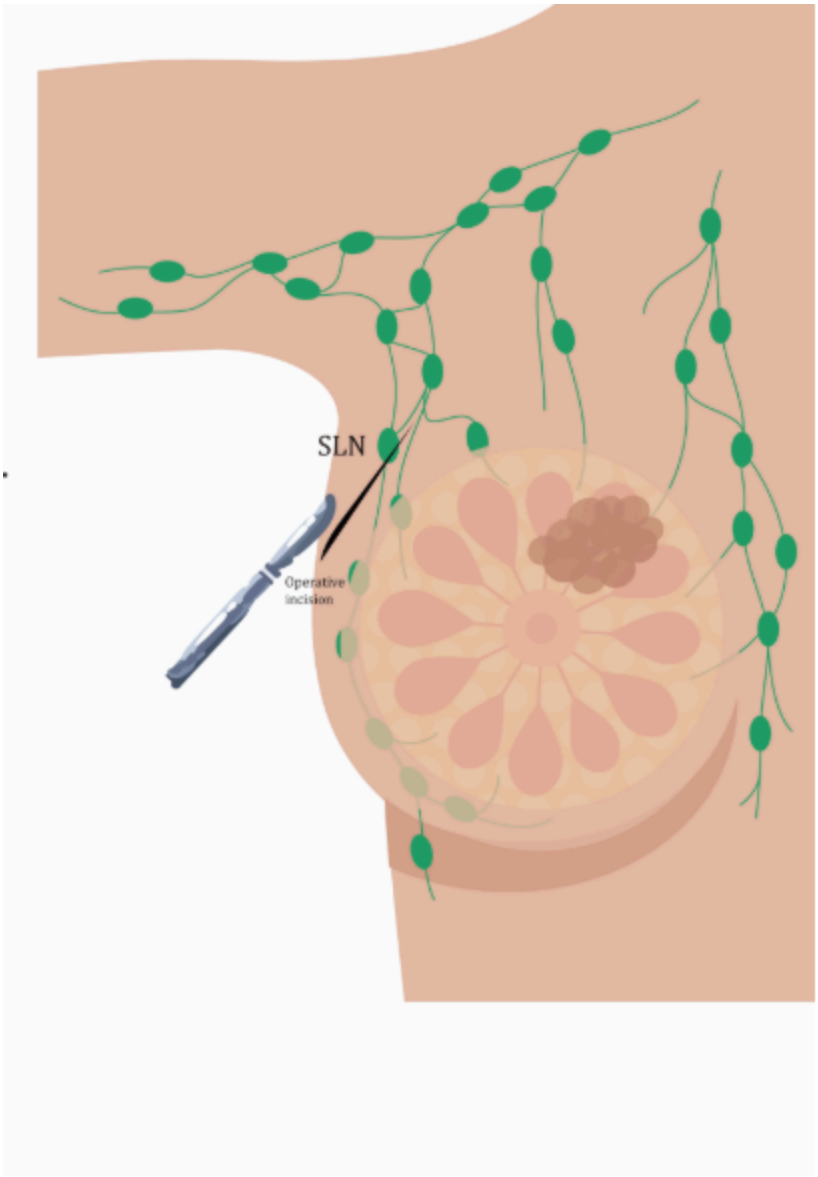


Figure 1

shows selection of surgical incision

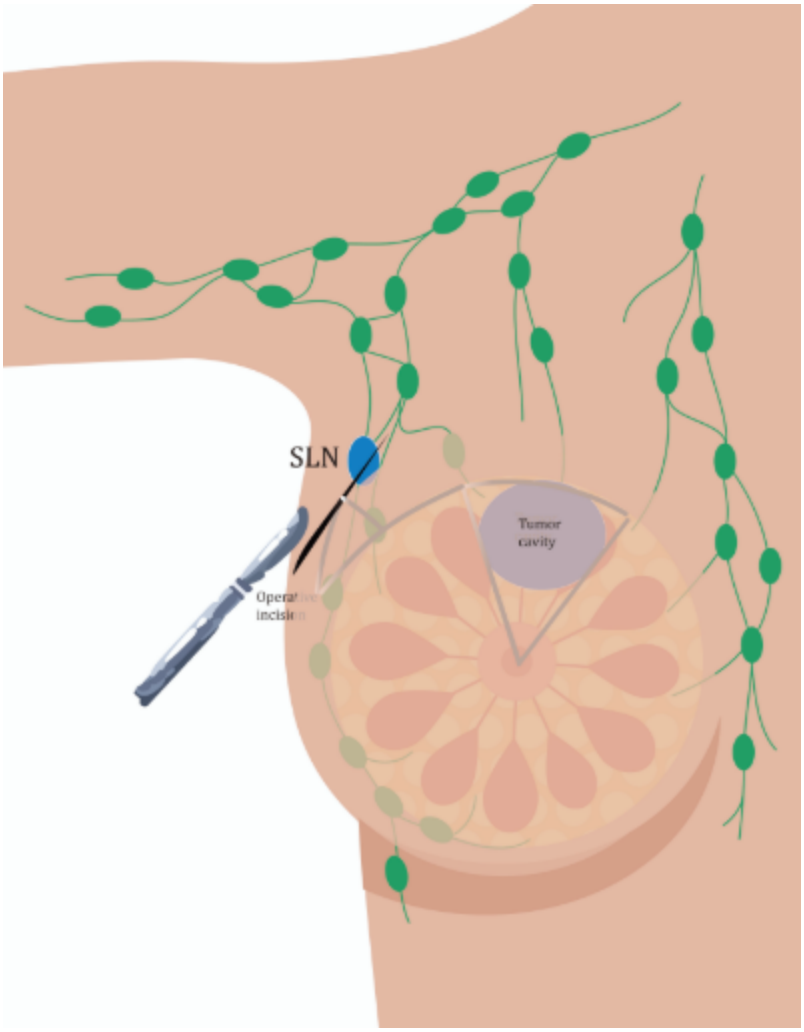


Figure 2

shows schematic diagram of the operation of Axillary Single-Incision Burow's Triangle Advancement (ASIBA) Tissue Flap

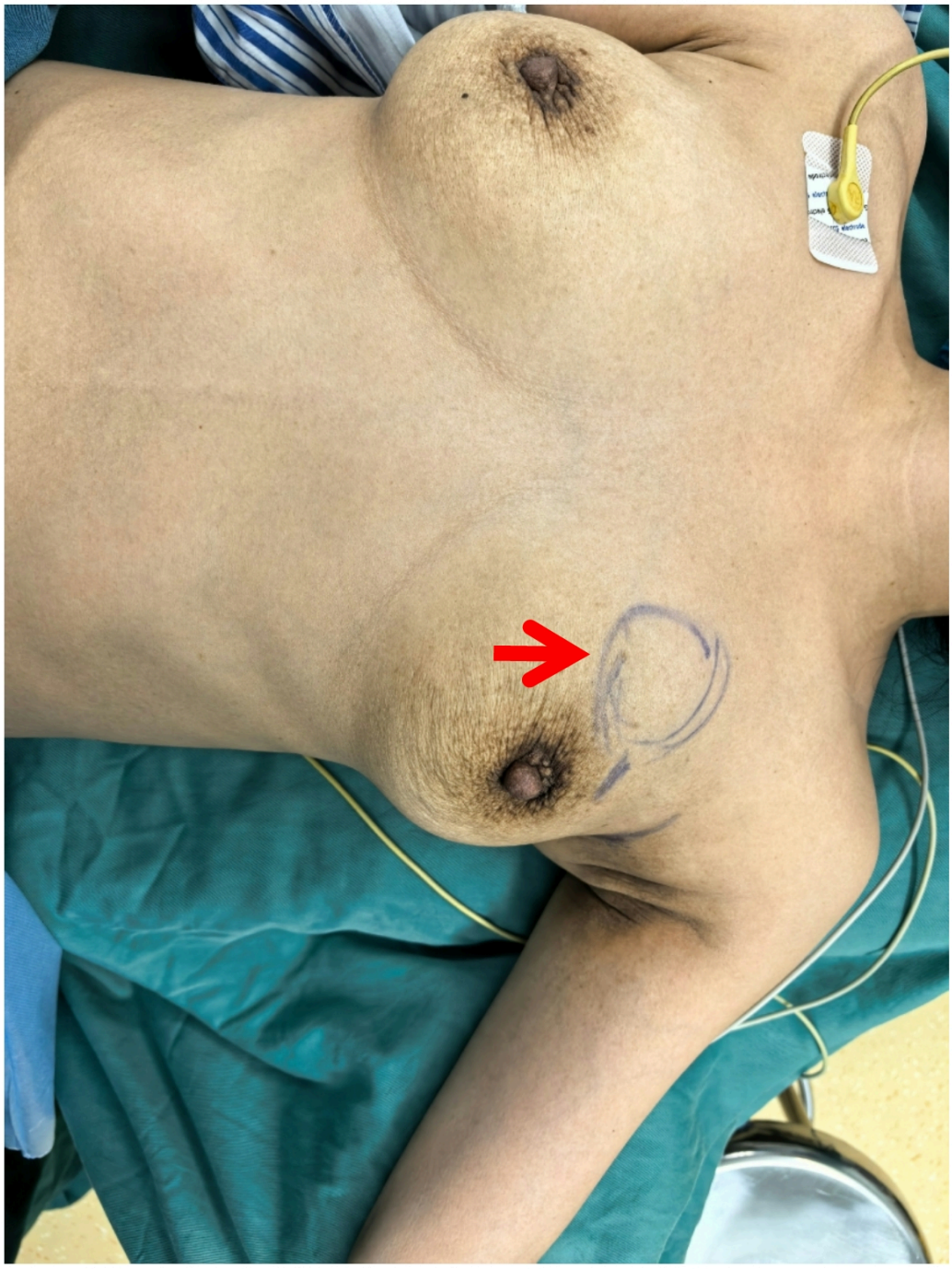


Figure 3

shows image before the ASIBA surgery



Figure 4

shows image taken during the surgery



Figure 5

shows image immediately after the surgery



Figure 6

shows image at 6 months after the surgery