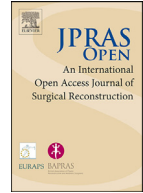




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## Original Article

# Comparative Analysis of Nipple Reconstruction Techniques: Five Flap vs. C-V Flap <sup>☆,☆☆,★,★★,‡</sup>

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### ABSTRACT

**Background:** Nipple–areola complex reconstruction represents the final phase in the comprehensive post-mastectomy treatment regimen. Despite the diversity of approaches available, there is currently no universally accepted benchmark technique for this critical aspect of breast reconstruction. In this study, we conducted a comparative assessment of two prominent techniques, the five Flap and C-V Flap.

**Materials and Methods:** Between November 2016 and April 2023, we recruited 100 female patients who had undergone unilateral post-oncological mastectomy and divided them into two groups: Group A comprising 50 patients who underwent the 5-Flap technique, whereas Group B comprising the remaining 50 underwent the C-V Flap technique. Over a 6-month observation period, we

<sup>☆</sup> **Disclosure:** The authors have no financial interest to declare in relation to the content of this article. The study was set up according to the ethical principles reported in the Declaration of Helsinki. The patients followed over time were informed about the nature of the study and gave their consent.

<sup>☆☆</sup> **Takeaways.**

**\* Question:** Comparative Study of Nipple Reconstruction: five Flap vs. C-V Flap.

**\*\* Findings:** The five-Flap technique proves to be a simpler, safer, and more effective approach as compared to the traditional C-V Flap.

<sup>‡</sup> **Meaning:** Our study underscores the practical advantages of the 5-Flap technique, showcasing its superiority over the conventional C-V Flap method for nipple reconstruction.

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assessed nipple projection loss and evaluated overall satisfaction through self-reporting by patients and independent assessments by a medical observer.

**Results:** In our study, none of the reconstructed nipples in Group A (5 Flap) experienced either total or partial necrosis, contrasting with Group B (C-V Flap) which encountered a 10% incidence of partial necrosis and 4% incidence of total necrosis. Furthermore, the average nipple projection loss in Group B was substantial, measuring a 30% reduction from the initial projection at the 1-year mark, whereas Group A demonstrated a significantly lower 13% reduction. Notably, despite these variations in outcomes, both groups reported an equal and high level of satisfaction, with patients and external observers providing an average satisfaction score of 8.0 and 9.0, respectively.

**Conclusion:** The five-flap technique represents a safe and effective approach for patients undergoing nipple reconstruction.

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## Introduction

Reconstruction of the nipple–areola complex (NAC) is a significant milestone in breast reconstruction surgery, offering women who have undergone mastectomy the opportunity to regain a sense of normality. Although nipple reconstruction may seem like a straightforward surgical procedure, its psychological impact on patients cannot be underestimated.<sup>1</sup> In a thorough review of the literature, there is some variation in the recommended cutoff values for performing a nipple-sparing mastectomy, with most experts suggesting a distance of at least 2 cm or more, based on clinical examination and preoperative imaging.<sup>2</sup> However, in cases where preserving the NAC is not feasible, maintaining the patient's body image becomes paramount.<sup>3</sup>

Nipple reconstruction is a tricky procedure because it involves the transformation of a 2-dimensional surface into a 3-dimensional structure. The most utilized method for nipple reconstruction is the local flap technique.<sup>4</sup> Typically, this procedure is performed approximately 4–6 months after mastectomy surgery, although it can be delayed due to factors such as radiation therapy and other oncology treatments.<sup>5</sup> The concept of using a skin flap for nipple reconstruction was first introduced by Berson in 1946.<sup>6</sup> Since then, several techniques have been developed, including the five Flap, C-V Flap, arrow Flap, H Flap, Hammond Flap, and others [4]. It's crucial to acknowledge that nipple reconstruction, like any surgical procedure, carries certain risks and potential complications, such as infection, bruising, delayed wound healing, and complete or partial nipple necrosis.<sup>7</sup> The choice of surgical technique ultimately rests with the surgeon, who makes this decision based on their experience and the patient's preferences.

In this retrospective comparative study, we evaluated and compared two of our most frequently used surgical techniques: the modified C-V Flap (as described by El-Ali et al.<sup>8</sup>) and five flap.<sup>9</sup>

## Material and Methods

Between November 2016 and April 2023, we conducted a comprehensive study involving a cohort of 100 female patients who had previously undergone unilateral mastectomy due to oncological reasons, resulting in the absence of the NAC. The age range of our participants spanned from 40 to 65 years, with a mean age of 50 years. All surgical procedures were skillfully performed by a single surgeon. The surgical intervention encompassed a concurrent approach to reconstruct the nipple using

**Table 1**  
General Patient Satisfaction Questionnaire.

Criteria	Statement	Score
Symmetry of position	Rate the degree of symmetry between the two NACs.	0–10
Texture	Do you believe that your neo-nipple-areola complex has a realistic texture? If you do, rate it.	0–10
Color	Rate the degree of chromatic similarity.	0–10
Nipple (diameter and projection)	Are you satisfied with your neo-nipple dimensions? If you are, rate them.	0–10
Areola diameter	Are you satisfied with your neo-areola dimensions? If you are, rate them.	0–10
	The nipple and the areola may have a retraction. Rate the stationarity's degree.	0–10
General satisfaction	Are you satisfied with the results? If you are, rate them.	0–10

a local flap technique, while the areola was reconstructed using a full-thickness skin graft harvested from the inner thigh region.

Our patients underwent rigorous follow-up assessments at multiple time points, specifically at 5-, 10-, and 15-days post-surgery, as well as at 1-, 3-, and 6-months postoperatively. During each of these postoperative evaluations, we measure critical parameters such as the diameter of the areola, the projection of the nipple, and the nipple's diameter, aiming to detect any potential retraction. To comprehensively gauge the overall satisfaction of the patients, both self-assessment and evaluations by an external medical observer were conducted at the conclusion of the follow-up period (Table 1). Patients were requested to complete a detailed questionnaire that addressed various aspects, including symmetry of position, texture, color, nipple characteristics (diameter and projection), areola diameter, and their general satisfaction with the outcomes. The postoperative satisfaction rate was quantified on a scale ranging from 0 to 10.<sup>9,10</sup>

## Surgical Techniques

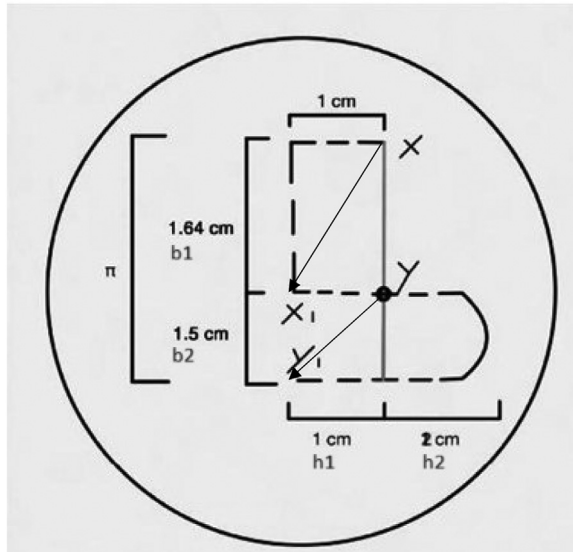
In our preoperative planning, we take a meticulous approach to ensure that the position and size of the nipple and areola are in harmony with the patient's unique anatomy. This evaluation takes place with the patient seated in an upright position, arms naturally relaxed alongside the body. Initially, we gather precise measurements from several key parameters of the contralateral NAC. These measurements encompass the diameter of the areola, diameter of the nipple, projection of the nipple, nipple-jugular distance, distance from the nipple to the mid-sternal line, distance from the jugulum (the central notch at the base of the neck) to the top of the areola, and distance from the areola to the mid-sternal line. These measurements serve as our reference points, ensuring that the newly constructed NAC is symmetrically positioned compared with the contralateral side. Our preoperative design is rooted in these geometric distances, as illustrated in the accompanying figures (Fig. 1).

The dissection of the skin flaps involves a meticulous removal of approximately 1 cm of subcutaneous tissue. Subsequently, the flaps are carefully elevated and brought together (Fig. 2a,b), using two absorbable monofilament 3/0 subcutaneous sutures.

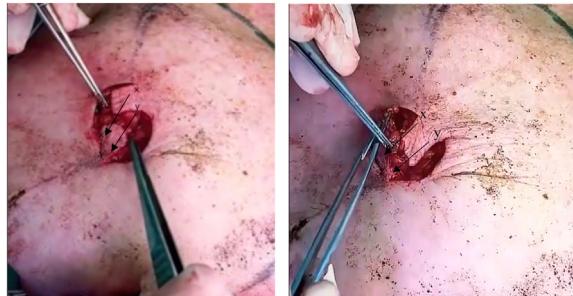
To create the desired structure, the two flaps are meticulously sutured together using an absorbable monofilament 4/0 running suture. This results in the formation of a dome-like structure, approximately 2 cm in height and close to 1.5 cm in width. The donor sites of the flaps are closed with two intradermal absorbable sutures (Fig. 3a).

The reconstruction of the areola can be achieved through two primary techniques: a full-thickness graft (usually taken from the upper inner thigh, then pierced centrally, creating a hole with a diameter slightly smaller than the base of the nipple) or the utilization of tattooing techniques (Fig. 3b,c).

Following the surgical procedure, a dressing is applied to the newly reconstructed NAC. This dressing consists of an initial layer of non-adhesive paraffin gauze, featuring a central aperture to accommodate the neo-nipple. Subsequently, a second layer of regular gauze is applied. The dressing package is securely fastened to the sutures of the graft. The tie-over dressing is then removed on the fifth-day post-surgery.



**Figure 1.** Pre-operative design of 5 Flap: The central point of the nipple is marked, and a 3.14 ( $\pi$ ) cm circle is drawn centered on this point and in a perpendicular orientation relative to the pre-existing mastectomy scar to provide an optimal vascularization to the flap pedicles. With this line as a reference, we draw a figure 5 with these measurements:  $b1 = 1.64$  cm;  $b2 = 1.5$  cm;  $h1 = 1$  cm; and  $h2 = 2$  cm. The flaps are lifted into an upright position and folded toward each other in a way that resembles the number 5. Then, they are sutured together at specific points: point x to  $x1$  and point y to  $y1$ .<sup>9</sup>



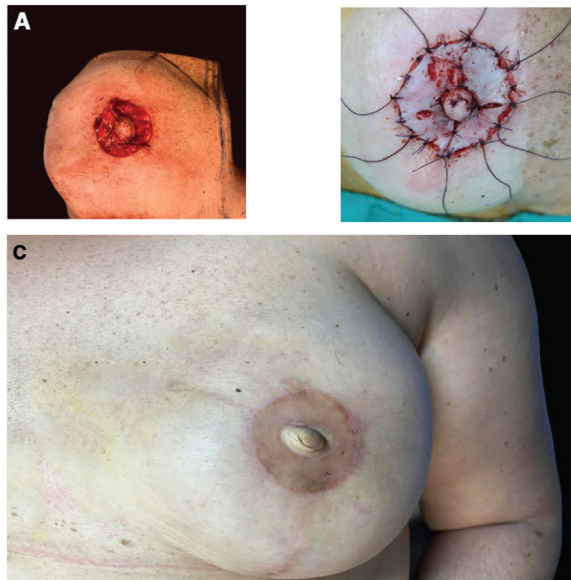
**Figure 2.** a, b Composition of the flaps obtained to obtain the salience of the new nipple<sup>9</sup>: point x and point y are sutured to point  $x'$  and  $y'$ , respectively, to create the base of the new nipple. The remaining portions of the 2 flaps are rotated clockwise on themselves to form the "walls" of the nipple, with the hemispherical portion of the lower flap being brought to form the "dome".

## Results

In our analysis that assessed the efficacy of nipple reconstruction techniques, specifically Group A (5 Flap) and Group B (C-V Flap), we've uncovered findings that shed light on the nuances of these procedures:

### 1. Incidence of Necrosis:

- In Group A (5 Flap), we have observed no instances of total or partial necrosis. In a few cases, we observed superficial de-epithelization of the flap surface, which completely healed within three weeks. There was also one case of partial de-epithelization of the areola. In some instances, subtle tonal changes in the color of the nipples and areolas were noted;



**Figure 3.** (a–c): a) assembly of the nipple, by suturing the 2 flaps together; b) to create the new areola, a full thickness skin graft is used (it can be tattooed later to assume a more natural appearance); and c) final appearance at 6 months follow up.<sup>9</sup>

- In Group B (C-V Flap), we have observed a higher incidence of necrosis, with 10% of cases encountering partial necrosis and 4% experiencing total necrosis. These results highlight the superiority of the C-V Flap technique in reducing the risk of necrosis significantly.

## 2. Preservation of Nipple Projection:

- In Group A, the average projection of the neo-nipple measured 15.3 mm. However, 6 months after reconstruction, the average projection decreased to 13.2 mm (ranging from 10 mm to 19 mm), resulting in an average projection loss of 13%.
- Group B started with an initial average projection of 15.4 mm after reconstruction but experienced a decrease to 10.2 mm after 1 year, representing a 30% reduction.

- ## 3. Patient Satisfaction:
- despite the differences in necrosis incidence and nipple projection loss between the two groups, it's noteworthy that both Group A and Group B reported similarly high levels of satisfaction. Patients in both groups provided an average satisfaction score of 8.0, indicating their overall contentment with the results of their respective nipple reconstruction procedures. Interestingly, external observers, likely comprised of medical professionals or individuals experienced in breast reconstruction awarded an even higher average satisfaction score of 9.0. This underscores the fact that patient satisfaction encompasses more than just objective measurements and technical outcomes. It emphasizes the importance of the overall patient experience in breast reconstruction.

These findings not only contribute valuable insights into the effectiveness of these nipple reconstruction techniques but also emphasize the holistic nature of patient satisfaction, which extends beyond the purely physical aspects of the procedure and highlights the importance of the emotional and psychological aspects of breast reconstruction for patients.

## Discussion

The importance of nipple reconstruction in breast reconstruction surgery is widely recognized, not only for the physical aspect but also for its profound impact on a patient's psychological well-being and overall satisfaction. This is particularly evident when considering the timing of nipple reconstruc-

tion, where timely intervention can significantly improve a patient's psychological state and overall satisfaction with the procedure.<sup>7–10</sup>

The choice of nipple reconstruction technique is a decision that involves both the surgeon's expertise and the patient's preferences. Patients may have varying priorities and expectations regarding nipple reconstruction, which should be considered during the decision-making process.

The literature on nipple reconstruction techniques is extensive, and these techniques have evolved over the years.<sup>8,11–13</sup> One commonly used method, the C-V Flap introduced in 1999,<sup>12</sup> has shown success in nipple reconstruction, although patient satisfaction rates can vary. Common reasons for dissatisfaction include changes in nipple projection, color mismatch, shape, size, and malposition.

In terms of projection and complication rates, there is considerable variation in the literature. Some studies have reported a loss of nipple projection ranging from 45% to 75%, with varying complication rates depending on the reconstruction method used.<sup>8,11,13</sup> For instance, complications after grafts were reported at 46.9%, whereas local flap reconstructions had a complication rate of 7.9%. Flaps combined with autologous grafts, alloplastic, or allograft augmentation had a lower complication rate of 5.3%, and areola reconstruction had a complication rate of 10.1%.

The comparative study conducted in Group A (five Flap) and Group B (C-V Flap) has yielded important findings. Notably, Group A, which utilized the 5-Flap technique, showed outstanding results with no cases of total or partial necrosis. This technique's advantage lies in its design with two opposing flaps sutured together with low tension and sufficient blood supply, ensuring adequate nipple projection even in cases with poor, thin, or tight skin.

Furthermore, the preservation of nipple projection is a crucial aspect of successful nipple reconstruction. The study revealed differences in nipple projection outcomes between the two groups. Group A experienced an average projection loss of 13% after 1 year, whereas Group B had a more substantial reduction, with an average projection of 10.2 mm, equating to a 30% reduction. This finding highlights the favorable outcome in terms of projection loss and incidence of necrosis in Group A.

In conclusion, nipple reconstruction is a vital component of breast reconstruction surgery, with far-reaching implications for patients' physical and psychological well-being. The choice of technique should be made considering the patient's preferences and expectations, and this study sheds light on the advantages and considerations associated with different methods.

## Conclusion

Indeed, this study provides valuable insights into nipple reconstruction techniques and their outcomes. The five-Flap technique shows promise in reducing necrosis risk and preserving nipple projection, aligning with the equally high levels of patient satisfaction reported in both groups. These findings underscore the importance of a patient-centered approach to breast reconstruction, where technical proficiency is harmonized with a deep understanding of patients' psychosocial needs.

In the realm of breast reconstruction, achieving not only physical but also emotional and psychological well-being is paramount. It's a journey that goes beyond the surgical procedure itself; it's about helping patients regain their self-esteem, confidence, and sense of wholeness. Therefore, the choice of nipple reconstruction technique should be a collaborative decision between the surgeon and the patient. It should take into account the patient's individual preferences, priorities, and the desired overall outcome.

As our understanding of breast reconstruction continues to evolve, we move closer to tailoring these procedures to meet the unique needs and aspirations of each patient. Ultimately, the goal is to provide the best possible outcome in their breast reconstruction journey, both in terms of physical appearance and, crucially, their overall well-being.

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**Conflict of interests:** None.

All the patients consented to the publication of the case.

**Ethical approval:** Not required.

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