

# NIPPLE RECONSTRUCTION: DESCRIPTION AND CONTRIBUTION TO FOUR-SQUARE TECHNIQUE OR CYLINDRICAL FLAP

Reconstrução da papila mamária: descrição e contribuição à técnica do retalho *four-square* ou retalho cilíndrico

José Slaibi Filho<sup>1,2\*</sup>, Douglas de Miranda Pires<sup>1,3</sup>, Raffaella Levy de Andrade<sup>3</sup>, Carolina Nazareth Valadares<sup>3</sup>, Carolina Lamac Figueiredo<sup>3</sup>, Mariana dos Santos Nascimento<sup>3</sup>

## ABSTRACT

**Introduction:** Techniques for breast reconstruction are becoming the new standard of care for breast cancer patients. In this context, reconstruction surgery of the nipple-areolar complex consists of an essential surgical approach to obtain a satisfactory esthetic result. **Objectives:** The article proposes a modification in a preexisting technique that would have less soft tissue loss and, consequently, better esthetic outcomes. **Methods:** Four patients underwent reconstruction of the mammary papilla with the technique proposed at Santa Casa de Ilhéus and Santa Casa de Belo Horizonte (SCBH). The technique consists of modifying the four-square flap. De-epithelialization of a lateral wing of the dermatoglossal flap is performed, which will remain in the center of the flap, providing increased central volume and increased vascularization. **Results:** Patients underwent nipple reconstruction with local anesthesia at least six months after breast reconstruction. They were then evaluated 30 days, 90 days and 180 days after the procedure. The volume and projection of the nipples were evaluated by photographic records. **Discussion:** There are numerous neo-nipple surgical descriptions, most of them presenting significant volume loss with impairment of body image. Several factors may contribute to nipple flattening after reconstruction, including the absence of natural anatomic infrastructure, inadequate vascularization of flaps, presence of centrifugal forces contrary to the reconstructed prominence, and dermal thickening of the available tissue. **Conclusion:** The technique detailed in the study maintains greater volume in the central part of the flap aiming to less flap volume loss and greater projection, with more satisfactory and long-lasting esthetic results. The short-term results are encouraging.

**KEYWORDS:** Nipples; breast neoplasms; reconstruction; mammoplasty.

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Study carried out in Santa Casa de Misericórdia de Belo Horizonte – Belo Horizonte (MG), Brazil.

<sup>1</sup>Institute of Education and Research, Santa Casa de Misericórdia de Belo Horizonte – Belo Horizonte (MG), Brazil.

<sup>2</sup>Santa Casa de Ilhéus – Ilhéus (BA), Brazil.

<sup>3</sup>Mastology Clinic, Santa Casa de Belo Horizonte – Belo Horizonte (MG), Brazil.

\*Corresponding author: slaibi-ba@uol.com.br

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## RESUMO

**Introdução:** Técnicas de oncoplastia para reconstrução mamária têm instituído um novo padrão de cuidado no tratamento do câncer de mama. Dentro deste contexto, a cirurgia reconstrutiva da aréola e do mamilo consiste em uma abordagem cirúrgica também fundamental para obter resultado estético satisfatório. **Objetivos:** Destacar simples alteração em uma técnica já consolidada, visando menor perda tecidual e, conseqüentemente, melhor resultado estético. **Métodos:** quatro pacientes foram submetidas à reconstrução da papila mamária com a técnica proposta na Santa Casa de Ilhéus e Santa Casa de Belo Horizonte (SCBH). A técnica consiste na modificação do retalho four-square. É Realizada a desepitelização de uma asa lateral do retalho dermogorduroso, a qual permanecerá no centro do retalho proporcionando aumento do volume central e vascularização aumentada. **Resultados:** Pacientes foram submetidas à técnica de reconstrução do mamilo sob anestesia local pelo menos seis meses após a cirurgia mamária reconstrutiva e avaliadas após 30, 90 e 180 dias do procedimento. Foram analisados o volume e a projeção dos mamilos por meio de registros fotográficos. **Discussão:** Existem inúmeras descrições cirúrgicas de neomamilo; a maioria apresenta perda de volume significativo com prejuízo na imagem corporal. Vários fatores podem contribuir para o achatamento do mamilo após sua reconstrução, como a ausência de uma infraestrutura anatômica natural disponível, vascularização inadequada dos retalhos, presença de forças centrífugas contrárias à proeminência reconstruída e espessamento da derme disponível. **Conclusão:** A técnica pormenorizada no trabalho mantém maior volume na parte central do retalho com objetivo de haver menor perda de volume do retalho e maior projeção do neomamilo, com resultados estéticos mais satisfatórios e duradouros. Os resultados em curto prazo são animadores.

**PALAVRAS-CHAVE:** Mamilos; neoplasias da mama; reconstrução; mamoplastia.

## INTRODUCTION

The impact of breast cancer on female scenario is not limited to its high incidence and mortality rate. The physical consequences, mainly resulting from surgical treatment, bring incalculable damages to women's self-esteem. Radical mastectomy, first described by the American surgeon William Halsted in the end of the 19th century, remained as the standard treatment for almost 100 years. Even after proposals of modified radical surgeries by Patey, Auchincloss, and Madden, only functional preservation is sought<sup>1</sup>. Over the last decades, breast cancer surgery approach has substantially distanced from its roots in general surgery<sup>2</sup>. The beginning of its new era was in the end of the 20th century, with the works of Bernard Fisher and Umberto Veronesi proposing conservative surgeries. Now, in addition to respecting oncological principles, there is also the concern with breast preservation in cases of early diagnosis. Such surgical approach, while preserving breast volume, produces deficiency in the glandular cutaneous tissue of the resected tumor area, in addition to almost always promoting deformity of the ipsilateral areola-papillary complex. The paradigms of classical oncologic surgery begin to be broken, showing more and more that female esthetics should be considered when defining the surgical scope. The preservation of women's self-esteem and the gain in quality of life starts being valued. Oncoplastic techniques for breast reconstruction became the new standard of care in breast-cancer management<sup>3</sup>. Werner Audretsch et al.<sup>4</sup> first introduced the concepts that associate both plastic and oncological surgery techniques with the aim of improving esthetic results. Despite being relatively new, this more holistic

approach has increasingly gained support by the medical community dedicated to breast-cancer treatment. The reconstruction of the areola-papillary complex is a critical component of breast reconstruction process. An artistic representation of this feminine symbol of nutrition and eroticism greatly contributes to the overall impression of realism achieved after a breast reconstruction<sup>5</sup>. This is an integral part of breast cancer treatment after mastectomy or central quadrantectomy, helping to transform the reconstructed volume inside the breast<sup>6</sup>. The main objective of reconstructing the areola-papillary complex is to achieve symmetry with the contralateral side or the appearance that is closer to normal in bilateral reconstructions. The position of the new complex, new nipple projection, base, coloration and also texture are evaluated<sup>7</sup>. Before choosing from various techniques of mammary papilla reconstruction, one should try to deal with some problems that may arise in the handling of this surgical approach. Ideal timing of procedure should be a concern, and it may occur as the same time as breast volume reconstruction (immediate or late). Late procedure tends to be the better option, when symmetry with the contralateral breast is achieved, since the reconstructed one has its volume reduced and, consequently, its positioning alters over time.

With regard to nipple reconstruction, numerous techniques have been described in the literature in recent years. The first one, published by Berson<sup>8</sup>, would create three triangular skin flaps that, raised and sutured, would acquire a papilla shape. The best results occur when a graft from the contralateral nipple is used, but in most cases nipples do not have right size for so. In 1984, Little created the skate flap technique, which became

widely accepted among breast surgeons. It consists of a vertical dermal-fat flap that is raised and whose lateral wings are wound around a nucleus<sup>9</sup>. Since Little's publication, several modifications have been proposed. Shestak and Nguyen described the double opposing flap technique, among others<sup>10</sup>. Other methods use local or distant-tissue grafts, alloplastic material, filling injections or combinations of these techniques<sup>10</sup>.

Despite the wide range of techniques available in the literature, papillary projection has become relevant due to the difficulty of maintaining the results in the medium and long term. Loss of at least 50% of nipple projection after reconstructive surgeries is observed regardless of the technique used in up to two years after the procedure<sup>6</sup>.

This work proposes a new approach to nipple reconstruction, using modifications of already established local flap techniques, in order to increase the thickness of the flap and, consequently, its vascularization. Reduction in nipple tissue loss and esthetic impairment is thus expected.

## OBJECTIVE

To propose a new nipple reconstruction technique by adding a modification to the four-square flap or cylindrical flap confection. It is worth mentioning that this is a simple technique, so its accomplishment and reproducibility is very feasible.

## METHOD

Patients underwent mammary papilla reconstruction with the technique proposed at Santa Casa de Ilhéus and Santa Casa de Belo Horizonte (SCBH). Three mastectomized patients and one post-centralectomy patient were evaluated. The surgeries were performed as part of the Graduate Program in Oncoplastic and Reconstructive Breast Surgery of SCBH (2015/2016). Primary breast reconstructions were performed using classic techniques such as myocutaneous TRAM flaps or skin-sparing mastectomy with prosthesis placement. (Table 1).

Nipple reconstruction was performed under sedation and local anesthesia without adrenaline, at least six months after breast reconstruction.

The new nipple was planned with the patient in orthostatic position and having the healthy breast as a guide.

## Technique

After determining the nipple's center, the cylindrical or four-square flap was sketched, with dimensions having base and height variations according to the healthy breast or the patient's desire. In this way, the chosen wing was de-epithelialized, then an incision was made throughout the marked flap. The entire flap was lifted, the de-epithelialized dermal-fat wing embraced the central flap and was secured with 4.0-nylon suture. The other

dermo-epidermal wing involved the central flap and was also sutured with 4.0 nylon thread. The same thread was used to suture the central wing of the flap, while the donor area was sutured with separate stitches, stabilizing the projection acquired. It results in a nipple with good central volume and increased vascularity, which it is expected to provide minimal tissue loss in the medium and long term, with little esthetic impairment. (Figures 1 and 2).

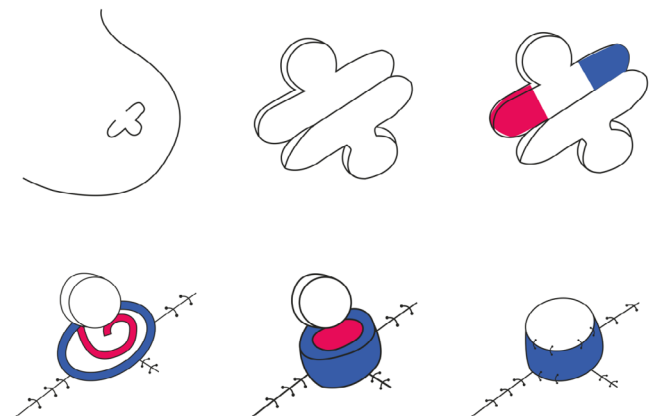
## RESULTS

This technique for the reconstruction of the areola-papillary complex was used in patients at Santa Casa de Ilhéus and Santa Casa de Belo Horizonte. Surgeries were performed between September 2015 and February 2016. Patients were evaluated 30, 90, and 180 days after the procedure. The volume and projection of the nipples were measured by photographic record.

Two cases had excellent volume and projection results after the analyzed period. In one of them, there was an approximate 20% loss of desired volume, with an acceptable esthetic result, while projection loss was superior to 50% in the other. This appears to have resulted from the patients' intrinsic comorbidities, which impaired the vascularization of the flap. Patients are currently being monitored for longer-term results.

**Table 1.** Selected patients (elaborated by the author).

	Age	Previous surgery
Case 1	36	TRAM
Case 2	62	Mastectomy + prosthesis
Case 3	45	Mastectomy + prosthesis
Case 4	48	Centralectomy



Red wing: de-epithelialized area; Blue wing: epithelialized area.

**Figure 1.** Schematic drawing for technique description (elaborated by the author).

## DISCUSSION

Breast cancer surgery has changed a lot over the past few years. In view of the changes in women's social and sexual behavior along with the advances in the pharmaceutical industry, with more effective drugs and consequent increase in survival rates, these procedures require more changes. Preserving the breast, axilla and their functionality is no longer enough. Women long for something beyond the biological treatment of cancer; they wish to maintain their body esthetics, femininity, and sexuality<sup>12</sup>.

Oncoplastic and breast reconstruction surgery is a reality in several areas of Brazil. Increasingly performed by qualified breast surgeons, it greatly softens the esthetic impact of mutilation.

Several areola-papillary complex reconstruction techniques have been described, as well as the proper time to perform them. The literature shows certain consensus that the ideal time to perform this procedure should be between three and six months after breast reconstruction surgery. It is believed that this is the satisfactory time to stabilize involutive changes resulting from the surgery. Some authors have reported good results for breast volume repair using myocutaneous flaps with the technique of immediate papilla reconstruction<sup>13,14</sup>; others argue that immediate intervention should only be performed in bilateral cases.

The most appropriate positioning of the new papilla is another topic for discussion. Its positioning should be initially centralized within the reconstructed breast volume. Its marking should

be made with the patient in supine position, mainly bilaterally, to achieve good symmetry. In unilateral cases, symmetry is more challenging and some authors recommend that the markings be performed with the patient in horizontal position; they also suggest that patients be involved in the choice of ideal spot for the papilla and encouraged to draw her own marking<sup>6</sup>.

Another discussion point is papilla reconstruction in irradiated breasts. The undesirable effects of radiotherapy on the surgical wound have long been a cause of concern for surgeons. Vascular changes in fibroblastic activity and in growth factors, which are fundamental in the reparative process, are compromised in this situation. Some authors place previous radiotherapy as a contraindication for mammary papilla reconstruction. There are predictive factors of poor prognosis that should be evaluated in such cases to minimize undesirable outcomes: patients who had necrosis or delayed cicatrization of the mastectomy flap, fine mastectomy flaps, or history of surgical infection should not be eligible to papilla reconstruction<sup>15</sup>. Selection criteria should apply to patients with thicker mastectomy flaps and without clinical evidence of late radiotherapy sequelae. These guidelines, in conjunction with patient-specific assessment, should support the selection of patients with good chances of success.

The major challenge of nipple reconstruction techniques is projection maintenance.



**Figure 2.** Reconstruction of the areola-papillary complex using the cylindrical flap in a training model (elaborated by the author).



A good esthetic result in nipple reconstruction surgery is observed using a contralateral nipple graft. However, this technique presents the low availability of adequate donor area as a limiting factor for its accomplishment<sup>16</sup>.

Several dermal-fat flaps techniques for nipple reconstruction have been described, most of them resulting in long-term projection loss.

Several factors may contribute to nipple flattening after reconstruction, including the absence of natural anatomic infrastructure, poor vascularization of the flaps, presence of centrifugal forces contrary to the reconstructed prominence, and dermal thickening<sup>6</sup>.

## CONCLUSION

Nipple reconstruction surgery is challenging. The techniques available are varied and offer possibilities of reconstruction to women submitted to mastectomy or centralectomy.

The technique herein proposed is easy to perform and reproduce, maintaining a larger volume of tissue in the central part of the flap and, therefore, more vascularity, avoiding loss of projection. Results in the short and medium terms are encouraging.

Measurements of papillary projection should be millimetric for greater scientific validation, and further cases with longer observation periods are required so this technique is lent more credibility.

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