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Versatility of Lateral Intercostal Artery Perforator Flaps in Partial Breast Reconstruction: First National Experience of Peru

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ABSTRACT

Objective: Oncoplastic breast surgery (OBS) allows wide oncologic resections without compromising breast symmetry. In small-breasted patients with minimal ptosis, volume displacement techniques have limited applicability. Lateral intercostal artery perforators (LICAP)-based perforator flaps allow immediate or delayed partial breast reconstruction for lateral and central defects, preserving muscle and minimizing donor-site morbidity. This study aimed to evaluate the safety and outcomes of LICAP-based flaps and to report the first national experience in Peru.

Materials and Methods: A retrospective observational study was conducted from August 2023 to August 2025 in patients who underwent OBS with perforator-based flap reconstruction, including LICAP, bilobed LICAP, and combined LICAP-lateral thoracic artery perforator (LTAP) flaps.

Results: Twenty patients were included. The mean age was 56.8 years (range, 27–81 years), and 65% were postmenopausal. Indications included invasive ductal carcinoma (85%), ductal carcinoma *in situ* (5%), and phyllodes tumor (10%). Tumor location: upper outer quadrant (65%), central (20%), upper inner quadrant (10%). Clinical stage IIA was the most frequent (55.5%), and tumors measuring 3–4 cm were observed in 45% of cases. Luminal B was the predominant subtype (40%), and 35% of patients received neoadjuvant chemotherapy. Procedures included bilobed LICAP (35%), LICAP+LTAP (30%), and LICAP (25%). The mean operative time was 134 minutes (range, 90–195 minutes), and the mean pathological tumor size was 3.57 cm (range, 0–7 cm). Negative margins were achieved in 95% of patients. Surgical complications (Clavien-Dindo grade I) occurred in 15%. During a median follow-up of 22.5 months (range, 10–24 months), no locoregional recurrences were observed.

Conclusion: LICAP-based volume replacement OBS is a versatile, safe, and reproducible technique that may expand the indications for breast-conserving surgery in selected patients and yields encouraging short-term outcomes comparable to those reported in international series.

Keywords: Oncoplastic breast surgery; LICAP flap; partial breast reconstruction; bilobed flap; breast-conserving surgery

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KEY POINTS

- Lateral intercostal artery perforators (LICAP)-based perforator flaps are a safe and versatile option for partial breast reconstruction in lateral and central breast defects.
- These flaps preserve muscle, minimize donor-site morbidity, and can be performed immediately or in a delayed setting.
- In this first national series from Peru, 94% of patients achieved negative margins with low complication rates (11%, all minor).
- The techniques, including LICAP+lateral thoracic artery perforator and bilobed LICAP modifications, allow reconstruction in small breasts with minimal ptosis and expand eligibility for breast-conserving surgery.
- Oncologic and aesthetic outcomes were comparable to international series, supporting LICAP-based flaps as a reproducible oncoplastic strategy.

Introduction

Breast-conserving surgery (BCS) is the standard of care for early-stage breast cancer and, when combined with radiotherapy, has been associated with higher overall survival rates compared with mastectomy (1). Oncoplastic breast surgery (OBS) techniques in BCS are indicated when tumor resection is expected to result in deformity and poor aesthetic outcomes. These techniques are broadly classified into volume displacement techniques, ideal for patients with large and/or ptotic breasts (grade 2 or 3), and volume replacement techniques, applied to small- to moderate-sized breasts with mild ptosis (grade 1) or no ptosis, as well as to cases where patients do not desire contralateral symmetrization surgery (2). Partial breast reconstruction using mammoplasty techniques and regional flaps has been widely described as a strategy to avoid mastectomy and total breast reconstruction, both of which are associated with more complex procedures, higher complication rates, and no demonstrated oncologic advantage over BCS (3).

Muscle-sparing regional flaps based on chest wall perforators for partial breast reconstruction were first described by Hamdi et al. (4), who demonstrated the use of lateral intercostal artery perforators (LICAP) located between the 5th and 8th intercostal spaces, approximately 2.5–3.5 cm from the anterior border of the latissimus dorsi muscle. These perforators allow the design of a flap that can be extended toward the dorsal region to reconstruct lateral breast defects; however, their use is limited in the central and medial quadrants because of the limited length of the vascular pedicle. To overcome this limitation, several modifications to the original flap design described by Hamdi et al. (4) have been proposed.

The bilobed LICAP flap, described by Paulinelli et al. (5), is a double transposition flap that enables volume replacement in the central breast region, using donor tissue from the upper outer quadrant of the breast and a lateral thoracic flap based on LICAP perforators, thereby preserving breast contour and symmetry. Another modification described by Meybodi et al. (2) involves an “S”-shaped incision along the breast contour, which avoids visible dorsal scarring and eliminates the need for patient repositioning during flap dissection. This approach also allows

tension-free closure and has been associated with a reduced rate of surgical site infections (2).

Additionally, McCulley et al. (6) described flaps based on the lateral thoracic artery perforator (LTAP), which is located between the 3rd and 5th intercostal spaces along the posterolateral breast border; the most consistent and dominant perforator was found 8–12 cm inferior to the axillary fold. These flaps can be used alone or in combination with LICAP-based flaps, increasing tissue mobilization and reconstructive volume for lateral breast defects.

The aim of this study is to present, to our knowledge, the first national experience in Peru with LICAP-based volume replacement techniques and their modifications in OBS.

Materials and Methods

Study Design

We conducted a retrospective, observational case series between August 2023 and August 2025. Patients who underwent OBS with perforator-based volume replacement flaps (LICAP, bilobed LICAP, and LICAP+LTAP) were identified in institutional records. All procedures were performed by a single surgeon with national certification and international OBS training (Spain and Brazil) at the Department of Breast Surgery, Hospital Nacional Guillermo Almenara Irigoyen, Lima, Peru.

Surgical indications were determined by a multidisciplinary surgical committee. Inclusion criteria were: women over 18 years of age with tumors located in the lateral or central breast quadrants; a poor tumor-to-breast volume ratio; minimal or no ptosis; a preference against contralateral breast surgery; and no prior breast irradiation. Diagnosis and neoadjuvant/adjuvant treatment of breast cancer and phyllodes tumors followed the National Comprehensive Cancer Network guidelines, with the primary objective of enabling BCS while minimizing deformity.

Surgical Technique

Preoperative markings for the oncoplastic pattern design were performed with the patient in the supine position. Breast ptosis was assessed and key measurements were obtained,

including the midclavicular point-to-nipple distance, nipple-to-inframammary fold distance, and nipple-to-sternal notch distance. The locations of LICAP and LTAP perforators were initially identified using anatomical landmarks. Patients were then placed in the supine position, and the exact locations of the perforators were confirmed using color Doppler ultrasound. Under general anesthesia, local infiltration was performed in the tumor resection area using Klein solution combined with tranexamic acid, as described by Ziegler Rodríguez et al. (7).

The choice of surgical technique was based on the following indications. The LICAP flap (as described by Hamdi et al. (4) was used in cases of tumors located in the lateral breast quadrants and/or when a large skin island was required for reconstruction of the surgical defect. The technique described by Meybodi et al. (2) was selected for patients who did not desire a visible scar in the dorsal region, which was avoided by using an “S”-shaped incision along the breast contour. This incision also facilitated the identification and dissection of the LTAP perforator. In these cases, both the LICAP and LTAP perforators were used, primarily for defects in the superolateral breast quadrants because of the length of the LTAP pedicle. Skeletonization of LICAP perforators was not required for propeller or turnover flap transposition. The LICAP perforator marking area was preserved as a skin island that was de-epithelialized after flap inset. Flap viability was assessed intraoperatively based on clinical signs, such as dermal bleeding

and capillary refill. The bilobed LICAP flap technique described by Paulinelli et al. (5) was indicated in cases of central tumors involving or located close to the skin, which required excision of the nipple-areolar complex (NAC). In these cases, reconstruction of the NAC was performed as a second-stage procedure using the Hammond flap technique (8).

In two cases with involvement of the superomedial breast quadrant (multifocal disease and heterogeneous response to neoadjuvant therapy), a modification of the original bilobed LICAP technique was performed. This involved mobilization of the upper breast quadrant toward a more medial position, using non-absorbable fixation sutures to the pectoral fascia. Part of the flap lobe was de-epithelialized to replace the resected volume. The nipple-areola complex was repositioned using a round block technique, allowing areolar expansion and preventing contour deformities. A schematic algorithm summarizing the indications and the surgical decision-making process for selecting LICAP, bilobed LICAP, or combined LICAP+LTAP reconstruction is presented in Figure 1.

Donor sites were meticulously closed in all cases using quilting sutures. A single 14 Fr closed-suction drain was placed at each of the donor and recipient sites. An additional drain was inserted in cases requiring axillary lymphadenectomy. Drains were removed when the output was <30 mL over 24 hours (Figure 1).

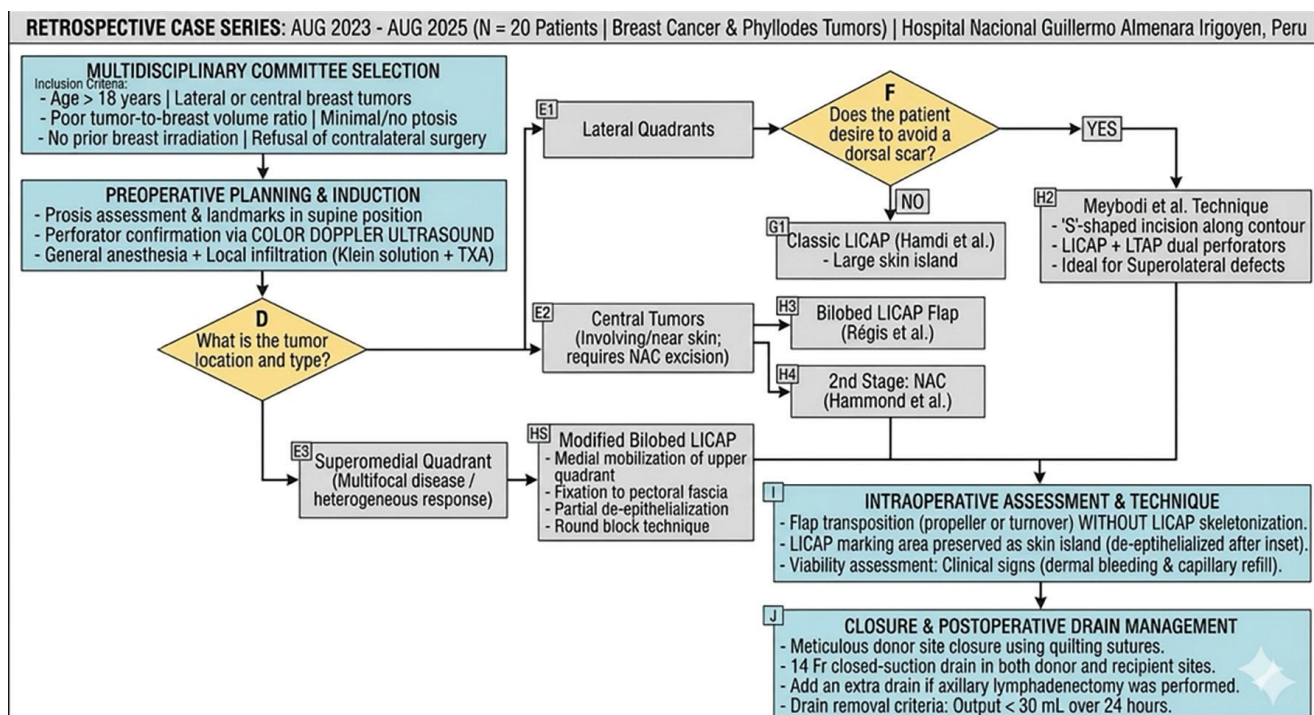


Figure 1. Surgical decision-making algorithm for LICAP-based oncoplastic breast reconstruction and perioperative management
NAC: Nipple-areola complex; LICAP: Lateral intercostal artery perforator; LTAP: Lateral thoracic artery perforator; TXA: Tranexamic acid; Fr: French gauge

Patient-Reported Outcome Measures

Patient-reported outcomes were assessed using the BREAST-Q breast-conserving therapy module. The questionnaire was completed by all eligible patients (100% response rate) after an informed discussion and confirmation of understanding of the following items, at 6 weeks after completion of adjuvant radiotherapy or at 6 weeks after surgery in patients who did not require adjuvant radiotherapy. The following domains were evaluated: psychosocial well-being, sexual well-being, physical well-being, satisfaction with breasts, satisfaction with outcome, and satisfaction with care. Scores for each domain were reported as the median and interquartile range (Q1-Q3) because the data were not normally distributed.

Statistical Analysis

Descriptive statistics were used to summarize the data. Continuous variables are presented as mean $\pm$ standard deviation and range, while categorical variables are expressed as frequencies and percentages. All analyses were performed using SPSS version 23 (IBM Corp., Armonk, NY, USA).

Ethics

The study was exempted from formal review by the Hospital Nacional Guillermo Almenara Irigoyen Ethics Committee of the Red Prestacional Almenara (ethics review no: 209, date: May 5, 2026). This exemption was granted in compliance with institutional regulations that exclude retrospective, descriptive, and non-experimental studies from formal evaluation. All procedures were conducted in accordance with the principles of the Declaration of Helsinki. Patient data were strictly anonymized and handled confidentially, and standard informed consent for surgical procedures was obtained from all patients prior to treatment.

Results

Between August 1, 2023, and August 31, 2025, 20 patients underwent BCS using OBS with LICAP flap-based volume replacement techniques. The mean age was 56.8 years (range, 27–81 years) and 65% of patients were postmenopausal. Four patients (20%) had comorbidities, including hypertension, hypothyroidism, and neuromyelitis optica (Table 1).

The surgical indications were invasive ductal carcinoma in 17 cases (85%), ductal carcinoma *in situ* in 1 case (5%), and phyllodes tumor in 2 cases (10%). Tumors were located in the upper outer quadrant (65%), central quadrant (20%), and upper inner quadrant (10%). The most frequent clinical stage was IIA (55.5%); initial clinical tumor size of 3–4 cm was observed in 45% of patients, and clinically node-negative disease was present in 70% of patients. The most common immunophenotype was

Luminal B (40%). Seven patients (35%) received neoadjuvant chemotherapy, with one achieving a pathological complete response (with residual ductal carcinoma *in situ*) (Table 1).

Preoperative planning included mammography and breast ultrasound in 94.4% of cases. The procedures performed were: 7 cases (35%) of bilobed LICAP flap (Figure 2); 5 cases (25%) of LICAP flap (Figure 3); 6 cases (30%) of LICAP+LTAP flap (Meybodi technique) (Figure 4); and 2 cases (10%) of bilobed LICAP flap associated with nipple-areola complex reconstruction (Hammond flap) (Figure 5). The mean operative time was 134 minutes (range 90–195 minutes) (Table 2).

The mean pathological tumor size was 3.57 cm (range, 0–7 cm). Surgical margin specimens were evaluated on permanent sections. Negative margins were achieved in 95% of cases. One patient (5%) had positive margins and subsequently underwent completion mastectomy, with multifocal disease identified on final pathology. Regarding axillary management, 11 patients (68.7%) underwent sentinel lymph node biopsy (SLNB) alone, 2 patients (12.5%) underwent SLNB followed by axillary lymph node dissection (ALND), and 4 patients (25%) underwent ALND alone. Three sentinel lymph nodes were identified in 50% of patients undergoing SLNB (Table 2).

The overall surgical complication rate was 15% ($n = 3$), all classified as Clavien-Dindo grade I. Two patients developed partial wound dehiscence, which was managed with local wound care; another presented with superficial erythema at the suture site and was treated with a short course of oral antibiotics. No cases of fat necrosis or late complications were observed (Table 2).

The BREAST-Q breast-conserving therapy questionnaire was administered six weeks after completion of adjuvant radiotherapy or, for patients who did not require adjuvant radiotherapy, six weeks after surgery. The following domains were assessed: psychosocial well-being (median 83; Q1-Q3, 80–91), sexual well-being (median 70; Q1-Q3, 66–84), satisfaction with breasts (median 88; Q1-Q3, 71–100), physical well-being (median 76; Q1-Q3, 75–85), satisfaction with outcome (median 91; Q1-Q3, 67–100), and satisfaction with care (median 100; Q1-Q3, 100–100) (Table 2).

A total of 18 patients (90%) received adjuvant therapy, including radiotherapy (RT) combined with endocrine therapy (ET) (40%) and chemotherapy combined with radiotherapy and endocrine therapy (35%). At a median follow-up of 22.5 months (range, 10–24 months), no locoregional recurrences were observed. One patient developed a distant recurrence (brain metastasis) and was treated with whole-brain radiotherapy and chemotherapy (Table 2).

Table 1. Patient demographics and tumor characteristics of patients who underwent LICAP, bilobed LICAP, LICAP+LTAP-based partial breast reconstruction

Variables	LICAP	Bilobed LICAP	LICAP+LTAP	Total
n (%) or mean (range)				
Age	67.0 (60–73)	56.6 (41–81)	48.5 (27–62)	56.8 (27–81)
Hormonal status				
Pre-menopausal	1 (20.0)	3 (33.3)	3 (50)	7 (35.0)
Post-menopausal	4 (80.0)	6 (66.7)	3 (50)	13 (65.0)
Comorbidities				
None	5 (100.0)	7 (77.8)	4 (66.7)	16 (80.0)
Neuromyelitis optica	0 (0.0)	0 (0.0)	1 (16.7)	1 (5.0)
Hypothyroidism	0 (0.0)	1 (11.1)	0 (0.0)	1 (5.0)
Hypertension	0 (0.0)	1 (11.1)	1 (16.7)	2 (10.0)
Ptosis				
No ptosis	3 (60.0)	5 (55.5)	2 (33.2)	10 (50.0)
G1	1 (20.0)	3 (33.3)	3 (49.8)	7 (35.0)
G2	1 (20.0)	1 (11.1)	1 (16.6)	3 (15.0)
G3	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Tumor location				
Upper outer	5 (100.0)	3 (33.3)	5 (83.3)	13 (65.0)
Lower outer	0 (0.0)	0 (0.0)	1 (16.7)	1 (5.0)
Lower inner	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Upper inner	0 (0.0)	2 (22.2)	0 (0.0)	2 (10.0)
Central	0 (0.0)	4 (44.4)	0 (0.0)	4 (20.0)
Diagnosis				
DCIS	0 (0.0)	0 (0.0)	1 (16.7)	1 (5.0)
IDC	5 (100.0)	9 (100.0)	3 (50.1)	17 (85.0)
ILC	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Phyllodes	0 (0.0)	0 (0.0)	2 (33.4)	2 (10.0)
ER				
Positive	5 (100.0)	6 (75.0)	3 (100.0)	14 (87.5)
Negative	0 (0.0)	2 (25.0)	0 (0.0)	2 (12.5)
PR				
Positive	2 (40.0)	3 (37.5)	0 (0.0)	5 (31.25)
Negative	3 (60.0)	5 (62.5)	3 (100.0)	11 (68.75)
HER2 receptor				
Positive	0 (0.0)	3 (37.5)	1 (33.3)	4 (25)
Negative	0 (0.0)	5 (62.5)	2 (66.6)	12 (75)
Clinical stage				
0	0 (0.0)	0 (0.0)	1 (20.0)	1 (5.5)
IA	1 (25.0)	0 (0.0)	0 (0.0)	1 (5.5)
IIA	2 (50.0)	5 (55.6)	2 (40.0)	11 (55.5)
IIIA	1 (25.0)	2 (22.2)	2 (40.0)	3 (16.6)
IIIB	0 (0.0)	2 (22.2)	0 (0.0)	2 (11)
DCIS: Ductal carcinoma <i>in situ</i> ; IDC: Invasive ductal carcinoma; ILC: Invasive lobular carcinoma; ER: Estrogen receptor; PR: Progesterone receptor; LICAP: Lateral intercostal artery perforators; LTAP: Lateral thoracic artery perforator				

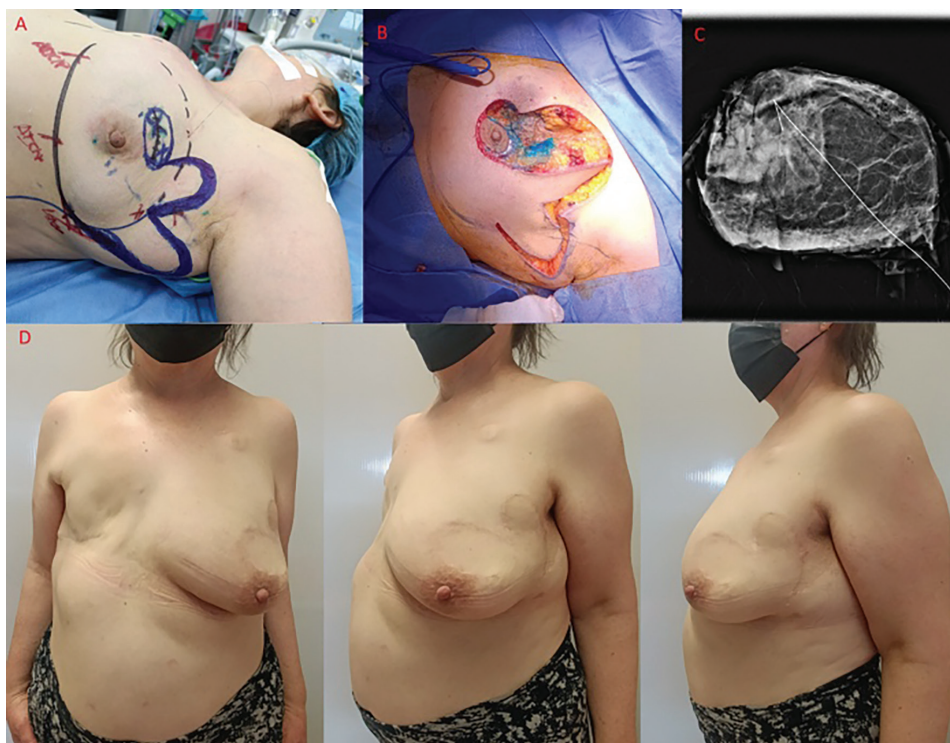


Figure 2. A. Preoperative bilobed LICAP flap design. B. Intraoperative defect following tumor resection with nipple-areola complex excision. C. Specimen mammography confirming complete lesion excision. D. Twelve-month postoperative follow-up after adjuvant radiotherapy (frontal, oblique, and lateral views), demonstrating preserved breast contour and satisfactory aesthetic outcome

LICAP: Lateral intercostal artery perforator



Figure 3. LICAP flap reconstruction for a lateral breast defect. A. Preoperative flap design. B. Intraoperative defect following tumor resection. C. Volume replacement using a LICAP flap. D. Clinical appearance at 10-month follow-up after adjuvant radiotherapy (frontal, oblique, and lateral views), demonstrating preserved breast contour and satisfactory aesthetic outcome

LICAP: Lateral intercostal artery perforator

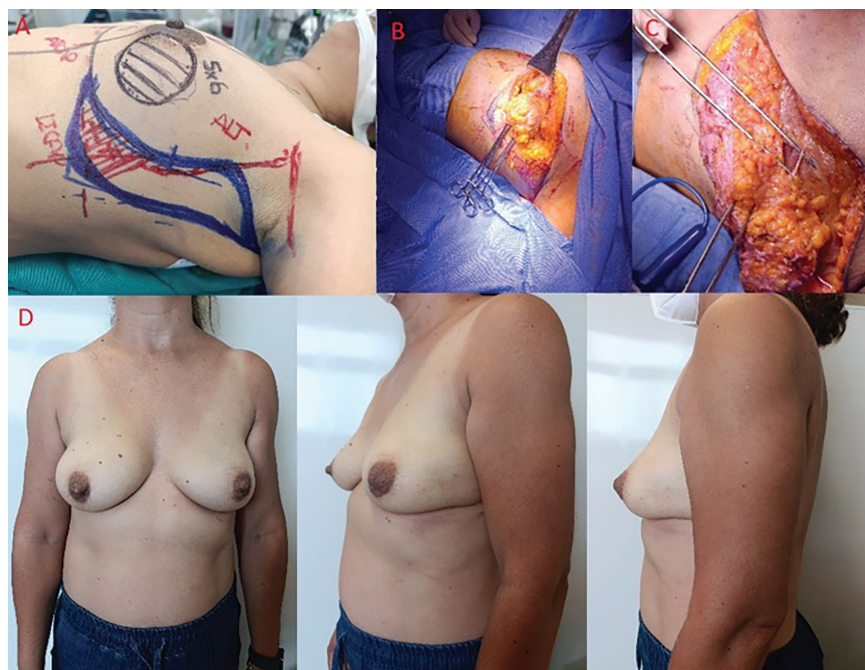


Figure 4. Combined LICAP-LTAP flap reconstruction using the Meybodi technique. A. Preoperative flap design. B. Intraoperative defect following tumor resection with flap elevation. C. Identification of the LTAP perforator during flap dissection. D. Clinical appearance at 10-month follow-up after surgery (frontal, oblique, and lateral views), demonstrating preserved breast contour and satisfactory aesthetic outcome

LICAP: Lateral intercostal artery perforator; LTAP: Lateral thoracic artery perforator



Figure 5. Bilobed LICAP flap with secondary nipple-areola complex reconstruction using the Hammond flap. A. Post-neoadjuvant chemotherapy mammogram. B. Preoperative flap design. C. Clinical appearance after primary breast reconstruction. D. Clinical appearance at 6-month follow-up after adjuvant radiotherapy and secondary Hammond flap reconstruction (frontal, oblique, and lateral views), demonstrating preserved breast contour and satisfactory aesthetic outcome.

LICAP: Lateral intercostal artery perforator

Table 2. Surgical and treatment details of patients who underwent LICAP, bilobed LICAP, LICAP+LTAP-based partial breast reconstruction

Variables	LICAP	Bilobed LICAP	LICAP+LTAP	Total
n (%) or mean (range) or Q1-Q3				
Axillary surgery				
SLNB	5 (100.0)	5 (55.6)	1 (33.3)	11 (64.7)
ALND	0 (0.0)	3 (33.3)	1 (33.3)	4 (23.5)
SLNB+ALND	0 (0.0)	1 (11.1)	1 (33.3)	2 (11.8)
Pathological T (cm)	3.0 (2.5–3.5)	3.8 (1.0–7.0)	3.6 (0.0–6.0)	3.6 (0–7)
Margin				
Negative	5 (100.0)	8 (88.9)	6 (100.0)	19 (95.0)
Positive	0 (0.0)	1 (11.1)	0 (0.0)	1 (5.0)
Surgery time (minutes)	115 (90–130)	120 (95–140)	105 (80–195)	134 (90–195)
Surgical complications				
No	5 (100.0)	8 (88.9)	4 (66.7)	17 (85.0)
Yes				
Surgical site infection	0 (0.0)	1 (11.1)	0 (0.0)	1 (5.0)
Partial wound dehiscence	0 (0.0)	0 (0.0)	2 (33.3)	2 (10.0)
BREAST-Q				
Psychosocial well-being	83 (83–90)	83 (72–90)	81 (75–100)	83 (80–91)
Sexual well-being	84 (68–95)	70 (66–87)	66 (47–80)	70 (66–84)
Satisfaction with breasts	100 (75–100)	88 (85–100)	73 (66–91)	88 (71–100)
Physical well-being	82 (70–85)	82 (68–92)	76 (74–76)	76 (75–85)
Satisfaction with outcome	71 (59–100)	91 (70–100)	83 (73–93)	91 (67–100)
Satisfaction with care	100 (100–100)	100 (100–100)	100 (91–100)	100 (100–100)
Adjuvant treatment				
No	0 (0.0)	0 (0.0)	2 (33.3)	2 (10.0)
TZT+RT+ET	0 (0.0)	0 (0.0)	1 (16.7)	1 (5.0)
CTX+RT	0 (0.0)	1 (11.1)	0 (0.0)	1 (5.0)
CTX+RT+ET	4 (80.0)	2 (22.2)	1 (16.7)	7 (35.0)
CTX+TZT+RT+ET	0 (0.0)	1 (11.1)	0 (0.0)	1 (5.0)
RT+HT	1 (20.0)	5 (55.6)	2 (33.3)	8 (40.0)
LICAP: Lateral intercostal artery perforator; LTAP: Lateral thoracic artery perforator; ALND: Axillary lymph node dissection; SLNB: Sentinel lymph node biopsy; TZT: Trastuzumab; CTX: Chemotherapy; RT: Radiotherapy; ET: Endocrine therapy; HT: Hormone therapy				

Discussion and Conclusion

To our knowledge, this report represents the first national experience in Peru evaluating LICAP-based oncoplastic volume replacement techniques, and it suggests that these flaps are safe, versatile, and reproducible options for partial breast reconstruction. Furthermore, our findings suggest that LICAP-based techniques can expand the indications for BCS in a Latin American population, enabling reliable reconstruction of lateral and central defects with minimal morbidity and encouraging early oncologic outcomes comparable to those reported in international series.

Breast cancer in Peru has an incidence of 7,797 new cases annually, representing the second most frequent malignancy among women nationwide (9) and the most common in Lima, the capital of Peru (10). In this context, the need for breast surgeons trained in oncoplastic surgery emerged in 2008 with the first national cases and specialized training courses led by international experts, including Benigno Acea Nebril (Spain), Eduardo González (Argentina), Régis Resende Paulinelli, and Cicero Andrade Urban (Brazil); these developments contributed to improving understanding of the OBS philosophy at the national level. This experience subsequently led to the first

national reports by Garcés et al. (11) as well as international publications, describing level I and II oncoplastic mammoplasty techniques (12). Oncologic safety outcomes have been reported, with local recurrence rates of 2.6%, regional recurrence of 1.61%, and distant recurrence of 2.67% over a 10-year follow-up, as described by Chávez et al. (13).

The classification of OBS into volume displacement and volume replacement techniques has facilitated surgical decision-making. Volume replacement OBS represents an appropriate option for immediate partial breast reconstruction using chest wall perforator vessels, allowing BCS for patients who would otherwise be considered candidates for mastectomy (14).

The use of LICAP flaps, initially described by Hamdi et al. (4), and the modifications proposed by Meybodi et al. (2), Paulinelli et al. (5), and McCulley et al. (6), have improved aesthetic outcomes of the incision, expanded indications to include central tumors, and enhanced perfusion reliability when combined with LTAP. In our initial experience, the described variants were successfully applied, supporting the use of LICAP-based volume replacement flaps as a safe option for reconstruction of lateral and central breast quadrants. These techniques were adapted to use the bilobed LICAP flap in two cases involving the superomedial quadrant because of tumor fragmentation after chemotherapy and multifocal disease (Figure 6).

Patient selection should be performed carefully, particularly in patients without ptosis, with mild ptosis, or in those with ptosis who decline breast reduction and contralateral symmetrization (15). This allows reproducibility of the techniques, which is further facilitated by the use of Doppler ultrasound similar to that described by Ersan and Yıldız (16). In our series, Doppler ultrasound aided preservation of LICAP within the skin paddle at the base of the flap, which was dissected as needed to allow greater rotation (propeller or turnover), and aided identification of LTAP in cases where dual-perfusion flaps were planned. This approach was directly associated with a mean operative time of 134 minutes (range 90–195 minutes), comparable to that reported by other authors such as Shen et al. (17) (142 minutes) Mangialardi et al. (18) (156 minutes) and Abd El Mohsen et al. (19) (134.4).

In BCS, achieving negative margins is crucial. Some series recommend intraoperative margin assessment and the option of delaying perforator flap reconstruction to a second stage when *in situ* disease is difficult to evaluate intraoperatively (18). In our series, immediate reconstruction was performed in all patients. The rate of positive margins was 5%, which falls within the range reported for BCS in multicenter studies (13.4%) (20) as well as in series focused on LICAP-based volume replacement OBS (7.3%) (14).



Figure 6. Modified bilobed LICAP flap reconstruction for an upper inner quadrant breast tumor. A. Preoperative flap design. B. Intraoperative defect following tumor resection. C. Flap elevation with identification of the LTAP perforator to increase flap mobility. D. Clinical appearance at 6-month follow-up after adjuvant radiotherapy (frontal, oblique, and lateral views), demonstrating preserved breast contour and satisfactory aesthetic outcome

LICAP: Lateral intercoastal artery perforator

LICAP-based flaps offer the main advantage of minimal donor-site morbidity, as they preserve the muscular structure, with low complication rates, as reported by Soumian et al. (20) (7.1%), Nava et al. (21) (13%) and Burhamah et al. (22) (16.4%), including hematoma, infection, seroma, wound dehiscence, partial or total flap necrosis, and fat necrosis. In our series, the complication rate was 15%; all complications were classified as Clavien-Dindo grade I and did not delay adjuvant therapy. No cases of fat necrosis or flap-related complications after radiotherapy were observed during the available follow-up, similar to the findings reported by Pujji et al. (23), who observed rates of total and partial flap necrosis of 0.2% and 1.8%. Overall, our patients demonstrated favorable short-term outcomes without clinically evident breast deformities during follow-up.

Our results demonstrate the versatility of partial breast reconstruction using LICAP flaps and their modifications. However, this study has limitations inherent in its descriptive, retrospective design and clinical context. As this case series represents the first national experience in Peru and was performed by a single surgeon, it was limited to 20 patients who were distributed into three groups according to the surgical technique used. Consequently, the sample size was insufficient to detect statistically significant differences between groups, increasing the risk of a type II error. For this reason, formal comparative analyses between surgical technique groups were not performed, and the study was intentionally designed as a descriptive case series. Furthermore, as this is a single-surgeon, single-center experience, the generalizability of these findings to other institutions and patient populations may be limited. Larger prospective multicenter studies are warranted to validate these results. Additionally, the median follow-up was 22.5 months, precluding assessment of long-term oncologic outcomes and durability of aesthetic results.

Aesthetic outcomes were assessed through physical examination, standardized photography, and validated patient-reported outcome measures, such as the BREAST-Q. However, objective cosmetic assessment tools, such as BCCT.core (breast cancer conservative treatment: cosmetic results), which evaluates breast asymmetry, color discrepancy, scar appearance, and the position of the nipple-areola complex, were not used. This represents a limitation of the study, and future research should incorporate standardized objective cosmetic assessment tools to complement patient-reported outcomes.

The LICAP-based oncoplastic volume-replacement flap is a versatile, reproducible technique for partial breast reconstruction. Its multiple modifications enable wide excisions in the lateral and central breast quadrants while preserving thoracic and dorsal musculature and minimizing donor-site morbidity.

This approach can be performed immediately or in a delayed setting and may broaden the indications for BCS in selected patients. To our knowledge, this represents the first reported national experience, demonstrating encouraging early oncologic outcomes, postoperative complication rates, and operative times comparable to those reported in international series. These findings suggest that LICAP-based techniques represent a safe and reproducible strategy to expand BCS in evolving oncoplastic settings, with encouraging short-term oncologic and aesthetic outcomes. However, given the limited number of patients and the relatively short follow-up period, these findings should be interpreted with caution. Larger prospective multicenter studies with longer follow-up are needed to confirm long-term oncologic safety and validate these results.

Ethics

Ethics Committee Approval: The study was exempted from formal review by the Hospital Nacional Guillermo Almenara Irigoyen Ethics Committee of the Red Prestacional Almenara (ethics review no: 209, date: May 5, 2026).

Informed Consent: Patient data were strictly anonymized and handled confidentially, and standard informed consent for surgical procedures was obtained from all patients prior to treatment.

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Footnotes

Authorship Contributions

Surgical and Medical Practices: M.C-D., C.C.C.L., H.N.S.P., W.M.G.O., J.F.T.A., M.d.R.C.P.; Concept: M.C-D., C.C.C.L., G.d.I.C.K., H.N.S.P., W.M.G.O., J.F.T.A., M.d.R.C.P.; Design: M.C-D., C.C.C.L., G.d.I.C.K., H.N.S.P., W.M.G.O., J.F.T.A., M.d.R.C.P.; Data Collection and/or Processing: M.C-D., C.C.C.L., G.d.I.C.K., J.F.T.A.; Analysis and/or Interpretation: M.C-D., C.C.C.L., G.d.I.C.K., H.N.S.P., W.M.G.O., J.F.T.A., M.d.R.C.P.; Literature Search: M.C-D., C.C.C.L., G.d.I.C.K., W.M.G.O., M.d.R.C.P.; Writing: M.C-D., C.C.C.L., G.d.I.C.K., H.N.S.P., W.M.G.O., J.F.T.A., M.d.R.C.P.

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