

DermaI Micropigmentation for the Nipple-Areola Complex Reconstruction: Integrative Literature Review

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Micropigmentação Dérmica na Reconstrução do Complexo Aréolo-papilar: Revisão Integrativa da Literatura

Micropigmentación Dérmica en la Reconstrucción del Complejo Areola-papilar: Revisión Integradora de la Literatura

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ABSTRACT

Introduction: Since 1986, dermal micropigmentation commonly known as tattooing has been a technique for reconstruction of the nipple-areola complex. **Objective:** To identify scientific evidence in the literature on the practice of dermal micropigmentation for reconstruction of the nipple-areola complex in women treated for breast cancer. **Method:** Integrative review upon search in the databases PubMed, SciELO and LILACS resulting in 14 articles selected according to the eligibility criteria. The review was reported according to PRISMA criteria, and the level of evidence classified according to the Oxford Center for Evidence-Based Medicine criteria. **Results:** 71.4% of the studies presented level four of evidence. The findings were synthesized in four categories: 1) dermal micropigmentation as the method of choice; 2) recommended period for micropigmentation; 3) steps of dermal micropigmentation; 4) expected and adverse reactions from micropigmentation. **Conclusion:** Dermal micropigmentation is a technique that has provided psychosocial benefits for women and offers the patient an areola with a natural appearance through a safe, fast, rarely painful procedure with low risk of complications, if biosafety measures are in place. Decisions in the process should be evidence-based and taken together with patients, respecting their wishes and sharing risks and benefits.

Key words: tattooing; nipples; breast neoplasms; women's health; evidence-based practice.

RESUMO

Introdução: A micropigmentação dérmica comumente conhecida como tatuagem é uma técnica de reconstrução do complexo aréolo-papilar desde 1986. **Objetivo:** Identificar na literatura científica evidências sobre a prática de micropigmentação dérmica à reconstrução do complexo aréolo-papilar em mulheres tratadas para câncer de mama. **Método:** Revisão integrativa com busca nas bases de dados PubMed, SciELO e LILACS. A partir dos critérios de elegibilidade, foram selecionados 14 artigos. A revisão foi relatada segundo os critérios do PRISMA e o nível de evidência classificado segundo o Centro para Medicina Baseada em Evidências de Oxford. **Resultados:** Na literatura consultada, 71,4% dos estudos são de nível quatro de evidência. Foram sintetizados os achados em quatro categorias: 1) micropigmentação dérmica como método de escolha; 2) período recomendado para realização da micropigmentação; 3) etapas da micropigmentação dérmica; 4) reações esperadas e adversas da micropigmentação. **Conclusão:** A micropigmentação dérmica é uma técnica que tem proporcionado benefícios psicossociais para as mulheres e oferece à paciente uma aréola com aspecto próximo ao natural, por meio de um procedimento seguro, rápido, raramente doloroso e com baixo risco de complicações, quando garantidas as medidas de biossegurança. As decisões no processo devem ser baseadas por evidências e tomadas em conjunto com as pacientes, respeitando desejos e informando riscos e benefícios.

Palavras-chave: tatuagem; mamilos; neoplasias da mama; saúde da mulher; prática clínica baseada em evidências.

RESUMEN

Introducción: La micropigmentación dérmica comúnmente conocida como tatuaje ha sido una técnica para reconstruir el complejo areola-pezones desde 1986. **Objetivo:** Identificar evidencia en la literatura científica sobre la práctica de la micropigmentación dérmica para la reconstrucción del complejo areola-pezones en mujeres tratadas por cáncer de mama. **Método:** Revisión integrativa con búsqueda en bases de datos PubMed, SciELO y LILACS. Con base en los criterios de elegibilidad, se seleccionaron 14 artículos. La revisión se informó de acuerdo con los criterios PRISMA y el nivel de evidencia clasificado de acuerdo con el Centro de Medicina basada en la evidencia de Oxford. **Resultados:** En la literatura consultada, el 71,4% de los estudios tienen nivel de evidencia cuatro. Fueron sintetizados los hallazgos en cuatro categorías: 1) micropigmentación dérmica como método de elección; 2) período recomendado de micropigmentación; 3) pasos de micropigmentación dérmica; 4) reacciones adversas y esperadas por micropigmentación. **Conclusión:** La micropigmentación dérmica es una técnica que ha brindado beneficios psicossociales para la mujer y ofrece a la paciente una areola con apariencia natural, a través de un procedimiento seguro, rápido, rara vez doloroso y con bajo riesgo de complicaciones, cuando las medidas de bioseguridad están garantizadas. Las decisiones en el proceso deben basarse en pruebas y tomarse junto con los pacientes, respetando los deseos e informando los riesgos y beneficios.

Palabras clave: tatuaje; pezones; neoplasias de la mama; salud de la mujer; práctica clínica basada en la evidencia.

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INTRODUCTION

Partial or total removal of the breast can impact the body image, creating feelings and emotions full of symbolisms and meanings that directly interfere in women's self-esteem¹. The perception lived intensely by these women can negatively impact their lives, causing emotional distress and changes of their social interaction¹.

Breast reconstruction is reported in the literature as a comforting moment of the treatment because it promotes, besides the reduction of the mutilation trauma, the reclaiming of the self-esteem and feelings of wholeness and femininity².

Mastectomized women are entitled to reconstructive surgery which in favorable conditions can be done in immediate post-operation or when these conditions are satisfied. Breast reconstruction is law-mandated in Brazil, including symmetry of the contralateral breast and reconstruction of the nipple-areola complex (NAC)³.

The reconstruction of NAC is the final stage of breast reconstruction, a pivotal fact to improve the body image and well-being of the patient⁴. Over the years, this procedure is going through many innovations, for example, dermal micropigmentation⁵. As it is commonly named, tattooing is known for years and was introduced as reconstructive procedures of NAC in 1986 by the American surgeon Hilton Becker^{6,7}. When associated with other reconstructive surgeries can achieve ideal pigmentation and texture⁷.

Dermal micropigmentation is being improved to achieve more delicate and suave results that nears at the most the natural design of the areola and nipple⁵. The procedure is progressing worldwide and applied by several professionals⁵, therefore, it is important a comprehensive understanding on when to do micropigmentation and possible complications.

This invasive procedure on the oncologic patient requires a review of the scientific evidences that can stimulate good-practices-based professional development⁸.

The current investigation aims to identify the scientific evidences for the practice of dermal micropigmentation to reconstruct NAC in women submitted to breast cancer surgical treatment.

METHOD

Six-steps integrative literature review: definition of the research question; definition of the inclusion and exclusion criteria for database search; extraction of evidences; critical analysis including level of evidence; discussion and presentation of the results⁹.

The research question was: What are the scientific

evidences for the practice of dermal micropigmentation in reconstructing NAC of women submitted to breast cancer surgical treatment?

Articles which met the following inclusion criteria were selected: (a) originals in full and expert opinion; (b) any language; (c) women submitted to surgery for breast cancer with removal of NAC; (d) any methodological design.

The health descriptors were applied: nipple, areolar, tattooing, reconstructive surgical procedure, breast cancer. The combinations of search strategy varied across the databases: (((“tattooing”[MeSH Terms] OR “tattooing”[All Fields]) AND (“nipples”[MeSH Terms] OR “nipples”[All Fields] OR “nipple”[All Fields])) AND AREOLAR[All Fields]) AND (“0001/01/01”[PDat] : “2019/05/31”[PDat]).

The following databases were searched until May 2019 for any period of time: US National Library of Medicine and National Institute of Health (PubMed), Scientific Electronic Library Online (SciELO), Latin American and Caribbean Health Sciences Literature (LILACS).

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria were applied to report the integrative review¹⁰.

Repeated articles and unavailable in full were excluded. After reading the material, articles which failed to respond the research question and did not meet the eligibility criteria were excluded.

After excluding duplicates, 1,803 articles were identified, analyzed by two independent reviewers according to the inclusion and exclusion criteria and the final sample consisted in those that responded to the research question.

The reviewers discussed the discrepancies and in case of disagreements, a third reviewer stepped in.

The guidelines of the Oxford Centre for Evidence-Based Medicine were followed for credibility¹¹.

RESULTS

The final sample was formed by 14 articles, six of which (43%) from Europe, six (43%) from USA and two (14%) from Asia.

The lower time limit was the year of 1995, however, the greatest production was in the last decade: one cohort study (7.2%), two case-control (14.3%), eight descriptive or case series (57.1%) and three expert opinions (21.4%). According to Oxford's classification, three were at level 5 (21.4%), ten, at level 4 (71.4%) and one, at level 3 (7.1%).

PRISMA flowchart is presented in Figure 1.

Chart 1¹²⁻²⁵ synthesizes the results with title, country, year of publication, number of patients, main

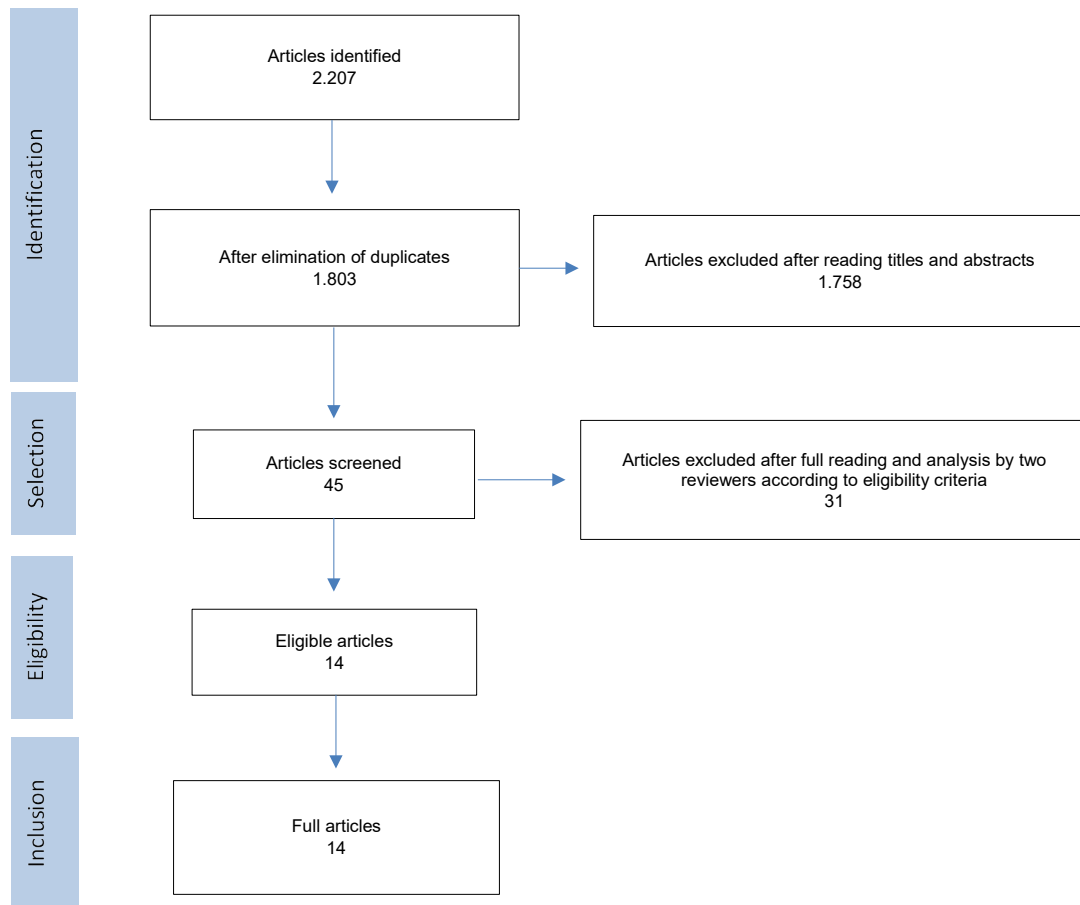


Figure 1. Articles found at databases according to PRISMA.

recommendations for the practice of micropigmentation according to the level of evidence.

DISCUSSION

Four categories of thematic analyzes were found summarizing the recommendations: 1) dermal micropigmentation as method of choice; 2) period recommended for micropigmentation; 3) stages of dermal micropigmentation; 4) expected and adverse reactions of micropigmentation.

DERMAL MICROPIGMENTATION AS METHOD OF CHOICE

There are different nipple-areola and reconstruction techniques⁵. Authors recommend the techniques which meet individual needs considering risks and benefits^{1,22}. Former complications with mammary implants are factors that imply in 61% of odds of non-reconstruction of NAC or tattooing while initial staging of breast cancer or mastectomy raises in 73% the chances of reconstruction²². The application of questionnaires in advance is an option for this initial evaluation of the patients' satisfaction and the changes that the breast reconstruction process would

mean to them^{26,27}. BREAST-Q qualifies the impact of breast reconstruction and the Body Investment Scale (BIS) evaluates the patients' self-image^{26,27}.

Dermal micropigmentation is a highly satisfactory technique for the patients^{24,28} ranging between 44% and 91%¹⁸ most likely because it does not need hospitalization, it is a simple and fast procedure lasting approximately 20-30 minutes for each breast²⁹, with good outcomes for symmetry and color^{13,18-21,23-25} against contralateral breast^{17,19}. One of the limitations is the necessity of follow-up and re-tattooing in the long run^{13,18,20,21}.

NAC surgical and non-surgical reconstructive techniques are innumerable^{6,30}. In general, micropigmentation is associated with other reconstructive technique²⁶, known as finalization technique³⁰. Micropigmentation for areolar reconstruction can be simultaneous or after surgical reconstruction of the NAC^{12,14-17,28}. Papillary micropigmentation is less utilized but even without palpable projection, 3-D may be used to mimic³¹. None of the techniques will offer erectile function to the new nipple³⁰.

Joint papillary and areolar micropigmentation is less common but can be a viable alternative for patients with severe comorbidities as diabetes, severe obesity,

Chart 1. Characteristics of the studies and synthesis of the main results, São Paulo, 2019

Title	Country/region	Method/Number of patients (n)	Results	Oxford Evidence
Breast reconstruction after surgery ¹²	United Kingdom/1995	Expert opinion (n=not reported)	Need further re-tattooing	5
Nipple-areola reconstruction by tattooing and nipple sharing ¹³	United Kingdom/1997	Descriptive study (n=31)	Simple and aseptic with local anesthetics, need re-tattooing in up to 4 years. NAC is designed in front of a mirror involving the patient to see the position and possibly a prosthesis. Pigments are mixed and tested against the normal areola. Paraffin gauze is applied for 24 hours. Review after 3-4 weeks. Thin crust arises from tattooed area and must be kept	4
Breast reconstruction ¹⁴	Canada/2000	Expert opinion (n= not reported)	NAC reconstruction with tattooing from 3 to 6 months after breast reconstruction	5
Nipple reconstruction using the C-V flap technique: addition to the technique ¹⁵	Brazil/2005	Descriptive study (n=9)	Micropigmentation after three months from the C-V flap technique with prosthesis	4
Breast reconstruction with autologous tissue following mastectomy ¹⁶	Germany/2006	Expert opinion (n=not reported)	Areola micropigmentation after 4-6 weeks from papillary reconstruction	5
Aesthetic quality of the nipple-areola complex in breast reconstruction with a new local graft technique ¹⁷	Brazil/2009	Descriptive study (n=122)	Areola micropigmentation after three months from NAC reconstruction. Anesthetics for 30-60 minutes ensured comfort and vasoconstriction. Scar and different ink shades match the natural tridimensional aspect of the areola	4
Patient satisfaction following nipple-areolar complex reconstruction and tattooing ¹⁸	United Kingdom/2011	Descriptive study (n=110)	Mean time of re-tattooing was 16.4 months (from the first) and 14.4 months (after the second). Six-points sterile tattooing needles but pigments were not sterile. Satisfaction was the evaluation method	4
Simple and safe technique for nipple-areola reconstruction with intradermal tattoo ¹⁹	Brazil/2012	Descriptive study (n=10)	Size, form and position against contralateral NAC with mold. Micropigmentation after 6-12 weeks post reconstructive surgery. Local anesthetics with 2% lidocaine with vasoconstrictor, reducing bleeding and facilitating visualization of pigment. Disposable holders were used to separate the inks. Following the procedure, a dressing with wound healing ointment (dexpanthenol) and polyvinyl chloride (PVC) was applied. Patients were instructed to keep dry for 48 hours. One patient evolved with infection	4
Areola size and jugulum nipple distance after bilateral mastectomy and breast reconstruction ²⁰	Spain/2013	Cohort without control group (n=103)	Women prefer smaller areolas than before the surgery. The reference points for the jugulum-nipple distance were the sternal notch and the nipple. Tape to measure the distance and size and circular sticky areola templates of different sizes were shown to the patient to evaluate which sample was more appealing to her. The tattoos were made between 3-6 months after nipple reconstruction. Procedure was conducted by a plastic surgeon or trained nurse. Re-tattooing after 3 months in 18.45%. After one year, no re-tattooing was necessary without further complications reported	3
Nipple reconstruction using the C-V flap technique: long-term outcomes and patient satisfaction ²¹	United Kingdom/2017	Descriptive study (n=33)	63.3% of the women preferred postoperative tattooing performed 8-12 weeks after the surgery. One patient needed re-tattooing	4
The necessity of the nipple: redefining completeness in breast reconstruction ²²	USA/2017	Case control (n=433)	Implant removal was associated with decreased chance of 61% of not reconstructing NAC or tattooing. Initial stage or mastectomy raises the chances of reconstruction in 73%	4

to be continued

Chart 1. continuation

Title	Country/region	Method/Number of patients (n)	Results	Oxford Evidence
Immediate nipple reconstruction during implant-based breast reconstruction ²³	South Korea/2017	Case control (n=61)	Areolar tattooing within 3 months after nipple reconstruction	4
Simultaneous nipple-areola complex reconstruction technique: combination nipple sharing and tattooing ²⁴	South Korea/2018	Case series (n=65 cases)	Outpatient-based procedure performed by one surgeon. Prophylactic intravenous antibiotics administered one-hour before surgery. Patient was evaluated and marked by vertical reference points including sternal notch. Midline and inframammary fold were marked and checked with the patient standing in front of a mirror. Intradermal tattooing was performed with permanent makeup device with sterile prepackaged 9-magnum needle cartridges and pigments. Three to five colors were used separately without mixing. Tattooing was done on all areas of the areola crossing 2-3 mm inside the designed nipple borderline. After the tattooing was completed, the graft was made. Dressing with topical antibiotic ointment and foam material was applied and the patient was educated to apply the topical antibiotic ointment once daily at home and change the foam material every other day until the 7-day follow-up. Oral antibiotics were taken for 3 days postoperatively. Mean interval between the procedure and therapy was 4.4 months; in non-adjuvant patients who submitted to chemotherapy, 4.4 months and for those who underwent radiotherapy, 6.7 months. Procedure took 46 minutes in average. In up to 6 months, the authors did not identify complications and mean of satisfaction was 8 in 10 scale	4
Tattooing associated with C-V flap placement in one-stage reconstruction of the nipple-areola complex ²⁵	Brazil/2018	Case series (n=21)	NAC position was designed and decided with the patient involvement in front of a mirror and with a mold. The color of the pigment was chosen together with the patient and pigments were mixed until the color is obtained similar to the contralateral side. The chosen color should ideally be a little darker than desired. Local anesthetics with 1% of lidocaine and antiseptics with aqueous chlorhexidine. At the end of the C-V flap placement, tattooing was done. The contralateral areola was also pigmented. Three complications related to the nipple, a partial necrosis and two dehiscence were found. No tattooing-related complications were found, or re-tattooing was required, only one patient needed to increase the size of the contralateral areola. Dressing with petroleum gauze and antibiotic ointment remaining for four days. Dressing was applied once a day with liquid vaseline and gauze for 30 days	4

Captions: NAC = nipple areola complex; USA = United States of America.

smoking, immunosuppression for chemotherapy; in less local favorable conditions as reduction of the thickness of the subcutaneous tissue, previous radiotherapy and history of necrosis of the cutaneous flap and who are not concerned with nipple projection, reconstruction anxiety and exhaustion in the long-term³².

PERIOD RECOMMENDED FOR MICROPIGMENTATION

Investigators support micropigmentation after surgical reconstruction of NAC to recover the tissue to ensure

the stability of the breast and nipple and analysis of the final shape of the breast mainly in relation to the changes that can occur during healing^{15-17,20,21,23}. However, there are differences found in the studies about the timing, some of them recommend at least from 4 to 12 weeks from surgery^{15-17,19,21,23}, others, until 24 weeks^{14,20,25,33}. However, in case of surgical reconstruction of the nipple in patients with thin flaps, investigators recommend micropigmentation after six to nine months after the surgery³². Dermal micropigmentation immediately after

breast reconstruction may lead to pigmentation flaws, mainly in the area of the scars²⁸.

A study reported that 28% of the patients submitted to reconstruction in areas irradiated, of these, 32% reported dissatisfaction with the results and 29% had complications¹⁸. Another study reported extended interval after radiotherapy (6-7 months), compared with non-adjuvant patients or who submitted to chemotherapy (4.4 months)²⁴. Early radiotherapy is associated with worst outcomes in relation to satisfaction with the breasts and physical, psychosocial and sexual well-being²⁷.

STAGES OF DERMAL MICROPIGMENTATION

Aseptic technique, one-time individual disposable material and equipment are mandatory^{18,24}. In addition, RDC (Board Ordinance) number 64 dated February 2016³⁴, determines safety and efficacy conditions to register implant products utilized in artificial permanent skin pigmentation. After using in a patient, all the disposable material should be discarded^{25,35}, including disposable ink cups to separate inks of the selected colors. Disposable gloves, goggles, watertight shoes will ensure the safety of the professional and patient during the procedure²⁵.

Although not encountered in the findings, it is required that the professionals explain and offer the patient a detailed Informed Consent Form with information about the procedure, potential risks and benefits and ask for free, voluntary and informed consent before the dermal micropigmentation^{25,33}.

The choice of the color, size of the areola and nipple is essential for the NAC micropigmentation because these aspects vary according to age, gender and race being primordial the shared decision between professional and patient^{20,22,24,25}. The professional marks NAC on the patient in front of the mirror^{13,24,25} and utilizes several diameters of nipple-areola molds for the patient to approve. If reconstruction is unilateral, the contralateral areola is the model, but when is bilateral, the patient is responsible for the choice. It is possible as well the utilization of the questionnaire with images of the nipple position with variations of the vertical and horizontal lines³³, further to projection images in surgical cases.

To correctly determine the unilateral nipple position, a meridian is designed on the healthy breast; next, three references of distance are measured from the sternal notch to the nipple, from the sternal midline to the nipple and from the inframammary line to the nipple²³. For bilateral tattooing, it is possible to use a template with several models and diameters of the areola and nipple and utilize the measure of the jugulum nipple notch to determine the position of the NAC, placing the nipples

at the base angles of an equilateral triangle with its apex at the jugulum notch²⁰. To determine the diameter of the areola, the authors^{20,23} utilized sticky circular templates with various sizes (2.5-6 cm) placed on the patient's breast for her to chose²⁰.

Therefore, the esthetic preferences of the patient determine the location, it is a personal question and should be based in the patient's involvement and consent for size, position and color.

Micropigmentation is a minimally invasive procedure, where pigments in the dermal layer below the epidermis are injected. Colors and shades are currently available for natural and satisfactory results. The pigments are inorganic, titanium dioxide and ferric oxide-based to reduce allergic reactions and rejection by the own organism, but these features do not avoid the risk of further complications³⁶.

Some kind of tingling or discomfort on the breast region during the procedure is expected even with reduced or absence of sensitiveness on the reconstructed breast²⁶. Some authors^{13,17,19} mention the utilization of topic anesthetics 30-60 minutes before the procedure or injectable 2% lidocaine with vasoconstrictor making it more comfortable for the patient and reducing dermal bleeding.

No instruments to measure pain were used in any of the study sample. It is important to evaluate pain in clinical practice to justify the use of anesthetics. Several pain evaluating methods exist to detect pain during a treatment, procedure and clinical visit, they can be used in the beginning and in the end of each consultation, as long as the conduct is dully registered. Visual Numeric Scale (VNS) from 0 to 10, Visual Analogue Scale (VAS), a straight line without numbers, one tip is "absence of pain" and the other "worst pain a person has ever felt" and Faces Scale with six faces expressing pain³⁷ are some of the instruments.

Post-pigmentation care initiate with occlusive dressing over the tattooed area. Some authors recommend paraffine non-adhesive gauze^{13,17,25}, and other, polyvinyl chloride film (PVC)¹⁹. Investigators had good results with its use, no infection has been reported or important pain or burning in a wet area.

The area should be kept dry for 48 hours after micropigmentation^{14,38,39}; minimum of 24-hours was the less reported in the study sample⁴⁰. After this period, wash with antiseptic soaps¹⁹. They also report the use of d-panthenol healing dressing which favors the process^{19,40}. It is suggested the utilization of antibiotic ointment if prescribed by a physician²⁰. An oncologic team from United Kingdom's West Hertfordshire hospital recommends the localized use of chloramphenicol-based

ointment and vaseline after non-surgical reconstruction³⁸. Prescriptions depend on specific reconstructive technique together with tattooing.

Although not reported in the findings, the periodicity of dressing change at the oncologic clinic of West Hertfordshire hospitals is once a day for two to three days³⁸. Sun exposure can impact the healing process and fixation of the pigments, thus beach, swimming pool and bathtub are contraindicated until the end of the healing avoiding exposure to infectious agents^{22,39}. Vaseline is recommended after total re-epithelization of the pigmented area during swimming pool, ocean and bathtub creating a protection barrier avoiding contact of the water with the pigment, protecting the color and shine for more time^{33,35}.

EXPECTED AND ADVERSE REACTIONS FROM MICROPIGMENTATION

After reconstruction, some authors report erythema and ecchymosis as the most common expected micropigmentation reactions with rare adverse reactions, for instance, infections that can be treated with systemic antibiotic therapy¹⁸.

Immediate reactions are noticed during the procedure; the area will present erythema with discreet spots of dermal bleeding (ecchymosis) mainly in areas of previous scars^{38,39}. After the procedure, it is expected a physiological inflammatory response as edema, pain (or loss of sensitiveness)⁶, and exudate, common during healing creating superficial crusts in a few days gradually detaching from the skin. Crusts are anticipated and should not be removed to avoid infections and impede healing process^{13,19,35,39}. Some authors report that these most exuberant signs and symptoms may disappear from one to two days³⁵, other, from one to seven days depending on the patient's skin characteristics³⁹ and of the reconstruction technique⁶.

The findings do not describe aspects related to allergy reactions because they could barely occur, there was only one report of late hypersensitiveness within seven weeks post 3D nipple tattooing, probably associated with red pigment⁴¹.

Some United Kingdom institutions recommend the patch-test at least for one day before the procedure with the application of a small amount of the ink on the patient's skin and evaluate post 24-hour likely allergy reactions³⁸⁻⁴⁰. Patch-test is utilized to detect exogenous agents possibly responsible for skin allergy⁴⁰. An internal, slow and complex process among proteins and the exogenous agent is the culprit for tattoo allergic reactions, possibly revealing that allergy to the product is not confirmed only by the superficial exposure on the

skin⁴⁰. Quite often for this reason, this procedure is not done more frequently.

As re-tattooing might be required, some authors^{12,13,20,21,28,38,39} prescribed the use of darker pigments against the contralateral breast because of fading in time, epidermal desquamation and phagocytosis process of deeper pigments. Most of the patients need two initial treatments with one-month interval but re-tattooing can be made until the desired color is reached, improving the final aspect^{12,13,20,21,28,38,39}.

Although being safe, reliable and low-cost with low risk of complications^{6,19,24,25,28}, it is required the clinical evaluation of the patients. The patient needs to be clearly informed that the procedure has risks, discomfort, necessity of re-tattooing to reach the ideal color, inflammation and local bleeding during and after, non-full coverage of the scars, further to risk of infections and allergy^{6,12,13,18-21,28,35,38,39,41}. The health professional plays a key role to assess, inform, guide and clarify doubts¹, favoring shared decisions.

The study limitations are the exclusive search of open access articles and non-reversal searches of the references of the articles selected, which may have limited the access to relevant scientific literature. Dermal micropigmentation is applied in other populations of women in breast cancer treatment. Yet, the results reported portray the diversity of the theme and better evidences for safe practices in oncology about dermal micropigmentation for NAC reconstruction of women submitted to surgery for breast cancer treatment.

CONCLUSION

Dermal micropigmentation for NAC reconstruction is widely used and is highly satisfactory for women as long as biosafety measures are followed by the patient and health professional. It is safe, fast with rare complications and hardly painful.

CONTRIBUTIONS

All the authors contributed substantially for the study design, acquisition, analysis and interpretation of the data, wording, critical review with intellectual contribution and approved the final version published.

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DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interests to declare.

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REFERENCES

- Volkmer C, Santos EKA, Erdmann AL, et al. Reconstrução mamária sob a ótica de mulheres submetidas à mastectomia: uma metaetnografia. *Texto Contexto Enferm.* 2019;8:1-17. doi: <https://doi.org/10.1590/1980-265X-TCE-2016-0442>
- Inocenti A, Santos MA, Loyola EAC, et al. Repercussão dos efeitos da cirurgia reconstrutora na vida de mulheres com neoplasias da mama. *Texto Contexto Enferm.* 2016;25(2):e4520014. doi: <https://doi.org/10.1590/0104-07072016004520014>
- Presidência da República (BR). Lei nº 13.770, de 19 de dezembro de 2018. Altera as Leis nº 9.656, de 3 de junho de 1998, e 9.797, de 6 de maio de 1999, para dispor sobre a cirurgia plástica reconstrutiva da mama em casos de mutilação decorrente de tratamento de câncer. *Diário Oficial da União, Brasília, DF.* 2018 dez 20 [acesso 2021 mar 6]; Seção 1:1. Disponível em: http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2018/lei/L13770.htm
- Satteson ES, Brown BJ, Nahabedian MY. Nipple-areolar complex reconstruction and patient satisfaction: a systematic review and meta-analysis. *Gland Surg.* 2017;6(1):4-13. doi: <https://doi.org/10.21037/gs.2016.08.01>
- Sisti A. Nipple-areola complex reconstruction. *Medicina (Kaunas).* 2020;56(6):296. doi: <https://doi.org/10.3390/medicina56060296>
- Sisti A, Grimaldi L, Tassinari J, et al. Nipple-areola complex reconstruction techniques: a literature review. *Eur J Surg Oncol.* 2016;42(4):441-65. doi: <https://doi.org/10.1016/j.ejso.2016.01.003>
- Nimboriboonporn A, Chuthapisith S. Nipple-areola complex reconstruction. *Gland Surg.* 2014;3(1):35-42. doi: <https://doi.org/10.3978/j.issn.2227-684X.2014.02.06>
- Mendes KDS, Silveira RCCP, Galvão CM. Revisão integrativa: método de pesquisa para a incorporação de evidências na saúde e na enfermagem. *Texto Contexto Enferm.* 2008;17(4):758-64. doi: <https://doi.org/10.1590/S0104-07072008000400018>
- Souza MT, Silva MD, Carvalho R. Integrative review: What is it? How to do it? *Einstein (São Paulo).* 2010;8(1):102-6. doi: <https://doi.org/10.1590/S1679-45082010RW1134>
- Shamseer L, Moher D, Clarke M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. *BMJ.* 2015;350:g7647. doi: <https://doi.org/10.1136/bmj.g7647>
- OCEBM Levels of Evidence Working Group. The Oxford 2011 levels of evidence [Internet]. Oxford: Centre for Evidence-Based Medicine; 2011 [cited 2021 Mar 6]. Available from: <https://www.cebm.net/wp-content/uploads/2014/06/CEBM-Levels-of-Evidence-2.1.pdf>
- Watson JD, Sainsbury JRC, Dixon JM. Breast reconstruction after surgery. *BMJ [Internet].* 1995 [cited 2021 June 14];310:117-21. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2548509/pdf/bmj00575-0051.pdf>
- Bhatty MA, Berry RB. Nipple-areola reconstruction by tattooing and nipple sharing. *Br J Plast Surg.* 1997;50(5):331-4. doi: [https://doi.org/10.1016/s0007-1226\(97\)90541-5](https://doi.org/10.1016/s0007-1226(97)90541-5)
- Brennan M. Breast reconstruction. *Can Fam Physician [Internet].* 2000 [cited 2021 June 14];46:1981-2. Available from: <https://www.cfp.ca/content/cfp/46/10/1981.full.pdf>
- Tostes ROG, Silva KDA, Andrade Júnior JCCG, et al. Reconstrução do mamilo por meio da técnica do retalho C-V: contribuição à técnica. *Rev Bras Cir Plást [Internet].* 2005 [acesso 2021 jun 14];20(1):36-9. Disponível em: <http://www.rbc.org.br/details/152/pt-BR/reconstrucao-do-mamilo-por-meio-da-tecnica-do-retalho-c-v--contribuicao-a-tecnica>
- Teymour HR, Stergioula S, Eder M, et al. Breast reconstruction with autologous tissue following mastectomy. *Hippokratia [Internet].* 2006 [cited 2021 June 14];10(4):153-62. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2464250/pdf/hippokratia-10-153.pdf>
- Costa MP, Ferreira MC. Aesthetic quality of the nipple-areola complex in breast reconstruction with a new local graft technique. *Aesthetic Plast Surg.* 2009;33(5):774-9. doi: <https://doi.org/10.1007/s00266-009-9387-z>
- Goh SCJ, Martin NA, Pandya AN, et al. Patient satisfaction following nipple-areolar complex reconstruction and tattooing. *J Plast Reconstr Aesthet Surg.* 2011;64(3):360-3. doi: <https://doi.org/10.1016/j.bjps.2010.05.010>
- Pessoa SGP, Matos JRF, Dias IS, et al. Técnica simples e segura para a reconstrução areolopapilar com tatuagem intradérmica. *Rev Bras Cir Plást.* 2012;27(3):415-20. doi: <https://doi.org/10.1590/S1983-51752012000300015>
- Pérez-Guisado P, Rodríguez-Mérida C, Rioja LF. Areola size and jugulum nipple distance after bilateral mastectomy and breast reconstruction. *Eplasty [Internet].* 2013 [cited 2021 June 14];13:e56. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3819114/>
- Jalini L, Lund J, Kurup V. Nipple reconstruction using the C-V flap technique: long-term outcomes and patient satisfaction. *World J Plast Surg [Internet].* 2017 [cited 2021 June 14];6(1):68-73. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5339612/>

22. Weissler EH, Schnur JB, Lamelas AM, et al. The necessity of the nipple: redefining completeness in breast reconstruction. *Ann Plast Surg.* 2017;78(6):646-50. doi: <https://doi.org/10.1097/SAP.0000000000000943>
23. Hong KY, Kim YE, Minn KW, et al. Immediate nipple reconstruction during implant-based breast reconstruction. *Aesthetic Plast Surg.* 2017;41(4):793-9. doi: <https://doi.org/10.1007/s00266-017-0804-4>
24. Cha HG, Kwon JG, Kim EK. Simultaneous nipple-areola complex reconstruction technique: combination nipple sharing and tattooing. *Aesthetic Plast Surg.* 2019;43(1):76-82. doi: <https://doi.org/10.1007/s00266-018-1247-2>
25. Laitano FF, Oliveira Neto FL. Tatuagem associada ao retalho em C-V para reconstrução do complexo areolopapilar em tempo único. *Rev Bras Cir Plást.* 2018;33(1):19-23. doi: <https://doi.org/10.5935/2177-1235.2018RBCP0004>
26. van Verschuer VMT, Mureau MAM, Gopie JP, et al. patient satisfaction and nipple-areola sensitivity after bilateral prophylactic mastectomy and immediate implant breast reconstruction in a high breast cancer risk population: nipple-sparing mastectomy versus skin-sparing mastectomy. *Ann Plast Surg.* 2016;77(2):145-52. doi: <https://doi.org/10.1097/sap.0000000000000366>
27. Cohen WA, Mundy LR, Ballard TNS, et al. The BREAST-Q in surgical research: a review of the literature 2009-2015. *J Plast Reconstr Aesthet Surg.* 2016;69(2):149-62. doi: <https://doi.org/10.1016/j.bjps.2015.11.013>
28. Bezerra FJF, Moura RMG. Reconstrução da papila e imediata tatuagem do complexo areolopapilar: técnica, resultados e revisão de literatura. *Rev Bras Cir Plást.* 2018;33(1):12-8. doi: <https://doi.org/10.5935/2177-1235.2018RBCP0003>
29. Cha HG, Kwon JG, Kim EK, et al. Tattoo-only nipple-areola complex reconstruction: another option for plastic surgeons. *J Plast Reconstr Aesthet Surg.* 2020;73(4):696-702. doi: <https://doi.org/10.1016/j.bjps.2019.11.011>
30. Ramos RFM, Strassburger CP, Falcão M, et al. Reconstrução do complexo areolo-papilar: do que dispomos atualmente? *Rev Bras Mastologia [Internet].* 2016 [2021 Jun 14];26(1):18-23. doi: http://www.mastology.org/wp-content/uploads/2016/03/MAS-v26n1_18-23.pdf
31. Hammond JB, Teven CM, Bernard RW, et al. 3D nipple-areolar tattoo: it's technique, outcomes, and utilization. *Aesthetic Plast Surg.* 2021;5(2):453-458. doi: <https://doi.org/10.1007/s00266-020-01967-w>
32. Starnoni M, Baccarani A, Pinelli M, et al. Tattooing of the nipple-areola complex: What not to do. A case series. *Ann Med Surg (Lond).* 2020;55:305-7. doi: <https://doi.org/10.1016/j.amsu.2020.05.041>
33. Lewin R, Amoroso M, Plate N, et al. The aesthetically ideal position of the nipple-areola complex on the breast. *Aesthetic Plast Surg.* 2016;40(5):724-32. doi: <https://doi.org/10.1007/s00266-016-0684-z>
34. Ministério da Saúde (BR), Agência Nacional de Vigilância Sanitária, Diretoria Colegiada. Resolução-RDC nº 64, de 23 de fevereiro de 2016. Altera a Resolução da Diretoria Colegiada RDC nº 55, de 6 de agosto de 2008, para mudar os requisitos de segurança e eficácia para o registro de produtos implantáveis, utilizados nos procedimentos de pigmentação artificial permanente da pele [Internet]. *Diário Oficial da União, Brasília, DF.* 2016 fev 24 [acesso 2021 jun 14]; Edição 36; Seção 1:30. Disponível em: https://www.in.gov.br/materia/-/asset_publisher/Kujrw0TZC2Mb/content/id/22420745/impresanacional
35. Galsworthy V, Pilley M. Micropigmentation (medical tattooing) UHL guideline [Internet]. Leicester (UK): University Hospitals of Leicester NHS Trust; Nov 2012 [reviewed 2020 July; cited 2021 June 14]. Available from: [https://secure.library.leicestershospitals.nhs.uk/PAGL/Shared%20Documents/Micropigmentation%20\(Medical%20Tattooing\)%20UHL%20Guideline.pdf](https://secure.library.leicestershospitals.nhs.uk/PAGL/Shared%20Documents/Micropigmentation%20(Medical%20Tattooing)%20UHL%20Guideline.pdf)
36. Kristoffersen CM, Seland H, Hansson E. A systematic review of risks and benefits with nipple-areola-reconstruction. *J Plast Surg Hand Surg.* 2017;51(5):287-95. doi: <https://doi.org/10.1080/2006566X.2016.1251935>
37. Bottega FH, Fontana RT. A dor como quinto sinal vital: utilização da escala de avaliação por enfermeiros de um hospital geral. *Texto Contexto Enferm.* 2010;19(2):283-90. doi: <https://doi.org/10.1590/S0104-07072010000200009>
38. National Health Service, West Hertfordshire Hospitals. Nipple areola micro-pigmentation (tattooing): patient information [Internet]. Hertfordshire, (UK): Breast Care Unit; 2015 May [review 2018 May; cited 2021 June 14]. Available from: https://www.westhertshospitals.nhs.uk/patientinformation/documents/oncology/00122_4-17v02%20Nipple%20Areola%20Micro-Pigmentation%20Patient%20Information%20Leaflet%20FINAL.pdf
39. National Health Service, University Hospitals Coventry and Warwickshire. Breast care: tattooing service [Internet]. Version 8.1. Coventry (UK): UHCW; [update 2021 Feb; cited 2021 June 14]. Available from: <https://www.uhcw.nhs.uk/download/clientfiles/files/Patient%20Information%20Leaflets/Surgical%20Services/Breast/Tattooing%20service.pdf>
40. Serup J, Carlsen KH. Patch test study of 90 patients with tattoo reactions: negative outcome of allergy patch test to baseline batteries and culprit inks suggests allergen(s) are generated in the skin through haptenization. *Contact Dermatitis.* 2014;71(5):255-63. doi: <https://doi.org/10.1111/cod.12271>

41. Joseph WJ, Roy E, Stofman GM. Delayed hypersensitivity reaction after nipple tattooing: a novel case report. *Plast Reconstr Surg Glob Open*. 2019;7(9):e2394. doi: <https://doi.org/10.1097/GOX.0000000000002394>

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