

The “Five-flap” Technique for Nipple–Areola Complex Reconstruction

Giuseppe Andrea Ferraro, MD
 Giuseppe Lanzano, MD
 Corrado Gentile, MD
 Sara Izzo, MD
 Elisa Grella, MD
 Adelmo Gubitosi, MD
 Giovanni Francesco Nicoletti, MD

Background: Nipple–areola complex reconstruction aims to be the last step in the postmastectomy treatment procedure. Different techniques have been developed with the purpose of achieving optimal symmetry in position, size, shape, pigmentation, and permanent projection of the reconstructed nipple, but to date, there is no gold standard technique. The five-flap technique provides an easy, simple nipple–areola complex reconstruction method, effectively maintaining longer nipple projection, with a negligible rate of complications.

Methods: From November 2018 to April 2021, a total of 21 female patients with an absent unilateral nipple–areolar complex due to postoncological mastectomy were subjected to our technique consisting of a combination of local flaps and a full-thickness skin graft. Patients were observed for 6 months to estimate the percentage of the nipple projection loss. Overall satisfaction was evaluated by the patients themselves and by an external medical observer at the end of the follow-up period.

Results: None of the reconstructed nipples experienced either total or partial necrosis. Two minor complications were observed. Nipple projection loss was negligible with an average reduction of 12% from the initial projection. The nipple–areolar complex shape remained excellent in all cases, with minimal alteration of the immediate postoperative results. The total average satisfaction score was 8.0 for patients and 9.0 for external observers.

Conclusion: The five-flap technique represents a simple, safe, and efficacious procedure in patients with implant-based reconstruction requiring moderate to very projected nipples. (*Plast Reconstr Surg Glob Open* 2021;9:e3917; doi: [10.1097/GOX.0000000000003917](https://doi.org/10.1097/GOX.0000000000003917); Published online 4 November 2021.)

INTRODUCTION

Reconstruction of the nipple–areola complex (NAC) completes the final aesthetic step of breast reconstruction and restores the body image of breast cancer patients who have undergone mastectomy.^{1–6} An ideal reconstruction should provide good symmetry as regards color and projection compared with the contralateral nipple. The nipple can be reconstructed using a local flap, a local flap with synthetic/allogeneic/autologous graft inside or a skin graft. The areola is reconstructed by a split skin graft from hyperpigmented areas or from the contralateral areola or by tattooing. The above-mentioned techniques have some strengths and weaknesses, and no gold

standard procedure exists at present. The local flap is the most frequently used technique for nipple reconstruction. It is generally performed 4–6 months after mastectomy, as an outpatient procedure, under local anesthesia. The first description of nipple reconstruction using a local skin flap dates to a 1946 study by Berson.⁷ To date, several local flap surgical techniques have been described to reconstruct the nipple such as the star flap, skate flap, S-flap, H-flap, C-V flap, arrow flap, cylindrical flap, and others.^{8–17} Although each local flap exhibits its own advantages, certain common limitations are ubiquitous. The most common shortcomings seen with local flap techniques are the loss of long-term projection and diameter. Objective measures assessing long-term nipple projection in the literature are sparse, but some studies have cited a long-term loss of projection of 40% or more. Moreover, necrosis of the flap is a non-negligible event.^{18–21} To overcome these problems, we developed an easy and effective nipple reconstruction technique that we have named the

From the Plastic and Reconstructive Surgery Unit, Multidisciplinary Department of Medical-Surgical and Dental Specialties, University of Campania Luigi Vanvitelli, Naples, Italy.

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“five-flap technique,” which yields more stable and longer-lasting results in terms of nipple projection and areola shape, with a significantly low rate of complications.

PATIENTS AND METHODS

From November 2018 to April 2021, a total of 21 female patients with unilaterally absent NAC due to post-oncological mastectomy and implant-based breast reconstruction were recruited. The age range was from 40 to 65 years (mean age: 50 years). All procedures were done by a single surgeon, and the operation consisted of a simultaneous procedure of nipple reconstruction using a local flap and areola reconstruction using a full-thickness skin graft from the inner thigh. Informed consent was provided by all patients undergoing NAC reconstruction, and the study was approved by University of Campania Luigi Vanvitelli Internal Ethical Committee.

Surgical Technique

The position and size of the nipple and areola are planned with the patient sitting upright with her arms relaxed along her body. Firstly, we measured the following parameters of the contralateral NAC: the areola diameter, the nipple diameter, the nipple projection, the nipple-jugular distance, the distance between the nipple and the mid-sternal line, the distance from the jugulum to the top of the areola, and the distance from the areola to the mid-sternal line. These parameters allow us to set the neo-NAC in a symmetrical position compared with the contralateral (Fig. 1A–C). The central point of the nipple is marked, and a 3.14 (π) cm line is drawn centered on this point and in a perpendicular orientation relative to the preexisting mastectomy scar to provide an optimal vascularization to the flap pedicles. With this line as a reference, we draw a figure five with these measurements: $b_1 = 1.64$ cm; $b_2 = 1.5$ cm; $h_1 = 1$ cm; $h_2 = 2$ cm. So, two facing skin flaps are created (Fig. 2). The dissection of the skin flaps includes about 1 cm of subcutaneous tissue. Then, the flaps are raised to an upright position and turned in toward each other in the middle of the figure five, suturing point x to x_1 and point y to y_1 with two absorbable monofilament 3/0 subcutaneous sutures (See Video [online], which displays how to face the two

Takeaways

Question: To perform nipple–areola reconstruction according to a simple and effective design, reducing complications and improving the aesthetic outcome compared with other procedures.

Findings: We performed a retrospective study, measuring the projection and volume of the new nipple with a follow-up of 6 months. We found a reduced loss of nipple projection compared with other available techniques and a better aesthetic outcome with negligible complications.

Meaning: The five-flap technique represents a new procedure that every surgeon who deals with breast reconstruction must have in their armamentarium, due to its better outcome compared with other techniques.

flaps). The two flaps are sutured to each other with an absorbable monofilament 4/0 running suture to create a dome about 2 cm high and close to 1.5 cm wide. The donor sites of the flaps are sutured with two intradermal absorbable sutures. The areola area is de-epithelialized around the neo-nipple to a size and shape corresponding to the opposite areola and engrafted with a full-thickness skin graft taken from the upper inner thigh, where the skin is more pigmented and gives an acceptable donor scar (Fig. 3A–C). The graft is pierced centrally, creating a hole with a diameter slightly smaller than the base of the nipple. A dressing is placed on the neo-NAC after the operation, consisting of a first layer of nonadhesive paraffine gauze with a central hole that accommodated the neo-nipple, and a second layer of normal gauzes. The dressing package is tied to the graft’s stitches. The tie-over dressing is then removed on the fifth day after surgery. The patients were all followed-up at 5, 10, and 15 days and at 1, 3, and 6 months after surgery (Fig. 4A–C). At each follow-up examination, the surgeons measured the areola diameter, nipple projection, and nipple diameter with a caliper to estimate any retraction that may have taken place. Overall satisfaction was evaluated at the end of the follow-up period by the patients themselves and by an external medical observer. The patients answered a questionnaire concerning symmetry of position, texture,

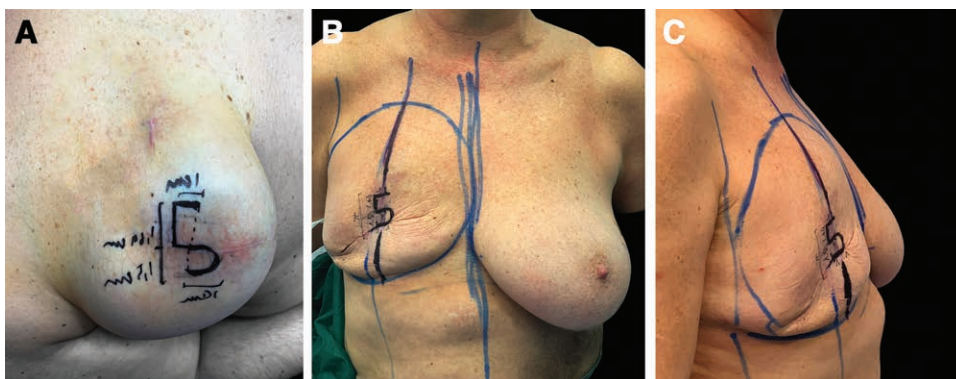


Fig. 1. Preoperative skin marking of the five-flap technique.

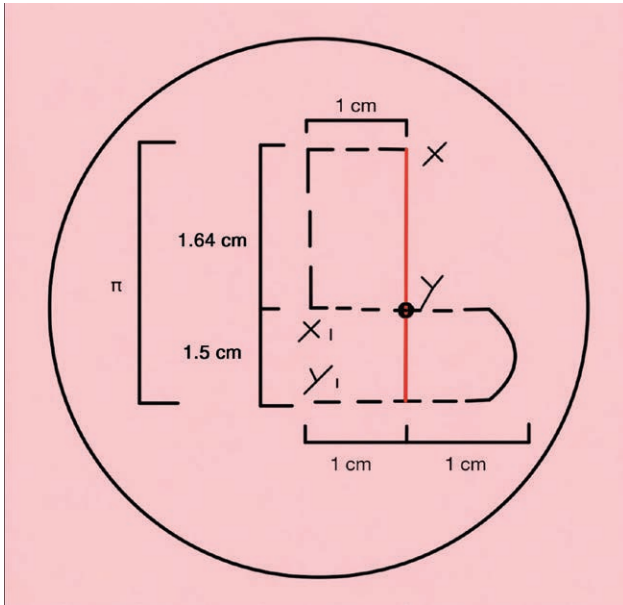


Fig. 2. Preoperative design scheme for NAC.

color, nipple (diameter and projection), areola diameter, and general satisfaction. Postoperative satisfaction rate was measured on a scale of 0–10 (Table 1).

RESULTS

None of the 21 reconstructed nipples experienced total or partial necrosis. We only observed two minor complications. In one case, the de-epithelization of the flap surface that had completely healed in 2 weeks. In another case, the partial de-epithelization of the areola. Both cases were successfully treated as outpatients. The shape of the neo-nipple remained unaltered during the entire follow-up period for all patients. The average initial projection of the neo-nipple was 15.4 mm and the average projection 6 months after reconstruction was 13.5 mm (10 mm–19 mm), with an average loss of projection of 12%. The mean horizontal diameter of the nipple base was 15.8 mm (range 7–19 mm), and the vertical one was 15.3 mm (range 9–20 mm). The color of the nipples and areolas tend to lose some of their original tonality. However, in most of the cases, the cosmetic result was acceptable. The total average satisfaction score was 8.0 for patients and 9.0 for external observers.

DISCUSSION

The main complication in NAC reconstruction is represented by necrosis of the flap or skin graft, followed by retraction of the nipple projection due to scar retraction and change in the areola shape. According to some articles, the loss of nipple projection in nipple reconstruction varied from 45% to 75%. The complication rate was 46.9% after graft, 7.9% after local flap, and 5.3% in case of flaps with autologous graft/alloplastic/allograft augmentation, whereas complications in areola reconstruction were 10.1% after graft.²¹ Flaps seem to be more reliable than grafts in nipple reconstruction. The use of flaps with autologous graft/alloplastic/allograft augmentation (cartilage, fat, calcium hydroxyapatite, acellular dermal matrix, polymethylmethacrylate, biologic collagen) showed a minor loss of nipple projection but may lead to a major number of postoperative flap necroses.²² Although our study is limited in terms of number of cases (21) and follow-up period of 6 months, loss of projection usually occurs within the first 3–6 months after reconstruction and, in our study, nipple retraction after this period was negligible, with an average of 1.75 mm. Variation in areola shape was also minimal. Kroll¹⁶ suggested that flap width is the most important factor for obtaining long-term projection, as increasing the width augments the flap blood supply and reduces fat necrosis. The five-flap technique enables the nipple to be sufficiently wide, with a height/width ratio of about 1:1, allowing adequate blood flow. In C-V and skate flaps, which are made by collecting multiple flap lobules or tips in one place, blood supply is inevitably reduced at the tip area, potentially resulting in severe nipple retraction. The advantage of using a design with two opposing flaps sutured together with low tension and sufficiency of blood supply is that it ensures adequate nipple projection even with poor, thin, or tight skin. The five-flap technique also ensures a better aesthetic outcome regarding the shape of the nipple, which, in techniques like the S-flap, appears to be sharper compared with the contralateral nipple.¹⁷ Regarding areola reconstruction, we prefer grafting the areolar site rather than intraoperative tattooing like other authors perform.¹⁸ In our opinion, the main problem of that procedure is that it leaves a noticeable scar. In our technique, the scars resulting from the flap preparation at the donor site are covered by the graft, while the scar of the donor area is well hidden in a physiological skin fold. Tattooing certainly has some advantages over grafting, with a high rate of satisfaction. In our study,

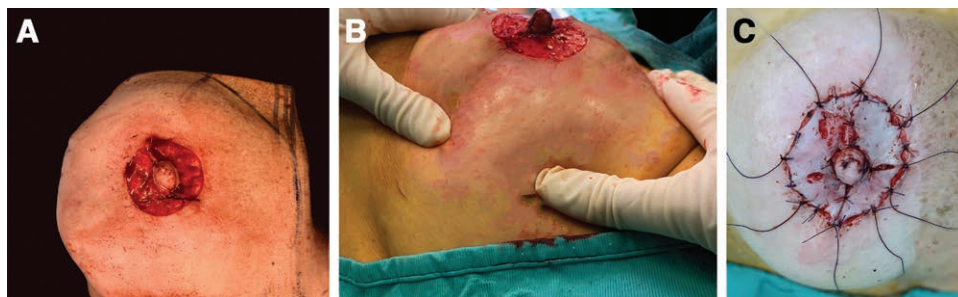


Fig. 3. Intraoperative surgical steps. A-B, The two flaps are sutured to each other creating the neo-nipple. C, Full-thickness skin graft from the upper inner thigh is engrafted creating the neo-areola.

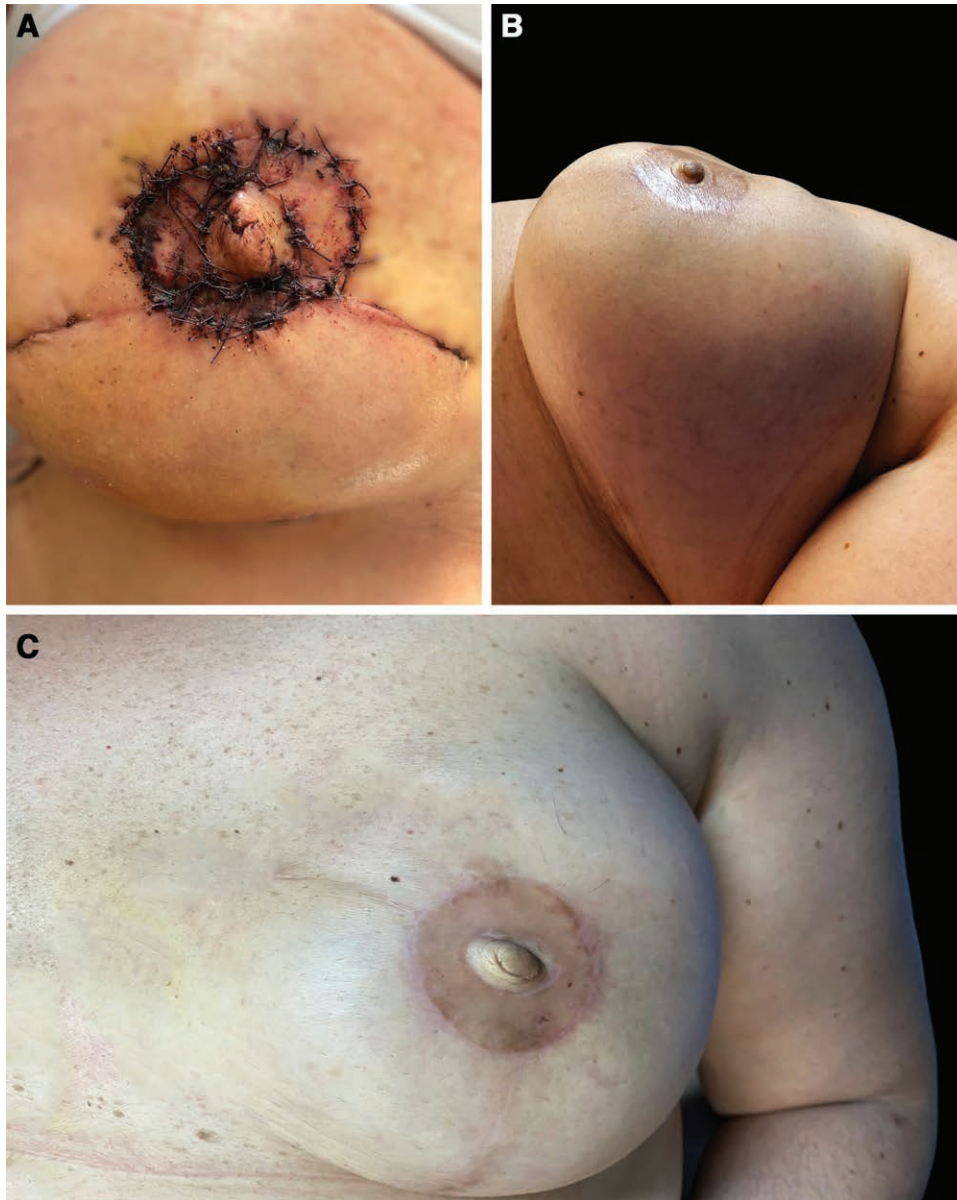


Fig. 4. Postoperative at T0 and at 6-month follow-up. A, Photograph of results on postoperative day 5. B, Lateral view of results at 6 months postoperative. C, Frontal view of 6-month postoperative results.

grafts were preferred for many reasons. In patients with a history of prior radiotherapy or prosthetic-based breast reconstruction, areola grafting should be preferred compared with tattooing. Furthermore, tattooing is affected by fading in some cases with time, leading to asymmetry

in the contralateral color match and usually requires at least two sessions, which could reduce patient compliance compared with a 1-step surgery like our NAC technique. However, we have no experience with the 3D nipple-areolar tattoo introduced by Hammond et al.²³

Table 1. Questionnaire Used to Determine the General Patient Satisfaction

General Patient Satisfaction Questionnaire		
Criteria	Statement	Score
Symmetry of position	Rate the degree of symmetry between the two NAC.	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
Scar retraction	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

CONCLUSIONS

The five-flap technique for nipple reconstruction represents a simple, quick, and effective procedure to obtain an adequate nipple projection and an aesthetically satisfying shape, with a negligible rate of complications. It is particularly indicated for reconstructing moderate to very projected nipples.

Giuseppe Lanzano, MD

Plastic and Reconstructive Surgery Unit
Multidisciplinary Department of Medical-Surgical
and Dental Specialties
University of Campania Luigi Vanvitelli
Piazza Luigi Miraglia, 2, 80138, Napoli
Naples, Italy
E-mail: dottgiuseppelanzano@gmail.com

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