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Chapter

L-Shaped Nipple Reconstruction: A Novel Technique to Improve Patient Satisfaction Outcomes

Krishnamurthy Sreedhar Murthy

Abstract

Nipple reconstruction is the final stage of breast reconstruction and performed after acceptable breast mound shape and symmetry has been achieved. The objectives of this study are to describe an original technique of nipple reconstruction, using a combination of random flap (for new nipple) and dermal graft (for new areola), and also measure patient satisfaction outcomes. Thirty-one patients underwent the L-shaped nipple reconstruction (2011-2016) at Liverpool Breast Unit and completed satisfaction survey of this technique. This cohort was compared to 59 patients who underwent traditional CV flap during the same period, in our Breast Unit. The study analysed the combined data of 90 patients (L flap N = 31 and CV flap N = 59). "L"-shaped flap is a random local skin flap to create new nipple and dermal graft is used to create new areola. There was no statistically significant difference in complication rates between traditional CV flap (9.7%) and L-shaped (13.6%) nipple reconstructions (Fishers exact test p = 0.74). In our L flap cohort, 94% were pleased and 93% would recommend it to a friend. Thus L flap is a viable alternative to CV flap in suitable patients and has positive patient satisfaction outcomes.

Keywords: L flap, nipple reconstruction, novel technique, patient satisfaction, areolar graft

1. Introduction

Reconstruction of nipple-areolar complex has been shown to have a positive influence on the overall recovery process of women undergoing post mastectomy breast reconstruction and hence helps to restore body image more completely. This clearly underscores the well-known concept that, part of the reconstruction of an aesthetically pleasing breast, is a high-quality nipple-areolar reconstruction [1].

Over the last 30 years, many different techniques have been described to accomplish this task. The goals for this nipple-areola reconstruction include appropriate nipple projection, areolar colour, and areolar texture. A number of reconstructive techniques have been described for nipple reconstruction including skin grafts, composite grafts, and various local flaps. Numerous techniques, using a variety of geometric designs, have been reported and reviewed [2–9]. Each of these techniques aims to achieve a natural shape with maintenance of projection over time, and minimal donor site morbidity. The most popular techniques benefit from simplicity, reliability and reproducibility.

Presented in this article is an original and novel technique, L shaped nipple reconstruction; which achieves these goals by providing an alternative to traditional techniques such as CV flap [9]. This has proven to be a suitable alternative option when previous mastectomy scars preclude optimum nipple positioning.

In this chapter, we share our institution's experience with the L flap nipple areolar reconstruction. Here, an earnest attempt is made to describe the indications for its use, flap design and surgical technique, and outcomes and complications associated with its use.

2. Patients and methods

Thirty-one patients underwent L shaped nipple reconstruction following breast reconstruction between 2011 and 2016, at Liverpool Breast Unit, Linda McCartney Centre. The study cohort were identified from prospectively collected data and analysed. All patients with transversely placed mastectomy scar, considered otherwise unsuitable for traditional CV flap reconstruction, were included in this study.

Once the patients were identified, their case notes were reviewed to record patient's age, body mass index, and position of previous mastectomy scar, type of breast reconstruction, chemotherapy, medical history, and smoking history. Complications explored included haematoma, postoperative wound healing problems, nipple-areola complex necrosis (partial and complete), infection, discharge, pain, fat necrosis and hypertrophic scarring.

Of the 31 patients, 17 patients (55%) had implant based reconstruction and 12 patients (39%) had latissimus dorsi (LD) with implant reconstruction and 2 patients (6%) had LD flap autologous breast shape reconstruction.

The timing of L flap reconstruction ranged from 6 months to 2 years after their initial cancer surgery or breast reconstruction, with an average time of 15 months.

Each patient was sent an outcome questionnaire, using validated Likert scoring scales (scale of 1–5), relating specifically to their nipple reconstruction. The questionnaire using Likert Scales was developed to evaluate overall patient satisfaction with cosmetic result, and addressed key issues, such as perceived match to contralateral nipple, confidence in clothing and reported complications.

3. Surgical technique

L-flap nipple reconstruction is a random skin flap, containing dermal and adipose tissue. It has a pedicle with long and short arms which resemble the letter L and hence the terminology. The L-flap was used on all our patients with transverse mastectomy scars, which would otherwise preclude the use of traditional flap, such as CV flap (**Figure 1**).

The traditional CV flap marked in **Figure 1**, would produce unsatisfactory neo-nipple position, i.e., above or below the mastectomy scar. Whereas, the alternate L shaped flap offers optimal neo-nipple position.

Preoperative marking was performed with patient standing to achieve ideal and closest natural nipple position. Marking with patient stood up would further ensure to centre the nipple symmetrically to the opposite side (natural or reconstructed nipple). The important markings included the patient's breast meridian, inframammary fold, and new nipple-areolar position (**Figure 2**).

The skin incision is made using no. 11 blade with depth of incision extending to pectoral fascia or onto subcutaneous tissue in event of autologous tissue breast shape reconstruction (**Figure 3**). The base of the L pedicle is measured to be equal to the nipple diameter to be created. The short arm lies opposite to the pedicle

(**Figure 3**). The long arm of the L flap is based on a laterally based random flap and is one and half to two times the diameter of the nipple. The marked long arm is raised and rotated through 180°, and sutured (**Figure 4**) with absorbable 4–0 monocryl (poliglecaprone 25, Ethicon) sutures. The short arm is then sutured to the upper border of long arm to create the summit of the neo-nipple and hence fashioned to create a projecting neo-nipple (**Figure 4**).

The area surrounding the reconstructed nipple site is de-epithelialised to match the areola on the native breast and this forms the first step in preparing the areolar base (**Figure 5**).

The next step involves harvesting and preparing the areolar graft from abdomen or from skin envelope of the opposite breast. The skin graft is then fashioned and placed over the raw surface to reconstruct the neo-areola (**Figure 6**), using absorbable 4–0 monocryl.



Figure 1.
Transverse mastectomy scar with mark up of L flap and CV flap (depicted with arrows).

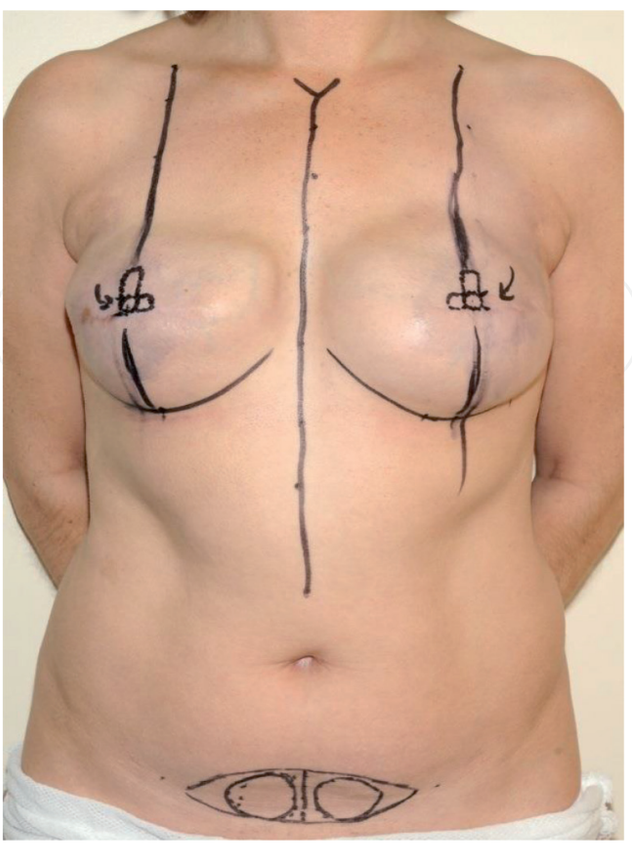


Figure 2.
Pre-operative markings for L flap nipple and areola.

The full thickness graft is fenestrated to facilitate drainage of serous collection or blood, which would ensure very low infection rates. The additional value of designing small openings in the graft is that it eventually generates the appearance of Montgomery tubercles over the neo-areola (**Figure 7**).

An interrupted 4–0 monocryl suture is used to secure the skin to the graft. Once the graft is secured, the entire neo-nipple/areolar complex is covered with Mepitel or Jelonet, covered with surgical gauze with a central button hole; all held together with clear Tegaderm hydrocolloid dressings. Tegaderm backing allows the patient to shower, easy to use and can be applied one-handed. The dressing is left intact for



Figure 3.
Details of raising the L flap.



Figure 4.
Neo-nipple inset and creation of base for areola.



Figure 5.
De-epithelialised neo-areolar base.



Figure 6.
Full thickness skin graft to create neo-areola.



Figure 7.
A per op view of neo-nipple and neo-areola with typical fenestrations.

10 days until the outpatient clinic review, wherein all 31 patients were reviewed by the Surgeon.

Prophylactic antibiotics are administered, with Co-amoxiclav (500 mg/125 mg) being our antibiotic of choice. In patients with allergies to penicillin, we found macrolide antibiotics such as erythromycin or clarithromycin helpful.

4. Statistical analysis

The data of complications from concurrently performed traditional CV flap was compared with the novel L-flap technique.

The categorical data were summarised using frequencies, percentages, cross tabulation and bar chart and analysed by Fisher's exact test. All statistics and analyses were produced using IBM SPSS version 20.

5. Results

A total of 31 patients met inclusion criteria (previous transverse mastectomy scar and not deemed suitable for CV flap nipple-areola reconstruction) and were evaluated. The mean age of patients identified was 44 years (range, 33–64 years) and the mean body mass index was 28 (range, 24–32). Patients displayed minimal medical co-morbidities, and there were no patients who were actively smoking at the time of surgery.

All patients had undergone total mastectomy and had well healed transversely placed chest wall scars. Twelve patients (38.7%) were treated with chemotherapy (Adriamycin with or without Paclitaxel) and none of the 31 patients underwent external beam irradiation.

Intra-operatively, all patients underwent L-shaped flap nipple reconstruction with areolar skin graft from abdomen or contralateral breast, with technique as described above.

As depicted in **Table 1**; the incidence of any complications, including infection, discharge, pain, bleeding, partial or total nipple loss; as compared with traditional CV flap were similar and no statistically significant difference (Fisher's exact test).

Table 2 summarises the patients' undergoing L flap showed good cosmetic outcomes in comparison with patients' undergoing CV flap in the same breast Unit during the same period of time as the study cohort.

Table 3 shows that nipple projection in the study cohort of L flap compared favourably with patients' undergoing traditional CV flap, over 6 and 24 months.

6. Discussion

Nipple reconstruction and patient satisfaction outcomes study seem to be an area of very limited research and hence lack of evidence based scientific literature. While nipple reconstruction is considered a minor procedure, its profound implications on patient satisfaction after post-mastectomy breast reconstruction have been clearly demonstrated [9, 10].

Complications	L flap (n = 31)	CV flap (n = 59)	P-value (Fisher's exact test)
Superficial nipple tip necrosis	3 (10%)	6 (10%)	P = 1.0
Cellulitis	2 (6%)	3 (5%)	P = 1.0
Pain	2 (6%)	5 (8%)	P = 1.0
Bleeding/haematoma	1 (3%)	3 (5%)	P = 1.0
Partial nipple loss	2 (6%)	2 (3%)	P = 0.60
Surgical revision	2 (6%)	3 (5%)	P = 1.0

Table 1.
Complications: L flap and CV flap nipple reconstructions compared.

	L flap (n = 31)	CV flap (n = 59)	P-value
Overall cosmetic outcome—satisfied/very satisfied	90% (n = 28)	86% (n = 51)	P = 0.74
Wearing daily clothes—confident/very confident	81% (n = 25)	69% (n = 41)	P = 0.32
Wearing swim clothes—confident/very confident	77% (n = 24)	63% (n = 37)	P = 0.24
Wearing night clothes—confident/very confident	71% (n = 22)	63% (n = 37)	P = 0.49
Nipple Reconstruction-Good/Very Good Match to opposite side	77%(n = 24)	69%(n = 41)	P = 0.47

Table 2.
PROMs (patient reported outcome measures) in each of the techniques.

Nipple projection	L flap	CV flap
Immediate post-op	4–5 mm (4.5 mm)	5–6 mm (5.5 mm)
6 months follow-up	3–5 mm (4 mm)	4–5 mm (4.5 mm)
24 months follow-up	2–4 mm (3 mm)	2–4 mm (3 mm)

Table 3.
Comparison of nipple projection between two cohorts.

A vast majority of contributions related to nipple reconstruction merely focus on surgical techniques. Literature review has shown a major emphasis of articles has been on ways to prevent the inevitable loss of nipple projection [11–16]. This is in contrast to the limited number of studies analysing risk factors and complication rates after nipple reconstruction [13, 17].

It is prudent, however, to not only concentrate on preservation of nipple projection but also analyse and identify factors that predict poor outcome, as complications after nipple reconstruction can have devastating consequences for patients.

It is reasonable for the patient undergoing breast shape reconstruction to expect the same high standards of nipple-areolar reconstruction as the breast mound itself [18]. Hence it would be prudent to give the greatest consideration to the position of the new nipple-areola complex and to the symmetry on the other side. It is important to assert that nipple-areola reconstruction represents the final stage of breast reconstruction, whereby a reconstructed breast mound is transformed into a breast facsimile that more closely resembles the original breast. Shestak et al. in their salient review of Assessment of Long-Term Nipple Projection—A Comparison of Three Techniques, using either a bell flap, a modified star flap, or a skate flap and full-thickness skin graft for areola reconstruction; note that loss of nipple and areola projection was quite remarkable using the bell flap and hence would discourage its use in virtually all patients requiring nipple-areola reconstructions [19]. They find the other two techniques reviewed, i.e., modified star flap and skate flap with full-thickness skin graft for areolar reconstruction, to be more suitable in a variety of situations to maintain long term nipple projections [19].

The complexity and outcomes of the creation of a new nipple areola following cancer surgery is succinctly demonstrated by Sisti et al. [20] In their seminal review of literature, the authors having thoroughly analysed 75 papers published over 69 years, and have observed that flaps have held the "*test of time*" in nipple reconstructions. Overcorrection of nipple projection (up to 50%), in suitable patients, to prevent long term loss of nipple projection is an interesting observation in this review. In this context, being informed and sharing decision making with patients, helps patient empowerment and improves overall satisfaction. This concept could support future studies involving techniques, outcomes and influence patient confidence which would all further enhance patient safety.

This novel L-flap nipple reconstruction was devised and developed at Liverpool Breast Unit, to provide a viable and robust alternative to traditional flaps and keeping with patient's expectations and interest. This technique seems a very useful resource considering several criteria it should fulfil to near match contralateral native nipple areolar complex or a previously reconstructed neo-nipple. Our clinical observation over the years of an unsatisfactory nipple position with traditional CV flap, in people with transversely placed mastectomy scar, has led us to develop this innovative L flap. The outcomes of PROMs (patient reported outcome measures), in addition to our clinical observation of a better and satisfactory nipple position achieved with L flap have supported our journey to develop this L flap.

Our choice of creating neo-areola by means of a full-thickness graft has resulted in a better colour match and projection compared with other techniques, such as tattooing.

In this study we have noted complication rates in all our L-shaped flaps are not significantly different from the traditional and well established CV flap. There was no statistically significant difference in complication rates between both types of nipple reconstruction, although perceived clinical difference should be individually addressed. These outcomes support our nascent work of developing a technique to enhance patient satisfaction.

We acknowledge the study limitations being small population sizes and intermediate follow up period. A larger group of patients and a longer follow up will help us draw conclusions, with particular attention to nipple projection. Analysing the patient feedback and reflecting on the overall outcomes, we are pleased that we have developed and presented a novel technique to enhance patient care and safety. This provides further stimulus to our on-going service improvement project keeping In line with modern National Health Services, "patient centred care".

7. Conclusions

This novel design for nipple-areola complex reconstruction can be used in either primary or secondary nipple reconstruction. Of particular and distinct advantage is that all the scars are contained within the peripheral peri-areolar incision and thus can be completely camouflaged by an intra-dermal tattoo. Nipple projection has been consistently maintained and outcomes are reasonable and are similar to that of a CV flap. The creative use of patient's own tissue expands the utility of the L flap beyond its current application in poorly placed transverse mastectomy scars.

Acknowledgements

We acknowledge Dr. Poornima Murthy BDS, MPH, FRSH, for her help in manuscript preparation and graphics.

We would like to thank Mr. M.V. Chandrashekar for sharing the pictures of L flap nipple reconstruction.

Conflict of interest statement

None.

Funding

None.

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