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Volume 4 Issue 1
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ES Journal of Oncology

Patient Reported Outcome Measures (PROMS) and Aesthetic Considerations in Partial Breast Reconstruction with the Use of Chest Wall Perforator Flaps

Research Article

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Received: Sep 04, 2025; **Accepted:** Sep 17, 2025; **Published:** Sep 19, 2025

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Abstract

The purpose of the study was to evaluate breast aesthetics in patients undergoing Chest Wall Perforator Flaps (CWPF) surgery using Patient Reported Outcome Measures (PROMS).

All patients (59) who were operated with the use of CWPFs, between 2021-2025, were identified from our database. 44 patients met the inclusion criteria and were administered local PROMS questionnaire during follow-up visits.

Our local questionnaire contains 7 domains and its scope is to assess patient satisfaction with the breasts post treatment with this innovative technique.

All patients responded to our survey. Mean patient's age was 56.6 years. PROMs showed that most patients were extremely satisfied with the appearance of their breasts after cancer surgery (82.1%). No patient reported poor aesthetic outcome. There is extreme paucity of studies evaluating PROMS related to CWPF technique. Our study highlights the need of assessing aesthetics in breast cancer patients and that CWPFs produces high satisfaction rates.

Keywords

Perforator flaps; Breast cancer; Volume replacement; PROMS; Oncoplastic; Aesthetic outcomes

Introduction

Oncoplastic Breast Conserving Surgery (OBCS) allows surgeons to resect large tumors in patients that otherwise would require mastectomy [1]. OBCS, also, provides better cosmesis and maintains more natural breast contour over simple Wide Local Excision (WLE), especially in women with small or medium cup size breasts [2,3]. Volume replacement techniques utilize tissue transfer from distant parts of the body or regional areas around the breast border. Recently, better understanding of the anatomy of perforating source vessels led to the application of muscle-sparing pedicled local flaps, in order to facilitate breast conservation even in more complex cases. Hamdi et al [4,5] introduced the concept of the Lateral Intercostal Artery Perforator Flap (LICAP) in 2004 and, later, McCulley et al described the Lateral Thoracic Artery Perforator Flap (LTAP) [6].

Although the oncological and surgical outcomes of the technique have been described extensively in the literature [7-10], the last years, there is paucity in data related to PROMS.

It is well established that breast cancer treatments can have a significant impact on body image [11] and the aesthetic outcome of such treatments (surgery,

radiotherapy) can affect psychosocial well-being and patient's quality of life [12]. With excellent survivorship (80% at ten years), women experience the long-term aftermath of the surgical interventions.

PROMS are instruments that quantify health-related quality of life and can reflect patient's satisfaction with the aesthetic outcome after breast surgery (cancer, reconstruction, aesthetic surgery) [13]. BREAST-Q is the most widely adopted PROMS questionnaire that assess patient's perception with their care, but, so far, is not validated specifically for patients undergoing partial breast reconstruction with chest wall perforator flaps [14,15]. We established our own local questionnaire, which comprises 7 domains (shape, softness, volume, symmetry, nipple position, scar appearance and overall satisfaction) and it is a modification of the Delphi scoring system described by Godden et al [16].

Materials and Methods

This is a single retrospective cohort study. All patients (59) undergoing CWPFs in our Breast Unit, during the period 2021-2025, were identified from a prospectively maintained database. Only breast cancer patients were included. A few patients had a combination of volume replacement and volume displacement (mammaplasty) techniques and were excluded from the survey. 5 patients who underwent mastectomy and total breast reconstruction with CWPFs were, also, excluded. One patient deceased, after developing distant metastasis, 3 years after surgical treatment and was excluded from the study. In total, 42 patients met the inclusion criteria. Descriptive statistics were used.

Inclusion criteria:

- Primary breast cancer
- Partial breast reconstruction with CWPFs as a sole oncoplastic technique
- Previous breast surgery for benign lesions
- Multifocality/multicentricity

Exclusion criteria:

- Mastectomy patients
- De novo metastatic disease or deceased patients
- CWPFs combined with volume displacement techniques

Technique description

Perforators were mapped preoperatively with a hand-held acoustic Doppler on the bedside. We routinely marked all vessels that give a good signal and, during surgery, we made the final decision on which vessel we will keep the flap perfused. We markup the patients on a standing or a sitting position utilizing the landmarks: midline from sternal notch to umbilicus, breast meridian, inframammary fold. We perform a pinch test, in order to test the skin laxity on the upper abdomen and lateral chest wall, under the axillary fold. We design the flap on supine and standing position.

During surgery, we dissect -most of the times- the flap completely on its perforators (skeletonization). We check, again, with the Doppler the blood flow. We rotate the flap into the defect either as a propeller or a turnover flap. Occasionally, we use Indocyanin Green (ICG) dye, intravenously, to confirm flap perfusion (Figure 1).

We leave a surgical drain at the donor site for a few days.

All patients are being discharged the next day, after their surgery (24 hours stay).

A modified Delphi scoring questionnaire (Table 1 & 2) was administered to all patients at least 1 month postoperatively. Most patients were conducted 6 months after they completed radiation treatment. Our local survey instrument comprises 7 domains related to breast aesthetics: shape, softness, volume, symmetry, nipple position, scar visibility and overall patient's satisfaction. Each domain uses a 4-point Likert scale (1-4), as per Harvard score introduced by Harris [17]. There is a maximum score of 28 points, if a patient selects 4 points in every domain. Outcomes were analyzed and categorized as below:

- 7-13: poor
- 14-21: fair/good
- 21-28: excellent

Results

All patients (42) who met the inclusion criteria responded to our survey. All patients but one had postoperative radiotherapy. Only 7 patients needed chemotherapy (1 had neoadjuvant). The majority also needed a boost in the tumor bed (usually 4-5 fractions).

Most patients (88%) had invasive cancers and only 5 patients had pure DCIS.

56% of women had A/B cup size and only 6 (15%) had D cup breasts. Mean BMI was 24,7 kgr/m^2. If one considers that the mean specimen weight was 62,6gr and more than half of the cases presented with multifocal/ multicentric tumours, we can conclude that CWPFs expand the indications for breast conservation. Another important factor is that the rate of margin re-excision was 0%, which proves that the technique provides oncological safety along with preservation of the breast aesthetics.

Most popular flaps performed were the lateral ones (LICAP, LTAP) as most of the tumors lie in the lateral aspects of the breast (upper and lower outer quadrants) (Figures 1-6).

The mean time from surgery to response to questionnaires was 9,2 months (range 1-38 months) with most patients evaluating their breasts around 6 months post-surgical treatment.

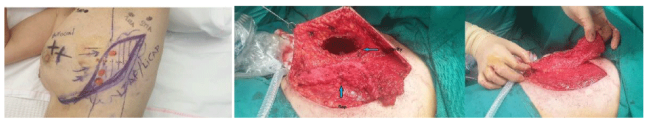

Figure 1: Perforators mapped with a handheld Doppler on the bedside. A combined LICAP/LTAP flap has been raised and will fill up the cavity resulting from excising an area containing bifocal DCIS.

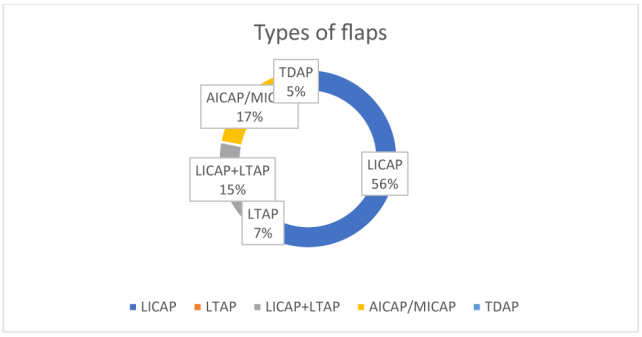

Figure 2: Distribution of types of laps.

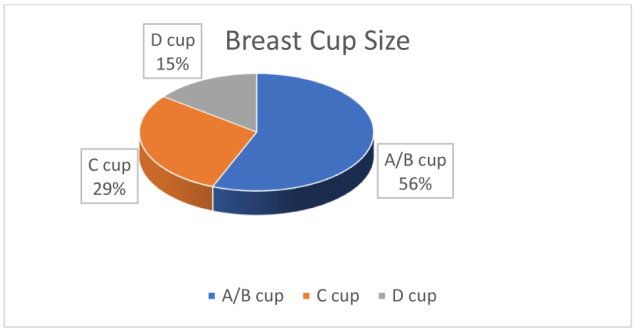

Figure 3: Breast cup size.

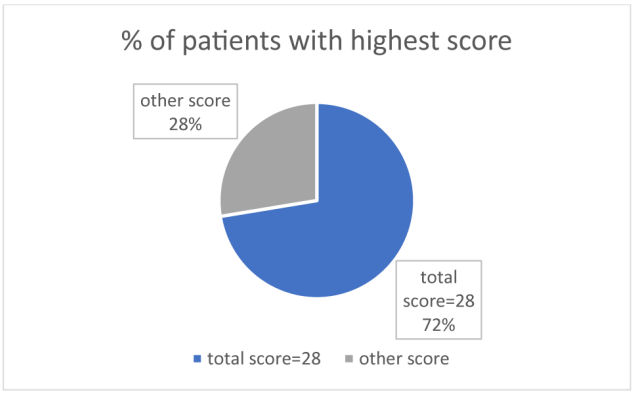

Figure 4: Breast cup size.

Figure 5: Tumor at the "no man's land" position- the upper inner quadrant. Scar appearance at the end of the operation. Breast demonstrating satisfactory fullness 3 weeks postop.

Patient's responsiveness to the survey was impressive, as all women were willing to participate. 23 out of 42 patients scored excellent in all domains (28/28), while only 2 patients scored below 21 (16 and 17). Out of those patients who had the lowest score, the first (51 years old) had delayed wound healing due to chronic inflammation and needed re-intervention 1 year postop. We found partial flap necrosis and we excised that part of the flap. The other patient (50 years old), 1 year post surgery and 2 months post radiation therapy (she also had adjuvant chemotherapy), developed partial flap necrosis with a hard lump at the treated site (lower inner quadrant). She also lost some volume of her reconstruction and, as a consequence, her nipple developed medial deviation (Figure 7).

Complication rate was low (11,9%) and in line with the literature [8,9]. As mentioned above, one patient needed revision for delayed wound healing, while another one

Figure 6: 40 years patient with ILC+LCIS in the outer lower quadrant. Partial breast reconstruction with LICAP and pictures 1 year postop.

Figure 7: Flap dissected and being raised on its perforators. In the middle, breast appearance 2 years after surgery. Scar visibility is minimal.

Figure 8: Multifocal breast cancer on the lateral aspect of the breast. After wide local excision, an immediate partial breast reconstruction with a LiCAP was performed. Despite the large defect resulted from the tumour excision, the right breast has maintened the volume, fullness and shape. Both breasts demonstrate good symmetry 6 months post radiation treatment (left side).

developed a hematoma a few hours after surgery and needed urgent evacuation (both minor complications).

Discussion

Partial breast reconstruction with CWPFs has shown promising results in expanding the indications of BCS and reducing mastectomy rates. As patient's and surgeon's uptake of the technique is continuously on the rise [9], there is a need of measuring specific effects, like body image and breast integrity. Patient self-evaluation provides a unique perspective on the success of the surgical procedure, as panel assessments tend to show great inter- and intra-panellist variability [16]. PROMS, potentially, can measure a clinically meaningful change resulting from a new technique.

The best validated PROMS in breast cancer surgery is the BREAST-Q [18,19].

BREAST-Q explores quality of life domains (psychosocial well-being, physical well-being, sexual well-being) and satisfaction domains (satisfaction with breasts, satisfaction with care).

So far, BREAST-Q is not validated to measure patient's perspectives in muscle-sparing flaps. Muktar et al [15] used in their study a combination of BREAST-Q along with panel assessment utililising 2D and 3D surface images, in order to assess functional and aesthetic outcomes in volume replacement BCS with CWPFs. Agrawal et al [20], in their pilot study of 10 patients, combined 2 BREAST-Q modules (BCT and LD flap) to evaluate patient's satisfaction and health-related QoL. Laroia et al [21] used a questionnaire modified from the National Mastectomy and Breast Reconstruction Audit to assess PROMS. Both studies showed high degree of patient's satisfaction with the technique. These results are in line with a systematic review by Puji et al [8] reporting patient's satisfaction rate as high as 93%.

In our study, we used a modification of the Delphi scoring system and we focused on factors affecting breast aesthetics (shape, symmetry, volume, softness, scar, nipple position). Currently, there is not an existing evaluation process, on a national level, to validate questionnaires related to patient's outcomes. Therefore, we used a validated system with a slight modification. BREAST-Q was deemed quite complex to engage our population in the study.

Table 1: Patient's and tumor characteristics. Patient demographics, tumour and treatment characteristics

Characteristic	Value/Percentage
Age (mean)	56,6 (35-74)
BMI (mean)	24-Jul
Breast Cup size	
A/B cup	24
C cup	12
D cup	6
Specimen Weight	62,6 gr (mean)
Tumor location	
Lateral	28/42
Central	Apr-42
Inner	May-42
lower	May-42
Type of flaps	
LICAP	23
LTAP	7
LICAP+LTAP	3
AICAP/MICAP	7
TDAP	2
Type of cancer	
Invasive	37 (88%)
DCIS	May-42
Multifocality	21
Multicentricity	4
Chemotherapy	7
RT Boost	25/42 (59%)
Margin Re-excision	0
Complication rate	5/42 (11,9%)
Mean time to response	6,2 (range 1-38 months)

Table 2: Delphi scoring system
Minimim score: 7x1=7
Maximum score: 7x4=28

Characteristic	Value/Percentage
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RT Boost	25/42 (59%)
Margin Re-excision	0
Complication rate	5/42 (11,9%)
Mean time to response	6,2 (range 1-38 months)

All patients responded to our survey, which strengthens the outcome and minimizes the potential bias between responders and non-responders.

Our survey showed that CWPFs can become the modality of choice in BCS, especially when there is a high tumor to breast size ratio, as it is associated with low complication rates and excellent aesthetic outcomes. 90% of our patients evaluated the post-operative appearance of their breasts as excellent and 72% of them chose the highest score in every domain. Kim et al [2] and Koppiker [22] et al demonstrated similar results using PROMS in their studies.

57% of our patients (24/42) had A/B cup breast size and mean BMI was 24,7 kgr/m^2. In PartBreCon [9] almost 50% of participants had A/B cup size and the median BMI was 25.4. Those characteristics show the CWPFs are applicable for small to median breasts.

Most of our patients underwent a LICAP flap reconstruction (56%), as most tumors lie in the lateral aspect of the breasts. LICAP is the most easy to dissect flap and it does not require microsurgical expertise. It can be harvested on the supine position with a slight tilt placing a sand bag under the patient's shoulder or on the lateral position. Anterior-based flaps (AICAP, MICAP) have the advantage that there is no need for changes in patient's position on the operating table.

Almost all our patients received postoperative radiotherapy with 59% having an additional boost dose (usually in 4-5 fractions). It seems that boost did not have a negative impact on final breast appearance.

Regarding oncological safety, our rate of margin re-excision was 0%, meaning that CWPFs offer the advantage of excise sizeable tumors with an adequate rim of healthy breast tissue in one stage. Our value is significantly below the acceptable rate in the literature [23]. Rutherford et al, in their systematic review, demonstrate a 7.2% rate of margin re-excision. We believe that patients accept easily a well-hidden long scar around the breast border instead of losing their entire breast due to positive margins after a WLE.

Complication rate was similar to that described in the literature [8,9,23]. There was no total flap loss, with only 2 patients experiencing partial fat necrosis. Surgical intervention was needed in 2 patients: one patient developed a postoperative haematoma, a few hours after her procedure and the other one needed a revision due to delayed wound healing and partial flap necrosis.

In general, the appearance of the scar is very acceptable, as it is discreetly hidden under the bra line or beneath the breast, on the Inframammary Fold (IMF). The technique ensures minimal breast scarring, as in many cases the tumor excision can be performed through the incision used for the flap design, at the periphery of the breast (lateral chest wall or upper abdominal wall). Through the same incision, the surgeon can perform sentinel node biopsy or axillary clearance, as indicated.

No symmetrisation surgery on the contralateral breast was performed, as CWPFs replace like with like. Most patients have maintained the volume that the flap has provided, except for a couple of women that developed a dent where the cavity was created after tumor extirpation. We believe that this is due to flap atrophy and shrinkage, without knowing the exact reason. In most cases, breasts maintained their initial volume, even 1 year or more after

radiation treatment was delivered. This flap shrinkage can be managed easily with 1 or 2 sessions of lipomodelling.

Time from surgery to evaluation may play a critical role. There was a variation in the time frame where patients submitted their appraisal. We concluded that patients that had their surgery in the early days of initiation of the technique and were administered the questionnaires more than two years from surgery, were still very satisfied with the outcome.

One interesting observation was that, in a few cases, patients were more satisfied with their postoperative appearance compared to the initial appearance of their breasts, as the outcome shown in figure 4. That lady had a minor crescent mastopexy, which, combined with the volume provided by the flap, enhanced her breast shape. Patients that had formal mammaplasty/mastopexy in combination with flaps were excluded from our survey. In some cases, the flap can provide more volume than the one that is being lost from the wide local excision. That gives more fullness to the breast and, probably, this is the reason that women may even like more the operated breast, despite CWPFs aim to maintain the same image as before treatment.

The above findings are in agreement with a meta-analysis exploring aesthetic and oncological outcomes of level 1-2 Oncoplastic breast surgery techniques (volume displacement) compared with standard breast conservation surgery [24]. Mammaplasty techniques provide better aesthetics, as CWPFs, compared to standard lumpectomy, especially in women with large, ptotic breasts and large tumors.

Current limitations: As a retrospective study, data collection is subject to inherent selection bias. Also, results are based on a single surgeon's experience and a small sample size, which could limit generalizability. At the moment, worldwide, there is a huge variation in surgeons' expertise in performing Level III Oncoplastic Breast Surgery. Additionally, patient's population and, especially, bra size can vary significantly from country to country, a factor that can affect aesthetic outcomes. A last limitation is the short follow up when assessing those patients. We are interested in exploring the stability of aesthetic results of the technique years after the initial operation.

Conclusions

Our study supports the idea that CWPFs can be a valuable tool in the armamentarium of Oncoplastic breast surgery. Our survey is a retrospective single cohort study based on a single surgeon's experience. More research is needed to establish a validated objective instrument for assessing breast aesthetics more effectively after volume replacement techniques with CWPFs.

Funding

This research received no external funding.

Informed Consent Statement

The study conformed to the provisions of the Declaration of Helsinki (as revised in 2013) Informed consent was obtained from all subjects involved in the study.

Institutional Board Review

The study was approved by the Ethical Review Committee (Approval Code: IRB ID: CWPF2025#3107).

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