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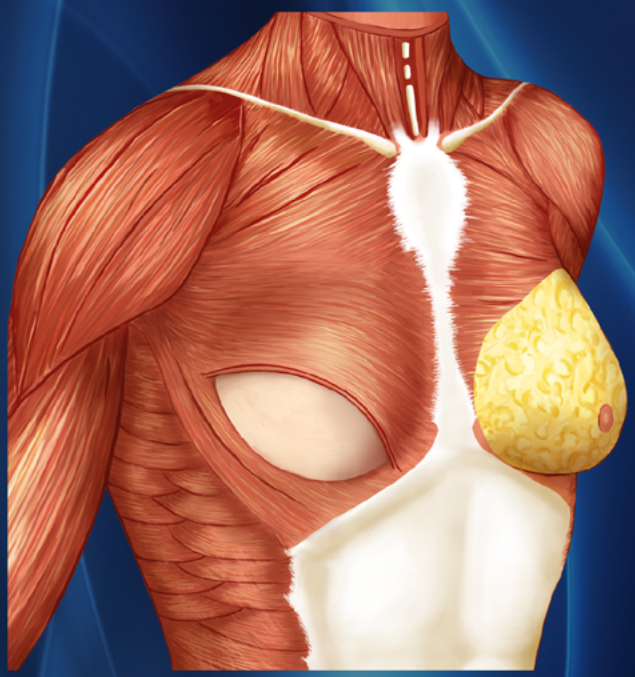

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REVISTA BrazilEIRA DE CIRURGIA PLÁSTICA

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REVISTA BrazilEIRA DE CIRURGIA PLÁSTICA
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The aim of the Brazilian Journal of Plastic Surgery is to record scientific developments in Reconstructive and Aesthetic Plastic Surgery, to promote research, and to support and inform professionals in this specialty, as well as to report new investigations, surgical experiments, and other original contributions.

Manuscripts submitted for publication in the Brazilian Journal of Plastic Surgery must cover topics related to plastic surgery and related areas. The journal publishes the following types of articles: Editorials, Original Articles, Review Articles, Case Reports, Ideas and Innovations, Special Articles, and Letters to the Editor.

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Original Article - This category includes controlled and randomized trials and observational studies, as well as basic investigations using animal experimentation. Original articles must contain the following sections: Introduction, Objective, Methods, Results, Discussion, Conclusion, References, Summary, and Abstract. The length of the text should not exceed 3,000 words, excluding tables, references, summary, and abstract. The number of references should not exceed 30, and the number of figures or figure parts should be limited to 20. There should be no more than 4 tables.

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Animal investigations must be carried out in accordance with rules applicable to such procedures, as specified in the Basel Declaration (www.basel-declaration.org) and the Guide for the Care and Use of Laboratory Animals (Institute of Laboratory Animal Resources, National Academy of Sciences, Washington, D.C., USA). The Editorial Board of the Journal may decline articles that do not strictly comply with ethical principles of research, whether involving humans or animals. The authors should accurately identify all drugs and chemicals used, providing the names of active ingredients, dosages, and routes of administration. They should also avoid using commercial or proprietary names.

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Within this context, the Brazilian Journal of Plastic Surgery adopts the definition of a clinical trial recommended by the WHO, summarized as follows: "any research that prospectively designates humans for one or more interventions aimed at assessing their effects on health-related outcomes. Interventions include drugs, cells and other biological products, surgical procedures, radiological, devices, behavioral therapies, changes in care processes, preventive care, etc".

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1. Having conceived and planned the activities that led to the final work, or interpreted the results of these activities, or both;
2. Having written the work or revised successive versions and taken part in the review process;
3. Having approved the final version.

Individuals who do not meet the aforementioned requirements or whose participation consists of purely technical or general support may be mentioned in the Acknowledgments section.

The Journal adheres to the Vancouver Requirements - Uniform Requirements for Manuscripts Submitted to Biomedical Journals, as organized by the *ICMJE* - "Vancouver Group", available at www.icmje.org. Compliance with the instructions is mandatory for the study to be considered for review.

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The maximum number of authors permitted for an article is 8, and the contribution of each author must be specified. Authors are considered those who have: contributed substantially to the design and planning, and/or analysis and interpretation of the data; contributed significantly to the draft or critical review of the content; and participated in the approval of the final version of the manuscript.

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The abstract of an original article should be structured, with an Introduction, Methods, Results, and Conclusions. The abstract should be written in order to allow understanding of the study without reading the entire text. Similarly, the Abstract must accurately reflect the Summary, and should follow the same structure: Introduction, Methods, Results, and Conclusions. Review articles and Case Reports should also include a Summary and Abstract, but a structured format as above is not required. Neither the Summary nor the Abstract may exceed 250 words. At least 5 keywords should be listed, with a maximum of 10, identifying the subject of the work. The descriptors should be based on the Health Sciences Descriptors (DeCS) published by Bireme, a translation of the Medical Subject Headings (MeSH) of the National Library of Medicine, available at: http://www.decs.bvs.br

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Introduction - This section should discuss the purpose of the article and the rationale for the study. It must establish the theoretical premise that led the authors to investigate the topic. The Introduction should explain why the topic should be studied, clarifying flaws or inconsistencies in the literature and/or difficulties in clinical practice that make the work interesting to the specialist.

Objective - This section must describe the purpose of the work clearly and objectively in one paragraph.

Methods - This section should clearly describe the basis for selection of observation and experimental elements, such as patients, laboratory animals, and controls. Where appropriate, inclusion and exclusion criteria should be described. This section should provide sufficient detail to allow reproduction and use in other works. Methods that have already been published, but about which little is generally known, must be accompanied by a bibliographical reference; new techniques should be described in detail. Similarly, the time and place of study, statistical methods, and any computer programs should be described.
The authors should state in this section that the study was approved by the Ethics Committee of the institution where the work was carried out, providing the registration number in the text.

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Conclusions - These should be concise and address only the proposed objectives.

Acknowledgments - If desired, these should be presented at the end of the text, mentioning the names of participants who contributed intellectually or technically in any phase of the work, but did not meet the requirements for authorship. Any funding agency that supported the research that resulted in the published article should also be mentioned.

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References should be cited when actually consulted, in Arabic superscript numerals and numbered in the order of citation in the text. All authors up to 6 should be cited; if the authors exceed 6, the first 6 should be cited, followed by et al. The presentation should be based on the "Vancouver Style" format and the titles of the journals should be abbreviated according to the style presented in the List of Journals Indexed in Index Medicus, of the National Library of Medicine. The following are some examples of the main types of bibliographic references; other examples can be consulted at the website of the National Library of Medicine (http://www.nlm.nih.gov/bsd/ uniform_requirements.html).

Journal Article
Quintas RC, Coutinho AL. Risk factors for the commitment of surgical margins in basal cell carcinomas resections. Rev Bras Cir Plást. 2008;23(2):116-9.

Book Chapter
D'Assumpção EA. Problems and solutions in rhytidoplasty. In: Melega JM, Baroudi R, eds. Plastic surgery fundamentals and art: cosmetic surgery. Rio de Janeiro: Medsi; 2003. p. 147-65.

Book
Saldanha O. Lipoabdominoplasty. Rio de Janeiro: Di Livros; 2004.

Thesis

Freitas RS. Jaw bone elongation using internal device: quantitative analysis of results [Doctoral thesis]. São Paulo: University of São Paulo, School of Medicine; 2003. 97p.

Events

Carreirão S. Reduction mammoplasty. In: XXXVI Brazilian Conference of Plastic Surgery; 2001 Nov 11-16; Rio de Janeiro, Brazil.

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The number of figures must not exceed 20 (twenty) for original articles, and each image attached to the study is considered a figure; for example, Figure 1 (A, B, C, D), will correspond to 4 of the 20 allowed figures.

Photos of patients should have a uniform background, especially when color is used, and without showing any foreign objects, e.g., doorknobs, lamps, etc. The field photographed should be strictly of the area of interest. In pictures of the face, use resources to prevent patient identification; however, if identification is possible, the author should enclose an individual authorization.

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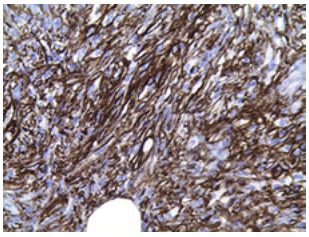
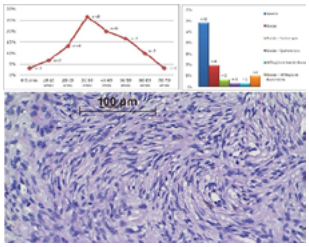
Medium shade	Continuous photo shade that does not contain text		tif, png, jpg	RGB or grayscale	300 dpi
Combination	Containing halftone image plus text or line-art elements		tif, png, jpg	RGB or grayscale	300 dpi

• Line example taken from: Di Lamartine J, Cintra Junior R, Daher JC, Cammarota MC, Galdino J, Pedroso DB, et al. Reconstrução do complexo areolopapilar com double opposing flap. Rev Bras Cir Plást. 2013;28(2):233-40.

• Shade example taken from: Alves JC, Fonseca RP, Silva Filho AF, Andrade Filho JS, Araujo IC, Almeida AC, et al. Ressecção alargada no tratamento do dermatofibrossarcoma protuberante. Rev Bras Cir Plást. 2014;29(3):395-403.

• Combination example taken from: Alves JC, Fonseca RP, Silva Filho AF, Andrade Filho JS, Araujo IC, Almeida AC, et al Ressecção alargada no tratamento do dermatofibrossarcoma protuberante. Rev Bras Cir Plást. 2014;29(3):395-403.

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Once accepted for publication, a sample of the article for publishing (PDF format) will be sent to the corresponding author for evaluation and final approval.

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Prior to the submission of a manuscript, the authors should use the checklist corresponding to the category of the article:

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EDITORIAL / EDITORIAL

ORIGINAL ARTICLES / ARTIGOS ORIGINAIS

IDEAS AND INNOVATIONS / IDEIAS E INOVAÇÕES

REVIEW ARTICLE / ARTIGO DE REVISÃO

CASE REPORTS / RELATOS DE CASO

SPECIAL ARTICLE / ARTIGO ESPECIAL

LETTER TO THE EDITOR / CARTA AO EDITOR

Editorial

Pandemic and reflections

Pandemia e reflexões

Few of us have certainly experienced such a difficult time in life and on the planet. It is a moment of full reflection where we must be absolutely attentive, careful and respectful in relation to the rules of care to minimize the expansion of this disease.

Doctors and scientists are quickly looking for answers not only to understand what is happening, but also to define effective ways to reduce transmission, stabilize the critical patient and effectively treat Covid-19.

Research has its time. The ethical, administrative and bureaucratic procedures must be respected but rethought in the moment of crisis, in order to speed up the successive stages.

Efficient filters are necessary in order to differentiate thoughts from certainties, hypotheses of facts, ideas and reality.

In Brazil, we often find ourselves facing diverse barriers that delay participation in international and multicentric scientific projects. This is a time for reflection and reassessment, in which the authorities involved must join forces in order to allow the change of processes, making Brazilian science faster.

Health must be seen not only as a priority in care but also in scientific development, which ultimately culminates in the discovery of effective measures in the treatment of diseases.

Our country is recognized as a leader in the development of drugs and vaccines and as in any country in the world, we will have the chance to develop research and to collaborate in the development of studies with positive repercussions worldwide.

We will have time, whether we like it or not, to reflect deeply on these issues and make national science more pragmatic, allowing the outcomes of studies to occur more readily. Obviously, always with the highest priority in relation to ethical principles in scientific research.

DOV GOLDENBERG
EDITOR-IN-CHEIF OF BJPS

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Original Article

Vascular complications from facial fillers with hyaluronic acid: preparation of a prevention and treatment protocol

Complicações vasculares dos preenchimentos faciais com ácido hialurônico: confecção de protocolo de prevenção e tratamento

JOSÉ CARLOS DAHER [1]*
SUELLEN VIEIRA DA-SILVA [1]
AMANDA COSTA CAMPOS [1]
RONAN CAPUTI SILVA DIAS [1]
ANDERSON DE AZEVEDO DAMASIO [1]
RAFAEL SABINO CAETANO COSTA [1]

■ **ABSTRACT**

Introduction: Over the past two decades, there has been an exponential advancement in treating signs of facial aging. The growing demand for less invasive therapies has stimulated the development of biomaterials toward better products, seeking to fulfill safety criteria, such as biocompatibility and reversibility. Hyaluronic acid (HA) is the most widely used facial filler worldwide, being routine in plastic surgery clinics. Even with low complication rates, it is prudent for the plastic surgeon to be attentive to the signs of vascular occlusion because the interruption of the progression towards necrosis and permanent sequelae depends on rapid medical action. Thus, our service saw the need to create a prevention and treatment protocol, since such complications are serious and sometimes even irreversible. **Methods:** A systematic review of the literature was conducted from January 2003 to January 2018, using descriptors of vascular complications after facial filling with HA and its treatment. **Results:** Filling with HA presents a low potential for complications when performed by qualified professionals. Hyaluronidase, which is currently used off-label, can hydrolyze HA, even in its cross-linked form. If used correctly in a timely manner, it can treat possible vascular complications that would progress to irreversible damage. Accordingly, we prepared a treatment protocol given the current evidence. **Conclusion:** Every plastic surgeon who works with fillers and HA must have a protocol and be aware of the necessary material for early intervention.

Keywords: Hyaluronic Acid; Hyaluronoglucosaminidase; Dermal Fillers; Embolism; Necrosis.

Institution: Hospital Daher Lago Sul, Brasília, DF, Brazil.

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Conflicts of interest: none.

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[1] Hospital Daher Lago Sul, Brasília, DF, Brazil.

■ **RESUMO**

Introdução: Ao longo das últimas duas décadas, houve um avanço exponencial no tratamento dos sinais causados pelo envelhecimento facial. A procura crescente por terapias menos invasivas estimulou a evolução dos biomateriais em direção ao produto ideal, buscando preencher os critérios de segurança, tais como biocompatibilidade e reversibilidade. O ácido hialurônico é o produto mais utilizado mundialmente para preenchimento facial, sendo rotineiro nos consultórios de cirurgia plástica. Mesmo com baixos índices de complicações, é prudente que o cirurgião plástico esteja atento aos sinais de oclusão vascular, pois a interrupção da evolução em direção à necrose e sequela permanente depende da rápida atuação médica. Sendo assim, o nosso serviço vislumbrou a necessidade da confecção de um protocolo de prevenção e tratamento, uma vez que tais intercorrências são graves e algumas vezes até mesmo irreversíveis. **Métodos:** Revisão sistemática da literatura entre janeiro de 2003 a janeiro de 2018, utilizando descritores de complicações vasculares após preenchimento facial com AH e o respectivo tratamento. **Resultados:** O preenchimento com AH apresenta baixo potencial de complicação quando realizado por profissionais habilitados. A hialuronidase, atualmente utilizada off-label, é capaz de hidrolisar o ácido hialurônico, mesmo na sua forma cross-linked. Se utilizada corretamente em tempo hábil, pode tratar possíveis complicações vasculares que naturalmente evoluiriam para danos irreversíveis. Para tanto, confeccionamos um protocolo de tratamento à luz das evidências atuais. **Conclusão:** Todo cirurgião plástico que atua com preenchimentos e ácido hialurônico, deve ter em mãos um protocolo e o material necessário para intervenção precoce.

Keywords: Hyaluronic acid; Hyaluronoglucosaminidase; Dermal fillers; Embolism; Necrosis.

INTRODUCTION

The aging process is multifactorial and results in simultaneous changes in the various components of the face. The pathogenesis of facial aging can be explained anatomically and is the result of the interaction of intrinsic factors (maturity of soft parts, skeletal atrophy/changes and muscular hyperactivity) and extrinsic factors (gravity and solar damage). Consequently, the smooth confluent appearance of the face is slowly replaced by spiked angles, wrinkles, grooves and prominences. Skeletal changes lead to a general decrease in facial height and moderate enlargement and deepening of the facial structure. The decrease in maxillary height and the increase in orbital volume results in sunken eyes and less space for the insertion of available soft tissue.

Superficial lines that cross the upper limit of the dermis are responsive to dermabrasion, peeling, and lasers. However, dynamic wrinkles respond to muscle inactivation with botulinum toxin or myectomy/myotomy and can be improved using dermal fillers. Fillers are also useful in treating grooves during their initial stages or as an adjuvant modality to surgery.

The filling of soft parts is an alternative for patients seeking facial rejuvenation with minimal downtime. For young patients, this might be the ideal modality, while for older patients, the combination of filling and surgery is more effective. To date, the ideal filler has not been found, and there is no consensus on its ideal characteristics (Chart 1).

Chart 1. Characteristics of the ideal filler.

Characteristics of the ideal filler	
Non-toxic	Produces natural and noticeable changes.
Biocompatible	Minimal downtime.
Lasting	Predictable.
Reversible	Work well with ageing.
Autologous	Not perceptible to touch.
Ease of use	Safe

The history of facial filling began in 1830, when the German chemist Karl Ludwig, in 1830[1], discovered paraffin. Using this material, in 1899, Gersuny[2], an Austrian, reported using the substance for esthetic purposes, when he created a testicular prosthesis for a patient who had been treated with orchiectomy due to tuberculosis. After that, paraffin became widely used in rhinomodeling, until in 1911[2] a list of complications that the use of this material could generate emerged. It was then abandoned for cosmetic purposes.

Adipose tissue grafting was initially developed in the late 19th century for facial reconstruction. Neuber, in 1893[3], described an autologous fat graft, from the arm, which consisted of fragments of fat tissue to correct facial defects. However, this method only became popular in 1982, after Illouz[4] described the use of cannulas for vacuum aspiration and grafting of the aspirated product. Several techniques have been proposed since then, and this grafting modality is still widely studied and used by plastic surgeons for facial filling and other areas of the body. In the 1940s, in Japan, injectable liquid silicone was used for breast augmentation. This product gained prominence after being introduced in the United States of America in the 1960s, but in the following years, reports of complications and sequelae of the use of liquid silicone emerged. Its use for cosmetic purposes was banned by the Food and Drug Administration (FDA) in 1979.

Clinical experiments with bovine collagen occurred between 1977-1978, to treat age-related wrinkles. After 6 years of research, the substance was approved by the FDA for aesthetic purposes, under the name Zyderm. Despite the success of this material in the 1980s and it becoming the standard to which all other injectables were compared, it was not an ideal product and had a number of drawbacks. As well as its short duration, all biological materials were derived from organic sources, which can lead to sensitization to foreign animal or human proteins, the transmission of diseases, and immunogenicity. During the following years, there was an evolution of collagen materials, as shown in Chart 2 below:

Chart 2. Evolution of collagen-based fillers.

Collagen-based biological filling	
Zyderm(1981)/Zyplast (1985)	Collagen (bovine)
Dermalogen (1998)	Human collagen matrix
Surgisis (1998)	Pig collagen matrix
CosmoDerm/CosmoPlast (2003)	Collagen (human)

Hyaluronic acid (HA) is a polysaccharide found naturally in the connective tissue of mammals (skin, cartilage, bone, and synovial fluid), with a gelatinous consistency, high viscoelasticity and high degree of hydration because of its structural characteristics[5]. This material was first described in 1934 by Meyer and Palmer[6], during the analysis of bovine vitreous humor, which in its natural state is a very good filler but has a short half-life. After minimum chemical changes (cross-linking), it was possible to create a material that was tolerated by the immune system, non-reactive, and had greater longevity. Two techniques were developed to produce the acid: bacterial fermentation or extraction from rooster crest. For large-scale production reasons, the first technique is the most widely used today.

Since FDA approval in 2003, HA has become the most widely used filler in the world due to its properties, such as biocompatibility and reversibility. According to the American Society of Plastic Surgery, in 2014, soft tissue filling increased by 253% when compared to 2000, with HA accounting for 78.3% of all injectable fillers.

METHODS

An extensive search was performed in the MEDLINE, Cochrane, and PubMed databases between January 2003 and January 2018. The keywords used were “dermal fillers”, “vascular complications”, “hyaluronic acid” and “hyaluronidase”. Initially, 49 articles were selected.

The inclusion criteria were:
- Year 2003-2018;
- Clinical trials and case studies;
- HA facial filler;
- Vascular complications;
- Treatment with hyaluronidase.

Exclusion criteria:
- Case reports;
- Filling with other materials besides HA;
- Focus on other complications.
- The results yielded 19 articles.

DISCUSSION

Although infrequent[7], adverse effects related to the use of HA injections may occur. It is important for all surgeons who work with HA to perfect the infiltration technique and to recognize early complications and master its handling.

The complications of HA filling can be divided into early and late, according to the time of appearance. Those classified as early appear within a period of hours to days. The most common are edema, pain, hyperemia, and ecchymosis[8]. These reactions are usually self-limiting and do not require major interventions. On the other hand, vascular complications that can result in tissue necrosis and loss of vision can occur rarely. These require further attention and follow up due to

the high potential of sequelae[9]. Late complications include biofilms, granulomas, depigmentation, and scarring. (Chart 3)

Chart 3. Complications related to the use of hyaluronic acid.

Early	Tardias
Relate to infiltration:	Infections
Edema	Granulomas
Pain	Nodules
Bleeding	Depigmentation
Ecchymosis	Scars
Inflammatory Reactions	
Allergic Reactions	
Vascular infarction/Tissue necrosis	

Venous obstruction is uncommon but may be observed in some cases where some degree of occlusion is already present[10]. It can occur when a large volume of material infiltrates topographies with significant tension, where the tissue is restricted, with the absence of the usual elasticity, as with scars. An accidental intravenous injection may not have repercussions and often goes unnoticed. In contrast, the injection of intra-arterial material can result in flow obstruction, leading to hypoxia in a certain territory and tissue ischemia[11].

The signs of vascular occlusion are immediate and usually present with: pale tissue, followed by livedo reticularis, and ischemia. If no intervention is performed, blisters, sores, and tissue necrosis can occur (Chart 4). The most serious complication related to vascular obstruction is a loss of vision, which can happen when there is occlusion of an ophthalmic artery or the retina via a retrograde flow of material injected into the supraorbital area. This is associated with an influx of a large volume at an excessive infusion pressure. The symptoms are immediate and include ocular pain and visual disturbance. Tissue necrosis occurs more in the so-called risk zone, which is the nose, mainly in the glabella. The glabella is supplied by arteries from the supratrochlear, which travels in a medial path to the eyebrows. Due to this anatomical course, it is suggested that there is a greater risk that inadvertent intra-arterial injection may occur[12]. The alar topography of the nose is vascularized by terminal branches of the angular artery, a site poor in collateral branches, and is, therefore, a common area of tissue necrosis. Most of the cases reported in the literature occurred in Asia, where there is a high prevalence of filling in risky facial areas[13].

The first strategy against vascular complications from using HA is prevention. The doctor must be knowledgeable about the vascular anatomy of

Chart 4. Signs of complications x time.

Clinical findings	Time after filling
Skin pallor	Seconds Minutes
Livedo reticularis	Hours
Cyanosis	Hours to days
Blisters	Days to weeks
Barrier loss, ulceration	Dias a semanas

the topography, where infiltration of the material occurs. During an initial visit, it is crucial for patients to question their experience with previous facial procedures. Most of the face is supplied by branches of the external carotid artery, except for the forehead, the central part between the eyes and the upper part of the nose, which are supplied by the ophthalmic artery, and a branch of the internal carotid artery. The arteries involved in complications of the glabella and forehead are the supratrochlear and supraorbital arteries, both of which can lead to eye-related complications. The supra-trochlear artery is constant in most cases, varying its position by a maximum of 5mm. It starts deep in the superomedial part of the orbit and becomes subcutaneous 15 to 25 mm from the supraorbital ridge as it moves superiorly. The supraorbital artery appears at the supraorbital border, vertical to the pupil, becoming subcutaneous 15 to 20 mm above the orbital ridge, heading towards the forehead. Filling in the nasal region should be performed in the deep supraperiosteal plane, below the SAMS, thus avoiding the anastomotic venous network.

The use of cannulas for deep injection is another recommendation since it is less likely that a blind tip thin cannula penetrates an artery compared to a needle. It is prudent to always aspire before infiltrating the material and when withdrawing the needle. Avoid the infiltration of a very large volume (<0.1) of material at an exaggerated pressure, using smaller syringes for flow control, to avoid a possible reversal of flow and retrograde embolism[14].

Even after prevention strategies are undertaken, vascular complications can occur that should be treated immediately. Hyaluronidase is a mucolytic enzyme capable of degrading HA in both its natural and cross-linked form. It hydrolyzes HA, breaking its bonds, generating increased permeability in the skin and connective tissue. Its plasma half-life is approximately two minutes, with it inactivated during its passage through the liver and kidneys[15]. However, its effect on subcutaneous tissue is immediate, with a long duration, ranging from 24 to 48 hours.

In 2007, Hirsch[16] et al. reported the first case of vascular occlusion by HA filling, which reverted successfully after the use of the enzyme. In 2014,

DeLorenzi[17] developed an *in vitro* study to assess whether hyaluronidase was able to cross the intact human facial artery wall to hydrolyze the HA filler through small segments of the facial artery, which were filled with a monophasic HA, acquiring the aspect of "sausages". Then, they were immersed in 300IU of hyaluronidase (manipulated) or saline (control). Only the samples immersed in hyaluronidase displayed degradation of the filler at the end of 4 and 24 hours. Thus, the result indicated that the enzyme could hydrolyze HA even with the vessel wall intact.

Currently, the treatment for vascular accidents by HA requires the use of the enzyme in the entire extension of the lesion. However, there is no standardization of the dose in the literature. In 2007, Soparkar et al.[18] used 375IU of hyaluronidase to dissolve an HA filler in the face of a patient. In their opinion, the recommended dose should vary from 150 to 200IU of hyaluronidase for each 1ml of HA to be removed. In 2014, Rao et al.[19] exposed four types of HA fillers to various concentrations of hyaluronidase *in vitro* and concluded that the enzymatic reaction is time and dose-dependent. The literature recommends early treatment, demonstrating a considerable reduction of its effectiveness after 24h of filling[20], which may reach 50%.

We feel that a protocol is required that includes the treatment of these possible complications and adopts the abovementioned knowledge carefully. Given current scientific evidence, we propose the following protocol for treating possible vascular complications:

1. Immediately stop the procedure;
2. Use high doses of hyaluronidase in the affected area;
3. Massage the area;
4. Wait 60 minutes and reassess the possibility of new infiltration.

At the first sign of vascular involvement during the use of HA, the procedure must be stopped. The ACE GROUP, in 2018[21], recommend the immediate infiltration of hyaluronidase to prevent the progression to tissue ischemia and necrosis, since studies corroborate that the best results are with the early use of the enzyme[22], and preferably within the first 4 hours.

The literature emphasizes that it is important to avoid a sub dosage, since the progression of the complication may lead to severe cases, with irreparable consequences[23]. High doses (450-1500IU) should be infiltrated across the affected area[24], followed by a local massage to dissipate the obstruction.

In Brazil, Hyalozima® 2000utr (Apsen) is available, which must be reconstituted in 5 mL of diluent that accompanies the product, resulting in 400U per mL. Initially, 1mL is aspirated, and after adequate antisepsis and asepsis, 0.1 points must be infiltrated for every extension of the affected area, with needles between 27G and 30G, and a spacing of 3 to 4cm between the points. The application must be repeated after 60 minutes if there is no improvement in the initial framework, and may be conducted up to 4 times[25]. The product should be kept cool between 2-8 degrees to ensure its stability. Once opened, the rest of the product should be discarded.

There have been reports of severe allergic reactions to the enzyme. Therefore, patients should be observed for at least 60 minutes after the application of hyaluronidase[21]. Due to its propagation, it should not be infiltrated into areas where botulinum toxin was applied in the last 48 hours.

Patients should be reassessed daily to check for signs of improvement or regression of vascular congestion. Hyperbaric medicine can be useful, as it acts by carrying oxygen to the tissues and is increasingly being used for treating ischemia, which progresses to necrosis[26,27].

The monitoring of affected patients involves routine care with surgical wound debridement and surveillance of secondary infections. Patients diagnosed early usually have a satisfactory prognosis. Those with a delayed diagnosis are more likely to have major complications, requiring many weeks of wound care, which can result in different degrees of scarring[12].

CONCLUSION

Although not very common, complications related to the use of HA can be severe and irreversible. The most serious are vascular complications, as they can lead to irreversible sequelae. Therefore, any surgeon using HA for facial fillers must have a treatment protocol and appropriate medications available.

COLLABORATIONS

JCD	Analysis and/or data interpretation, Final manuscript approval
SVS	Analysis and/or data interpretation, Conception and design study, Data Curation, Writing - Review & Editing
ACC	Analysis and/or data interpretation
RCSD	Analysis and/or data interpretation
AAD	Analysis and/or data interpretation
RSCC	Analysis and/or data interpretation

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Original Article

Anatomical mapping of vascular anomalies of the lips

Mapeamento anatômico das anomalias vasculares dos lábios

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■ **ABSTRACT**

Introduction: The lip is the body region more often affected by vascular anomalies (VAs). Identifying the appropriate etiology of the lesion is significantly important when determining the treatment of choice for the patient. This study aimed to determine the association between the anatomical positioning and the characteristics of the lesions and the etiological diagnosis of VAs of the lips to identify the appropriate tool to be used in clinical practice. **Methods:** A retrospective analysis was performed in 150 patients with VA of the lips evaluated between 1999 and 2017. The etiological diagnosis was based on the International Society for the Study of Vascular Anomalies 2014 classification. Clinical and photographic analysis was performed to assess the anatomical pattern of involvement and map the lesions. **Results:** An infantile hemangioma was observed to a lesser extent in only one lip and was situated more centrally, with rare involvement of the labial commissure. Venous and venous-lymphatic malformations and arteriovenous malformations (AVMs) involving the upper lip were predominantly located more laterally and caused significant deformity. However, AVMs more often extended beyond the limits of the vermilion. Capillary malformations were observed in the entire lower lip in some patients. Simple lymphatic malformations were observed in the entire upper lip with significant distortion in some patients. **Conclusion:** The initial presentation of VAs often comprises minimal changes; hence, establishing an assertive diagnosis is considered difficult. Specific patterns of involvement were observed for each etiological diagnosis studied. Anatomical mapping can be used as an auxiliary diagnostic tool and can possibly identify an appropriate clinical intervention in patients with VAs of the lip.

Keywords: Hemangioma; Lip; Multiple abnormalities; Vascular tissue tumors; Congenital abnormalities.

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■ **RESUMO**

Introdução: O lábio é a região do corpo mais frequentemente acometida por anomalias vasculares (AV). A correta determinação da etiologia da lesão é determinante à escolha do tratamento do paciente e à correta condução do caso. O objetivo deste estudo é correlacionar o posicionamento anatômico e as características das lesões com o diagnóstico etiológico das AVs dos lábios, a fim de promover uma ferramenta que auxilie na prática clínica. **Métodos:** Análise retrospectiva de 150 pacientes com AV dos lábios, avaliados entre 1999 e 2017. O diagnóstico etiológico foi baseado na classificação de ISSVA 2014. Análise clínica e fotográfica foi realizada para avaliar o padrão anatômico de envolvimento e mapear as lesões. **Resultados:** Hemangioma infantil apresentou acometimento de apenas um lábio, em menor extensão e situado mais centralmente, com raro envolvimento de comissura oral. Malformações venosas e venolinfáticas (MVs) e malformações arteriovenosas (MAVs) envolveram o lábio superior predominantemente, situadas mais lateralmente e acarretando significativa deformidade. Contudo, MAVs apresentaram mais frequente extensão além dos limites do vermelhão. Os pacientes com malformações capilares (MCs) sofriam de acometimento integral do lábio inferior. Todos os casos de malformações linfáticas exclusivas (MLs) envolveram o lábio superior inteiro, com grande distorção. **Conclusão:** A apresentação inicial das AVs muitas vezes consiste em pequenas alterações, desafiadoras ao diagnóstico assertivo. Padrões específicos de acometimentos foram observados para cada diagnóstico etiológico estudado. O mapeamento pode ser utilizado como ferramenta auxiliar diagnóstica e contribuir para melhor intervenção nos pacientes com anomalias vasculares labiais.

Descritores: Hemangioma; Lábio; Anormalidades múltiplas; Neoplasias de tecido vascular; Anormalidades congênitas.

INTRODUCTION

According to the International Society for the Study of Vascular Anomalies (ISSVA) classification, vascular anomalies (VAs) are categorized into the following two main groups: tumors and malformations. Infantile hemangioma (IH) is the most common vascular tumor, while congenital malformations are defined according to the presence of a venous, lymphatic, arteriovenous, and capillary component or the combination thereof[1-5]. For the past years, the consensus on the terminology and classification of these lesions was unclear, with negative clinical outcomes on the therapeutic strategies performed, which were often applied in a heterogeneous and nonparameterized manner, increasing the iatrogenic effects of these lesions. After the standardization of the ISSVA, different treatment options were compared, and each etiological diagnosis was associated with a gold standard procedure. The diagnosis of a VA is essentially clinical and is based on anamnesis and careful physical examination. Radiological examinations are required in selected situations[3,6].

VAs are the most common congenital abnormalities of the soft tissues, affecting up to 10% of newborns. They are observed in any region of the body, but are more common in the head and neck than in the extremities. The lips are the body region most frequently affected by VAs [5,7,8]. Considering their central position on the face, they are particularly visible, which creates a significant esthetic stigma, which tends to worsen as the patient grows. Additionally, VAs can potentially involve the oral muscles, resulting in functional problems, such as improper speech, oral incontinence, and impairment in facial mimicry[5,7,9].

The pattern of involvement in the lip can be related to the etiology of the lesion, but only few studies have been conducted confirming this hypothesis[7,10,11]. Based on a large number of cases, this study aims at evaluating this association, contributing to a better diagnosis and management of patients with VAs of the lips.

METHODS

This was a case series conducted between 1997 and 2017 in a single Vascular Anomalies Service in São Paulo, Brazil. The present study was approved by the institutional ethics committee (protocol number 1.630.646), and patients' parents or guardians provided informed consent for inclusion in the study.

A total of 150 patients with VAs of the lips were included and evaluated by photographic analysis. Based on the ISSVA 2018 classification, the etiological diagnosis was defined by clinical evaluation, complementary tests, and biopsies, as needed. The following data were collected: type of VA, age, sex, lip involved (top/bottom/both), involvement of the labial commissure (central, lateral, central side, whole), extension (25% to 100%), involvement beyond the vermillion, and distortion of the lips (Figure 1). To compare the prevalence of IH, patients were divided by age into the following two groups: patients aged less than 7 years and patients aged greater than 7 years. An anatomical mapping of the lesions was performed, and the association between the lesions and the etiological diagnosis was assessed. The individual values were established to create heat maps for better visualization. Warmer colors represented the areas of higher incidence of the vascular anomaly represented.

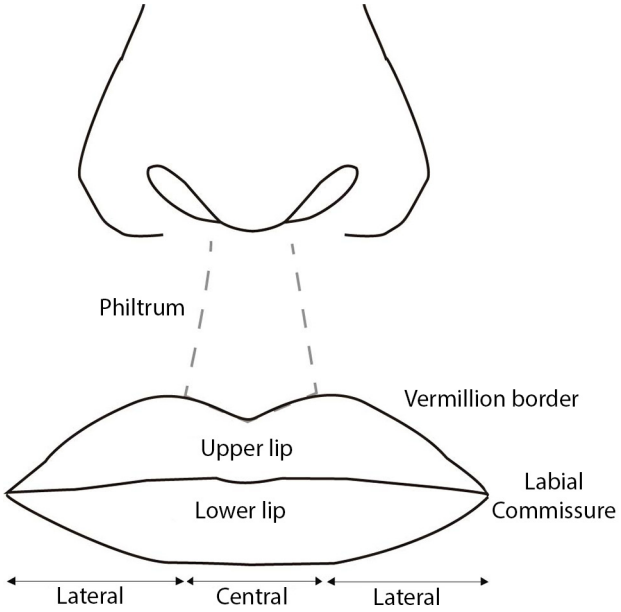

Figure 1. Anatomical landmarks of the lips

The data were grouped using MS Office 2013 and analyzed using the Statistical Package International Business Machines Corporation Statistical Package for the Social Sciences version 2–3.0. The likelihood ratio test was used, with a significance level of 5% (0.050).

RESULTS

A total of 150 patients (95, women; 55, men) were included in the study. Of these, 76 were diagnosed with IH, 35 with venous and venous-lymphatic malformations (VMs), 20 with arteriovenous malformations (AVMs), 16 with capillary malformations (CMs), and 3 with simple lymphatic malformations (LMs). A female predominance was related to a higher prevalence of IH (60% of 95 patients, female to male ratio = 1.7:1). Other vascular tumors in addition to IH were not observed. The results are shown in Table 1 and summarized in Figure 2.

Regarding the distribution per age group, 82 patients (54%) were younger than 7 years. Within this subgroup, 79% of the patients were diagnosed with IH. Vascular malformations were more prevalent in patients aged greater than 7 years (71.4% of VMs, 85% of AVMs, and 87.5% of CMs).

VAs were observed in both lips, but they were slightly more frequent in the upper lip (54%) than in the lower lip. The majority of patients (64.6%) presented with involvement of up to 50% extension of the lip. The most commonly affected was the center-lateral portion (40.6%), followed by the involvement of the lateral portion of the lip alone (23.3%). The involvement of the commissure was observed in 29.33% of patients. The involvement of the skin, that is, beyond the vermillion, was observed in 68.6% of patients. A distortion of the lip was observed in 85.33% of patients.

Considering only the group of vascular tumors, 85% of the patients were aged younger than 7 years. The pattern of involvement for IH was of only one lip, equally distributed between the upper and lower lip. The majority of the deformities caused lip distortion and extension beyond the vermillion. Some differences were observed between the upper and lower lip: in the upper lip, the lesions were often smaller and more centrally located compared to the lower lip, while the lower lip showed a higher degree of heterogeneity than the upper lip. Older patients were diagnosed with IH in the involuted phase. The pattern of involvement of IH is presented in Table 1 and summarized in Figure 3.

Different patterns were observed for each specific etiology of vascular malformations. Most patients were aged older than 7 years (77%). VMs were predominantly observed in the upper lip and were located more laterally. An impairment of 25% to 75% due to lip extension was observed, with significant deformity of its structure. Almost half of the patients had malformations that extended beyond the edges of the vermilion. Table 1 presents the data, and Figure 4 summarizes the pattern of involvement of VMs.

The AVMs were slightly more frequent in the upper lip than in the lower lip. The center-lateral

Table 1. Anatomical patterns of vascular anomalies of the lips.

Affected lip	**IH**		**VM**		**AVM**		**CM**		**LM**		**Total**
	Freq.	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**
Upper	38	46.91	23	28.40	13	16.05	4	4.94	3	3.70	81
Lower	38	55.88	12	17.65	7	10.29	11	16.18	0	0.00	68
Both	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00	1
Total	76	50.67	35	23.33	20	13.33	16	10.67	3	2.00	150
Location	IH		VM		AVM		CM		LM		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.
Central	25	83.33	5	16.67	0	0.00	0	0.00	0	0.00	30
Lateral	16	45.71	13	37.14	6	17.14	0	0.00	0	0.00	35
C+L	26	42.62	17	27.87	13	21.31	4	6.56	1	1.64	61
Whole	9	37.50	0	0.00	1	4.17	12	50.00	2	8.33	24
Total	76	50.67	35	23.33	20	13.33	16	10.67	3	2.00	150
Involvement of the labial commissure	IH		VM		AVM		CM		LM		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.
Yes	7	15.91	13	29.55	9	20.45	15	34.09	0	0.00	44
No	69	65.09	22	20.75	11	10.38	1	0.94	3	2.83	106
Total	76	50.67	35	23.33	20	13.33	16	10.67	3	2.00	150
Extension	IH		VM		AVM		CM		LM		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.
< 25%	31	63.27	13	26.53	5	10.20	0	0.00	0	0.00	49
25%–50%	27	56.25	10	20.83	8	16.67	3	6.25	0	0.00	48
> 75%	9	31.03	12	41.38	6	20.69	1	3.45	1	3.45	29
100%	9	37.50	0	0.00	1	4.17	12	50.00	2	8.33	24
Total	76	50.67	35	23.33	20	13.33	16	10.67	3	2.00	150
Involvement of the skin	IH		VM		AVM		CM		LM		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.
Yes	53	51.46	19	18.45	15	14.56	15	14.56	1	0.97	103
No	23	48.94	16	34.04	5	10.64	1	2.13	2	4.26	47
Total	76	50.67	35	23.33	20	13.33	16	10.67	3	2.00	150
Distortion	IH		VM		AVM		CM		LM		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.
Yes	62	48.44	32	25.00	19	14.84	12	9.38	3	2.34	128
No	14	63.64	3	13.64	1	4.55	4	18.18	0	0.00	22
Total	76	50.67	35	23.33	20	13.33	16	10.67	3	2.00	150

IH: Infantile Hemangioma; VM: Venous and Venous-Lymphatic Malformations ; AVM: Arteriovenous Malformations; CM: Capillary Malformations; LM: Simple Lymphatic Malformations.

portion of the lip was affected in the majority of patients, from 25% to 75% of their extension. A frequent involvement of the labial commissure and lip distortion were observed. The majority of the AVMs extended beyond the limit of the vermilion. The anatomical pattern is described in Table 1 and illustrated in Figure 5.

CMs predominantly affected the lower lip. All patients had full involvement of the lip, and 75% of the patients presented volume distortion (Figure 6). LMs involving the upper lip were observed in only three patients, with almost full extension and large distortion.

Some statistically significant differences were observed when comparing the tumors to the vascular malformations. The IHs were located more centrally ($p=0.001$), with rare involvement of the labial commissure ($p=0.001$), and were smaller than the vascular malformations ($p=0.02$). These results are shown in Figure 7.

Vascular Anomalies	Lip Involved	Segment Involved	Involvement Percentage	Involvement of the Labial Commissure	Involvement of the skin	Lip Distortion
Infantile Hemangioma	Sup = Inf	Central/ Central+ Lateral	<50%	+	+++	++++
Venous and Venous-lymphatic Malformations	Inf 1,5 : 2,5 Sup	Lateral	25-75%	++	+++	++++
Arteriovenous Malformations	Inf 1,5 : 2,5 Sup	Lateral	25-75%	++	+++	++++
Capillary Malformations	Inf 1,5 : 2,5 Sup	Total	75-100%	++++	++++	+++
Lymphatic Malformations	Superior	Total	75-100%	+	++	++++

0-25%: + 25-50%: ++ 50-75%%: +++ 75-100%: ++++

Figure 2. Summary of anatomical pattern of involvement of vascular malformations

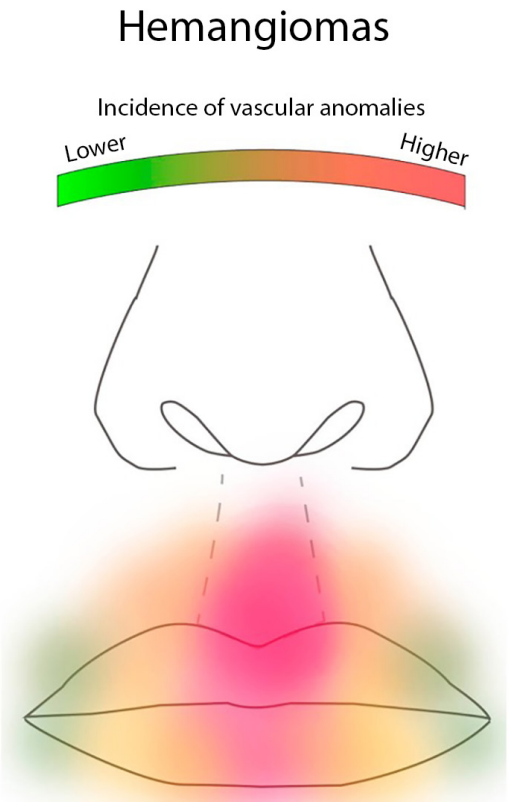

Figure 3. Pattern of involvement of infantile hemangiomas.

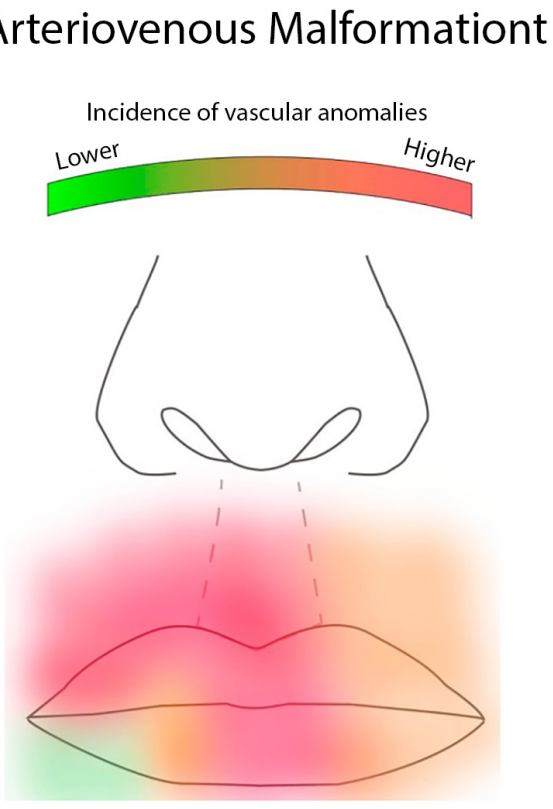

Figure 5. Pattern of involvement of arteriovenous malformations.

DISCUSSION

More than two-thirds of VAs are found in the head and neck region. When one considers the lips as a single unit, this region of the body has the highest prevalence of VAs[5,7]. A proper diagnosis is crucial for the proper management of patients to minimize the esthetic and functional impairment caused by VAs[5,6,7]. In clinical practice, treatment of VAs is often performed by nonspecialists. Consequently, any medical tool that assists in the differential diagnosis will allow for a faster referral to specialized healthcare professionals, resulting in a better management for patients with VAs.

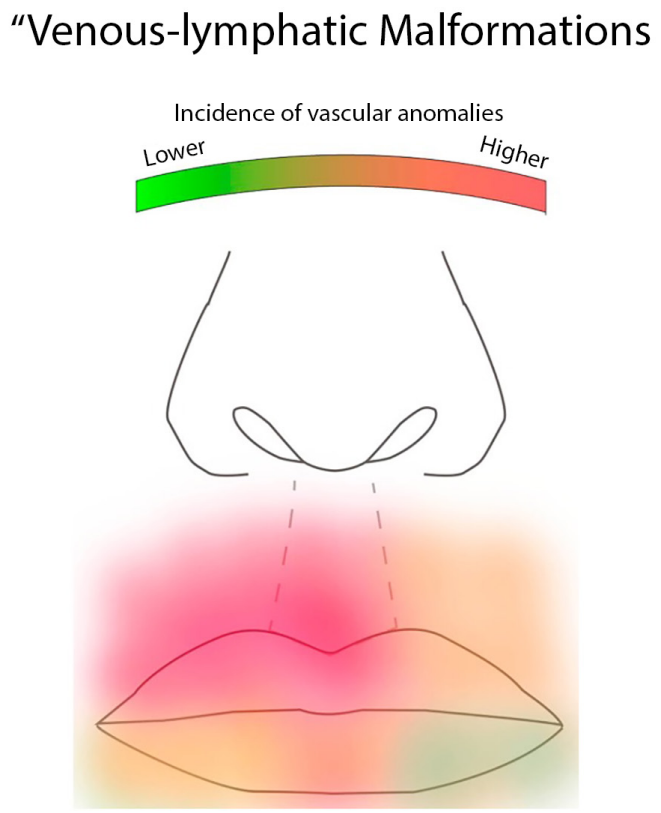

Figure 4. Pattern of involvement of venous and venous-lymphatic malformations.

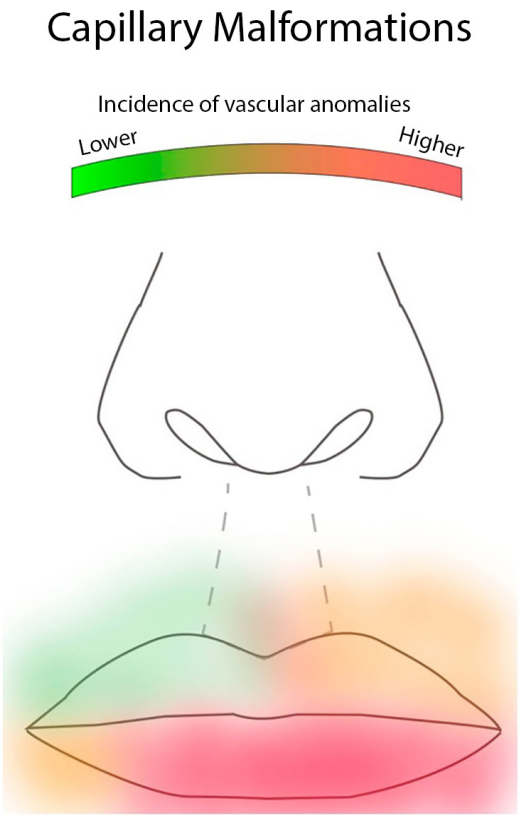

Figure 6. Pattern of involvement of capillary malformations.

The anatomical location may assist in the definition of the etiology of a VA. The treatment of VAs differs considerably in accordance with the established diagnosis. If an expectant management is preferred in vascular tumors such as IH, insufficient treatment of vascular malformations allows its expansion, deforming the location and resulting in a remarkable increase in the difficulty of treatment[12,13,14]. Currently, pharmacological treatment is particularly important in the treatment of VAs, and the therapeutic choice is specific for each etiology[15].

The surgical resection of VA of the lips can be one treatment option. The anatomical site is crucial when planning the procedure. Reconstruction after the resection aims at correcting contour deformities, rebuilding the labial commissure, and restoring the competence of the lips. The type of resection (complete or partial) and the prospect of recurrence of the lesion also depend on the etiological type of lesion[13].

This study revealed the anatomical pattern of involvement of the VAs of the lips and, more intensively, its association with the etiological diagnosis (Figure 2). The initial presentation of VAs often comprises minimal changes; hence, establishing an assertive diagnosis is considered difficult. Accordingly, the anatomical pattern of involvement is considered beneficial, specifically in mixed malformations where a profound component of the lesion can be neglected. Thus, the combination of clinical characteristics and anatomical location potentially reduces the diagnostic error and results in better treatment [14,15].

The use of images to summarize clinical concepts is gradually accepted in modern medicine. Heat maps are often used to represent complex statistical data. In this study, they were used to reveal the complex distribution of VAs in a concise and practical manner[16].

Although there are some limitations in this study, such as the retrospective pattern of data collection, an anatomical pattern of distribution can be identified. The main goal was achieved and is expected to minimize the diagnostic error, with a rapid referral of the patient to an appropriate treatment.

CONCLUSION

Anatomical patterns of involvement of the lips were identified for each vascular anomaly. Thus, a tool was created to assist in the diagnosis of patients and to provide better therapeutic management.

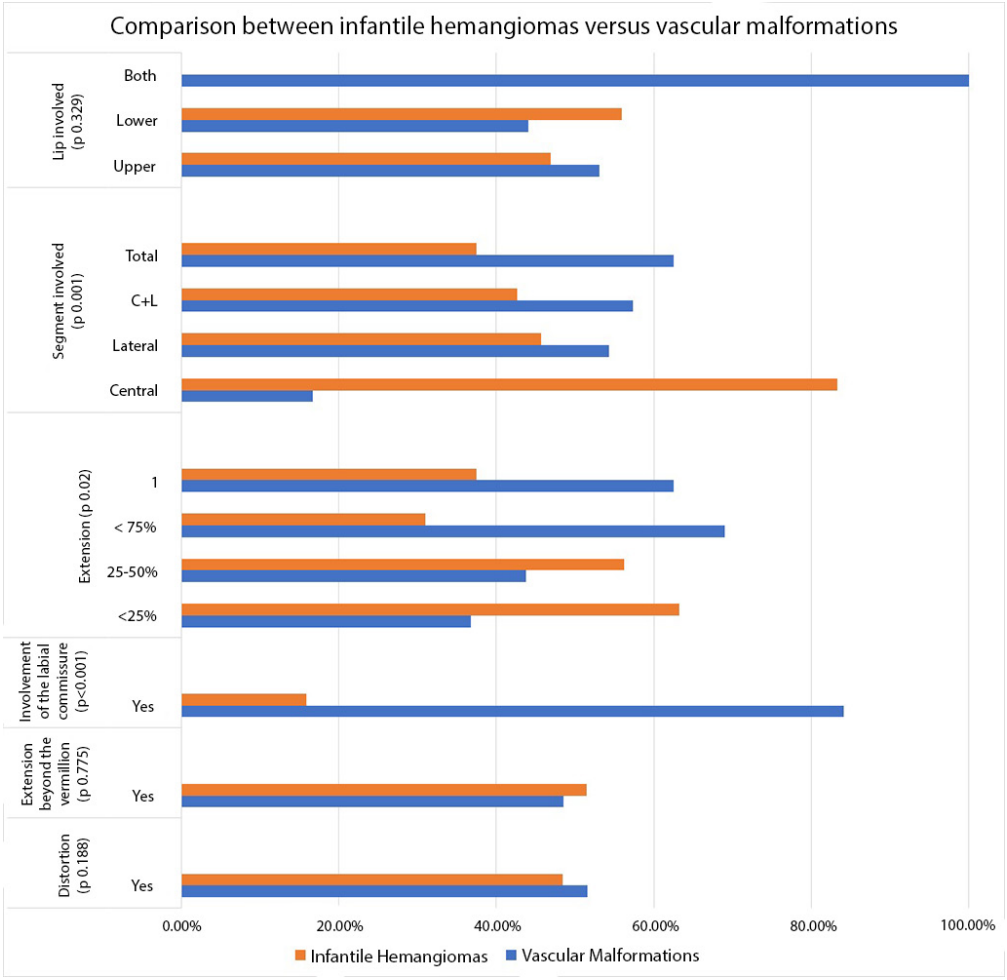

Figure 7. Comparison between infantile hemangiomas versus vascular malformations.

COLLABORATIONS

RFZ Analysis and/or data interpretation, Conception and design study, Data Curation, Final manuscript approval, Formal Analysis, Project Administration, Writing - Review & Editing

DCG Analysis and/or data interpretation, Conception and design study, Final manuscript approval, Project Administration, Supervision, Writing - Original Draft Preparation, Writing - Review & Editing

AK Analysis and/or data interpretation, Conception and design study, Data Curation, Final manuscript approval, Realization of operations and/or trials

EMC Analysis and/or data interpretation, Conception and design study, Data Curation, Final manuscript approval

RG Final manuscript approval, Supervision, Writing - Review & Editing

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Original Article

Primary palatoplasty using the von Langenbeck technique: surgical experience and aesthetic results of 278 cases

Palatoplastia primária pela técnica de Von Langenbeck: experiência e resultados morfológicos obtidos em 278 casos operados

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■ **ABSTRACT**

Introduction: Palatoplasty with elevated bilateral mucoperiosteal flaps using the von Langenbeck technique associated with intravelar veloplasty is a common procedure with low rates of oronasal fistula (ONF) and velopharyngeal insufficiency. The objective is to present the author's surgical experience and the incidence of ONF among 278 patients who underwent primary palatoplasty using the von Langenbeck technique associated with intravelar veloplasty. **Methods:** This retrospective study analyzed the medical records of 278 patients who underwent primary palatoplasty at the Mário Covas Treatment Center for Craniofacial Malformations of the Guilherme Álvaro Hospital located in the municipality of Santos, São Paulo, Brazil, between May 2010 and May 2018. **Results:** A total of 278 primary palatoplasty procedures were performed; of them, 225 (80.9%) were performed in two surgical stages and 53 (19.1%) in one surgical stage. The study population included 182 men (65.5%) and 96 women (34.5%). The prevalence of left and bilateral cleft lip and palate was 26.3% and 27%, respectively, and the prevalence of bilateral cleft palate, and right cleft lip and palate was 37.4% and 7.6%, respectively. Sixty-one patients had ONF (21.94%), the incidence of which decreased progressively throughout the study period. **Conclusion:** Primary palatoplasty, using the von Langenbeck technique associated with intravelar veloplasty, is reproducible when performed in one or two surgical stages, and considered safe when the learning curve is reached with a complication rate similar to those in the literature.

Keywords: Cleft palate; Oral fistula; Surgery, Plastic; Velopharyngeal insufficiency; Palate, Soft; Palate, Hard; Palatal muscles.

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■ **RESUMO**

Introdução: A palatoplastia com elevação de retalhos mucoperiostais bipediculados pela técnica de Von Langenbeck associada a veloplastia intravelar é técnica mais utilizadas na atualidade apresentando na literatura baixa taxa de fístula oronasal e de insuficiência velofaríngea. O objetivo é apresentar a experiência acumulada do autor e avaliar a incidência de fístula oronasal após 278 casos de palatoplastia primária, pela técnica de Von Langenbeck associada a veloplastia intravelar. **Métodos:** Estudo retrospectivo de 278 prontuários de pacientes submetidos à palatoplastia primária no Centro de Tratamento de Malformações Craniofaciais Mário Covas - Hospital Guilherme Álvaro - Santos/SP, entre de maio de 2010 a maio de 2018. **Resultados:** 278 procedimentos de palatoplastia primária pela técnica relatada, 225 (80,9%) em duas etapas cirúrgicas e 53 (19,1%) em única etapa. Masculino 182 (65,5%) e feminino 96 (34,5%). Fissuras labiopalatais esquerda e bilaterais (26,3% e 27%, respetivamente). As fissuras palatais completas corresponderam a 37,4% e a fissura labiopalatal direita com 7,6%. 61 pacientes apresentaram fístula oronasal (21,94%) observando-se uma diminuição progressiva da incidência em cada período. **Conclusão:** A palatoplastia primária pela técnica de Von Langenbeck associada à veloplastia intravelar é uma técnica reprodutível em uma ou duas etapas cirúrgicas e pode ser considerada segura quando alcançada uma adequada curva de aprendizado apresentando um índice de complicações acorde com a literatura mundial.

Descritores: Fissura palatina; Fístula bucal; Cirurgia plástica; Insuficiência velofaríngea; Palato mole; Palato duro; Músculos palatinos.

INTRODUCTION

Among the congenital craniofacial malformations, cleft lip and palate (CLP) is the most common and occurs in 1 of every 650 births in Brazil[1]. CLP may cause functional limitations in speech, difficulty eating and breathing, and negative social and psychological consequences during adulthood.

The palate acts as an anatomical barrier that separates the oral cavity from the nasal cavity. Together with other structures of the pharynx, it contributes to the function of the velopharyngeal sphincter by assisting in speech and feeding. Without the normal function of these structures, patients with cleft palate may develop changes such as nasal air leak and food reflux through the nose[2]. Moreover, patients with CLP have social adaptation problems because of their physical appearance.

CLP is classified according to the affected region into pre-foramen (lips and primary palate), transforamen (primary and secondary palate), and post-foramen. Therefore, the submucosal cleft should be identified in cases of bifid uvula, and cleft palate size can be classified as narrow, normal, or wide.

The history of palatoplasty is long, dating from 1760[3], with significant progress in clinical research, and most techniques are based on mobilization of the axial flaps supplied by the greater palatine artery. Von Langenbeck[4] (1862) described the use of bilateral mucoperiosteal flaps without reconstruction of the intravelar muscle or palatal stretching, leading to the development of the push back techniques described by Veau (1931)[5] and Wardill and Killner (1937)[6,7].

Repair of the soft palate requires dissection of the palatal muscles and repositioning of the levator veli palatini muscle with or without manipulation of the palatoglossal and palatopharyngeal arches and tensor veli palatini muscle for reconstructing the muscle sheath[8]. Braithwaite[9] (1964) and Kriens[10] (1969) defined "intravelar veloplasty" as the rotation and terminoterminal anastomosis of the levator veli palatini muscle to the tensor veli palatini muscles to improve the functional results of palatoplasty[11]. This technique was modified by Cutting et al.[12] (1995) and Sommerlad et al.[13] (2002). Furlow Junior[14] (1986) described double-opposing Z-palatoplasty and found that it achieved good functional results in the nasal and oral lining with lower rates of velopharyngeal insufficiency (VFI).

Regardless of the technique used, the objectives of palatoplasty are to: 1) Stretch the palate to minimize the incidence of VFI and promote adequate speech development; 2) Minimize the restriction of maxillary and alveolar growth; and 3) Prevent complications, including oronasal fistulas (ONFs).

OBJECTIVE

To present the author's experience and the incidence of ONF in 278 cases of primary palatoplasty using the von Langenbeck technique associated with intravelar veloplasty.

METHODS

This retrospective study reviewed the medical records of all patients treated surgically at the Mário Covas Treatment Center for Craniofacial Malformations, Guilherme Álvaro Hospital, Santos, São Paulo, Brazil, between May 2010 and May 2018.

The inclusion criteria were diagnosis of cleft palate (CP) or CLP associated or not with syndromes (excluding cases of cleft soft palate) and treated with primary palatoplasty using the described technique performed by the same surgeon (the author).

A total of 278 records were selected, and the following data were obtained:

- Diagnosis: right, left, or bilateral CLP corresponding to trans-foramen clefts; and bilateral CP, corresponding to post-foramen clefts;
- Sex (male/female)
- Race (Caucasian, mixed, or Black);
- Patient age (in months) at the time of primary palatoplasty;
- Surgical stage of primary palatoplasty (one or two);
- Clinical course with ONF (yes/no) during the 6-month follow-up period after the last procedure.

The data collected over the 8-year study period (May 2010 to May 2018) were organized and recorded in an Excel spreadsheet, and the data on the appearance of ONF were analyzed in eight 1-year periods based on the date of the last surgery.

Phonation results were not included in the analysis because the objective of this study was to evaluate the aesthetic results and the incidence of ONF.

RESULTS

A total of 278 primary palatoplasty procedures using the von Langenbeck technique associated with intravelar veloplasty were evaluated, including 225 (80.9%) performed in two surgical stages (soft palate first, followed by hard palate) and 53 (19.1%) performed in one surgical stage.

The study population included 182 (65.5%) men and 96 (34.5%) women.

In preoperative diagnoses, the incidence of left and bilateral CLP was 26.3% and 27%, respectively, while that of complete CP and right CLP was 37.4% and 7.6%, respectively. A total of 157 patients (56.4%) were Caucasian, 107 (38.4%) were mixed, and 14 (5.04%) were Black. The average age at the time of primary palatoplasty was 17.2 months.

Postoperative complications included total suture dehiscence (2 cases [0.7%]), postoperative bleeding (4 cases [1.44%]), and infection (2 cases [0.72%]). There were no cases of flap necrosis.

ONF occurred in 61 patients (21.94%) during the study period, and the incidence decreased progressively. The incidence of ONF in the first 1-year period (May 2010 to May 2011) and the last 1-year period (May 2017 to May 2018) was 25.00% and 18.75%, respectively (Table 1).

Table 1. Incidence of oronasal fistula (ONF) among during 8-year study period since May 2010 and May 2018.

Period	Patients	Fistula	%
May 2010 - May 2011	4	1	25.00
May 2011 - May 2012	7	2	28.57
May 2012 - May 2013	36	9	25.00
May 2013 - May 2014	35	9	25.71
May 2014 - May 2015	47	11	23.40
May 2015 - May 2016	49	10	20.41
May 2016 - May 2017	52	10	10.23
May 2017 - May 2018	48	9	18.75
Total	278	61	21.94

Data on ONF for the primary and secondary palates were included in the study, although their site of occurrence was not determined.

Surgical technique

Patients undergoing primary palatoplasty are treated surgically at 6–18 months of age depending on the ease of follow-up. In cases of trans-foramen clefts, primary cheiloplasty is performed in patients older than 3 months and primary palatoplasty can be performed 6 months later using the von Langenbeck technique with or without a vomer flap. Cheiloplasty was not performed together with primary palatoplasty in this population.

CP type was classified as narrow, normal, or wide; in narrow clefts, the procedure was performed

in one surgical stage, while in normal or wide clefts, it was performed in two stages (soft palate first, hard palate 6 months later).

All patients underwent surgery while under general anesthesia and orotracheal intubation under direct vision. A Dingman mouth gag was positioned after adequate visual inspection (Figure 1).

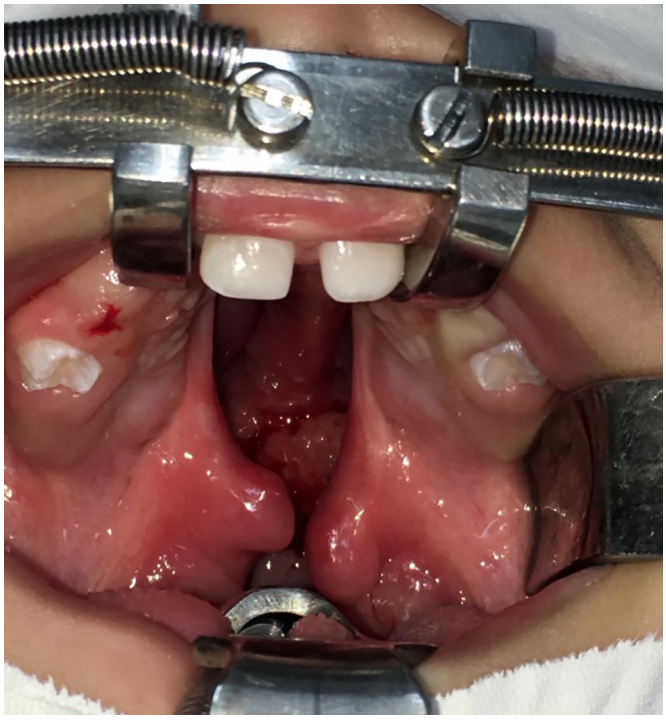

Figure 1. Preoperative aspect of a bilateral transforamen cleft.

The edges of the cleft were demarcated on the soft palate, which was infiltrated with 2% lidocaine combined with a vasoconstrictor (1: 200,000) for topical anesthesia. An incision was made on the edges, and the plane of the oral and nasal mucosa was dissected to release the anterior insertion of the levator veli palatini muscle bilaterally and, if necessary, the insertion of the tensor veli palatini muscle. The nasal mucosa was closed and the cleft uvula was repaired. The levator veli palatini muscle was closed and sutured with U-shaped Vicryl® 4-0 sutures, while the oral mucosa was sutured with U-shaped Vicryl® 5-0 sutures.

Relaxing incisions and vomer flaps were demarcated in the second surgical stage (Figure 2), and the incision sites and hard palate were infiltrated with 2% lidocaine combined with a vasoconstrictor (1: 200,000) for topical anesthesia.

Bilateral relaxing incisions were made on the medial hard palate at the alveolar crest according to the von Langenbeck procedure.

The bilateral mucoperiosteal flaps were elevated, the pedicle of the greater palatal artery was identified,

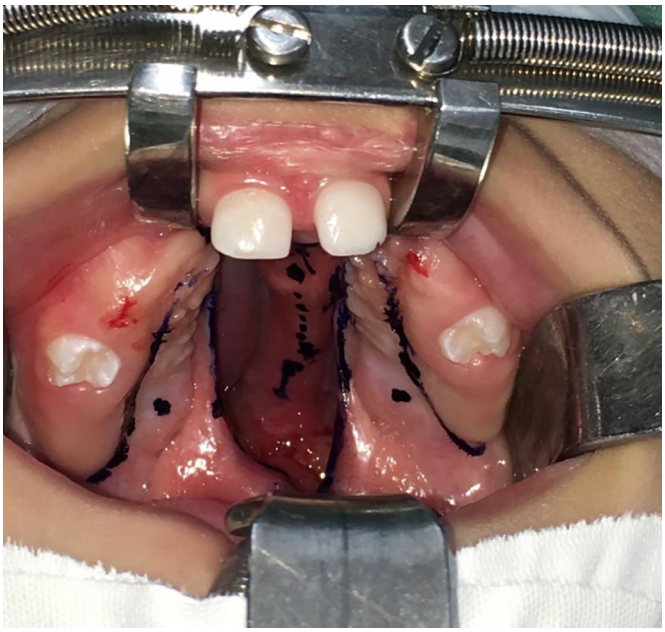

Figure 2. Preoperative markings.

and the nasal mucosa of the hard palate was dissected (Figure 3).

In wide and normal clefts, unilateral or bilateral mucoperiosteal flaps of the vomer were elevated to close the nasal lining (Figures 4 and 5).

The mucoperiosteal flaps were closed, and the oral mucosa was sutured with U-shaped Vicryl 5-0 sutures (Figures 6 and 7).

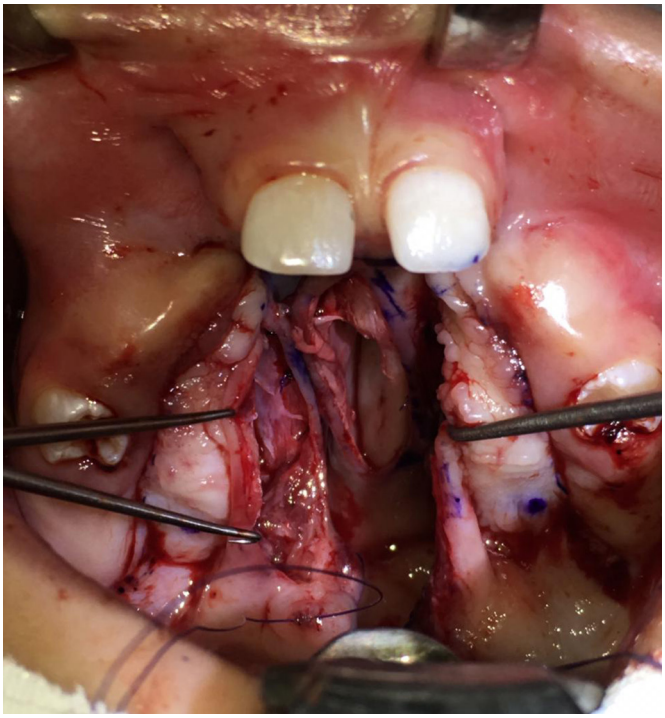

Figure 3. Visualization of the pedicle of the greater palatal artery after elevation of the bilateral mucoperiosteal flaps.

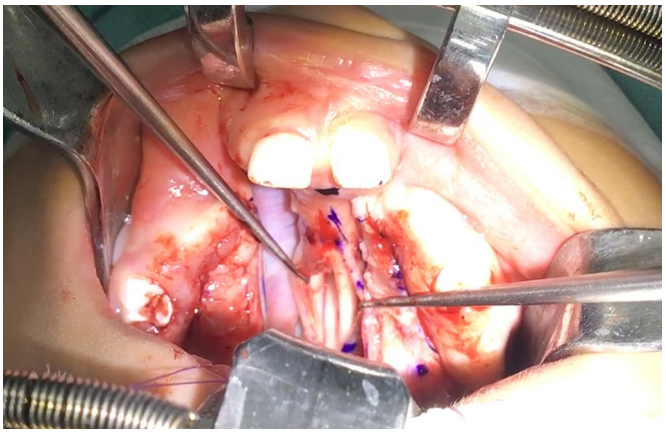

Figure 4. Elevation of the vomer flaps.

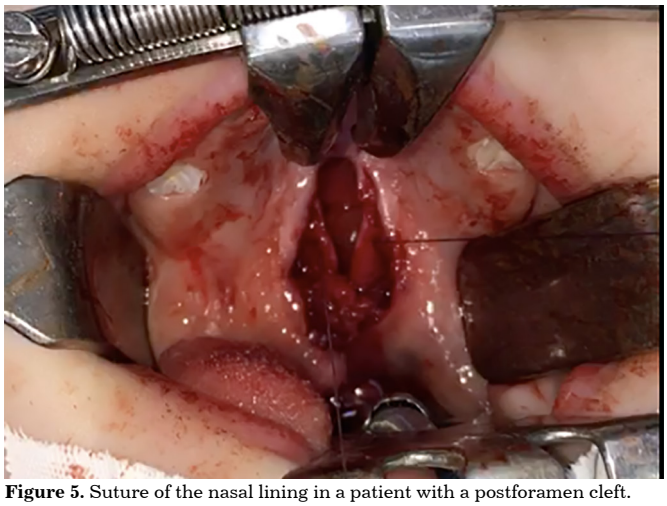

Figure 5. Suture of the nasal lining in a patient with a postforamen cleft.

Hemostatic dressings remained at the site of the relaxing incisions only in cases in which the open area was large because they did not impair healing, although they had no demonstrable benefit (Figures 8 and 9).

The steps mentioned above were performed simultaneously in cases of primary palatoplasty in a single surgical step.

DISCUSSION

The controversial aspects of palatoplasty include the ideal age at the time of primary surgery to interfere as little as possible with facial growth and allow adequate speech development.

CLP affects facial bone growth, allowing the development of trends and different protocols for its repair as well as surgical repair in one or two surgical stages[15,16] without affecting mandibular growth[17].

There is no consensus on the ideal age for primary palatoplasty. In our protocol, this surgery was performed at the age of 6–18 months in one stage or alternatively one stage for narrow clefts and two stages for normal and wide clefts.

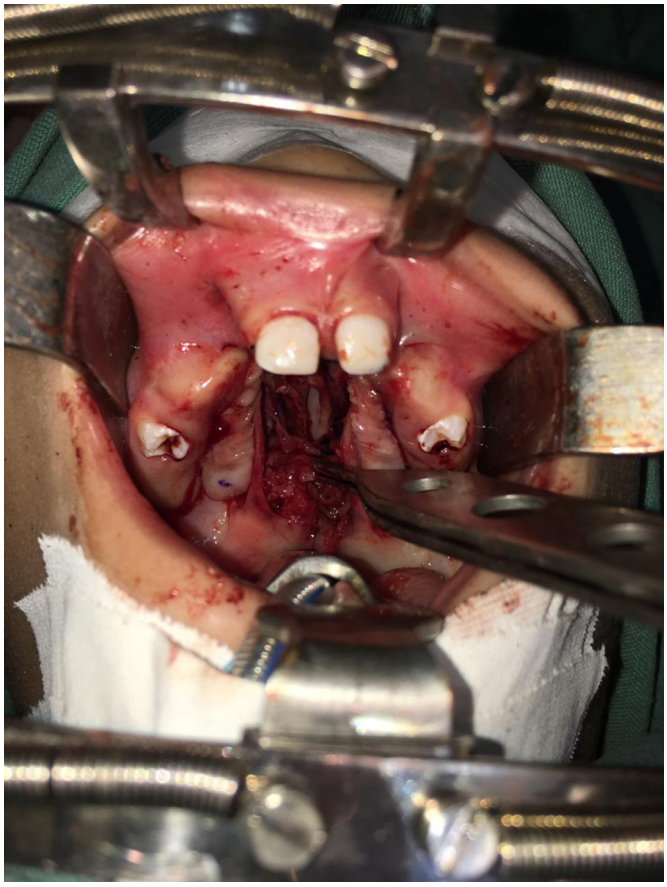

Figure 6. Posterior rotation of the levator veli palatini muscle.

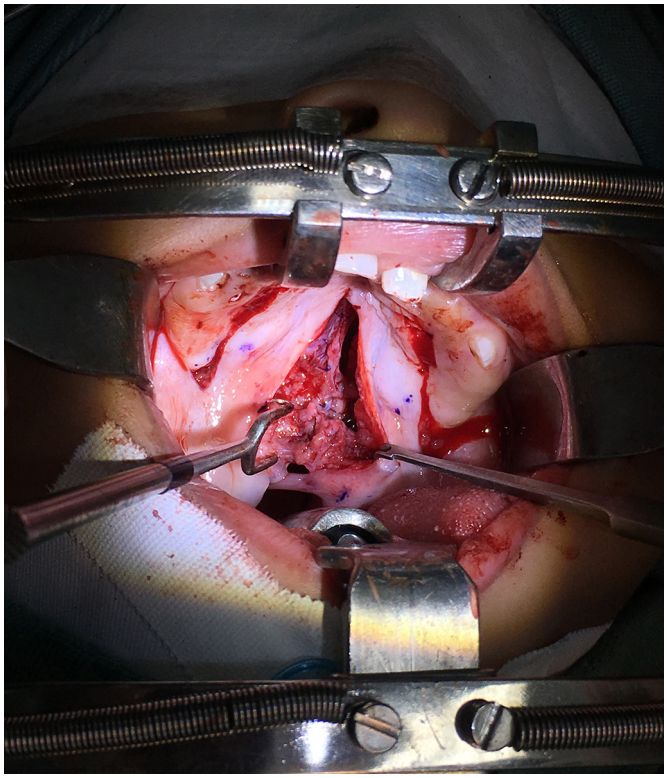

Figure 7. Intravelar veloplasty.

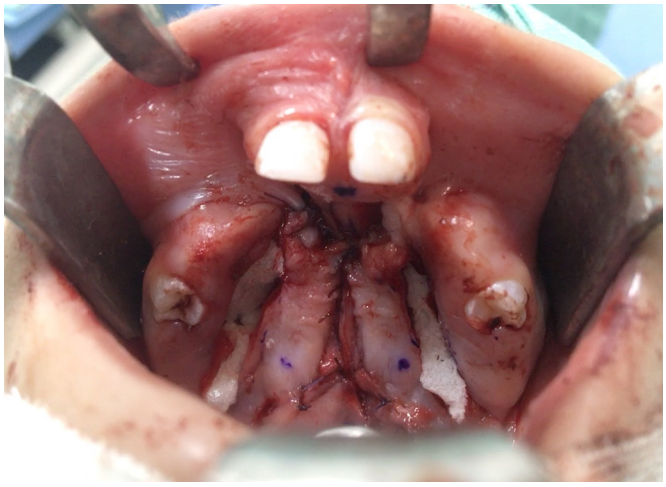

Figure 8. Immediate postoperative period of palatoplasty using a vomer flap and the von Langenbeck technique associated with intravelar veloplasty in a patient with a bilateral transforamen cleft.

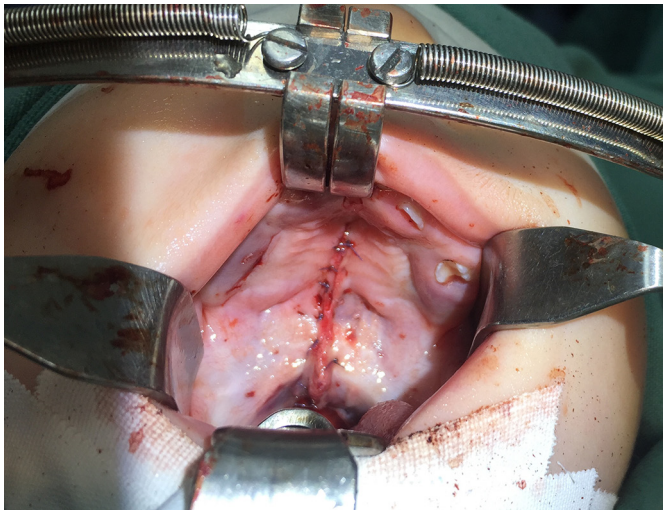

Figure 9. Aspect of the cleft immediately after surgery.

Despite being the oldest technique, von Langenbeck's palatoplasty is still used and a good option for wide and incomplete clefts because it is simple and facilitates dissection[18,19]. Palatoplasty combined with repair of the nasal lining and muscle sheath is safe and has a low rate of ONF[20]. The occurrence of ONF depends on patient age[21], cleft type and extent[22], association with syndromes[23], surgeon experience, and factors that affect the surgical outcome including suture tension, bleeding, and infection[20].

The incidence of ONF depends on surgical timing, and the primary surgery can be delayed because of the limited access to health services as demonstrated in our sample by the significant difference in patient age at the time of the first surgery. Surgeon experience also plays a fundamental role given that the author's learning curve improved over time (Figure 10). The sample was evaluated in eight 1-year periods from May 2010 to May 2018. The incidence of ONF in the first and last periods was 25% and 18.75%, respectively, and the average incidence throughout the study period was 21.94%, which agrees with data in the literature. It should be noted that all ONFs present at 6 months postoperative were identified, including those located anterior to the incisive foramen given that some studies disregarded them.

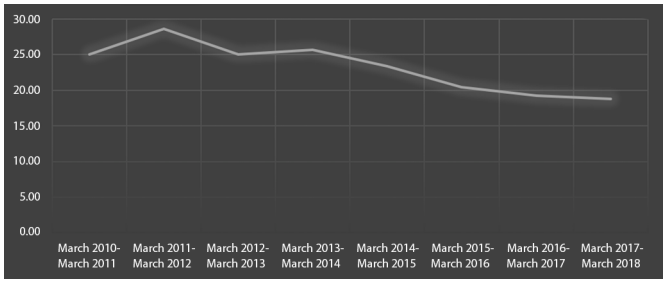

Figure 10. Curva shows incidence which decreased progressively a complication as ONF among during 8-year study.

The reported incidence of ONF is 0–60%, and the incidence in Brazil is 15.3%[24].

ONF can be classified as symptomatic or non-symptomatic; the former does not always require surgical management. However, in this case series, all ONFs located posterior to the incisor foramen were operated upon at 6 months after definitive surgery using different techniques according to their size and location because their description is beyond the scope of this study.

CONCLUSIONS

Primary palatoplasty using the von Langenbeck technique associated with intravelar veloplasty was reproducible in our service when performed in one or two surgical stages. Although the incidence of ONF was higher than that reported in the literature, this surgical procedure is considered safe when the learning curve is reached and improves the aesthetics of CP.

COLLABORATIONS

MRM Analysis and/or data interpretation, Conception and design study, Data Curation, Final manuscript approval, Formal Analysis, Funding Acquisition, Methodology, Project Administration, Realization of operations and/or trials, Resources, Supervision, Writing - Review & Editing

CGM Analysis and/or data interpretation, Conception and design study, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Realization of operations and/or trials, Writing - Original Draft Preparation

LG Conception and design study, Methodology, Realization of operations and/or trials, Writing - Original Draft Preparation

ACC Analysis and/or data interpretation, Conception and design study, Methodology, Realization of operations and/or trials

AOE Analysis and/or data interpretation, Data Curation, Formal Analysis, Investigation, Realization of operations and/or trials, Writing - Original Draft Preparation

OS Conceptualization, Final manuscript approval, Methodology, Project Administration, Resources, Supervision, Validation

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Original Article

Mandibular reconstruction with fibula free flap: case series

Reconstrução de mandíbula com retalho livre de fíbula: série de casos

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■ **ABSTRACT**

Introduction: Mandibular reconstruction is a complex procedure aimed at correcting defects of the lower third of the face and achieving functional rehabilitation, including chewing and oral competence. Fibula free flap is the first choice for the reconstruction of segment defects of the adjacent mandible and soft tissue. **Methods:** A retrospective clinical study was conducted from January 2005 to July 2017, analyzing the medical records of patients undergoing microsurgical reconstructions after resection of head and neck neoplasms at the plastic surgery service of the Clinical Hospital of the Federal University of Pernambuco (HC-UFPE). **Results:** This study included six patients, of which three were men (50%), aged between 12 and 48 years and with a mean age of 24 years. In 83% of the cases, reconstructions were performed with osteomyocutaneous fibula free flaps (in one case, there was no need for skin island flap). We observed an adequate coverage of the large defects analyzed, with good functional and aesthetic appearance in all cases. Immediate reconstruction was performed in 83% of cases. The fibula and receptive area were prototyped in two cases. **Conclusion:** Fibula free flaps are a great alternative for head and neck reconstruction. Our initial experience and literature show satisfactory results, partially restoring the shape and function of the affected areas.

Keywords: Microsurgery; Mandible; Surgical flaps; Printing, Three-Dimensional; Fibula; Reconstructive surgical procedures.

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■ **RESUMO**

Introdução: A reconstrução da mandíbula é um procedimento complexo, que visa a correção das deformidades do terço inferior da face e reabilitação funcional, incluindo mastigação e competência oral. O retalho livre de fíbula é a primeira escolha para a reconstrução de falhas segmentares da mandíbula e tecido mole adjacentes. **Métodos:** Foi realizado um estudo clínico retrospectivo, no período de janeiro de 2005 a julho de 2017, analisando os prontuários dos pacientes submetidos a reconstruções microcirúrgicas após a ressecção de neoplasias em cabeça e pescoço, operados pelo serviço de cirurgia plástica do Hospital das Clínicas da Universidade Federal de Pernambuco (HC-UFPE). **Resultados:** Seis pacientes foram incluídos no estudo, sendo três do sexo masculino (50%), a idade variou de 12 a 48 anos, com média de 24 anos. Em 83% dos casos foram realizadas reconstruções com retalhos livres de fíbula osteomiocutâneos (em um dos casos não houve necessidade de confeccionar ilha de pele junto ao retalho). Observou-se uma cobertura eficaz dos extensos defeitos estudados, apresentando em todos os casos bons resultados quanto ao aspecto funcional e estético. Em 83% dos casos reconstrução imediata foi realizada. A prototipagem da fíbula e da área receptora foi realizada em dois casos. **Conclusão:** Retalhos livres de fíbula constituem uma ótima alternativa para reconstrução em cabeça e pescoço. Nossa experiência inicial e a literatura mostram resultados satisfatórios, restaurando parcialmente forma e função das áreas acometidos.

Descritores: Microcirurgia; Mandíbula; Retalhos cirúrgicos; Impressão tridimensional; Fíbula; Procedimentos cirúrgicos.

INTRODUCTION

Mandibular reconstruction is a complex procedure and remains a challenge in plastic surgery[1]. Although attempts of reconstruction have been described since the 19th century, the greatest experience took place during the First and Second World War[1,2]. Initial reconstruction attempts using bone grafts and pediculated osteocutaneous flaps were characterized by a high incidence of postoperative complications and poor long-term outcomes[2].

The advent of microsurgery has modified reconstructive plastic surgery. Microsurgical flaps have many advantages: complex and larges defects can be repaired in a single stage, reducing hospitalization time, hospital expenses, and morbidity, and it allows primary closure of the donor area. There are several indications for mandibular reconstruction, including cancer resections, traumatic injuries, and osteoradionecrosis[3,4]. The ultimate goal is restoring form and function and improving chewing, swallowing, speech, and oral competence[5,6].

Currently, the transfer of vascularized bone through microsurgical technique is the gold standard for mandibular reconstruction[7,8,9,10]. Fibula free flap was first described by Taylor, 1975 *Apud* Hidalgo, 2002 introduced it in mandibular reconstruction in 1989[6]. Despite the many advantages of microsurgical reconstructions, mastering this tool requires a long learning curve, and failure can lead to consequences proportional to the magnitude of technique[11].

OBJECTIVES

This study aimed at evaluating a series of patients undergoing complex mandibular reconstructions performed by the plastic surgery team of the Clinical Hospital of the Federal University of Pernambuco (HC-UFPE) using fibula free flap after great tumor resections.

METHODS

A retrospective clinical study was conducted from January 2005 to July 2017, analyzing the medical records of patients undergoing microsurgical reconstructions after resection of head and neck neoplasms at the surgical service of the Clinical Hospital of the Federal University of Pernambuco (HC-UFPE).

The inclusion criteria were as follows: medical records of patients treated at the plastic surgery

clinic of HC-UFPE with a diagnosis (clinical and histopathological) of mandible neoplasm undergoing resections, followed by reconstruction with fibula free flaps. The following parameters were analyzed: gender, age, etiology, type of reconstruction, and complications. The following patients were excluded from the study: those with incomplete medical records or those who were lost to outpatient follow-up.

Since our study is retrospective using secondary data from medical records, obtaining an Informed Consent Form (ICF) was impossible. The study was approved by the Ethics and Research Committee of the Federal University of Pernambuco (CAAE: 82226718.8.0000.5208).

Prototyping was performed in two cases (Figures 2 and 3). The DVD containing the computed tomography of patients was sent to the Renato Archer Information Technology Center (Centro de Tecnologia da Informação Renato Archer) (Figure 1). On the day before surgery, the prototypes were taken to the surgical center, where the procedure was simulated, the margin of proximal resection was decided, the mandibular reconstruction plate was fixed, and the size of the screws for each bone segment was chosen (collected fibula). The number of osteotomies was defined in digital planning. All the fixation material was sterilized after model surgery. Skull base (with the glenoid), the donor fibula, an osteotomy guide for the fibula, and the defective mandible were prototyped (Figure 4).

Figure 1. A. Preoperative period; **B.** Donor area; **C.** Postoperative period; D. Osteomyocutaneous flap fixed to the plate; E. Radiological control: 6 months postoperatively.

RESULTS

The cases included six patients, three of whom were male (50%), aged between 12 to 48 years with a mean age of 24 years. All reconstructions were performed after the resection of head and neck neoplasms (Table 1).

Osteomyocutaneous fibula free flaps for mandibular reconstruction were performed in 5 cases (in one case, there was no need for flap skin island). In all cases, the large defects were adequately covered, with good functional and aesthetic results and minimal morbidity of the donor area.

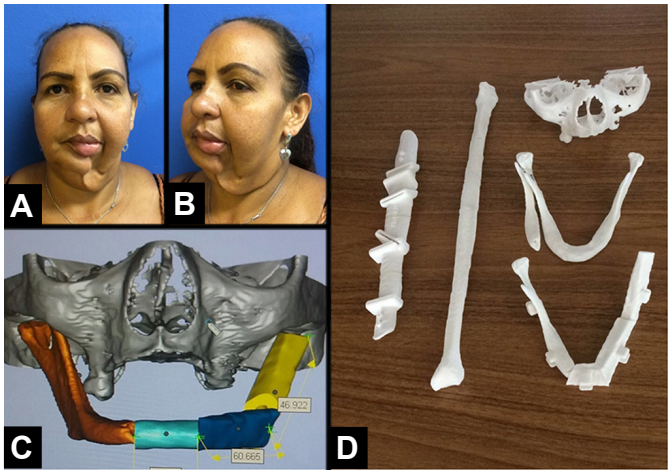

Figure 2. A and **B.** Preoperative period; **C.** Preoperative virtual reconstruction of skull base and fibula with osteotomies; D. Prototyping model reconstructing real-size fibula (whole and osteotomized), skull base, and osteotomy cutting guide.

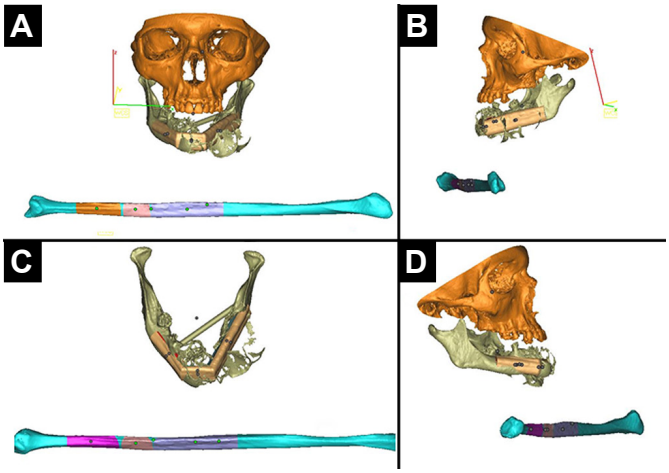

Figure 3. Preoperative virtual reconstruction: A, B, and D. Skull base and fibula; C. Appearance of the mandible with the projection of the fibula after osteotomy.

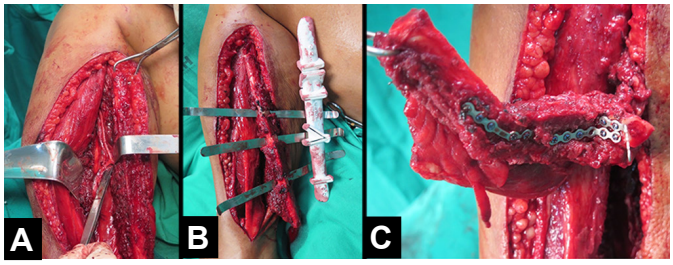

Figure 4. A. Exposed tibiofibular trunk; **B.** Positioning of the mould/guide of osteotomies; C. Osteotomized fibula fixed with plate (without proximal osteotomy).

Table 1. Characterization of the cases

Cases	Gender	Age	Etiology	Type reconstruction	Complications	Prototyping
1	Fem	48	Malignant fibrohistiocytoma	Delayed	No	Yes
2	Fem	40	Ameloblastoma	Immediate	No	Yes
3	Male	18	Aneurysmal bone cyst	Immediate	No	No
4	Fem	12	Giant Cell Carcinoma	Immediate	No	No
5	Male	17	Sarcomatous Neoplasia	Immediate	Defect at the contour of the mandible	No
6	Male	12	Aneurysmal bone cyst	Immediate	Osteomyelitis	No

One case required a second surgical period for a better definition of the new mandible and underwent arthroplasty for the affected hemiface. Another case had osteomyelitis in the 3rd month postoperatively and underwent surgical debridement and received venous antibiotic therapy.

All cases of reconstruction were tracheostomized intraoperatively, with the tube being removed within three weeks. Only one patient underwent delayed reconstruction (Table 1).

The feasibility rate of the flaps performed in our study was 100%.

DISCUSSION

Microsurgical reconstructions are complex techniques needed at advanced reconstruction centers and are crucial in head and neck cancer surgeries. Over the past 50 years, several advances in these techniques and several potential flaps have been described[1-5]. Three decades have passed since the introduction of the osteomyocutaneous fibula flap in 1986, and this flap remains the gold standard for reconstruction of bone defects in the mandible and extremities[6-8].

Mandibular rehabilitation is important because there are several functions performed by this bone, including participation in chewing, swallowing, oral competence, verbalization, and breathing support. Moreover, it significantly contributes to the contours of the middle third of the face[10].

In the sample analyzed, six mandibles were reconstructed after resection of tumors in the mandible.

Delayed reconstruction of the mandible was chosen for only one of the patients (Table 1). In this case, there was no history of prior local radiotherapy. In delayed reconstruction, the chances of detecting tumor recurrence and local spread are higher, unlike immediate reconstruction, covering the primary site[12,13,14]. Most authors prefer immediate reconstruction. It results in better aesthetic results, decreased morbidity, faster rehabilitation of the patient, prevention of sequelae that hinder delayed reconstruction, and reduction of cost and treatment time[14]. In Brazil, the absence of microsurgeons, limited operating room time, lack of adequate material, and doubt about free margins often lead to delayed microsurgical mandibular reconstructions[15].

Craniofacial and donor fibula was prototyped for two patients (Figures 2 and 3). The introduction of prototyping in medicine is relatively recent. With the technological advancement of radiology (tomography and resonance), high-definition images are generated, allowing detailed 3D visualization and analysis of anatomical structures. A digital printer can create a 3D model of the analyzed anatomical structure from these images (Figure 1)[16,17]. Computed tomography (CT) was used as a standard examination for prototype construction since the literature considered this type of image ideal[18].

In cases 1 and 2 (Table 1), model surgery performed the day before provided several benefits: decreased morbidity of the donor area (capturing only what was needed); definition of resection margins (in case 2); plate fixation; choice of screws; maintenance of the mandibular transverse diameter; fitting of the condyle prosthesis to the TMJ; maintenance of the best possible occlusion; shorter surgical time, shorter anesthesia time, and lower hospital cost. An important technical detail of this prototyping is that prototyping skull base (containing the glenoid) and the fibula with the osteotomy sites were required (Figure 4)[17,18,19,20].

The fibula is very important for dental rehabilitation in implant dentistry. Osseointegrated implants should be placed between 4 and 6 months, in case of bone grafts, and longer waiting periods may cause bone resorption owing to lack of load. Unfortunately, none of our patients have received osseointegrated implants owing to the unavailability of staff and material provided by the Brazilian Unified Health System (SUS)[12,13].

Mandibular reconstruction has greater complications than reconstructions performed in other regions of the face. In a previous study conducted by Portinho et al., in 2013[11], the incidences of complications in the receiving area, in patients undergoing mandibulectomies, were as follows: fistula, 21.2%; necrosis, 13.5%; dehiscence, 13.5%; infection, 11.5%; bleeding, 9.6%; and extrusion of osteosynthesis

material, 1.9%. In our study, we observed only one case that had a local infection (osteomyelitis), requiring hospitalization and use of antibiotics[21,22,23].

CONCLUSION

Fibula free flaps are a great alternative for head and neck reconstruction. Our initial experience and literature show satisfactory results, partially restoring the shape and function of affected tissues. The learning curve is long but tends to improve with training of the team.

COLLABORATIONS

MFMBL	Analysis and/or data interpretation, Conception and design study, Data Curation, Final manuscript approval, Methodology, Project Administration, Supervision, Validation, Visualization, Writing - Original Draft Preparation, Writing - Review & Editing
JPBRM	Supervision, Writing - Review & Editing
RA	Supervision, Writing - Review & Editing
JZS	Writing - Review & Editing
KK	Analysis and/or data interpretation, Data Curation

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Original Article

Triangular flap for nipple reconstruction

Retalho triangular para reconstrução da papila mamária

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■ **ABSTRACT**

Introduction: Despite the many published techniques, there are difficulties in satisfactorily achieving a nipple areola complex (NAC) with long-lasting results. The objective is to demonstrate results using the triangular cutaneous flap technique in nipple reconstructions and compare it with previously published techniques. **Methods:** A prospective study of nipple reconstruction using the triangular cutaneous flap technique from January 1, 2015, to March 1, 2016. Surgical technique: Marking of an equilateral triangle; decortication of the three points of the triangle that are united in the form of an envelope, with the central area adhered to the neo-breast; total skin grafting for construction of the areola. The patients were evaluated and results classified as fully satisfactory, satisfactory, partially satisfactory, or unsatisfactory. Primary type of breast reconstruction, postoperative or neoadjuvant chemo- or radiotherapy complications, comorbidities, and postoperative complications were evaluated. Statistical evaluation was performed using Fisher's exact test, chi-square test, and post hoc analysis (significance $p < 0.05$). **Results:** Thirty-one patients underwent nipple reconstruction using the triangular cutaneous flap technique, 17 unilateral and 14 bilateral, totaling 45 reconstructions. Mean age was 50 years, mean body mass index was 24.95 kg/m^2, and mean follow-up period was 14 months. Rated: demographic data, complications of patients versus the type of primary breast reconstruction and completion of chemo- and/or radiotherapy, types of breast reconstruction performed, evaluation of the nipples versus reconstruction, evaluation of the nipple reconstruction technique versus satisfaction of evaluators, and nipple complications versus reconstruction technique. **Conclusion:** The original triangular cutaneous flap technique presents the advantages of easy execution and safety in reconstruction of the NAC.

Keywords: Breast; Nipples; Breast neoplasms; Mammoplasty; Diagnostic surgery techniques.

Institution: Hospital Daher Lago Sul, Brasília, DF, Brazil.

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[2] Hospital Daher Lago Sul, Brasília, DF, Brazil.

■ **RESUMO**

Introdução: Apesar das muitas técnicas publicadas, há dificuldades para se atingir de forma satisfatória uma placa areolopapilar (PAP) com resultado duradouro a longo prazo. O objetivo é demonstrar resultados pela técnica do retalho cutâneo triangular nas reconstruções de papila e comparar com as técnicas já descritas na literatura. **Métodos:** Estudo prospectivo da reconstrução papilar pela técnica do retalho cutâneo triangular de 1 janeiro de 2015 a 1 de março de 2016. Técnica cirúrgica: Marcação em triângulo equilátero; decorticação dos três vértices do triângulo que são unidos em forma de envelope, com a área central aderida à neomama; Enxertia de pele total para confecção da neoareolar. Os pacientes foram avaliados e classificados como totalmente satisfatórios, satisfatórios, parcialmente satisfatórios ou insatisfatórios. Tipo de reconstrução mamária primária, realização de quimio ou radioterapia pós-operatórias ou neoadjuvantes, comorbidades, complicações pós-operatórias foram avaliados. Avaliação estatística por testes exato de Fisher, Qui quadrado e análise post hoc ($p < 0,05$ significativo). **Resultados:** Trinta e uma pacientes submetidas à reconstrução mamilar pela técnica do retalho cutâneo triangular, sendo 17 unilaterais e 14 bilaterais, totalizando 45 reconstruções. Média de idade de 50 anos, IMC médio de 24,95 kg/m^2 e acompanhamento médio de 14 meses. Avaliados: dados demográficos, complicações dos pacientes *versus* o tipo de reconstrução primária mamária e realização de quimio e/ou radioterapia, tipos de reconstrução mamária realizados, avaliação das papilas *versus* reconstrução, avaliação da técnica de reconstrução papilar *versus* satisfação dos avaliadores e complicações papilares *versus* técnica de confecção. **Conclusão:** A técnica original do retalho cutâneo triangular apresenta as vantagens de fácil execução e segurança na reconstrução das placas areolopapilares.

Descritores: Mama; Mamilos; Neoplasias da mama; Mamoplastia; Técnicas de diagnóstico por cirurgia.

INTRODUCTION

The nipple-areolar complex (NAC) should be considered a single esthetic unit in breast reconstruction, because it represents the final stage in breast reconstitution, in cases in which there is amputation of this complex during mastectomy[1]. After the preparation of the NAC, the neo-breast acquires an appearance as similar as possible to the contralateral breast.

Several techniques have been published in recent years, with the aim of achieving the best shape and projection of the NAC[2-14]. However, most present controversial results, some considered very good and others frustrating. The loss of projection seems to be more prominent with the use of certain techniques compared with others.

The loss of projection and final result of nipple reconstructions are related to a number of reasons: scarce subcutaneous flap tissue, poor planning of flaps, natural process of wound contraction, tissue memory, increased internal (tense sutures) or external pressure (e.g., the pressure exerted by a bra), infection, and prior radiation[1-18].

Thus, the main challenge is to rebuild a nipple that is able to overcome these local obstacles and natural tendencies[18]. In breast reconstruction, the NAC should be considered a single esthetic unit, because it represents the final stage in breast reconstitution, in cases in which there is amputation of this complex during mastectomy[1]. After the preparation of the NAC, the neo-breast acquires an appearance as similar as possible to the contralateral breast.

According to the work of Broadbent et al.[2], patients and partners evaluate better the outcome of the breast when the reconstruction of this anatomical unit is completed compared with patients who do not undergo NAC reconstruction. In addition,

satisfaction is related to the sustained projection of the nipple (especially in the long term) and absence of complications[2].

Millard et al.[5], in 1971, described the so-called "nipple banks." Originally, it consisted of the withdrawal of the NAC and transfer to the buttocks, groin, or abdomen as total skin graft during mastectomy. After the reconstitution of the breast, the grafts were collected and used for NAC reconstruction. Doubts in relation to the safety of this method arose after description of cases in which patients had lymph node involvement, with mammary cells in the inguinal region when using the groin area as "nipple bank".

In the last 20 years, the defining step in NAC reconstruction techniques has been the use of local flaps. The first technique was published by Berson[6], in 1946, which involved preparing three triangular skin flaps that would be raised and sutured to form a nipple projection. In 1984, Little[7] created the *skate flap*, which became the most popular flap used for NAC reconstruction. This is a vertical dermal fat flap that is raised, and both wings are wrapped around a central fat core to ensure adequate nipple projection. To recompose NAC color, skin tattooing was used.

Multiple alterations of this technique have emerged since then. A very efficient technique was described by Shestak and Nguyen[8] called *double opposing flap*. This technique enables the reconstruction of the NAC with appropriate diameter and good projection, symmetrical to the contralateral side, with the possibility of closing the donor area and with all the scars contained in the topography of the new rebuilt areola.

Published evidence shows the difficulties in achieving a satisfactory NAC, due to variations of local flaps. The projection may be difficult to maintain, especially in patients with flaccid, thin, or irradiated skin. Some patients do not feel comfortable with the projection of the nipples all the time. Others reject surgical approaches, because they do not desire another surgical procedure. Finally, in irradiated patients, skin tattooing may be a safer option considering the increase in the rate of complications of other techniques in these patients. Spears et al.[15] reported that 84% of their patients were satisfied with skin tattoo and 86% would choose tattooing again[15-16].

The loss of projection and the final result of the reconstructed nipples are related to a number of reasons: scarce subcutaneous flap tissue, poor planning of flaps, natural process of wound contraction, tissue memory, increases internal (tense sutures) or external pressure (the pressure exerted by a bra, for example), infection, and prior radiation[1,16]. Thus, the main challenge is to rebuild a nipple that is able to overcome these local obstacles and natural tendencies[16].

OBJECTIVE

To describe the triangular cutaneous flap technique for nipple reconstructions.

METHODS

A prospective study of a series of 31 patients who submitted to a second breast reconstruction was conducted, in which 45 NACs (17 unilateral and 14 bilateral) were reconstructed using the *inverted triangular skin flap technique for nipple construction*, from January 1, 2015, to March 1, 2016, in two hospitals in Brasilia, DF, Brazil.

Because of its versatility, the technique was used after breast reconstruction with a transverse rectus abdominis myocutaneous (TRAM) flap, with the latissimus dorsi muscle (LDM), reconstructions with silicone implant and expanders, regardless of the presence of scars in the donor area or scarcity of cutaneous or subcutaneous tissue.

The development of the new technique was based on studies to optimize the long-term projection and shape and minimize complications such as necrosis and unsatisfactory results. All surgeries were performed by the same plastic surgeon.

Thirty-one patients who underwent nipple reconstruction using the *triangular cutaneous flap technique* were analyzed, 17 unilateral and 14 bilateral reconstructions, totaling 45 reconstructions.

The sample exclusively consisted of women, with a mean age of 50 years (ranging from 32 to 64 years), body mass index (BMI) of 24.95 (ranging from 20.76 to 36.76 kg/m^2), and mean follow-up of 14 months (ranging from 12 to 18 months).

All patients underwent total mastectomy.

Surgical technique

The "inverted triangular" format - the original technique of the inverted triangular cutaneous flap - presents an innovative characteristic, which differs from the usual forms of papillary markings already proposed in literature. Figure 1 illustrates the schematic drawing of the inverted triangular cutaneous flap.

Like most local flaps, this NAC construction technique should be performed after obtaining stability of the neo-breast projection in the second or third stage of breast reconstruction.

In unilateral breast reconstructions, one should initially consider the position of the contralateral nipple, projection and the diameter of the base, and horizontal and vertical measures of the areola to achieve the greatest possible symmetry of the reconstructed NAC. Taking the opposite areola in cases of unilateral

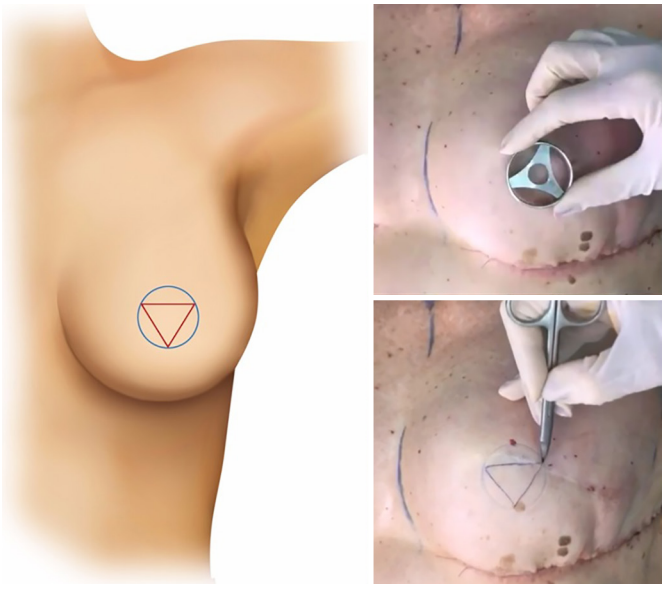

Figure 1. New technique for nipple construction. Step 1. Marking: Marking held in an inverted triangle regardless of the presence of scars.

reconstruction, the flap is drawn with the papilla located at the point of greatest projection of the neo-breast. The width of the base of the opposing nipple and its projection determine the size of the flap to be drawn.

In cases of bilateral reconstructions, this measure should be projected in accordance with the peculiarities of each case, which provides greater versatility.

For a better explanation of the inverted triangular cutaneous flap technique, 5 steps are described:

Step 1 - Marking

Previous markings are performed according to Figure 1, forming an equilateral triangle within the limits of the neo-nipple.

Step 2 - Decortication

Total decortication of the three points of the triangle forms 3 skin flaps, with maintenance only on the fixed center in its bed (Figure 2).

Step 3 - Initial nipple structure

The 3 vertices of the triangle (A, B, and C) are united in the form of a folding envelope, keeping only the central area of Figure 2 adhered to the neo-breast (Figure 3).

Step 4 - Final nipple construction

Simple sutures are carried out for the coaptation of the edges, and then, the construction of the neo-nipple is finalized (Figure 3).

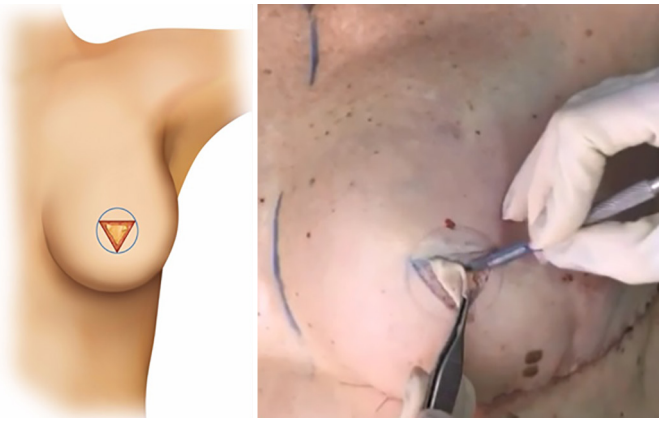

Figure 2. New technique for nipple construction. Step 2. Decortication: Decortication of 3 vertices of the triangle as one performs a partial skin graft, maintaining the pedicled center.

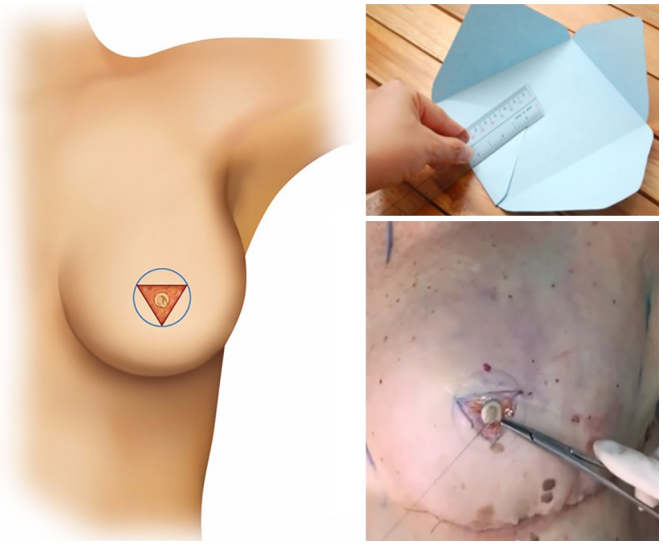

Figure 3. New technique for nipple construction. Step 3. Nipple construction: The three vertices of the triangular flap are elevated and sutured in the form of an envelope, thus constructing the new nipple.

Step 5 - Areola grafting

Full skin excision from the crural region is used to make the neo-areola with a central opening for the emergence of neo-nipple already constructed in all patients. Continuous suturing is performed on the skin graft (Figure 4).

The results were evaluated by photographic documentation preoperatively and postoperatively and preoperatively and late postoperatively in the second reconstruction phase by three plastic surgeons who had not participated in the surgeries.

The evaluations were performed through pictures, considering the defined criteria. In the case of unilateral reconstructions, the results from the likeness and naturalness of the neo-nipple with the contralateral nipple were analyzed. The measurement

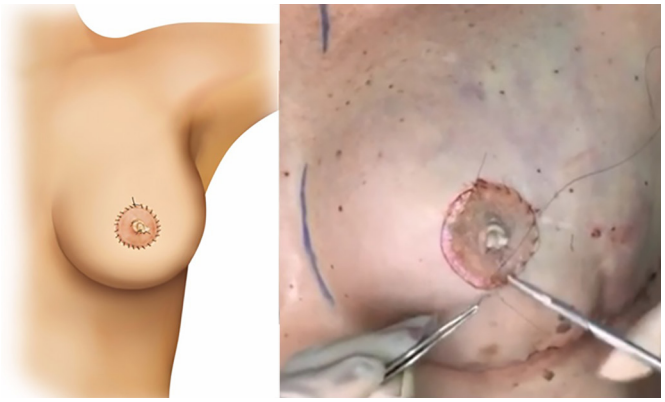

Figure 4. New technique for nipple construction. Step 4. Areola grafting: Areola grafting through total skin graft from the crural region.

performed with ruler of the contralateral nipple and comparison of the neo-nipple values were used to assess similarity. In the bilateral cases, the similarity in projection and naturalness of the appearance (base of the areola being twice the apex) were considered, respecting the feasibility of the flaps. Based on these criteria, the neo-nipple was classified as satisfactory or very satisfactory.

Data such as type of primary reconstruction, laterality, achievement of postoperative or neoadjuvant chemo- and radiotherapy, comorbidities, and postoperative complications were also retrieved from the analysis of medical records.

Statistical evaluation of the results was performed by Fisher's exact test, chi-square test, and post hoc analysis, with a p-value < 0.05 considered statistically significant.

The present study followed the principles of the Declaration of Helsinki, adopted by the 18th World Medical Assembly, Helsinki, Finland, on June 1964, and corrected by the 29th Medical Assembly, Tokyo, Japan, on October 1975, and the 35th World Medical Assembly, Venice, Italy, on October 1983, and the 41st World Medical Assembly, Hong Kong, on September 1989.

RESULTS

Among all patients who submitted to the new nipple construction technique, 25 patients underwent neo-adjuvant chemotherapy, and 16 patients underwent postoperative radiotherapy (Table 1).

Various comorbidities such as hypertension, diabetes, smoking, hypothyroidism, and depression were observed in approximately 80% of patients, however, without significant influence in the evolution of the neo-nipple.

The demographic data of the patients and their characteristics are shown in Table 1.

Table 1. Demographic data of patients who submitted to the triangular cutaneous flap nipple construction technique.

Number of patients (n)	**31**
NeoNAC	45
Laterality: unilateral	17
Bilateral	14
Mean age (mean ± SD)	50.7 ± 2.3
BMI – kg/m2 (mean ± SD)	24.95 ± 3.4
Number of surgeries performed	50
Total mastectomy	31
Treatment: chemotherapy	25
Radiotherapy	16
Comorbidities:	
SAH	6
DM	3
Smoking	10
Hypothyroidism	7
Depression	7
Histopathological examination	
IDC (%)	24
DCIS (%)	8
ILC (%)	3

BMI: Body mass index; NAC: Nipple areola complex; SAH: Systemic arterial hypertension; DM: Diabetes mellitus; IDC: Invasive ductal carcinoma; DCIS: Ductal carcinoma in situ; ILC: Invasive lobular carcinoma.

Table 2 presents the incidence of complications in the reconstruction of the nipple in relation to the type of primary breast reconstruction (silicone implant, latissimus dorsi, expander, or TRAM) and chemotherapy and/or radiotherapy. This analysis showed no statistical significance.

Of all nipple reconstructions performed, 5 patients needed to be complemented with polymethyl methacrylate (PMMA) for filling and better nipple contour, and only 1 patient evolved with a small area of partial necrosis. No treatment was necessary in the last patient, only dressings, and it did not compromise the final result. These results are presented in Table 2.

The main form of primary breast reconstruction was performed with the use of silicone implants (n=19), which totaled more than 60%. The other types were the TRAM flap (n = 5), latissimus dorsi muscle (n = 4), and the use of expanders (n = 3). The types of breast reconstruction performed in the sample are quantified in Graph 1 (Figure 5).

Logistic regression was performed through post hoc analysis to identify which nipple reconstruction technique attained higher index of satisfaction of the evaluators. The triangular cutaneous flap technique

Table 2. Evaluation of complications of patients versus the type of primary breast reconstruction and chemotherapy and/or radiotherapy.

Complications	Loss of Projection	Necrosis Partial	Good Evolution	*p*
Silicone Implant	4	1	14	0.741
Latissimus dorsi	0	0	4	
Expander	1	0	2	
TRAM	0	0	5	
Therapy	**Loss of Projection**	**Necrosis Partial**	**Good Evolution**	***p***
Chemotherapy	4	1	20	0.883
Radiotherapy	2	0	16	0.299

TRAM: Transverse rectus abdominis myocutaneous flap; $p < 0.05$ = statistical significance.

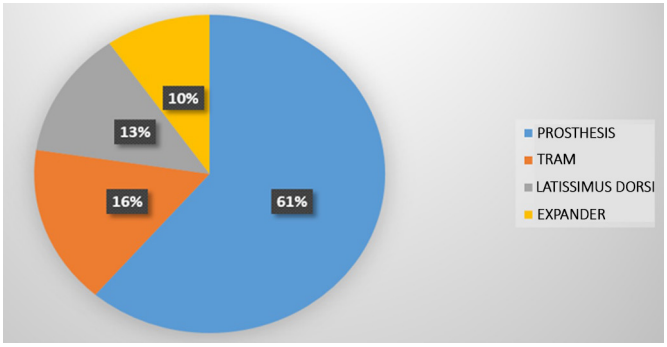

Figure 5. Type of breast reconstruction used. Graph 1 shows the distribution based on the type of breast reconstruction that was used, in which 61% of reconstructions were performed with silicone prosthesis, 16% with transverse rectus abdominis myocutaneous flap (TRAM), 13% with the latissimus dorsi muscle, and, finally, 11% with tissue expanders.

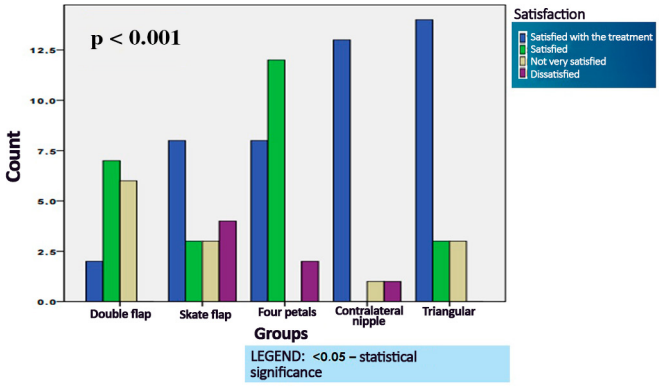

Figure 6. Assessment of the breast reconstruction technique versus the satisfaction of evaluators. Graph 2 shows the evaluation of the breast reconstruction technique according to the degree of satisfaction of the evaluators. The nipple reconstruction techniques that used contralateral nipple and inverted triangular cutaneous flap technique presented higher index of satisfaction on the part of the evaluators, with statistical significance ($p < 0.05$).

for nipple reconstruction attained the highest levels of total satisfaction, with statistical significance $p < 0.01$ (Graph 2) (Figure 6).

Table 3 shows the comparative results of postoperative assessment of neo-nipple according to the type of primary breast reconstruction. After analysis using Fisher's exact test, all reconstructions showed minimal variation in their evaluation, which denotes a statistical significance ($p = 0.48$).

Table 4 presents the nipple complications due to the type of technique used for its construction. The post hoc analysis showed $p < 0.001$ in the comparison between the contralateral nipple and 4-petal technique (for clearing factor), $p < 0.001$ in the comparison between contralateral nipple and skate flap (necrosis), and $p < 0.001$ in the comparison between contralateral nipple and double-opposing flap (for necrosis) (Table 4).

Figures 7 to 12 display the surgical results of the sample in which the triangular cutaneous flap technique was used in the reconstruction of the nipples.

DISCUSSION

The excellence of the results in nipple reconstructions is acquired when one attains symmetry in position, shape, size, and texture, in addition to permanent projection. The creation of a natural nipple with lasting three-dimensional projection remains a challenge, while the areola reconstructions are of simple execution and usually offer no difficulties. In order to optimize the results, some rules should be followed, regardless of the technique used.[6]

Farhadi et al.[11] and Berson[6] showed that, in unilateral reconstructions, the choice of technique for nipple reconstruction should be dictated by the characteristics of the contralateral nipple, and we fully agree with this hypothesis. In a previously published study[17], it was verified that, in the cases of patients with very projected contralateral nipples or with very wide base, the technique that offered better results when compared to others was grafting of the contralateral nipple. In patients with poorly designed contralateral nipple, it is the quality of the skin and subcutaneous tissue that will indicate the success of the technique.

Currently, we have observed that, with the increase in reconstructions using prostheses or expanders, as shown in Table 3, the cutaneous flap

Table 3. Evaluation of the nipples versus the kind of reconstruction.

Evaluation of the nipples X Type of reconstruction	Expander (15)	TRAM (27)	Latissimus dorsi (36)	Silicone implant (24)	*p*-value
TS	10 (66.66%)	14 (51.85%)	17 (47.22%)	16 (66.66%)	$p < 0.48$
S	0 (0.00%)	9 (33.33%)	11 (30.55%)	4 (16.66%)	
PS	2 (13.3%)	1 (3.70%)	6 (16.66%)	4 (16.66%)	
U	3 (20%)	3 (11.11%)	2 (5.55%)	0 (0.00%)	

TS: Totally satisfactory; S: Satisfactory; PS: Partially satisfactory; U: Unsatisfactory.

Table 4. Evaluation of nipple complications versus the construction technique.

Complications	*Double flap* (15)	*Skate flap* (18)	4 Petals (22)	Contralateral nipple (15)	Triangular (20)	*p*
Slight necrosis	2 (13.4%)	2 (11.1%)	0 (0.0%)	0 (0.0%)	1 (5.0%)	
NAC asymmetry	1 (6.6%)	0 (0.0%)	2 (9.1%)	0 (0.0%)	0 (0.0%)	
Erasure	0 (0.0%)	0 (0.0%)	4 (18.2%)	0 (0.0%)	5 (25.0%)	0.001
Partial loss of the graft	0 (0.0%)	2 (11.1%)	2 (9.1%)	0 (0.0%)	0 (0.0%)	
Without complications	12 (80.0%)	14 (77.8%)	14 (63.6%)	15 (100.0%)	14 (70.0%)	

NAC: Nipple areola complex.

Figure 7. Case 1 - The image illustrates a nipple made by the inverted triangular cutaneous flap technique and shows a satisfactory nipple.

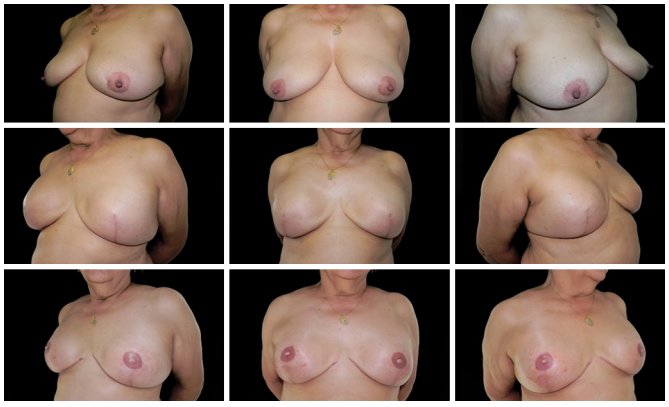

Figure 8. Case 2 - A female patient who underwent breast reconstruction with the use of the latissimus dorsi muscle flap bilaterally without the need of a skin island and, subsequently, the nipples were constructed using the inverted triangular cutaneous flap. The nipples have a satisfactory outcome.

donor area is increasingly scarce and, most of the time, has a scar crossed in the central part of the neo-breast, resulting in the withdrawal of the NAC in mastectomies with preservation of the skin. These two factors, in a large majority of patients, started to

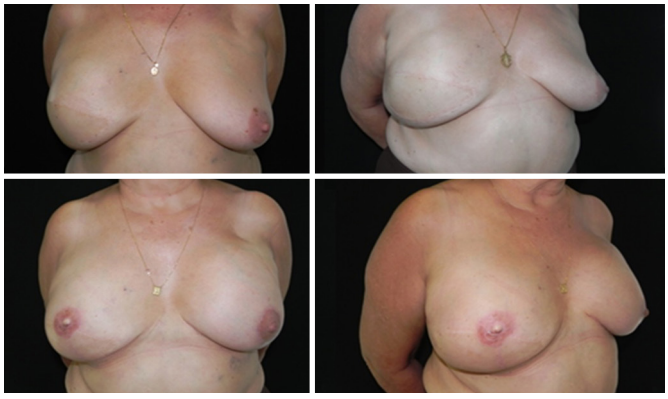

Figure 9. Case 3 - A female patient who underwent breast reconstruction with the latissimus dorsi muscle unilaterally with the need of a skin island and subsequently nipple construction unilaterally by the inverted triangular cutaneous flap technique. The nipple had a totally satisfactory outcome.

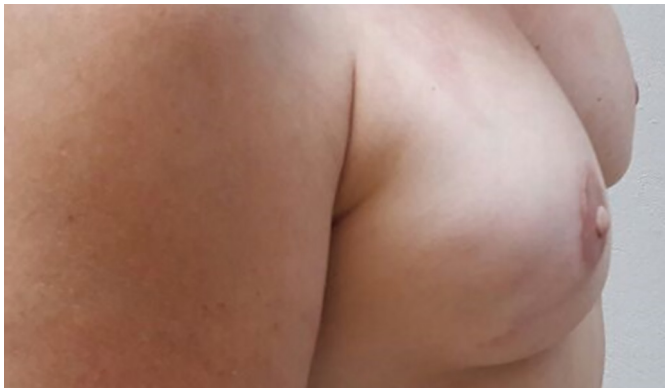

Figure 10. Case 4 - A) A nipple constructed using the inverted triangular cutaneous flap technique showing a maintained projection, after 1 year of follow-up.

Figure 11. Case 4 - B) A nipple constructed using the inverted triangular cutaneous flap technique showing a maintained format, after 1 year of follow-up.

Figure 12. Case 4 - C) A nipple constructed using the inverted triangular cutaneous flap technique showing a maintained symmetry, after 1 year of follow-up.

become a contraindication for NAC reconstruction in the second breast reconstruction, being necessary to perform fat grafting in this region to enable a future reconstruction.

The ideal technique for NAC reconstruction should allow its construction on any type of tissue, despite previous scars and radiotherapy; moreover, the limits of the new NAC should not exceed the margins of flaps used in breast reconstructions. Losken et al.[13] (C-V flap), Anton et al.[14] (star and wrap flaps), and Little and Dilamartine et al.[16] (skate flap) presented results in accordance with these characteristics.

However, over the years, we have accompanied the loss of the outcome with increasing index of dissatisfaction by the patients. In addition, all these characteristics can still be aggravated if the patient is submitted to radiotherapy. The sum of these factors has led us to develop a technique that allowed a safe construction of the nipple.

The dermal flaps, in general, when constructed on a tense surface, tend to flatten, since there is the enlargement of the scar on the area where it was removed. Farhadi et al.[11] reported that loss of nipple projection occurs due to the contraction of the wound. Thus, hypercorrection should be of 25% to attain, in the long term, better symmetry with the contralateral nipple[2,17].

The triangular cutaneous flap technique was based on the observation of the so-called "dog ear," in which there is excess skin in an area without tension, which prevents the accommodation of this excess tissue. This skin with little dermal component reduces the shrinkage, and as we maintain the integrity of the subdermal plexus, we observed few complications related to necrosis, even with the presence of scars in this area (Table 4).

In relation to the bilateral reconstructions, the indication of the technique is based on the desire of the patient for a more or less projected nipple, again depending on the quality of the skin. If the option is for greater projection, Shestak et al.[1], Shestak and Nguyen[8], and Farhadi et al.[11] suggest the double-opposing flap technique to construct the nipple, and we also found good results in this technique. However, in general, we have observed a preference for less projected nipples. Some patients do not feel at ease with a bulky permanent projection. In these cases, we opted the triangular cutaneous flap technique as an indication[17].

Bezerra et al.[18] demonstrated satisfactory late results using autologous tissue as fillers, as did Tostes et al.[19], who used synthetic materials. Tanabe et al.[20] and Brent and Bostwick[3] used atrial cartilage to achieve better nipple projections and showed partial projection loss of 48.1% with minimal complications.

Tanabe et al.[20] used bilobed and trilobed flaps in their studies and proved that bilobed flaps provide greater nipple projections, while the trilobed ones lead to higher rates of loss of projection and partial necrosis. This new technique, despite being trilobed, presented a low index of necrosis. We believe this is due to the slight thickness of the flap that remains irrigated only by the superficial dermal plexus.

A variety of these alloplastic materials are available to increase the NAC projection. However, the risks of foreign body reaction or infection and the tendency to migrate and extrude render the use these materials a challenge[3].

Spears et al.[15] described a three-dimensional tattooing technique in which only the tattoo is made for the reconstruction of the entire NAC and obtained good esthetic results[4]. In addition,

the three-dimensional technique can resolve asymmetries after NAC reconstruction, without additional surgical procedures. As for the projection, an optical illusion caused by pigmentation shadowing occurs[4]. It is a significant advance in obtaining better esthetic results for women undergoing breast reconstruction[4].

We observed a very satisfactory evaluation of patients who underwent the original triangular cutaneous flap technique. This can be due to greater care in predicting disappearance and asymmetry in comparison with other techniques. In addition, there is a tendency for low rates of complications in the donor area compared with local flaps, including distortions and flatness of the breast.

The emotional and esthetic impact in the final appearance of the reconstructed NAC is essential in breast reconstruction. While this procedure is often regarded as "small" in the patient's mind, the result can change the fate of the entire breast reconstruction process[17]. Thus, the position and symmetry of the NACs are critical elements to be considered in the evaluation of the appearance of the breast after the surgery.

Poor positioning of NACs and the need for new correction surgeries are not uncommon, reaching up to 50% correction levels in published studies[5]. In our series, there were no cases needing surgical reassessment to correct asymmetries; however, in 5 cases, PMMA injection was used to correct distortions in the projection.

CONCLUSION

The original inverted triangular cutaneous flap technique presents the advantages of easy execution and safety in reconstruction of the NAC.

COLLABORATIONS

MCC Analysis and/or interpretation of data; final approval of the manuscript; conception and design of the study; completion of surgeries and/or experiments; writing the manuscript or critical review of its contents.

MCAG Analysis and/or interpretation of data; final approval of the manuscript; completion of surgeries and/or experiments; writing the manuscript or critical review of its contents.

LGM Analysis and/or interpretation of data.

LMCD Analysis and/or interpretation of data.

LDPB Analysis and/or interpretation of data.

OMC Analysis and/or interpretation of data.

BEP Analysis and/or interpretation of data.

FTM Statistical analyses.

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Original Article

Quality of life of mastectomized women undergoing immediate breast reconstruction in a cancer referral hospital in Amazonas: a cross-sectional study

Qualidade de vida de mulheres mastectomizadas submetidas à reconstrução mamária imediata em hospital de referência oncológica no Amazonas: um estudo transversal

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■ **ABSTRACT**

Introduction: The assessment of the quality of life is considered important for a more humanistic and comprehensive treatment approach. Methods: This is a descriptive cross-sectional observational study using a quantitative approach. The quality of life of women undergoing immediate breast reconstruction after mastectomy at the Amazonas Oncology Control Center Foundation (Centro de Controle de Oncologia do Amazonas) from January to June 2015 was assessed. The assessment instrument used was the WHOQOL-BREF questionnaire, following the syntax of the WHOQOL Group. **Results:** The sociodemographic profiles of 22 patients were evaluated. The predominant age group was 45–49 years, the predominant educational level was high school (63.64%), 90.91% of the patients were from Manaus, and 72.73% were married. A total of 41% of the respondents defined their quality of life as good in the questionnaire, with the physical domain being the most affected and the social relationships domain being the less affected. **Conclusion:** The assessment of the quality of life should be prioritized in the choice of treatment for breast cancer.

Keywords: Plastic surgery; Breast implants; Breast neoplasms; Quality of life; Aesthetics.

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■ **RESUMO**

Introdução: A avaliação da qualidade de vida é importante para uma abordagem mais humana e abrangente. **Métodos:** Trata-se de um estudo observacional transversal descritivo com abordagem quantitativa que avaliou a qualidade de vida em mulheres submetidas à reconstrução mamária imediata após a mastectomia, no período de janeiro a junho de 2015, na Fundação Centro de Controle de Oncologia do Amazonas. O instrumento de avaliação foi o questionário WHOQOL-bref, seguindo a sintaxe do Grupo WHOQOL. **Resultados:** Foram avaliadas 22 pacientes, em relação ao perfil sócio demográfico, a faixa etária predominante foi de 45 a 49 anos, o ensino médio foi o mais frequente no estudo (63,64%) e em relação a procedência 90,91% das pacientes foram de Manaus, quanto a estado civil 72,73% eram casadas. Na avaliação através do questionário, a autoavaliação de qualidade de vida foi definida como boa em 41%, o domínio físico apresentou o maior comprometimento, enquanto o domínio de relações sociais foi o menos afetado. **Conclusão:** A avaliação da qualidade de vida deve ser parte primordial na escolha do tratamento do câncer de mama.

Descritores: Cirurgia plástica; Implantes de mama; Neoplasias da mama; Qualidade de vida; Estética.

INTRODUCTION

Cancer and its treatment still involve a crucial factor, namely body image changes, which are intensively experienced by women. Women with cancer may experience significant emotional and psychosocial trauma. Cancer is a disease that is often associated with death; hence, cancer patients develop a stigma toward the disease. Patients diagnosed with malignant neoplasm experience various losses, extending from the diagnosis to the treatment and prognosis of the disease. In women, body image changes are associated with significant psychological trauma[1].

The assessment of the quality of life (QOL) considers the subjective perception of the patient, which is an important step toward a more comprehensive and humanistic approach to cancer treatment. This trend is well documented in the literature due to the increased number of breast cancer studies presenting results obtained through the assessment of the QOL[1].

Breast reconstruction can restore the patient's physical form and integrity, among other demonstrated benefits. In this scenario, psychological well-being plays a crucial role since breast reconstruction can reduce the impact generated by stigmas and the sequelae of cancer surgery. An increasing number of patients are being favored[2] by the spread of this surgical technique and its advances.

Indicating immediate breast reconstruction not only optimizes body contour of women but also, causes a positive impact on their QOL. Understanding this should increase the awareness of the importance of this parameter because treatment of the disease is not enough; it is necessary to provide QOL after treatment[2].

This study aims to demonstrate, by assessing the QOL questionnaire, the importance of QOL for all professionals involved in the treatment, which would ensure that this parameter is prioritized in the choice of treatment of women with breast cancer at the CECON Foundation (FCECON).

METHODS

This is an observational, cross-sectional, descriptive, quantitative study where we assessed the QOL of women undergoing mastectomy with immediate breast reconstruction through the administration of the WHOQOL-BREF questionnaire. It is a self-explanatory and self-assessment instrument comprising 26 questions related to 4 domains: physical, psychological, social relationships, and environment. Each of the questions was scored on a scale from 1 to 5. The scores of the domains were calculated according to the syntax proposed by the WHOQOL Group ranging from 0 to 100 and following a positive direction, that is, higher scores represented a better assessment of QOL.

The study population comprised women registered at FCECON who underwent a mastectomy and who wanted to undergo immediate breast reconstruction and who spontaneously agreed to complete the WHOQOL-BREF questionnaire. Twenty-two patients were selected.

From January 2015 to June 2015, 51 mastectomies were performed at FCECON (6 in January, 5 in February, 10 in March, 11 in April, 12 in May, and 7 in June). Only 25 patients were selected because the remaining 26 patients had advanced tumors, and the breast service did not indicate immediate reconstruction for these patients (3 in January, 5 in March, 8 in April, 5 in May, and 5 in June). A total of three patients withdrew from the study: one patient decided at the time of surgery not to undergo immediate breast reconstruction after mastectomy (March, 15) and two patients did not undergo breast reconstruction due to tumor growth and loss of surgical margin of safety (1 in March and 2 in May).

The patients answered the questionnaire during outpatient care 30 days after undergoing the surgical procedure of immediate breast reconstruction after mastectomy. The questionnaire was administered during this time because, at that time, patients have not yet received adjuvant treatments, such as chemotherapy and radiotherapy, whose side effects could interfere with QOL.

The study was assessed and approved by the Human Research Ethics Committee of the FCECON (CAAE number: 39808514.4.0000.0004).

RESULTS

The age group with the highest incidence of breast reconstruction was 45–49 years, corresponding to 27.27% of patients, and the age groups with the lowest incidence of breast reconstruction were 60–64 years and 65–69 years, corresponding to 4.55% of patients. High school was the most prevalent educational level, accounting for 63.64% of patients, and higher educational level and complete and incomplete elementary education accounted for 22.73% and 4.55% of patients, respectively. Married, divorced, and single women accounted for 72.73%, 18.18%, and 9.09% of the study sample, respectively.A total of 90.91% of the patients were from Manaus City, and the rest were from the countryside cities of Itacoatiara and Apuí.

A total of 41% of the patients defined their QOL as good, and 5% defined it as bad. Approximately 50% of patients considered themselves very satisfied with their health, while 4% reported dissatisfaction.

In the psychological domain, which assesses the acceptance of physical appearance, 55% of the patients reported being completely satisfied, and the rest was divided between being very satisfied and moderately satisfied. None of the patients reported being completely dissatisfied with their physical appearance. While 5% of patients reported being dissatisfied with themselves, 50% reported being satisfied. A total of 82% of women had negative feelings.

A total of 36%, 9%, and 14% of patients reported being satisfied, being very satisfied, and being dissatisfied with their performance in daily activities, respectively.

Regarding social relationships, while 46% of patients reported being satisfied with their sexual life, 13.5% reported being dissatisfied. In the subjective self-assessment of personal relationships, 46% of patients reported being very satisfied, and only 9% reported being dissatisfied to some extent.

As shown in Table 1, although there was no significant difference between the domains, the scores for personal relationships and self-assessment of QOL domains were slightly higher than those of other domains.

Figure 1 shows the means of the domains' scores of the questionnaire for assessing the QOL on a scale from 0 to 100. All domains had an approximate score of 72.51, with the physical domain having the lowest score of 68.83.

Figure 2 shows the means of the scores of the 24 facets and the QOL self-assessment question on a scale from 0 to 100. The mobility facet, which

Table 1. Descriptive domain statistics.

Domínio	Mean	Standard Deviation	Coefficient Of Variation	Minimum Value	Maximum Value	Extent
Physical	15.01	2.36	15.72	10.86	18.86	8.00
Psychological	15.58	2.33	14.98	7.33	18.00	10.67
Social relationships	16.00	3.05	19.07	8.00	20.00	12.00
Environment	15.70	1.89	12.02	12.00	19.00	7.00
Self-assessment of QOL	16.73	3.30	19.71	8.00	20.00	12.00
Total	15.60	1.96	12.55	9.85	18.62	8.77

QOL: Quality Of Life

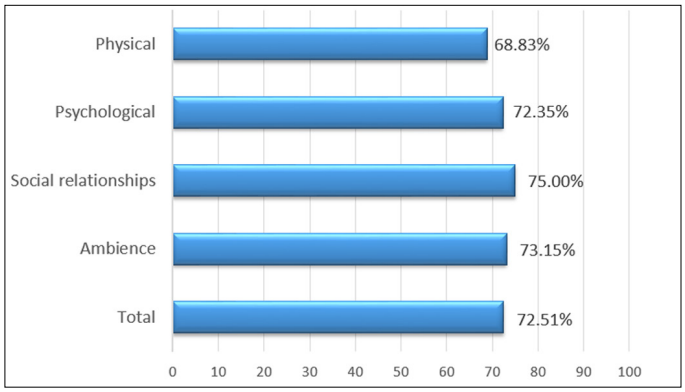

Figure 1. Distribution according to the general analysis of the WHOQOL--BREF domains.

belongs to the physical domain, had the best score, with 89.77. However, the environment domain, represented by the recreation and leisure facet, had the lowest score, with 43.18. The score of self-assessment of QOL was 79.55, showing that the patients had good QOL.

DISCUSSION

The predominant age group undergoing breast reconstruction was 45–49 years, corresponding to 27.27% of patients. The age groups 40–44 years and 55–59 years corresponded to 22.73% of patients. Gomes et al., in 2015[3], conducted a cross-sectional study with 37 women and observed a mean age of 57 years and a prevalence of 72% of women aged 50 years or higher. Similarly, Garcia et al., in 2018[4], conducted a cross-sectional study with 35 women and observed a mean age of 50 years.

High school was the predominant educational level, corresponding to 63.64% of the patients assessed. Complete and incomplete elementary education corresponded to 4.55% of patients. Seidel et al., in 2017[5], assessed 35 patients in the State of Santa Catarina and observed a prevalence of 53.1% of patients who had completed high school. Ferraz, in 2009[6], observed that 65% of patients had incomplete elementary education, and 16.7% had completed high school, a result which is inconsistent to the results obtained in the present study.

Married women were predominant, corresponding to 72.73% of the study sample; moreover, 18.18% and 9.09% of women were divorced and single, respectively. Hughet et al., in 2009[7], conducted a cross-sectional study with 110 women in Campinas (São Paulo) and observed that 68% of them were married. Seidel et al., in 2017[5], found a similar result in their study conducted in 58 women in Santa Catarina with a prevalence of 56.6% of married women, which is consistent with the results obtained in the present study.

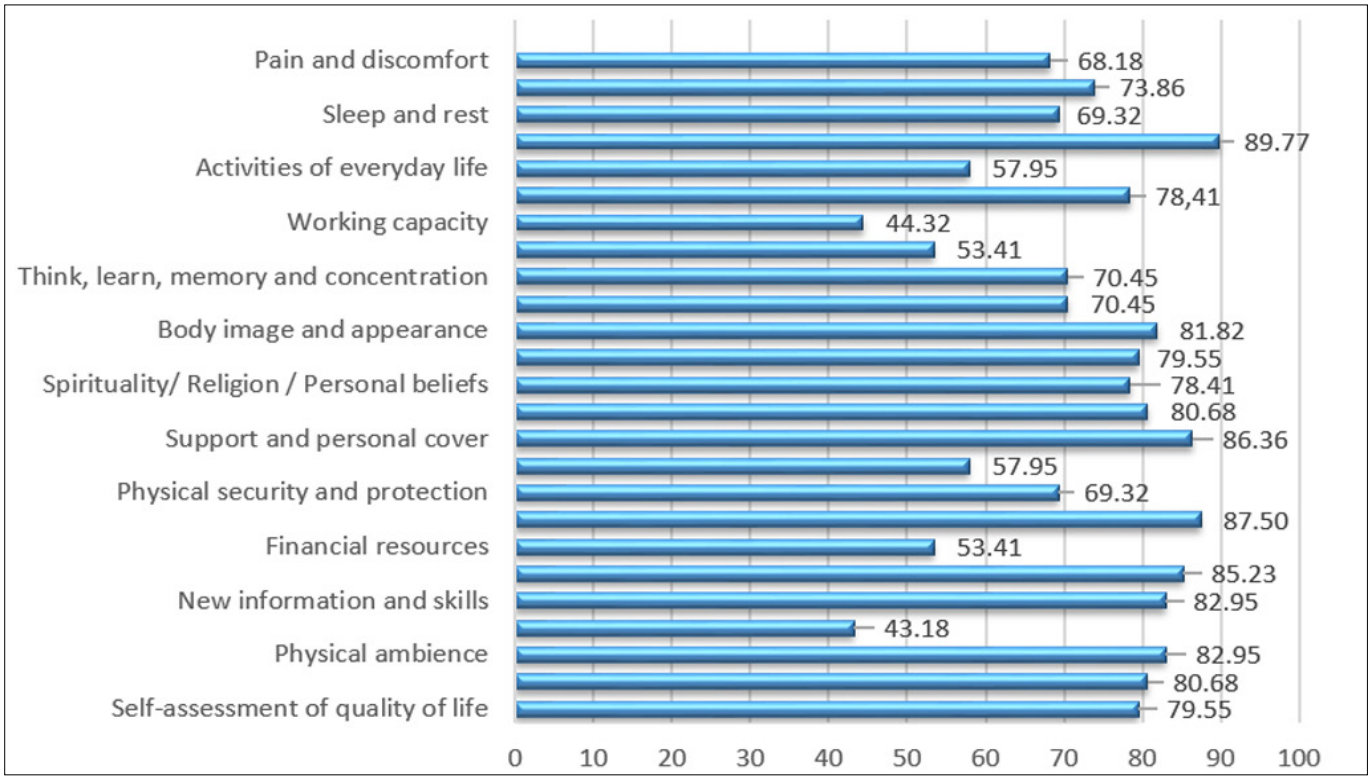

Figure 2. Distribution according to the general analysis of the WHOQOL-BREF facets.

A total of 90.91% of patients were from the Manaus City, and the rest were from the countryside cities of Amazonas. Pereira et al., in 2017,[8], assessed 211 women from 2003 to 2013 at FCECON and observed that 21% were from countryside cities different from those of the present study.

A total of 41% of patients defined their QOL as good. Our results were consistent with the results obtained from the study of Paredes et al., in 2013[9], who assessed 27 women in Fortaleza and obtained a satisfaction level of 41%.

The physiological score was 72.35, which is close to the scores obtained by Gomes et al., in 2015[3], 71.87, and by Fuga, in 2016[10], who assessed 18 patients in Rio Grande do Sul and found a mean age of 55.83 years and a score of 75.17.

The physical domain had the lowest score, with 68.83. This finding is consistent with the findings observed in the study of Garcia et al., in 2018[4], in which the physical domain score of the 35 women assessed was 65.09. Jorge e Silva, in 2010[11], conducted a cross-sectional descriptive study with 50 patients in the region of Triângulo Mineiro, from August 2007 to April 2009, and observed that the physical domain was the most affected, with a score of 56.00.

Kluthcovsky and Urbanez, in 2012[12], conducted a cross-sectional study with 199 women in Paraná and observed that the social relationships domain had the highest score, a result consistent with the results obtained in the present study, with a social relationship score of 75.00. However, in the study by Gomes et al., in 2015[3], comprising 37 patients, the social relationships domain had a score of 62.39.

Jorge e Silva, in 2010[11], and Garcia et al., in 2018[4], found low environment scores, 58.10 and 60.31, respectively. The present study had different results, with a score of 73.15.

Paredes et al., in 2013[9], assessed 27 mastectomized women undergoing immediate or late breast reconstruction using the WHOQOL-BREF questionnaire and found that women who underwent late reconstruction were more satisfied compared to women who underwent immediate breast reconstruction.

CONCLUSION

When analyzing the criteria for QOL, negative feelings had an unfavorable outcome. However, breast reconstruction had a positive impact on the physical, social relationships, and environment domains.

The assessment of the QOL of women undergoing breast carcinoma treatment should be prioritized in the choice of surgical treatment since body image directly influences their QOL. In this way, breast reconstruction can provide this woman with an improved body contour, which will directly impact her QOL.

QOL should be prioritized in the choice of treatment to be offered to women with breast cancer. Further studies will certainly demonstrate the importance of this assessment.

COLLABORATIONS

RAP	Analysis and/or data interpretation, Conception and design study, Conceptualization, Data Curation, Final manuscript approval, Formal Analysis, Funding Acquisition, Investigation, Methodology, Project Administration, Realization of operations and/or trials, Resources, Visualization, Writing - Original Draft Preparation, Writing - Review & Editing
HFBESAP	Writing - Original Draft Preparation, Writing - Review & Editing
GPSN	Data Curation
EOA	Writing - Review & Editing
VTA	Data Curation

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Original Article

Histological comparison between irradiated and non-irradiated breasts in breast reconstruction

Comparação histológica entre mamas irradiadas e não irradiadas em reconstrução mamária

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■ **ABSTRACT**

Introduction: The treatment of breast cancer includes not only curative therapies but also breast reconstruction. Radiotherapy, an adjuvant strategy, provides favorable outcomes by reducing the rate of recurrence of the disease. This study aimed to compare histological differences between irradiated and non-irradiated breasts in the same patient. **Methods:** This is a prospective cohort study of patients undergoing breast reconstruction with prosthesis or expander under pectoralis major muscle flap that compared histological skin patterns, subcutaneous cell tissue, pectoralis major muscle, and implant capsule of irradiated and non-irradiated breasts in paired samples of the same patient. All patients included in this study were irradiated in only one breast. The results of the anatomopathological analysis were compared to clinical findings and intraoperative macroscopic aspects. **Results:** The study included a total of 7 patients with a mean age of 52.15 years. The main histological findings in the skin and subcutaneous cellular tissue of the irradiated breast were as follows: epidermal hyperplasia, flattening of the papillary layer, atrophy of the skin appendages, vascular congestion in fatty tissue, high density of skin collagen fibers, hyalinization, and reduction of elastic fibers in the deep dermis and unidirectional alignment of collagen fibers. The main histological findings for the capsule and pectoralis major muscle in the irradiated breast were as follows: lower density of elastic fibrosis, perivascular fibrosis, synovial metaplasia, skeletal muscle sequestration at the interface with the capsule, capsular hyalinization, and capsular fibrosclerosis. **Conclusion:** We found common histological changes in irradiated breasts in most patients. These findings are compatible with the clinical and macroscopic changes observed. This study presents itself as a pilot for the development of further studies investigating the physiopathological mechanisms of the described histological changes.

Keywords: Breast; Breast neoplasms; Radiotherapy; Adjuvant radiotherapy; Prostheses and implants.

Institution: Hospital Daher Lago Sul, Brasília, DF, Brazil.

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■ **RESUMO**

Introdução: O tratamento do câncer de mama inclui, além de terapias curativas, a reconstrução mamária. Entre as estratégias adjuvantes, a radioterapia fornece desfechos favoráveis em termos de redução da taxa de recorrência da doença. Esse estudo tem como objetivo comparar as diferenças histológicas entre mamas irradiadas e não irradiadas em um mesmo paciente. **Métodos:** Estudo prospectivo de coorte em pacientes submetidos à reconstrução mamária com prótese ou expansor sob retalho muscular de peitoral maior, comparando os padrões histológicos de pele, tecido celular subcutâneo, músculo peitoral maior e cápsula do implante, de mamas irradiadas e não irradiadas em amostras pareadas de um mesmo paciente. Todos os pacientes deveriam receber irradiação em apenas uma das mamas. A análise anatomopatológica foi comparada aos achados clínicos e aos aspectos macroscópicos do transoperatório. **Resultados:** O trabalho contou com um total de 7 pacientes, sendo a idade média de 52,15 anos. Os principais achados histológicos em pele e tecido celular subcutâneo da mama irradiada foram: hiperplasia epidérmica, achatamento da camada papilar, atrofia dos apêndices dérmicos, congestão vascular no tecido gorduroso, alta densidade das fibras de colágeno dérmico, hialinização das paredes vasculares, redução das fibras elásticas na derme profunda e alinhamento unidirecional das fibras de colágeno. Os principais achados histológicos de cápsula e músculo peitoral maior na mama irradiada foram: menor densidade de fibras elásticas, fibrose perivascular, metaplasia sinovial, sequestro de músculo esquelético na interface com a cápsula, hialinização capsular e fibroesclerose capsular. **Conclusão:** Encontramos alterações histológicas comuns nas mamas irradiadas em boa parte das pacientes, achados esses que são compatíveis com as alterações clínicas e macroscópicas observadas. Esse estudo apresenta-se como um piloto para o desenvolvimento de novos estudos que pesquisem os mecanismos fisiopatológicos relacionados às alterações histológicas descritas.

Descritores: Mama; Neoplasias da mama; Radioterapia; Radioterapia adjuvante; Próteses e implantes.

INTRODUCTION

Since the 1990s, the treatment of breast cancer has included not only curative therapies but also breast reconstruction, which has increased patients' interest in getting protected from cancer and obtaining better aesthetic results. Many studies have reported that breast reconstruction has no negative impact on cancer safety, reassuring patients and motivating them to perform the procedure[1,2].

Studies show that radiotherapy, an adjuvant strategy, provides favorable outcomes by reducing the rate of recurrence of the disease, thus increasing the number of indications. The guidelines for radiotherapy began to include more diverse indication criteria, further expanding the use of this therapeutic modality[3,4].

Immediate reconstruction is indicated because it can significantly improve the quality of life of a woman, helping in her body image satisfaction and psychosocial well-being, compared to delayed reconstruction[5].

Breast reconstruction using implants is a relatively simple procedure, with short surgical time and rapid postoperative recovery. It also provides excellent aesthetic results. Its advantages compared to autologous flap reconstruction include smaller procedures with good results, without the need to transpose skin islands from other regions of the body to the breast[6,7]. Given these facts, it is currently one of the most popular surgical methods. The increasing indication of breast reconstruction with implants, combined with the full application of radiotherapy, have made it more difficult to understand and avoid potential

complications associated with the interaction between radiation and implant. Capsular contracture, infection, and poor positioning of the breast implant were indicated as the main complications. Although capsular contracture is the most important complication, being the most common cause of reoperation,[3,8,9] its pathogenesis induced by radiation is still unknown[10].

Some of the skin changes after irradiation have been investigated, and early effects (up to 90 days after the onset of radiation) include dehydration, pigmentation changes, loss of skin appendages, erythema, and desquamation. Delayed histological changes (after 90 days) include atrophy or hyperplasia of the epidermis, hypocellular fibrosis of the dermis, sclerotic vascular changes, and absence of pilosebaceous units (appendages). However, it is still unclear whether these changes are associated with the difficulties and complications of breast reconstruction with expander/implant[11,12]. The susceptibility of the skin to changes after irradiation can be determined genetically. This concept is reinforced by individual differences in changes caused by radiation and developed complications[13,14,15].

This study aimed to describe and compare histological differences between skin, subcutaneous cell tissue, pectoralis major muscle, and capsule of irradiated and non-irradiated breast implant in the same patient and to guide further studies to analyze possible methods of prophylaxis and treatment of complications. Currently, there are no studies that address such comparisons on all tissue layers.

METHODS

Study design

Patients and tissue collection

This was a prospective cohort study of patients who underwent breast reconstruction with prosthesis or expander under pectoral major muscle flap, between January and August 2019, at the Daher Lago Sul Hospital, Brasília (DF). The histological patterns of skin, subcutaneous cellular tissue, pectoralis major muscle, and capsule of irradiated and non-irradiated breast implant were compared in paired samples of the same patient. All patients signed an informed consent form authorizing and agreeing to undergo surgical procedures and anatomopathological examinations and to record them for scientific purposes. The study was submitted to *Plataforma Brasil*, and the manuscript was validated by the Research Ethics Committee of the Health Sciences Teaching and Research Foundation/FEPECS/SES/DF, whose CAAE number is 15942719.6.0000.5553.

Surgeries were performed at the Daher Lago Sul Hospital–DF and the Brasília Hospital– DF. All selected patients had a history of previous radiotherapy in another institution, following the current reference scheme (50 Gy), which consists of 25 radiotherapy sessions for five weeks plus an additional dose on the tumor bed. Patients older than 18 years undergoing breast reconstruction for treatment of capsular contracture or other complications of adjuvant radiotherapy or contralateral symmetrization were included. Patients that were included in this study received irradiation in only one breast.

Biopsy tissues were collected during breast reconstruction. Samples of skin and subcutaneous cell tissue with length, width, and depth ranging between 0.5 and 1.0 cm were taken bilaterally from the submammary sulcus.

Samples of capsular tissue and pectoralis major muscle with dimensions 1.0 × 1.0 cm were taken from the site of greatest cicatricial retraction in the irradiated breast and in the inferomedial portion near the submammary sulcus of the non-radiated breast.

Anatomopathological analysis was performed, and the results were compared to the clinical findings of physical examination and the transoperative macroscopic aspects such as color, elasticity, vascularization, healing, and tissue sensitivity, to establish correlations between the clinical/histological variables and radiation.

Histological approach

The histological processing of tissue specimens was performed according to the method described by Huanget et al., in 2016[16]. Briefly, tissue specimens were fixed in buffered formaldehyde, embedded in paraffin, and stained by hematoxylin-eosin, Masson's trichrome, and Voerhoff elastic fibers for light microscopy. The histological evaluation was performed by a single pathologist in the Diagnose laboratory, Brasília (DF).

Quantitative and qualitative aspects of the epidermis were evaluated. Panniculus and implant capsule in the dermis were quantitatively and qualitatively evaluated for collagen, cellularity, inflammation, and vascularization.

RESULTS

The data from 7 patients, all female, with a mean age of 52.15 years (ranging from 34 to 68 years) were analyzed. They received 25 sessions of conventional radiotherapy in one breast, with a total dose of 50 Gy. The mean time between the last radiotherapy session and breast reconstruction was 54.14 months (ranging from 7 to 204 months). One of the postoperative

complications of the first surgery was capsular contracture, which affected all patients and led to the second surgical period. One patient had suture dehiscence on both breasts, which was resolved with local bandages. None of them had infections.

While skin and subcutaneous cell tissue biopsies were collected in all patients, capsule and pectoralis major muscle biopsies were also collected, since the breast contralateral to radiotherapy did not receive the implant. The main clinical and macroscopic changes during the surgical procedure were as follows: dry skin (100%), loss of skin elasticity (85.71%), hypovascularized fat (100%), capsular contracture (100%), capsular thickening (85.71%), muscle hypotrophy (100%), hypovascularized muscle (85.71%), and skin dyschromia (42.85%), as shown in Table 1.

The main histological findings in the skin and subcutaneous cellular tissue in the irradiated breast were as follows: epidermal hyperplasia (71.42%), flattening of the papillary layer (85.71%), atrophy of the skin appendages (100%), vascular congestion in fatty tissue (71.42%), high density of skin collagen fibers (100%), hyalinization of vascular walls (85.71%), reduction of elastic fibers in the deep dermis (85.71%), and unidirectional alignment of collagen fibers (100%), as shown in Table 2. These findings were observed in the samples of irradiated skin with considerable differences.

The main histological findings of capsule and pectoralis major muscle in the irradiated breast were as follows: lower density of elastic fibers (80%), perivascular fibrosis (100%), synovial metaplasia (100%), skeletal muscle sequestration at the interface with the capsule (80%), capsular hyalinization (80%), and capsular fibrosclerosis (100%), as shown in Table 3.

All patients had similar anatomical findings, which were consistent with clinical findings. It should be mentioned that cases 5 and 7 had more discreet anatomopathological findings, occasionally having a mixed pattern of presentation with areas containing normal tissue in the irradiated breast. Figures 1, 2, 3, and 4 show the main histological differences between irradiated and non-irradiated breasts.

Table 1. Macroscopic clinical and intraoperative changes of the irradiated breast.

Case		Time between last radiation and surgery	Irradia ted side	Clinical and macroscopic changes of irradiated breast							
				DS	LSE	HF	CC	CT	MH	HVM	SD
1	57	108 months	Left	+	+	+	+	+	+	+/-	-
2	68	204 months	Right	+	+	+	+	+/-	+	+	+
3	60	24 months	Left	+	+	+	+	+	+/-	+	+
4	34	18 months	Right	+	+	+	+	+	+/-	+	-
5	42	10 months	Left	+	-	+/-	+	+/-	+/-	-	-
6	40	7 months	Right	+/-	+/-	+	+	+	+	+	+/-
7	64	8 months	Right	+	+	+/-	+	-	+	+	-

DS: Dry skin; LSE: Loss of skin elasticity; HF: Hypovascularized fat; CC: Capsular contracture; CT: Capsular thickening; MH: Muscle hypotrophy; HVM: Hypovascularized muscle; SD: Skin dyschromia; "-" (not found); "+/-" (found moderately); "+" (found).

Table 2. Anatomopathological findings of skin and subcutaneous cellular tissue.

Case	Age	Time between last radiation and surgery	Side irradiate	Irradiated breast							Non-irradiated breast					
				EH	FPL	ASA	VC	HDCF	HVW	RFEDP AUFC	EH	FPL	ASA	VC HDCF	HVW	RFEDP AUFC
1	57	108 months	E	+	+	+	+	+	+	+ +	-	-	-	- -	-	- +
2	68	204 months	D	+/-	+	+	+	+/-	+	+ +	-	-	-	- +	-	+/- -
3	60	24 months	E	+	+/-	+	+	+	+	+ +	-	+	-	- -	-	- -
4	34	18 months	D	+	+	+	+	+	+/-	+ +	-	+/-	-	- -	+/-	- -
5	42	10 months	E	-	+	+/-	+/-	+	+/-	+/- +	-	-	-	+/- -	-	- -
6	40	7 months	D	+	-	+	-	+/-	+/-	- +/-	-	-	-	- +/-	-	- -
7	64	8 months	D	-	+	+	-	+/-	-	+/- +/-	-	-	-	- -	-	- -

EH: Epidermal hyperplasia; FPL: Flattening of the papillary layer; ASA: Atrophy of the skin appendages; VC: Subcutaneous vascular congestion; HDCF: High density of collagen fibers; HVW: Hyalinization of the vascular wall; REFDD: Reduction of elastic fibers in the deep dermis; UACF: Unidirectional alignment of collagen fibers; * skin and subcutaneous cell tissue analysis; "- " (not found); "+/- " (found moderately); "+" (found).

Table 3. Anatomopathological findings of implant capsule and pectoralis major muscle.

Case	Age	Time between last radiation and operation	Degree of capsular contractur	Irradiated side	Irradiated breast						Non-irradiated breast					
					LDEF	EF	SM	SMS	CH	CF	LDEF	EF	SM	SMS	CF	CF
1	57	108 months	Baker 3	E	+	+	+	+/-	+	+	-	+/-	-	-	-	-
2	60	24 months	Baker 2	E	+/-	+	+	+	+	+	-	-	-	+/-	-	-
3	34	18 months	Baker 3	D	+	+/-	+	+	+	+	-	-	-	-	-	-
4	42	10 months	Baker 2	E	+	+	+	+/-	+/-	+/-	-	-	-	-	-	-
5	40	7 months	Baker 2	D	+	-	+	-	-	+	-	-	-	-	-	-

LDEF: Lower density of elastic fibers; PF: Perivascular fibrosis; MS: Synovial metaplasia; SMS: Skeletal muscle sequestration; CH: Capsular hyalinization; CF: Capsular fibrosclerosis; * capsule and pectoralis major muscle analysis; "-" (not found); "+/-" (found moderately); "+" (found).

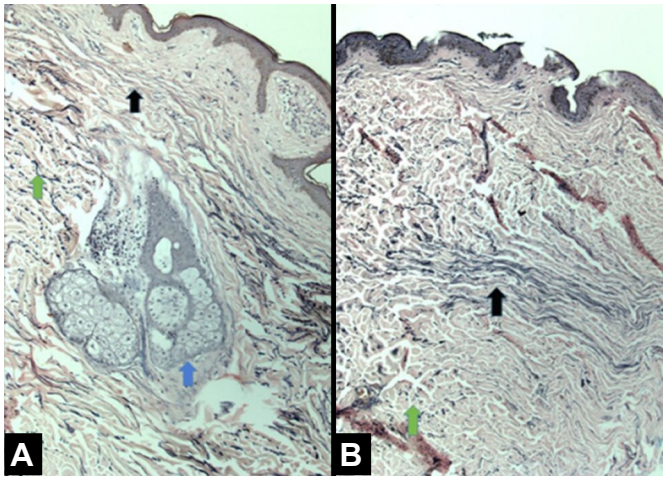

Figure 1. Histological comparison of the skin of non-irradiated. **A:** and irradiated. **B:** Breasts. Emphasis for the greater density of elastic fibers in normal skin (green arrow), for the unidirectional arrangement of elastic fibers in irradiated skin (black arrows), and for the presence of skin attachments in normal skin (blue arrow).

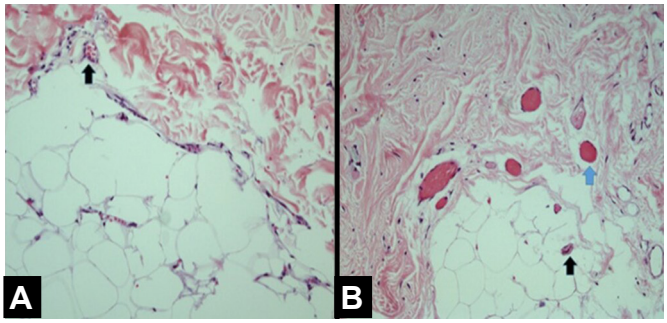

Figure 2. Histological comparison of subcutaneous cell tissue of non-irradiated. **A:** Irradiated. **B:** Breasts. Emphasis for the hyalinization of vascular wall in the irradiated breast and the preservation of fine and delicate walls in the capillaries of the non-irradiated breast (black arrows) and the vascular congestion observed in the irradiated breast (blue arrow).

Clinical cases

Case 1

A 36-year-old patient, without comorbidities, diagnosed with invasive ductal carcinoma in the right breast, undergoing neoadjuvant chemotherapy +

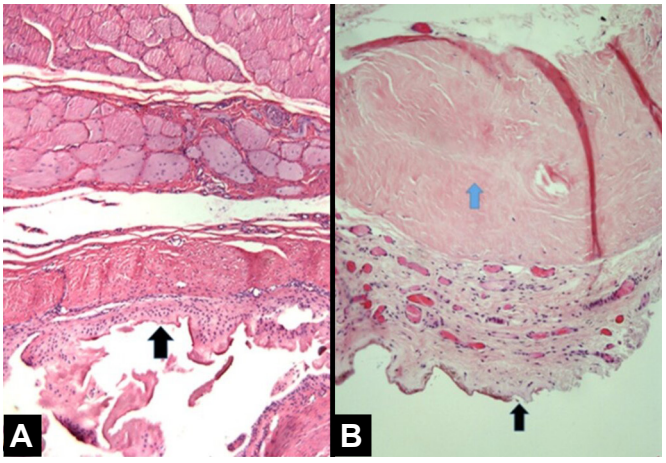

Figure 3. Histological comparison of the capsules of non-irradiated. **A:** Irradiated. **B:** Breasts. Emphasis for the greater thickness of the capsule in the irradiated breast (black arrow) and for fibrosclerosis and subcapsular hyalinization in the irradiated breast (blue arrow).

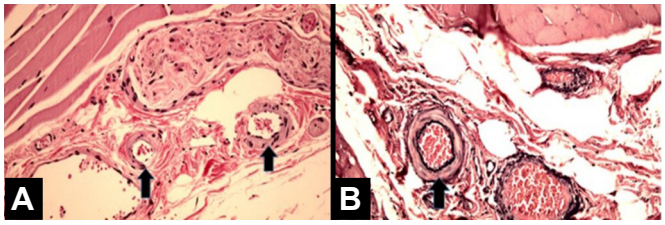

Figure 4. Histological comparison of muscle tissue and its neurovascular plexus in non-radiated. **A:** Irradiated. **B:** Breasts. Emphasis for the more organized and circular aspect of the arterioles in the irradiated breast, as well as perivascular fibrosis (black arrows).

bilateral mastectomy without preservation of nipple-areola-complex, with right axillary dissection + immediate reconstruction with retromuscular remote valve expanders, in February 2016, without complications. Expansion was performed with physiological solution until March 2016 and adjuvant radiotherapy was performed in the right breast (last session in June 2016). Submitted to second surgical period in February 2017 for replacement of expander by silicone implants + bilateral reconstruction of nipple-areola-complex + liposuction of axillary extensions without complications. Due to the development of intense radiodermatitis not responsive

to clinical treatments, she underwent microsurgical reconstruction of the right breast with transverse flap of the rectus abdominis muscle in June 2019, as shown in Figure 5.

Figure 5. JSFB, 37th month postoperatively. Bilateral mastectomy without preservation of nipple-areola complex, with right axillary dissection + immediate reconstruction with retromuscular remote valve expanders and 25th month postoperatively expander replacement by silicone implants + bilateral reconstruction of nipple-areola complex + liposuction of axillary extensions.

Case 2

A 41-year-old patient with no comorbidities, diagnosed with invasive carcinoma in the left breast, undergoing left mastectomy with sentinel lymph node biopsy (negative) and contralateral prophylactic mastectomy + immediate reconstruction with retromuscular silicone implants with lower pole amputation (Torek) in December 2017, without complications. She underwent adjuvant radiotherapy in the left breast (last session in August 2018), and the second surgical period in June 2019 for left capsulotomy + implant repositioning, fat grafting for symmetrization and correction of scars in axillary extensions (reconstruction of nipple-areola complex programmed in the third period) without complications as shown in Figure 6.

Figure 6. QNPO, 9th month postoperatively. Left mastectomy with sentinel lymph node biopsy (negative) and contralateral prophylactic mastectomy + immediate reconstruction with retromuscular silicone implants with lower pole amputation (Torek).

DISCUSSION

As a result of early detection and improvement in treatments such as surgery, hormonal therapies, chemotherapy, and radiotherapy, the mortality rate for breast cancer has been decreasing since the 1950s. Therefore, more patients with breast cancer are surviving and remaining with sequelae that must be treated. In this study, we sought to describe the histological differences of skin, subcutaneous cell tissue, implant capsule and pectoralis major muscle between irradiated and non-irradiated breasts of the same patient. Previous studies have addressed only the skin and subcutaneous region.

The findings of epidermis hyperplasia, flattening of the papillary layer, atrophy of the skin appendages, high density of the skin collagen fibers, and presence of unidirectional collagen fibers had already been reported[11,12]. Atrophy of skin appendages is of particular clinical importance, as loss of sebaceous tissue and sweat glands lead to dehydrated skin, resulting in the need for long-term skincare using moisturizers. Chronic radiation dermatitis is reported to be associated with fibroblast atypia, which is not seen in other types of fibrosis, such as third-degree burn scars[12.13]. The present study corroborates these findings. Other findings included the following: reduction of elastic fibers in the deep dermis, vascular congestion in fatty tissue, and hyalinization of vascular walls. Although histological changes in dermatitis due to radiation have already been described[12,13], these have been considered to be less important clinically with acceptable side effects. However, this does not apply when planning breast reconstruction with silicone expander/implant.

Archambeau et al., in 1995[11], found skin changes due to irradiation progressing for up to 10 years. Given this fact, the delay in indicating reconstruction after radiotherapy does not increase safety. This finding could explain the mild findings found in cases 5 and 7,

in which the last radiotherapy session was more recent (10 and 8 months, respectively).

One of the main complications of radiotherapy is fibroproliferation of the capsular tissue around the implant with a resulting capsular contracture. This leads to an inadequate expansion with distortion and undesirable aesthetic results, sometimes causing additional surgery. Currently, the pathogenetic mechanism of fibroproliferation and capsular contracture induced by radiation is unknown. The correct anatomical description of the observed changes can help in the development of new studies, unraveling the biochemical mechanisms involved in this pathogenesis.

Understanding the pathogenesis of the fibroproliferative process, which starts with the expansion of the tissue previously subjected to radiotherapy, may probably lead to the discovery of prevention strategies or clinical treatment. For example, COX-2 selective inhibitors are commercially available and were effective in partially decreasing cell proliferation in fibrosis models mediated by increased catenin levels[17]. There is great potential to explore treatment protocols in an animal model and eventually in clinical trials.

Encapsulation occurs as a result of an inflammatory response to the presence of the foreign body, and fibrosis progresses to nearby tissues. When fibrosis progresses excessively, due to the persistence of the inflammatory response and exposure to external risk factors, contracture occurs around the thickened capsule[18].

Therefore, breast reconstruction with implants is performed under the assumption that if radiotherapy is administered, capsular contracture will be recognized as a fundamental limitation, and many studies will be conducted to find solutions to this question.

Kim et al., in 2018[19], confirmed that the infiltration of myofibroblasts was promoted in irradiated mice, suggesting that this phenomenon acts as a catalyst to accelerate the progression of contracture. We did not find this type of cellular infiltration in any of the samples of irradiated breast.

Some studies reported using coverage with acellular skin matrix and some medications such as montelukast, antileukotrienes, and steroids to reduce the occurrence of capsular contracture around textured implants[20,5]. Although it is consensus that radiation can induce fibroproliferation in skin and subcutaneous tissues[11,13], the relative occurrences of specific molecular mechanisms are still unclear.

We believe that dry skin may be related to atrophy of the skin appendages. The loss of skin elasticity was related to the reduction of elastic fibers in the deep dermis, epidermal hyperplasia, flattening of the papillary layer, high density of skin collagen fibers, and unidirectional alignment of collagen fibers. Hypovascularized fat was related to subcutaneous vascular congestion and hyalinization of vascular wall. The thickened and contracted capsule was related to lower density of elastic fibers, capsular hyalinization, capsular fibrosclerosis, and synovial metaplasia. Hypotrophic and hypovascularized muscle was related to perivascular fibrosis and skeletal muscle sequestration by capsule.

With the data obtained so far, it is not possible to establish a cause and effect relationship, but we will continue to include new patients into the study and try to optimize the quantitative analysis of the information to get to this point. Since each histological evaluation was performed between the breasts of the same patient and not between two different groups, even a small number of patients provided significant results.

CONCLUSION

We found common histological changes in irradiated breasts in most patients. These findings are compatible with the clinical and macroscopic changes observed. This is a descriptive study that presents itself as a pilot for the development of new studies investigating the physiopathological mechanisms related to the described histological changes, thus proposing methods of prophylaxis and treatment for the complications of radiotherapy.

COLLABORATIONS

AB	Analysis and/or data interpretation, Final manuscript approval, Realization of operations and/or trials
RCSD	Analysis and/or data interpretation, Conception and design study, Data Curation, Writing - Review & Editing
ACC	Analysis and/or data interpretation
COPC	Analysis and/or data interpretation
MCC	Final manuscript approval
JCD	Final manuscript approval

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Original Article

Breast reconstruction with implant: creating a pocket with a reverse serratus anterior muscle flap

Reconstrução mamária com implante: confecção de bolsa com retalho reverso de músculo serrátil anterior

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■ **ABSTRACT**

Introduction: Immediate breast reconstruction plays an important role in the treatment of breast cancer and relatively promotes patients' emotional and physical recovery. It may be difficult to cover the entire prosthesis with a muscle flap in single-stage breast reconstructions based on a permanent implant. This study aimed to present a muscle pocket for the implant using a reverse anterior serratus muscle flap associated with submuscular dissection of the pectoralis major muscle. **Methods:** This was a prospective study comprising 61 patients undergoing mastectomy followed by immediate reconstruction (74 reconstructions) with implant and anterior serratus muscle reverse flap associated with submuscular pectoralis dissection between January 2017 and July 2018. In this study, age, adjuvant and neoadjuvant therapies, implant volume, length of hospital stay, follow-up, and complications, including functional deficit and reconstruction failure, were analyzed. **Results:** The technique described was used to operate 74 patients with a mean age of 49.2 years. The volume of the implant varied from 200 to 500 cc, and the mean follow-up time was 14.9 months. Complications such as hematoma, suture dehiscence, skin flap necrosis, and implant extrusion were observed in 14 patients (18.9%). **Conclusion:** In most cases, breast reconstruction with an anterior serratus muscle reverse flap associated with submuscular dissection of the pectoralis major muscle allows the complete muscle coverage of the implant, reduces the occurrence of major surgical complications, and has a good aesthetic result.

Keywords: Surgery, Plastic; Breast neoplasms; Mastectomy; Reconstruction; Breast implants.

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■ **RESUMO**

Introdução: A reconstrução mamária imediata desempenha papel importante no tratamento do câncer de mama, permitindo uma recuperação emocional e física, ainda que parcial, das pacientes. Nas reconstruções mamárias em único estágio, baseada em implante permanente, pode ser difícil cobrir toda a prótese com retalho muscular. O objetivo do estudo é apresentar a realização de uma bolsa muscular para implante através do retalho reverso do músculo serrátil anterior associada à dissecção submuscular do músculo peitoral maior. **Métodos:** Foi realizado um estudo prospectivo com 61 pacientes submetidas à mastectomia seguida de reconstrução imediata (74 reconstruções) com implante e retalho reverso do músculo serrátil anterior associado à dissecção submuscular do peitoral, entre janeiro de 2017 e julho de 2018. Foram analisados a idade, terapia adjuvante e neoadjuvante, volume do implante, tempo de internação hospitalar, seguimento e complicações, incluindo déficit funcional e falha na reconstrução. **Resultados:** 74 pacientes foram operadas pela técnica descrita com idade média de 49,2 anos. O volume do implante variou de 200 a 500cc e o tempo médio de proservação foi de 14,9 meses. 14 pacientes (18,9%) apresentaram complicações como hematoma, deiscência de sutura, necrose de retalho cutâneo e extrusão do implante. **Conclusão:** A reconstrução mamária com retalho reverso do músculo serrátil anterior associado à dissecção submuscular do peitoral maior permite, na grande maioria dos casos, cobertura muscular completa do implante, redução de complicações cirúrgicas maiores e bom aspecto estético.

Descritores: Cirurgia plástica; Neoplasias da mama; Mastectomia; Reconstrução; Implante mamário.

INTRODUCTION

Immediate breast reconstruction plays an important role in the treatment of breast cancer and relatively promotes patients' emotional and physical recovery[1,2].

Types of breast reconstruction include implant placement and/or use of autologous tissue. The use of permanent implants or expanders is widely accepted and increasingly recommended, specifically with the increased number of skin- and nipple-areolar complex (NAC)-sparing mastectomies[3].

It may be difficult to cover the prosthesis with a muscle or fascial flap in single-stage reconstructions based on a permanent implant.

This study presents the technique of creating a muscle pocket for the implant using a reverse anterior serratus muscle flap associated with submuscular dissection of the pectoralis major.

OBJECTIVE

This study aimed to present the technique of creating a muscle pocket with a reverse serratus muscle flap to cover the implant in immediate breast reconstruction.

METHODS

This was a prospective, descriptive, and analytical study following the principles of the Declaration of Helsinki revised in 2000 and Resolution 196/96 of the National Health Council. The study was approved by the research ethics committee of the Felício Rocho Hospital (CAAE 94178618.0.0000.5125) (opinion number 2,947,562). All patients included in this study signed an informed consent form. The authors declare no conflicts of interest, and there were no sources of funding.

A total of 61 patients underwent mastectomy at the Breast Care Clinic of Felício Rocho Hospital (Belo Horizonte/MG, Brazil) between January 2017 and July 2018. Apart from these 61 mastectomies, 13 mastectomies were bilateral, resulting in 74 immediate breast reconstructions with permanent implant. The reconstructions were performed at the Plastic Surgery Clinic of the same institution. The prostheses were

placed in a pocket formed by the reverse anterior serratus muscle flap and the submuscular dissection of the pectoralis major.

The inclusion criterion was as follows: patients undergoing skin- or NAC-sparing mastectomy with an indication for immediate unilateral or bilateral reconstruction with permanent implant.

The exclusion criteria were as follows: previous remote mastectomy, inflammatory breast cancer, and patients with large skin resections (with indication for a musculocutaneous flap or expander). Moreover, patients with inadequate postoperative follow-up were excluded in the study.

The studied variables were age, adjuvant and neoadjuvant therapies, implant volume, length of hospital stay, follow-up, and complications, including functional deficit and reconstruction failure.

Functional deficit, mainly winged scapula, was evaluated using the Hoppenfeld test[4], where the patient is instructed to stand, flex his/her shoulder at 90°, place his/her hands flat on the wall (shoulders close to his/her hands), and extend his/her elbows by pushing his/her body back. During this test, in the presence of winged scapula, the medial half of the scapula is more evident compared to the unaffected side[5].

Reconstruction failure was considered in patients who required reoperation to replace or remove the permanent implant or a rescue operation with a musculocutaneous flap during the follow-up period.

Microsoft Office Excel spreadsheets were used for statistical analysis. The related literature was reviewed using the PubMed and LILACS databases.

Surgical technique

The size of the permanent implant is defined in a preoperative consultation by evaluating breast measurements using plastic shells of predetermined volume (Mamasize®). Intraoperatively, the volume of the removed breast is stipulated using the method of Archimedes[6] through the total immersion of the surgical specimen in a container filled with 0.9% saline solution. The overflowing solution is collected in a second container placed immediately below the first one and accurately measured by aspiration using a 60-mL syringe.

Breast reconstruction begins by detaching the pectoralis major muscle from its lateral margin to its sternal origin using an electrocautery. Inferiorly, the dissection advances at least 2 cm into the sheath of the rectus abdominis muscle, passing the inframammary fold. The permanent implant is placed in a subpectoral pocket (Figure 1), and the pocket with reverse anterior serratus muscle flap is marked. Line A is defined as the lateral margin of the pectoralis major, line B as the base of the permanent implant in the chest wall, and line C as the transfer of the distance between lines A and B. The width of the reverse anterior serratus muscle flap should be adequate for inferolateral muscle coverage of the alloplastic material (Figure 2). Lines A and C are approximated and sutured with separate polyglactin 2 (Vicryl®) stiches as shown in Figures 3 and 4. The procedure ends with the placement of a suction drain, and the surgical wound is sutured by tissue planes (Figure 5).

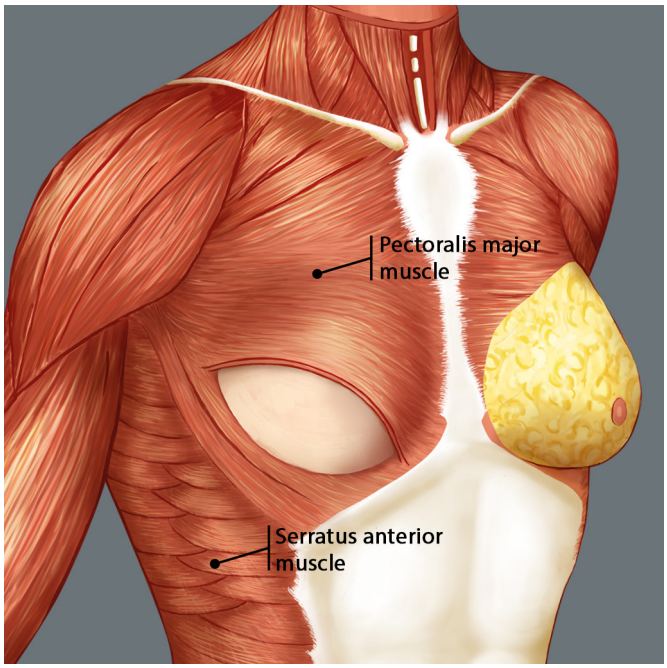

Figure 1. After detaching the pectoralis major muscle from the lateral to the sternal border, the dissection inferiorly advances at least 2 cm into the sheath of the rectus abdominis muscle, passing the inframammary fold. Subsequently, the textured silicone implant is accommodated in a subpectoral pocket.

RESULTS

A total of 61 patients were operated. Apart from these 61 patients, 13 underwent bilateral reconstruction, resulting in 74 breast reconstructions using the technique described (Figures 6 to 8).

The age of the patients ranged from 32 to 82 years, with a mean age of 49.2 years. The volume of the implants ranged from 200 to 500 cc, with a mean volume of 344.5 cc. Hospital stay was 24 hours for 46 patients (75.4%) and 48 hours for 15 patients (24.6%).

Postoperative follow-up varied from a minimum of 8 months to a maximum of 24 months, with a mean period of 14.9 months.

Thirteen patients (21.3%) had a history of neoadjuvant chemotherapy as a complementary treatment. Of these, nine patients (14.7%) underwent adjuvant radiotherapy, and four (6.5%) underwent adjuvant chemotherapy.

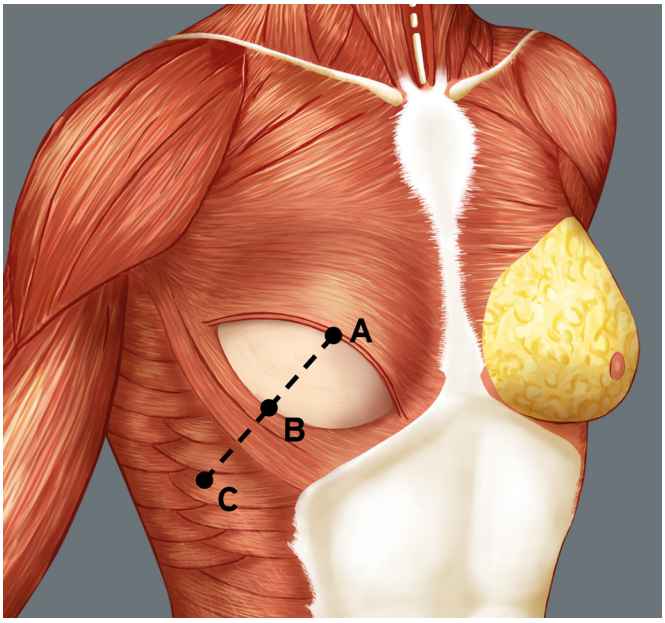

Figure 2. Line A is defined as the lateral border of the pectoralis major; line B, the base of the silicone implant in the chest wall; and line C, the transfer of the distance between line A and line B, defining the necessary width of the anterior serratus muscle reverse flap or inferolateral muscle coverage of the implant.

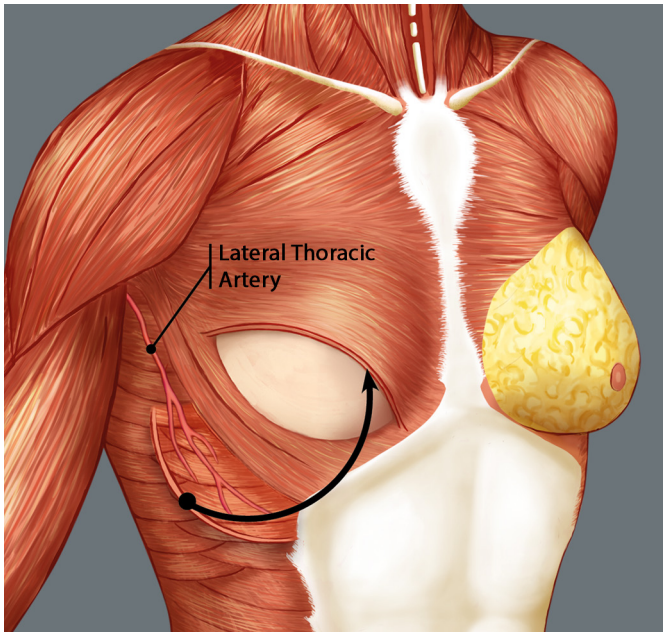

Figure 3. Anterior serratus muscle reverse flap. Lines A and C are approximated.

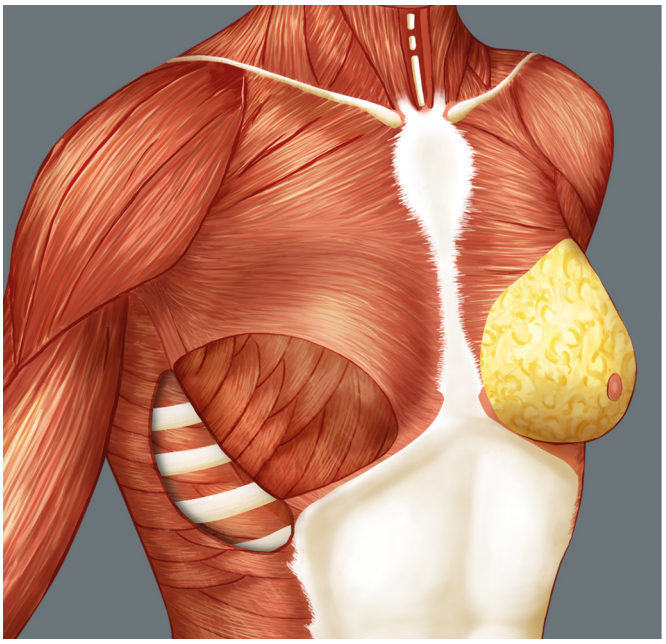

Figure 4. Lines A and C are approximated and sutured to cover the implant.

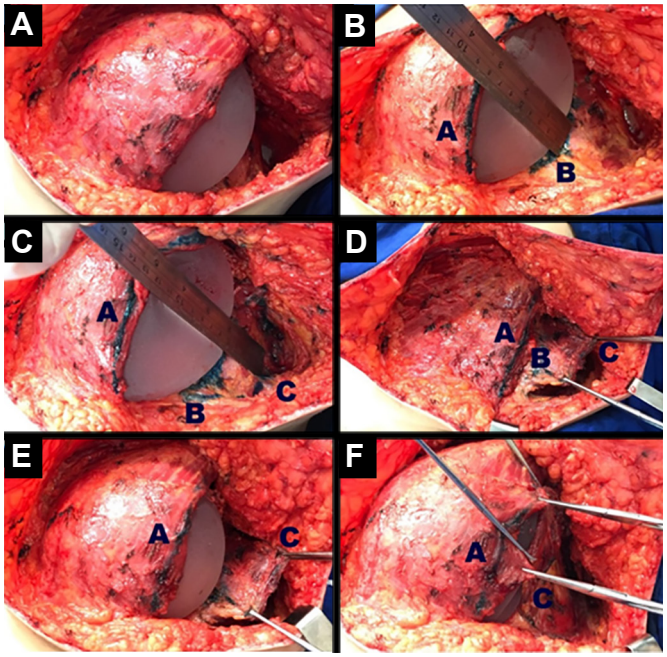

Figure 5. Surgical technique. **I.** Implant in a subpectoral pocket; **II.** Measurement of the distance between lines A and B; **III.** Determination of line C; **IV** and **V.** Anterior serratus muscle reverse flap; **VI.** Lines A and C are approximated to cover the implant.

The following complications were observed: persistent seroma after suction drain removal that was treated with aspiration in two (2.7%) patients, hematoma drained in the first 24 hours after surgery in five (6.75%) patients, and wound infection treated with oral antibiotic therapy with improvement in two patients (2.7%). Regarding necrosis, five (6.75%) patients had partial flap necrosis with improvement after conservative treatment with necrosis debridement and implant maintenance (Figure 9), and two (2.7%) patients presented with implant extrusion and removal, followed by a rescue operation with a latissimus dorsi muscle flap.

The overall incidence of complications was 18.9% (14 patients). Most of the complications were considered

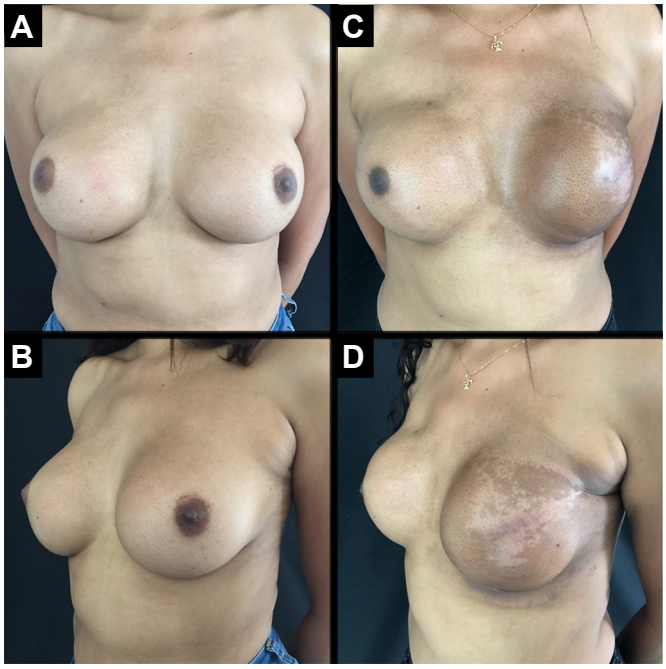

Figure 6. A and **B.** Preoperative; **C** and **D.** Six months after a bilateral mastectomy and immediate reconstruction with silicone implant (high profile, 390 cc volume) using a pocket made with an anterior serratus muscle reverse flap and adjuvant radiotherapy on the left breast.

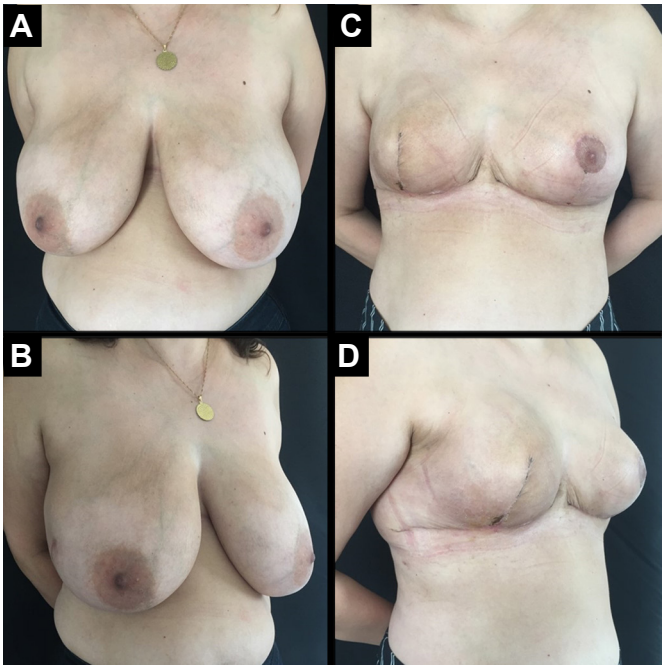

Figure 7. A and **B.** Preoperative; **C** and **D.** Three months after mastectomy on the right breast and immediate reconstruction with silicone implant (high profile, 425 cc volume) using a pocket made with an anterior serratus muscle reverse flap associated with skin reduction and left breast symmetrization.

minor, and a total of 2.7% (two patients) of complications were considered major with reconstruction failure. Complaints of severe pain and significant functional limitations during follow-up were not observed.

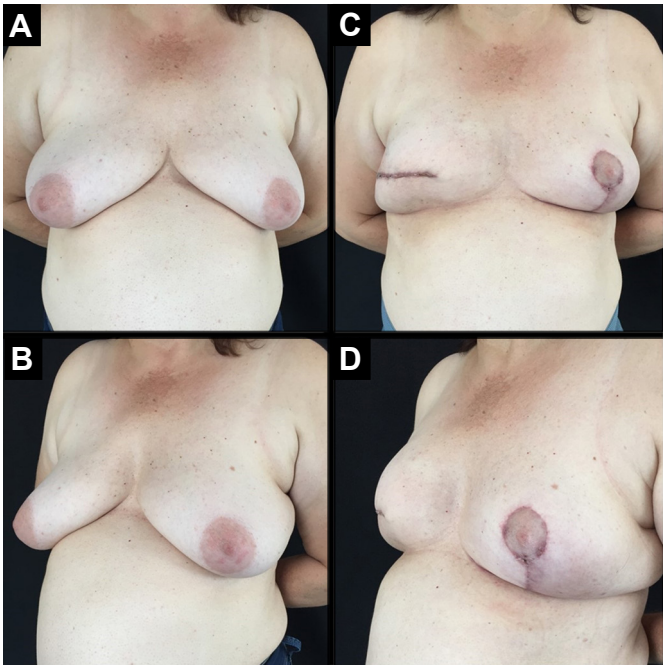

Figure 8. A and **B.** Preoperative; **C** and **D.** Four months after mastectomy on the right breast and immediate reconstruction with a silicone implant (high profile, 445 cc volume) using a pocket made with an anterior serratus muscle reverse flap and left breast symmetrization.

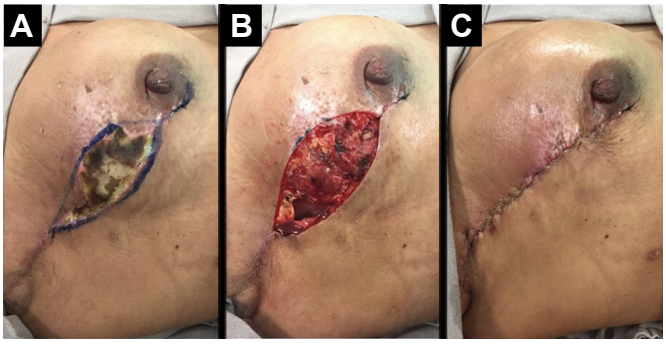

Figure 9. A. Necrotic area on the skin flap; **B.** Debridement of necrosis with identification of the viability of the anterior serratus muscle flap and implant coverage; **C.** Skin suture.

DISCUSSION

Advancements in breast oncology and complementary treatments and improved screening resulted in increased indications for total skin- and NAC-sparing mastectomies, consequently increasing the number of reconstructions using implants[7,8].

Breast reconstruction with implants and immediate reconstruction increased by 11% and 5% per year, respectively. The indication to perform these reconstructions and the choice of technique are individualized, taking into consideration the medical team and the patient[9].

The anterior serratus muscle has a jagged outline that is significantly similar to the edge of a saw blade; hence, the term serratus comes from the Latin term

serra meaning "saw." It is located in the lateral posterior side of the chest and originates from the lateral sides of the first to tenth ribs. Its fibers follow the posterior direction and are attached to the anterior face of the medial margin of the scapula, including its lower angle. It has three portions: the first comprises muscle fibers from the first to the second rib, the second portion from the second to the fourth rib, and the third portion from the fifth to the tenth rib. The main function of this muscle is to protrude and rotate the scapula and keep it against the chest wall[10,11].

It is mostly innervated by the long thoracic nerve (Bell's nerve), which originates from the spinal nerve roots (C5 to C7). It starts an upper anteromedial path, passes through the oblique muscle, and crosses the vascular pedicle. Throughout this path, the main nerve trunk has several branches. Thus, long flaps can be obtained by dissecting the anterior serratus muscle, preserving the innervation of the remaining muscle. This prevents the development of a winged scapula[11,12].

The anterior serratus muscle flap is classified as group III by Mathes and Nahai (1997)[13], with a rich vascularization by the dominant vascular pedicles (branches of the lateral thoracic artery and thoracodorsal artery). It also has collateral vascularization through the lateral perforating branches of the intercostal arteries, which are widely anastomosed with branches of the thoracodorsal artery and form an important and constant source of arterial nutrition[13,14].

The use of the anterior serratus muscle in reconstructive surgery is widely described in the literature. It is used as a free flap, a pedicled muscle flap, or a myofascial cutaneous flap[15-17]. The proposed surgical technique using a reverse anterior serratus muscle flap improves breast reconstruction with implant.

In immediate breast reconstruction with more common regional muscle flaps, the definitive implant is covered by the pectoral muscle, usually in the upper two-thirds. The lower and lateral thirds are unprotected. In most cases, the reverse flap of the anterior serratus muscle allows for a complete muscle coverage of the implant. In some cases, part of the external oblique muscle can be used with the serratus for better implant coverage[18]. Complete coverage of the prosthesis is important in thin skin flaps. The proposed technique recreates the lateral fold containing the implant and has a good aesthetic result.

Regarding skin- and NAC-sparing mastectomy, the possibility of skin necrosis is always considered and varies in the literature with rates from 0% to 21.6%[19-21]. Muscle coverage of the implant, specifically in thin skin flaps, reduces the tension on the skin. The implant becomes less noticeable on palpation, and there is no extrusion in cases of dehiscence of the surgical wound or small skin necrosis.

A complete submuscular positioning of the implant can be elevated in the upper pole of the reconstructed breast, with upward displacement of the inframammary fold[22]. Hence, the dissection in the technique presented advances at least 2 cm into the sheath of the rectus abdominis muscle, passing the inframammary fold.

Both the proposed muscle flap and the acellular dermal matrix (ADM) aim to support the inferolateral part in immediate breast reconstruction and to provide total implant coverage. ADM has the following advantages: it has a short operation time and is an easily performed surgical technique. On the contrary, ADM is considered costly[23-25].

A recent meta-analysis suggests that ADM has a higher rate of complications than submuscular reconstruction, such as infection and seroma[26].

Breast reconstruction with saline expanders has the following disadvantages: results in multiple returns for gradual expansion, produces pain after expansion, and requires a second operation when a permanent implant is in place, increasing costs[27,28].

In this case selection, there were no important functional sequelae, such as winged scapula. The emission of multiple branches by the long thoracic nerve allows an effective innervation of the remaining anterior serratus muscle. The upper portion of the anterior serratus muscle was spared while making the flap, and the function of the trapezius stabilized the scapula.

All patients were followed up by the specialized physiotherapy team at the oncology clinic of the same institution.

Thirteen patients (21.3%) underwent neoadjuvant chemotherapy. Currently available scientific evidence states that immediate breast reconstruction is safe in this group of patients, and the number of postoperative complications does not significantly increase[29,30]. All patients underwent surgery at least 15 days after the end of complementary therapy.

Adjuvant treatment with radiotherapy is an increasingly recommended practice in breast cancer. It has several oncological benefits, but collateral damage to the chest wall and to the quality of the breast skin negatively affects breast reconstruction, with relatively high complication rates[31]. A recent study on postoperative morbidity associated with radiotherapy in reconstruction with implants shows a complication rate of 45.3% and a reconstruction failure of 29.4%[32]. The present study had an incidence of complications less than that reported in the literature: 18.9% for general complications and 2.7% for reconstruction failure. Patients must be properly advised on these possible complications so that shared decisions can be made.

Nine patients (14.7%) underwent adjuvant radiotherapy, and Baker grade III and IV capsular contracture was not identified[33]. Long-term follow-up of this group of patients and the inclusion of more patients undergoing adjuvant radiotherapy may increase the incidence of this complication.

Although this study has several strengths, it also has the following limitations: this study has a relatively small sample size and a short follow-up period. An increased number of patients and longer follow-up periods can provide more valuable information. Although some patients who require large volume implants and have less developed muscle tissue may experience difficulties in fully covering the implant, this technique can still be performed.

CONCLUSION

The reverse serratus anterior muscle flap is a useful approach in immediate breast reconstruction with implant.

COLLABORATIONS

ACMA Analysis and/or data interpretation, Conception and design study, Data Curation, Final manuscript approval, Methodology, Project Administration, Realization of operations and/or trials, Supervision, Writing - Original Draft Preparation, Writing - Review & Editing

AFSF Analysis and/or data interpretation, Conception and design study, Conceptualization, Final manuscript approval, Investigation, Methodology, Project Administration, Realization of operations and/or trials, Supervision, Validation, Writing - Original Draft Preparation, Writing - Review & Editing

RSR Analysis and/or data interpretation, Data Curation, Final manuscript approval, Formal Analysis, Investigation, Writing - Original Draft Preparation, Writing - Review & Editing

NAP Analysis and/or data interpretation, Final manuscript approval, Realization of operations and/or trials, Validation, Visualization, Writing - Original Draft Preparation, Writing - Review & Editing

RPLF Analysis and/or data interpretation, Final manuscript approval, Realization of operations and/or trials, Validation, Visualization, Writing - Review & Editing

EHP Analysis and/or data interpretation, Final manuscript approval, Formal Analysis, Realization of operations and/or trials, Validation, Visualization, Writing - Original Draft Preparation, Writing - Review & Editing

RSOF Final manuscript approval, Validation, Visualization, Writing - Review & Editing

JCRRA Analysis and/or data interpretation, Final manuscript approval, Supervision, Validation, Visualization, Writing - Review & Editing

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Original Article

Other trends in abdominoplasty: new design and importance of lipo-mid-abdominoplasty in body contour surgery

Outras tendências na abdominoplastia: novo desenho e importância da lipomidiabdominoplastia na cirurgia do contorno corporal

ALBERTO MAGNO LOTT CALDEIRA [1]*
CAROLINA DURAN [2]
JUAN CAMILO HOLGUÍN [1]

■ **ABSTRACT**

Introduction: During the last few years, the surgical principles of abdominoplasty have remained unchanged. Therefore, many patients undergoing this technique have misalignment and high and straight transverse scars of the abdomen, with the final position of the umbilical scar being very close to the transverse scar, making the abdomen seem short. We propose modifying the basic concept of marking in abdominoplasty, because we believe it is important to position the transverse scar lower in the medial and pubic region and higher at the lateral ends, allowing anterior lumbar flap rotation in an inferomedial direction. **Methods:** We retrospectively analyzed 146 patients with abdominal defects and subjected them to lipo-mid-abdominoplasty, marking with strong upper concavity and guiding the sides of the scar towards the lower transverse line of the abdomen, 4 cm equidistant from the root of the thigh. We also define liposuction as a complementary treatment to body contouring. **Results:** We consider that mid-abdominoplasty parameters are applicable in most cases, obtaining satisfactory results both in patients with flatness and supraumbilical abdominal lipodystrophy and patients with an "apron" abdomen with considerable flaccidity and diastasis of the abdominal rectus. **Conclusion:** It is important to determine the area of the abdominal defect and its classification to establish treatment strategies and association with complementary procedures. A lower marking with respect to the treatment areas will allow a more aesthetic scar and a harmonic body contour as well as an adequate placement of the umbilical scar, pubis, and lateral ends of the transverse abdominal scar.

Keywords: Abdominoplasty; Body contour; Lipectomy; Abdominal fat; Body surface; Abdominal rectus; Abdominal wall; Umbilicus; Fat tissue.

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Conflicts of interest: none.

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■ **RESUMO**

Introdução: Durante os últimos anos, os princípios cirúrgicos da abdominoplastia permaneceram inalterados. Portanto, muitos resultados observados apresentam desalinhamento, cicatrizes transversais altas e retas do abdome, levando ao posicionamento final da cicatriz umbilical a ser muito próximo da cicatriz transversal, o que dá a impressão de abdome curto. Propomos que a abdominoplastia modifique a concepção básica de sua marcação, pois acreditamos que é importante posicionar a cicatriz transversal mais baixa na região medial e púbica, e mais alta nas extremidades laterais, permitindo, no nível dos flancos, a rotação dos retalhos lombares no sentido anterior em direção inferomedial. **Métodos:** Foram analisados de forma retrospectiva 146 pacientes portadores de deformidades abdominais e os submetemos a lipomidiabdominoplastia, marcando com forte concavidade superior e orientando os lados da cicatriz em direção à linha transversa inferior do abdômen, 4cm equidistantes da raiz da coxa. Também associamos a lipoaspiração como um tratamento complementar ao contorno corporal. **Resultados:** Consideramos que os parâmetros da midiabdominoplastia são aplicáveis na maioria dos casos, obtendo resultados igualmente satisfatórios, tanto nos pacientes com flacidez e lipodistrofia abdominal supraumbilical, quanto nos pacientes com abdome em avental com importante flacidez e diástase dos retos abdominais. **Conclusão:** É importante determinar a área da deformidade abdominal e sua classificação, para estabelecer as estratégias do tratamento e associação de procedimentos complementares. Uma marcação mais baixa, respeitando as áreas de tratamento, permitirá uma melhor cicatriz estética e um contorno corporal harmônico, além de uma adequada colocação dos elementos: cicatriz umbilical, púbis e extremidades laterais da cicatriz abdominal transversa.

Descritores: Abdominoplastia; Contorno corporal; Lipectomia; Gordura abdominal; Superfície corporal; Reto do abdome; Parede abdominal; Umbigo; Tecido adiposo

INTRODUCTION

Because aesthetic abdominal surgery requires a global approach to body contouring, it is necessary to evaluate the surrounding regions and structures[1,2]. For instance, obesity, significant weight loss, and consecutive pregnancies cause abdominal defects that affect more than one region of the body[3,4]. It is also important to determine the presence of predisposing factors such as skin flaccidity, localized or generalized lipodystrophy, musculoaponeurotic flaccidity, and stretch marks, which together with the determination of the affected areas, help in choosing suitable surgical strategies[1,2,5,6].

Abdominal plastic surgery is a procedure characterized by total resection of skin and fat within the infraumbilical region and is performed without considering the final tissue repositioning. This fact leads to a high horizontal scar near the neo-umbilicus, which makes the abdomen seem short or amputated[7]. Abdominoplasty includes the following elements: low transverse incision in the abdomen, medial dissection to the costal margin, treatment of diastasis of the rectus abdominis muscle with the plication procedure, abundant resection of the abdominal flap with maximum umbilical transposition of the medial resection, and closure of the skin with trunk flexion[3-5].

For this reason, we observed unsatisfactory aesthetic results, generating stigmas such as high and straight scars. Because most surgeons perform an elliptical resection with greater width in the medial axis, the umbilical final position is very close to the transverse lower scar, which makes the abdomen seem short, amputated, and unaesthetic[2,7,8]. Other observed stigmas are residual flaccidity of the flanks, depression of the suprapubic scar with soft tissue protuberances above and below the incision scar, superior displacement of the suprapubic region with excessive exposure, enlargement of the pubic hair area, and persistence of pubic lipodystrophy[9-11] (Figure 1).

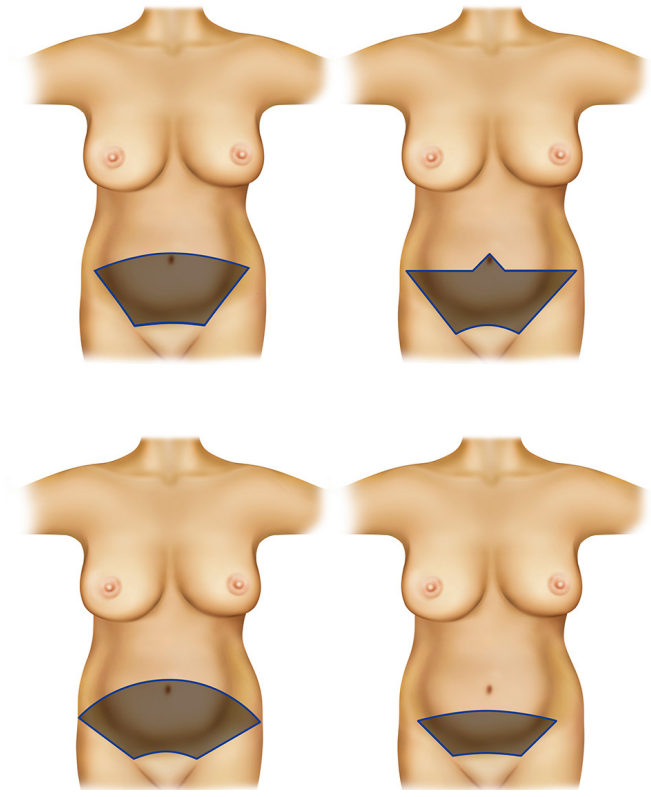

Figure 1. Since their initial proposition, abdominoplasties have always prioritized the largest resections in the median abdominal area, resulting in an unaesthetic appearance with abdominal shortening and a high and straight scar.

We should first refer to the terminology and conceptualization of procedures involved in abdominal plastic surgery, such as complete abdominoplasty, miniabdominoplasty, and mid-abdominoplasty. The first refers to the resection of the infra and/or periumbilical segment and is often indicated for patients with severe supra and infraumbilical abdominal flaccidity[3-5]. Miniabdominoplasty refers to the discrete abdominal resection of the infraumbilical, suprapubic segment, in patients with mild to moderate infraumbilical skin flaccidity, without supraumbilical flaccidity; whose resection does not cause a decrease in the umbilicopubic distance[6]. In general, it is indicated for patients with high or upper umbilicus.

The so-called mid-abdominoplasty is the indicated procedure for correcting supra- and juxtaumbilical skin flaccidity, whose detachment and medial traction of the abdominal flap results in lower repositioning of the periumbilical skin with reopening of the umbilicus at a higher skin level. The resulting scar is usually lower and reduced compared with that of full abdominoplasty[7,8].

We propose a new approach to the abdomen, regardless of the amount of skin to be resected. In this new approach, the final position of the scar must be low. For this, the resected segment must have a lower height in the medial area, requiring a partial resection of the infraumbilical segment[12].

The mid-abdominoplasty known as limited abdominoplasty was proposed and published for the first time in the study by Wilkinson and Swartz[13] in 1986. This technique corrected the flaccidity of the skin with a shorter incision, which must be placed on the root of the thigh. Subsequently, Ribeiro et al.[8] used this term in 1998 to describe a technique with reduced skin resection compared with standard abdominoplasty. However, the final scars remained straight because of the cuneiform resection of the skin.

The extent of skin resection is defined by the degree of flaccidity or lipodystrophy present in the supra- and infraumbilical segment[1,2], which indicates the appropriate treatment. Thus, we believe that many of the standardized techniques in abdominoplasty suggest a larger resection of the medial skin, regardless of the resulting lifting of the pubic area and the high position of the final transverse scar. The extension of the abdominal flap and the area of greater flaccidity occur laterally and not centrally, as in the usual standard abdominoplasty designs[14,15].

We also believe that abdominoplasty and liposuction must always be performed together and in a balanced and harmonic way to promote better results and safety, even if the approach to the body contour is performed during various surgeries[15,16].

In general, discrete or moderate infraumbilical lipodystrophy responds very well to liposuction, invariably accompanied by adequate and effective skin contraction, with a visible improvement in its elastic and structural properties. Conversely, supraumbilical skin and adipose components indicate the insufficiency of contraction after liposuction. This contractile inability or reduced elastic response to local liposuction imposes or requires the adoption of skin resection and traction methods for better adaptation[10,11].

OBJECTIVE

Our objective was to describe a new approach to abdominoplasty regardless of the amount of skin to be resected. A low and concave final position of the scar must be prioritized in abdominoplasty, maintaining the aesthetic integrity of the abdominal wall as a whole and preserving umbilical height[12].

METHODS

We retrospectively analyzed 146 patients, of which 143 were female and 3 were male, between January 1988 and March 2019. The senior author performed their surgeries at the Plastic Hospital, Rio de Janeiro, Brazil. All patients were instructed and

received sufficient clarification of all the benefits and risks of the procedures performed and considered and accepted all information relevant to the study. Thus, they agreed with the informed consent form provided to them. This study was conducted in accord with the Declaration of Helsinki, always promoting and safeguarding the health of patients, and was approved by the Ethics Committee of the Plastic Hospital (approval 09/2018).

The patients' age range was 30-50 years, with a predominance of patients aged between 41 and 50 years (40% of the surgeries).

In the diagnostic evaluation of the cases, we observed each of the three most important elements in the direct or indirect determination of the abdominal form separately, as well as the body contour. These elements are skin, subcutaneous panniculus, and the musculoaponeurotic complex[1,2,6,17,18]. For this purpose, pre- and postoperative evaluations were performed according to the classification of abdominal defects proposed by Caldeira et al.[1,2] in 1990 (Chart 1).

We began marking for the mid-abdominoplasty and liposuction with the patient in the supine position. We identified the pubic symphysis and drew a vertical line toward the umbilicus at a height of 5 cm from the medial commissure. We then marked a transverse curved line of upper concavity extending laterally toward the lower transverse fold of the abdomen. We set the position of the root of the thigh to ensure that the drawn line remained 4 cm above it in order to preserve the integrity of the inguinal region (Figure 2A and 2B) Thus, we preserved the strong adhesion zones described by Lockwood[19] in 2006 (Figure 3A and 3B).

For marking the upper limit of the skin resection, we defined the medial height of the flap by bidigital palpation, extending laterally in an upper convexity design, resulting in a larger resection of the tissue in the lateral areas of the abdomen. This marking is also applicable for cases with less skin resection, such as in a mini-abdominoplasty. The marking denotes

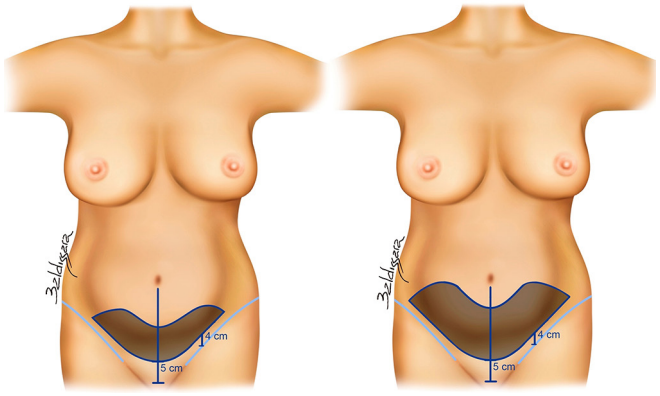

Figure 2. A: The marking of the flap to be resected must be reduced in the central portion and amplified in the lateral portions, thus defining the final position of the abdominal scar, respecting the height and position of the umbilical scar and, consequently, the resection pattern of the mid-abdominoplasty with liposuction. The extent of resection depends on the needs of each case; **B:** Rotation of lateral flaps and infraumbilical partial flap in inferomedial direction to obtain the transverse scar of the upper concavity.

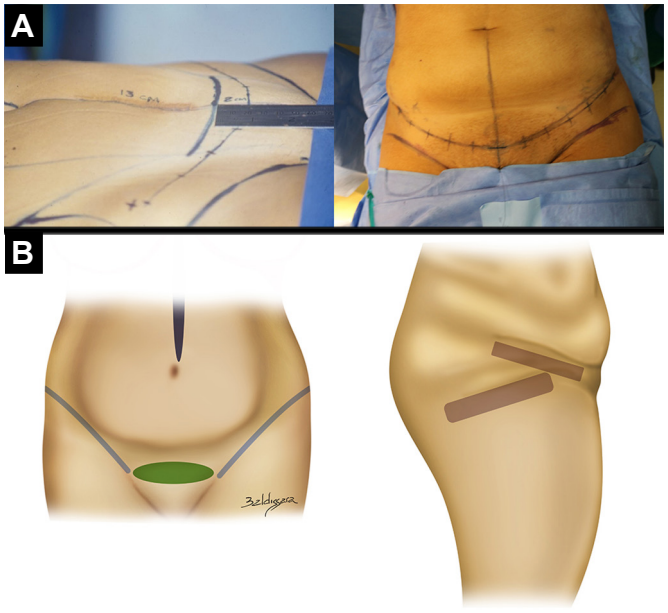

Figure 3. A: Zones of strong adhesion of the lower abdominal wall, defined according to Lodhud, should be preserved; **B:** The lower edge of the flap to be resected should present a strong upper concavity remaining 5 cm from the median commissure and 4 cm above the root of the thigh.

Chart 1. Classification of abdominal defects and their surgical correlations.

Category	Skin flaccidity	Lipodystrophy	Musculoaponeurotic flaccidity	Treatment
Group I	None	Mild to moderate	None	Liposuction
Group II	Mild to moderate in the infraumbilical region	Moderate	With or without	Mini-abdominoplasty with liposuction
Group III	Mild to moderate in the infra- and supraumbilical region	Moderate	Moderate	Mid-abdominoplasty with liposuction
Group IV	Marked	Moderate or marked	Moderate or marked	Lipoabdominoplasty
Group V	Presence of medium vertical scar with moderate or marked skin flaccidity	Moderate or marked	Marked	Vertical abdominoplasty

the areas of strong adhesion, and a smaller design is carried out proportional to the amount of tissue to be resected (Figure 4A). In cases with greater tissue resection, the lateral curved lines rise slightly higher, allowing more volume to be included. Thus, the shape of the drawing is maintained, and resection can reach the umbilicus (Figure 4B). In other words, full abdominoplasty is performed only when the resection of the lateral segments is higher than the umbilicus. We treat lipodystrophy with liposuction of the flanks and upper abdomen before dermolipectomy for providing a better outline of the silhouette. We continue with the plication of the abdominal rectus muscle with continuous suture using Prolene 0 in one or two planes. The umbilicus is then fixed to the aponeurosis as proposed by the technique of Avelar[20] in 2016. This position is set at 14-16 cm from the transverse scar[12]. The flap is then fixed to the aponeurosis with the points proposed by Pollock[21] in 2004 and by Baroudi[22] in 1998. It is then closed in three anatomical planes.

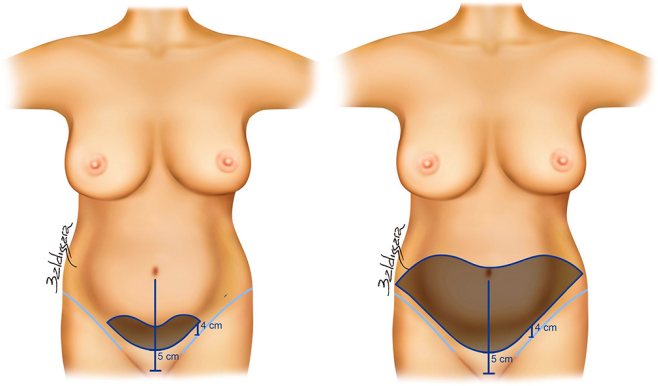

Figure 4. A. The standard resection of mid-abdominoplasty was replaced by minor resections, as in mini-abdominoplasty; **B.** In full abdominoplasties, we must maintain the same resection pattern in the mid-abdominoplasties, maintaining a higher height in the lateral regions of the flap to be resected.

Antibiotic prophylaxis is performed with 2 g of cefazolin at the beginning of the surgical procedure, following the standard scheme with continued outpatient use. We performed abdominal drainage of the flanks and lumbar region exteriorized by pubic contraincision, which was maintained for 5 to 7 days. The dressing consists of padded gauze wrapped by elastic bandages for 12 to 24 hours. A mild to moderate compression girdle is used on the first day of the postoperative period and maintained for 30 days together with an anterior abdominal rigid plate. Calf wraps are also used from the preoperative period (maintained for 7 days), and the patient starts receiving massages by a trained professional from the second week after surgery.

RESULTS

We treated 146 patients with a mean BMI of 28.1 kg/m^2 and predominantly aged between 41 and 50 years (40%). Most patients (143, 97.94%) were female, and three (2.05%) were male (Table 1).

Table 1. Patient characteristics.

	n	%
Mean Age		
41 - 50 years	58	39.72
Sex		
Female	143	97.95
Male	3	2.05
Mean Bmi	28.1	-
Patient Post-bariatric surgery	25	17.2
Procedure		
Abdominoplasty	15	10.27
Mid-abdominoplasty	130	89.04
Mini-abdominoplasty	1	0.68
Complications	12	8.21
Total	146	100

BMI, body mass index.

Mid-abdominoplasty was performed in 130 patients (89.04%). We initially performed mid-abdominoplasty for patients with flaccidity and significant lipodystrophy of the supraumbilical abdomen, obtaining good results (Figures 5 and 6). Subsequently, we extended the indication to cases of "pendulum" or "apron" abdomen with flaccidity and diastasis of the abdominal rectus muscle, as a result of the loss of body contour, also obtaining satisfactory results (Figures 7, 8, and 9). Therefore, we considered that the parameters of mid-abdominoplasty are applicable in most cases (Figure 10).

We also observed that the number of complications was low and within the expected value for an abdominoplasty procedure. Small seromas were observed in 5.47% of patients and were drained by a puncture in two to three sessions. Dehiscence was observed in two cases (1.36%), one of 1 cm and the other of 3 cm, and were addressed by resuturing. Two cases of necrosis (1.36%) were observed, one of 2 × 1.5 cm and the other of 2.5 × 2 cm, and were addressed with serial dressings (Table 2).

DISCUSSION

Since the beginning of modern abdominoplasty in 1960, modifications have been proposed by several

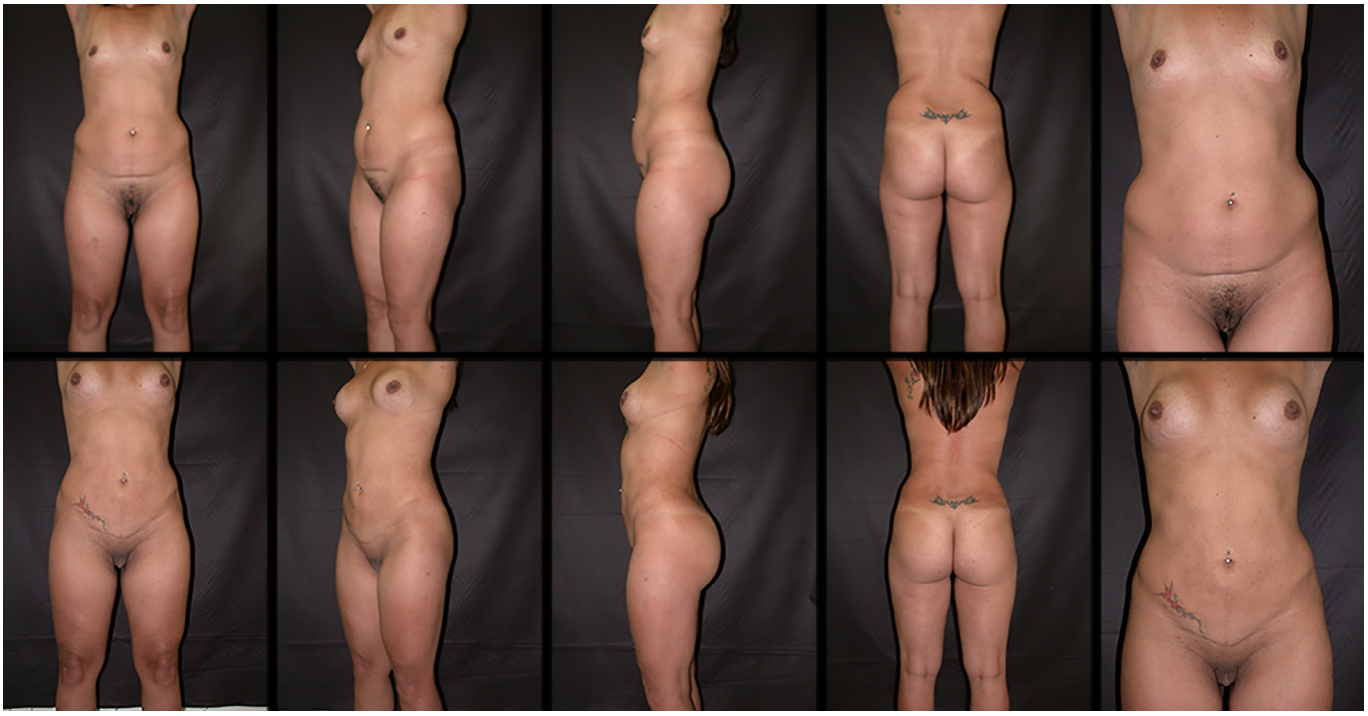

Figure 5. A 36-year-old patient undergoing body contour surgery with lipo-mid-abdominoplasty with disinsertion of the umbilical base and transposition and lower repositioning of the umbilical pedicle stump on the alba line, without a median vertical scar.

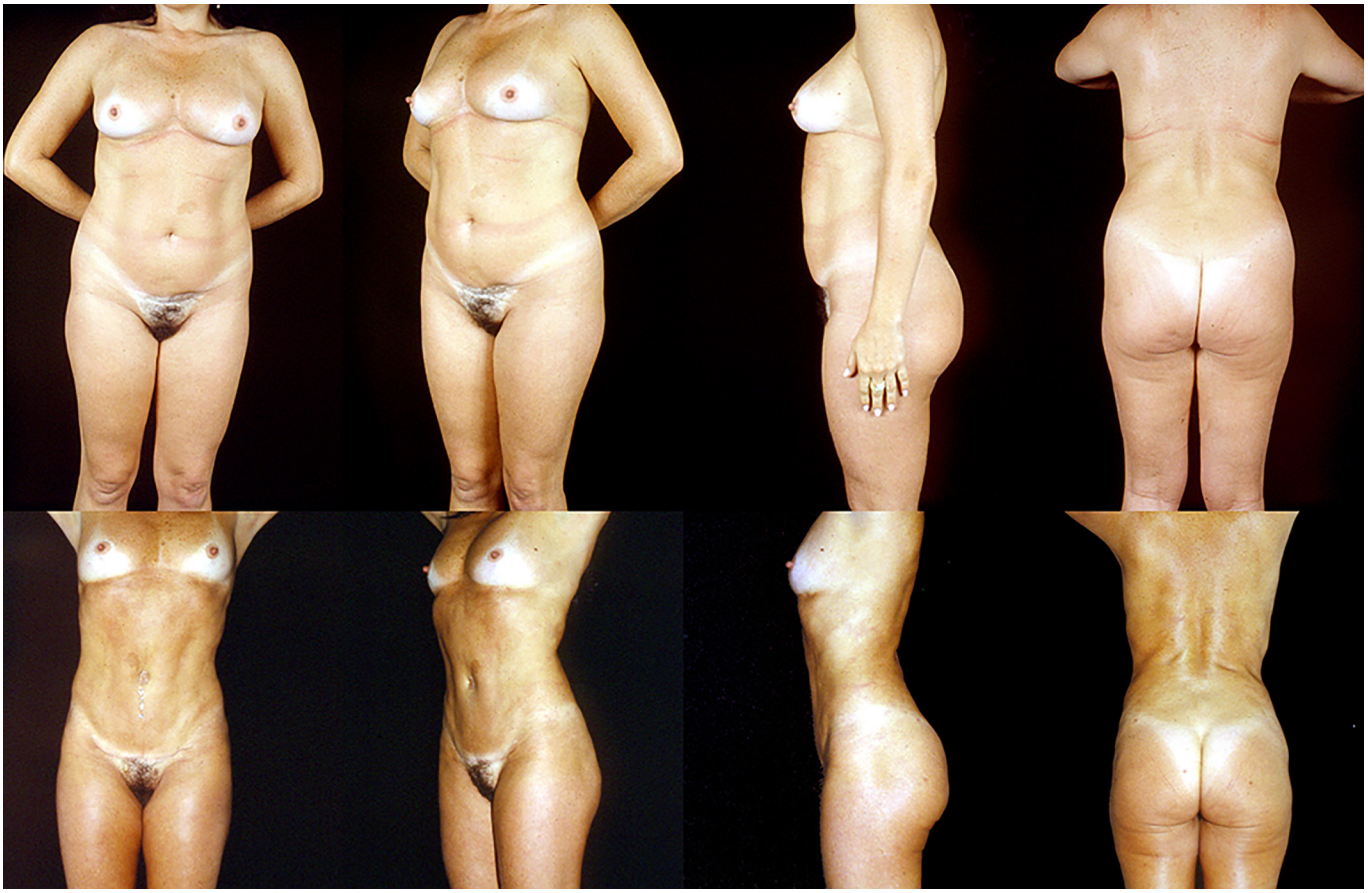

Figure 6. A 46-year-old patient undergoing body liposuction with lipo-mid-abdominoplasty, omphaloplasty, and anterior abdominal flap repositioning, resulting in a small median vertical infraumbilical scar.

Figure 7. A 50-year-old patient undergoing body contour liposuction associated with lipo-mid-abdominoplasty with omphaloplasty and repositioning of the anterior abdominal flap, resulting in a small median vertical infraumbilical scar.

Figure 8. A 33-year-old patient undergoing body contour liposuction and lipo-mid-abdominoplasty with extensive dermofat resection of the infraumbilical region.

Figure 9. A 46-year-old patient undergoing body contour surgery with liposuction and lipo-mid-abdominoplasty associated with breast fat grafting. We can observe a significant reduction in the volume of suprapubic dimensions with reconstitution and rejuvenation of this area.

Figure 10. A 32-year-old patient with a history of massive weight loss (40 kg) after bariatric surgery, undergoing liposuction and mid-abdominoplasty. The patient had temporary post-inflammatory hyperpigmentation.

Table 2. Complications.

Complications	No. of patients	Percent
Seroma	8	5.47
Necrosis	2	1.36
Dehiscence	2	1.36
Hypertrophic scar	0	0.00
No complications	134	91.78
Total number of complications	12	8.21

authors[7,8,13,15,23,24]. However, the surgical stigmas of these approaches, such as high and straight scars, remained constant. Therefore, changing the view on abdominoplasties is necessary. We consider that the final position of the scar must be prioritized rather than focusing on the amount of skin to be removed. Therefore, we try to set the final scar at a low level to protect the aesthetics of the abdomen[12] (Figure 11).

In order to keep the scar in this position and have a medial concavity, the infraumbilical region cannot be completely resected. In standard resection, the medial limitation of the tissue reduces the distance between the umbilicus and the final scar, which generates an upper straight scar.

We also propose that the lateral ends of the marking be high, thus allowing anterior rotation of the lumbar flaps in the inferomedial direction. The aim is to achieve a transverse scar with a robust medial concavity with the ends maintaining the lateral limits accompanying the lower transverse fold of the abdomen. This location allows us to position the scar in an anatomical position parallel to the Langer lines, reducing tension and favoring wound healing (Figure 12).

Moreover, weight in the abdominal region starts accumulating on the flanks extending secondarily to the hypogastrium. For this reason, abdominoplasty naturally requires a more significant resection of the lateral segments[15,16]. The result is an anatomically positioned final scar, providing the abdomen with a long, well-defined form (Figure 13).

Partial or subtotal resection of the medial infraumbilical segment was first indicated to treat only cases with a small amount of central flaccidity of the supraumbilical skin of the abdomen. Subsequently, we realized that our approach encompassed a critical aspect, which is that primary mid-abdominoplasty can be indicated even for patients with great weight loss and great abdominal flaccidity.

We also consider that the evaluation of the abdomen must differentiate the contractility response of the skin to the liposuction of the supraumbilical and infraumbilical regions as the quality and their behavior differ.

We evaluated in these regions whether there is a predominance of lipodystrophy over skin flaccidity. In cases of marked infraumbilical lipodystrophy, liposuction is indicated, because there is a good response, generating infraumbilical contraction of the skin. Conversely, in cases of supraumbilical lipodystrophy, where the response to skin contractility is reduced, we cannot recommend performing only liposuction, because the skin of this region can become flaccid. We use a classification of abdominal defects and their treatment as an attempt to standardize these treatments according to the degree of defect, the elements of the defect, and the possible strategies[1,2] (Table 1). Another point to be taken into account is the umbilicus, which contributes significantly to the abdominal aesthetics and the perception of a long abdomen[7,25-27].

The appearance of the three-dimensional umbilicus is influenced by the height, width, and shape of the abdominal incision; the length of the umbilical pedicle; the diameter of the disc; the umbilical shape; and the distribution of periumbilical fat. The umbilicus can have various forms: wide, narrow, superficial, herniated, virgin, already operated, and absent[28]. Treatment will depend on the form and the technique chosen for this purpose.

Currently, there are many proposals for positioning the umbilicus, and all of them are valid provided there is harmony. Harmony is achieved by considering the height of the umbilicus in relation to the transverse scar of the abdominoplasty. For this reason, we try to set the umbilicus at a mean height of 14 to 16 cm, provided that the original position allows it, and according to the patient's biotype[25,26,28]. The umbilicus is fixed on the aponeurosis 1 to 2 cm above its original position, with sutures on the cardinal points to decrease skin tension in the epigastrium[12,29].

It is important to remember that the location changes according to sex because the male umbilicus is usually lower in the abdominal wall than the female one.

For optimal repositioning of the umbilicus, we must consider the perfusion to minimize the risk of postoperative necrosis and visible scars[25]. With regard to vascularization of the abdominal dermofat flap, of the Huger zones, only zone III of the lateral perforators is preserved. A study by Munhoz et al.[30] in 2006 found that 80% of perforators, lymphatic vessels, and nerves could be preserved with limited dissection. Perforations of the deep upper epigastric artery are more predictable.

The association of liposuction with mid-abdominoplasty allows us to reduce the size of the scar and restructure and redefine the silhouette line and body contour[12]. Moreover, liposuction of the flanks moves the lateral flap toward the anterior and medial

Figure 11. A 33-year-old patient with marked aponeurotic muscle flaccidity, treated with lipoabdominoplasty with skin marking following the principles of mid-abdominoplasty and triple plication of the anterior abdominal wall.

Figure 12. A 23-year-old patient with massive weight loss of 45 kg, undergoing body contour surgery and lipo-mid-abdominoplasty with higher marking at the lateral regions, resulting in total resection of the infra- and periumbilical segment.

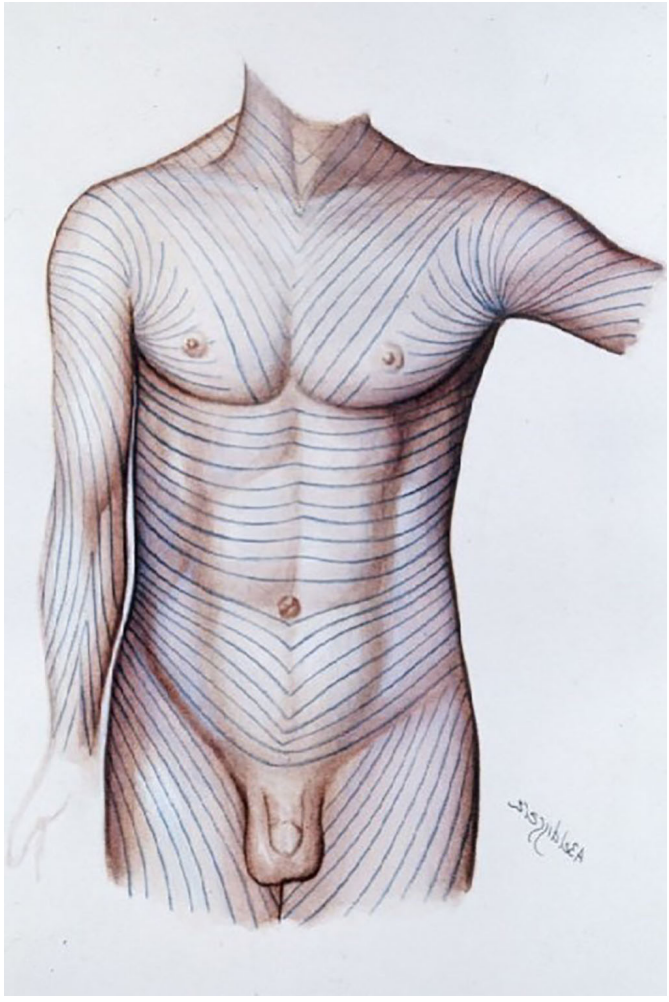

Figure 13. We followed the Langer parallel lines to ensure an anatomical and aesthetic final position of the scar.

direction, causing greater lateral rotation and lift of its ends.

Liposuction and fat grafting complement the range of procedures. We used liposuction to accentuate the Alba and Spiegel[31] lines. We take special care to perform the incision just above the new position of the umbilicus toward the xiphoid appendix, preserving the lower portion. High-definition liposuction is associated with abdominoplasty in specific cases, for which we think the result will be improved and will not affect the viability of the abdominal flap[31].

CONCLUSION

It is necessary to improve the position of the transverse scar and adequately position the elements umbilicus, pubis, and lateral ends of the transverse abdominal scar to obtain a more harmonious result. Adequate analysis and classification of abdominal defects are necessary to establish appropriate strategies for the treatment of each case.

COLLABORATIONS

AMLC Analysis and/or data interpretation, Conception and design study, Conceptualization, Final manuscript approval, Investigation, Methodology, Project Administration, Realization of operations and/or trials, Resources, Supervision, Validation, Visualization, Writing - Original Draft Preparation, Writing - Review & Editing

CD Analysis and/or data interpretation, Data Curation, Investigation, Visualization, Writing - Original Draft Preparation

JCH Analysis and/or data interpretation, Data Curation, Investigation, Visualization, Writing - Review & Editing

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Original Article

Treatment strategy for benign nerve tumors

Estratégia de tratamento nos tumores benignos de nervo

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ABSTRACT

Introduction: Peripheral nerve tumors are usually benign, rare, slow-growing and little symptomatic. The objective is to describe strategies for the diagnosis and treatment of patients with benign tumors of the ulnar nerve. **Methods:** This retrospective study of patients who underwent surgery between 2010 and 2015 for the treatment of benign tumor of the ulnar nerve analyzed patient symptoms and demographic characteristics, complementary examinations, and surgical techniques performed. **Results:** The study included 17 (8%) patients, with a prevalence of women (65%) in the fourth decade of life. The tumors tended to be extrinsic, with lipoma in 6 cases (35%); others were intrinsic, including schwannoma in 17% and hamartoma in 11% of the cases. Tumor excision was complete in 83% of cases and partial in 17% of cases; nerve decompression was performed in 12 cases. **Conclusion:** The strategies performed here yielded good functional results in 88% of patients. The worst results were in tumors of vascular origin.

Keywords: Ulnar nerve; Ulnar nerve compression syndromes; Neoplasms; Surgery, Plastic; Microsurgery.

RESUMO

Introdução: Os tumores de nervo periférico normalmente são benignos, raros, de crescimento lento e pouco sintomáticos. O objetivo é descrever estratégias para o diagnóstico e tratamento de pacientes com tumores benignos que afetam o nervo ulnar. **Métodos:** Estudo retrospectivo dos pacientes operados entre 2010 e 2015 com tumor benigno de nervo ulnar, segundo os sintomas, exames complementares, técnicas cirúrgicas realizadas e características demográficas. **Resultados:** O estudo incluiu 17(8%) pacientes, prevalência sexo feminino (65%) na quarta década de vida; e, natureza extrínseca, o lipoma, em seis casos (35%), seguido do tumor de origem intrínseca, o Schwannoma em 17% e hamartoma em 11%. A excisão tumoral foi total em 83% casos e parcial em 17% casos; em doze casos realizou-se a descompressão neural. **Conclusão:** Com as estratégias realizadas para o tratamento foi possível bons resultados funcionais em 88% dos pacientes operados. Os piores resultados foram nos tumores de origem vascular.

Descritores: Nervo ulnar; Síndromes de compressão de nervo ulnar; Neoplasias; Cirurgia plástica; Microcirurgia.

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INTRODUCTION

Peripheral nerve tumors are usually benign, slow growing, poorly symptomatic, and uncommon. Several cases of tumors of the ulnar nerve have been reported in the literature, primarily in the wrist and elbow, and may cause compressive syndromes, mainly in Guyon's canal and the cubital canal[1-5]. Guyon's canal, first described in 1861, is located in the wrist and formed by a bone floor and fibrous ceiling, pisiform, hamate hook, carpal ligament, tendon insertion of the ulnar flexor of the carpus, pisohamate ligament, and tendon of the short palmar muscle. The cubital canal is located in the elbow and bound by the arcade of Struthers, intermuscular septum, medial epicondyle, medial portion of the triceps, Osborne's band, pronator and flexors aponeurosis, and arcade of the flexor carpi ulnaris muscle[1-3]. As with the median nerve, the ulnar nerve and other peripheral nerves can be affected by tumors originating from the neural sheath as well as schwannoma and neurofibroma; intraneural, such as lipoma, hemangiomas, hamartomas, or cysts; and extrinsic, including lipoma, cysts, and bone tumors[1-5].

Upon clinical evaluation, tumors manifest with growth on the ulnar edge of the wrist, hand, or elbow and may be asymptomatic or manifest as sensory changes, with paresthesia of the ulnar edge of the hand in the fourth and fifth fingers; Froment's sign and a positive Tinel's sign; and decreased motor force of the intrinsic muscles of the hand as well as clamp, grip, and cubital claw strength. Sensitivity tests (Semmes-Weinstein) and motor assessments are required for its diagnosis[2]. According to the noted changes, compression syndromes are classified into: type I - compression with sensory and motor deficits; type II - compression of the deep branch with motor changes; and, type III, compression of the superficial branch consisting of sensory deficits without motor impairments[3].

Complementary electrophysiological, tomography, magnetic resonance imaging, and ultrasonography studies are performed to assess the tumor nature, site, size, invasion, necrosis; nerve functionality and malignancy; and aspect of the neighboring tissues. Tumors originating from the neural sheath are confirmed by incisional or excisional biopsy as well as microscopy and immunohistochemistry studies (S-100 and Leu-7).

The most common benign tumors originating from the neural sheath are Schwannomas (cellular and plexiform) and neurofibromas (solitary or plexiform)[6]. Other tumors can compromise the ulnar nerve, originating from the sheath and other structures, such as the giant cell tumor, lipoma, myxoma, hemangioma, lipofibromatous hamartoma, hemangioblastoma, meningioma; or extrinsic, such as synovial cysts or bone tumors, causing neural compression in the wrist, in the Guyon canal or in the elbow, in the cubital canal.

The tumor located in a single neural fascicle can be removed and repaired with neurorrhaphy or nerve grafting, and nerve function can be preserved. However, in some situations of tumor growth, depending on the type of tumor and time of evolution, tumor exeresis can cause irreversible cubital paralysis.

Although benign tumors that affect the ulnar nerve are rare, there is a variety of tumors and it is important the diagnosis to definition of strategies for treatment and prognosis.

OBJECTIVE

Here we aimed to describe the treatment provided for patients with benign tumors of the ulnar nerve at the Hospital SARAH Brasília between 2010 and 2015.

METHODS

This was a retrospective study of medical records of patients treated in the Hospital SARAH Brasilia between 2010 and 2015 for benign tumors of the wrist and elbow with ulnar nerve impairment. These tumors were divided into 2 categories: those that originated from the neural sheath and not from the neural sheath; and those that were asymptomatic or with compressive symptoms of the ulnar nerve. The study was evaluated and approved by the Research Ethics Committee (opinion CEP/APS no. 53559216.0.0000.0022).

***Inclusion criteria*:** Only benign tumors of the ulnar nerve originating from the neural sheath, with an intraneural or extrinsic location, and with or without compression syndrome of the ulnar nerve at the wrist or elbow.

***Exclusion criteria*:** Tumors of traumatic origin, malignant tumors of the ulnar nerve, and tumors of other nerves in the wrist and upper limb.

Studied variables: Sex, age, signs and symptoms; electroneuromyography, imaging exams with computed tomography, ultrasonography, nuclear magnetic resonance, and histopathological and immunohistochemical study findings; and surgical procedure and outcome.

***Statistical Analysis*:** Data were analyzed using Epi-info 3.2.2 software.

Physiotherapeutic assessment

The patients were evaluated preoperatively and in the sixth postoperative month by physiotherapists using a Semmes-Weinstein sensitivity map and a motor map according to the Louisiana State University Medical Center Grading System for Motor and Sensory Function.

Surgical technique

Patients underwent surgical procedures under hospitalization with general anesthesia or a brachial plexus block; asepsis and antisepsis measures; placement of surgical fields; emptying of the upper limb with an Esmarch band; and placement of a pneumatic tourniquet with a pressure of 100 mmHg above the systolic pressure;

In the wrist – A transverse or zigzag incision (Figure 1) was made at the ulnar edge of the hand and wrist; alternatively, an incision was made on the medial edge of the proximal phalanx of the little finger to the radial edge of the hypothenar eminence next to the abductor muscle of the finger (Figure 2). Tissue dissection and identification of the neurovascular bundle; opening of the Guyon's canal; tumor excision; hemostasis; and suture with 5-0 mononylon thread were performed. An occlusive dressing with gauze and a crepe bandage were applied with the wrist in a functional position.

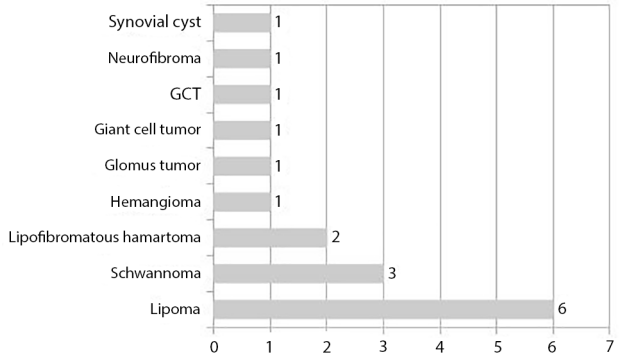

Figure 1. Distribution of extrinsic and intrinsic tumors of the ulnar nerve. GCT: Giant cell tumor.

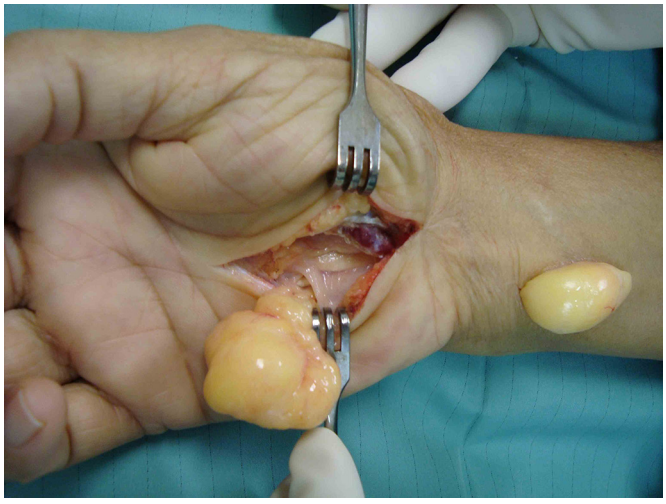

Figure 2. Transoperative image of total resection of a tumor of adipose origin (lipoma) inside Guyon's canal in the wrist.

In the elbow – A 10- to 12-cm incision, or according to the size of the tumor, was made in the medial portion of the elbow. The tissues and nerve were dissected from proximal to distal with preservation of the medial cutaneous branch of the forearm and the branches of the ulnar nerve. After opening of the intermuscular septum and arcade of Struthers, the intrinsic or extrinsic tumor was excised with anterior transposition of the ulnar nerve in the subcutaneous tissue and preservation of the vascularization. At the end, after hemostasis, a subcutaneous suture with monocryl 3-0 and immobilization with a double support sling were applied and the elbow kept flexed for 2 weeks.

Post-operative treatment

After surgery, the upper limb was elevated by a sling, dressings were changed regularly, the sutures were removed during the second postoperative week, and physiotherapy was completed.

RESULTS

A total of 220 patients with benign tumors in the upper limbs were treated between 2010 and 2015; of them, 17 (8%; 11 women, 6 men; age range, 7–58 years; predominance in the fourth decade of life) (Figure 1, Table 1). The most frequent tumor was lipoma in 6 cases (35%) (Figures 2 and 3), followed by tumor of intrinsic origin, schwannoma in 3 cases (17%) (Figure 4); and hamartoma in 2 cases (11%) (Figure 5). The other tumors were individual cases and are distributed in Table 2 (Figures 6 and 7). Tumor excision was complete in 14 (83%) cases and partial in 3 (17%) cases; neural decompression was performed in the Guyon's canal in 8 cases, and in 4 in the elbow. A patient with glomus tumor was initially operated at 9 years of age and presented recurrence ten years after and was reoperated (Figure 7). The average follow-up time was 6 months (range, 3 months to 10 years).

DISCUSSION

Tumors that affect the ulnar nerve are rare, occurring mainly in Guyon's canal and the cubital canal[7-13]. Clinically, patients can be asymptomatic or have a history of tumor growth, pain, paresthesia, and abnormalities of the ulnar nerve. An electroneuromyography examination is important to evaluating the degree of lesion in the nerve, revealing changes in 3 cases, mainly of a tumor of vascular origin. Even in the case of a neurofibroma, with extensive involvement of the ulnar nerve, an electromyographic examination may be normal. Imaging tests, such as x-rays, ultrasonography, and magnetic resonance

Table 1. Distribution of tumors of the ulnar nerve by surgical procedure and results.

Tumor	Location	N	Surgical Procedures	Results
Lipoma	4 wrist and hand 2 elbow	6	3 - total tumor resection + neural decompression 3 - total extraneural tumor resection	Normal
Schwannoma	1 elbow 2 fist	3	Total intraneural tumor resection + neural decompression	Normal
Lipofibromatous hamartoma	2 wrist and hand	2	Disarticulation of finger + neural decompression and partial tumor resection	1 – improvement in function and electromyographic findings1 – maintenance of electromyographic findings
Hemangioma	Fist	1	Partial resection + neural decompression + partial tumor resection	Persistence compressive symptoms
Synovial cyst	Distal forearm	1	Total tumor resection	Normal
Glomus tumor	Forearm	1	Partial tumor resection	Tumor recurrence, ulnar paresthesia
Giant cell tumor	Fist	1	Tumoral resection + neural decompression	Normal
Neurofibroma	Wrist and hand	1	Intraneural resection + neural decompression + partial tumor resection	Improvement in function and pain
Gouty tophus	Elbow	1	Tumor resection and neural decompression + partial tumor resection	Normal
Total		17		

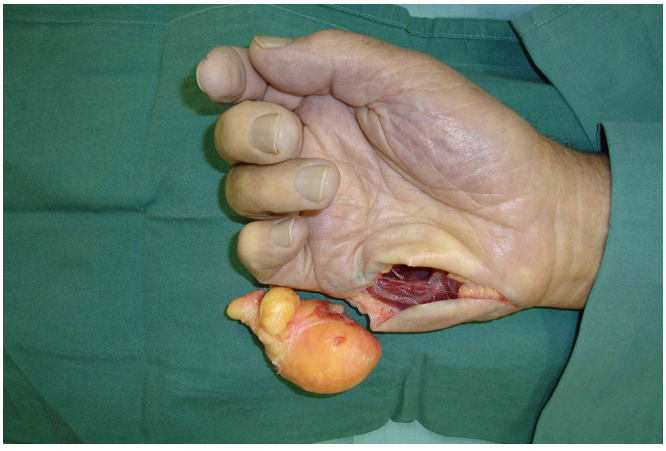

Figure 3. Transoperative image of an incision made on the ulnar edge of the hand and total excision of a tumor of adipose origin (lipoma) inside Guyon's canal under the abductor muscle of the fifth finger.

imaging, are important to identifying the cause of the compression, while the target sign is important for confirming the diagnosis of schwannoma[4,5]. Ultrasonography examinations have increasingly contributed to the complementary diagnosis.

Making the surgical decision is of the major problems encountered when treating patients with neural tumors since many tumors are slow growing and asymptomatic; thus, the specific strategies require a functional electroneuromyography diagnosis, definition of tumor size and location, and, if possible, tumor type to aid in surgical planning, postoperative follow-up, and prognosis assessment. Microsurgery, magnifying objects, and microsurgical material were

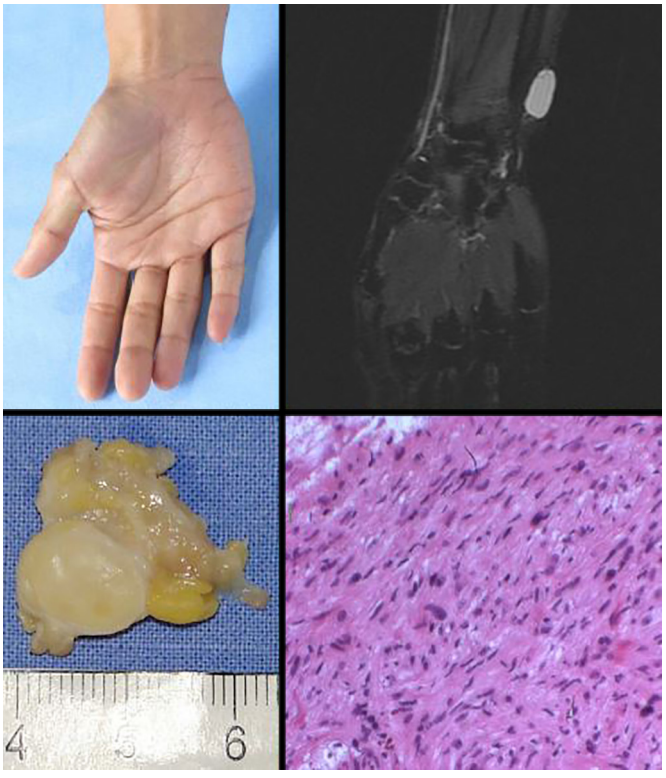

Figure 4. A. Preoperative images evidencing tumor growth in the ulnar edge of the distal third of the forearm; **B.** Nuclear magnetic resonance examination revealing the target signal; **C.** Surgically removed tumor evidencing the elongated structure measuring 2.0 × 1.5 cm with lobulated tissue and a well-defined nodule; **D.** Histopathological study with hematoxylin and eosin staining showing a nodule surrounded by innervated fibrous capsule with fragments of adipose tissue and moderate cellularity represented by elongated eosinophilic areas and remnants of peripheral nuclear palisades with an immunohistochemical profile representative of schwannoma.

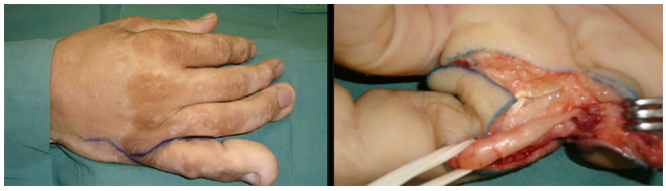

Figure 5. Preoperative aspect of patient macrodactyly; marking of the amputation of the fifth finger showing a hamartoma of the ulnar nerve.

Table 2. Distribution of tumors of the ulnar nerve by symptoms and electroneuromyography results.

Tumor	N	Positive compressive symptoms	Electroneuromyography positive for ulnar nerve
Lipoma	6	3	Normal
Lipofibromatous hamartoma	2	Negative	1 sensory lesion of the fifth finger 1 normal
Hemangioma	1	Negative	Normal
Synovial cyst	1	Negative	Normal
Glomus tumor	1	1	1 lesion of the ulnar nerve motor fibers, discreet, without denervating activity
Giant cell tumor	1	1	Normal
Neurofibroma	1	1	Normal
Gouty tophus	1	1	1 myelin lesion of the ulnar nerve on the elbow

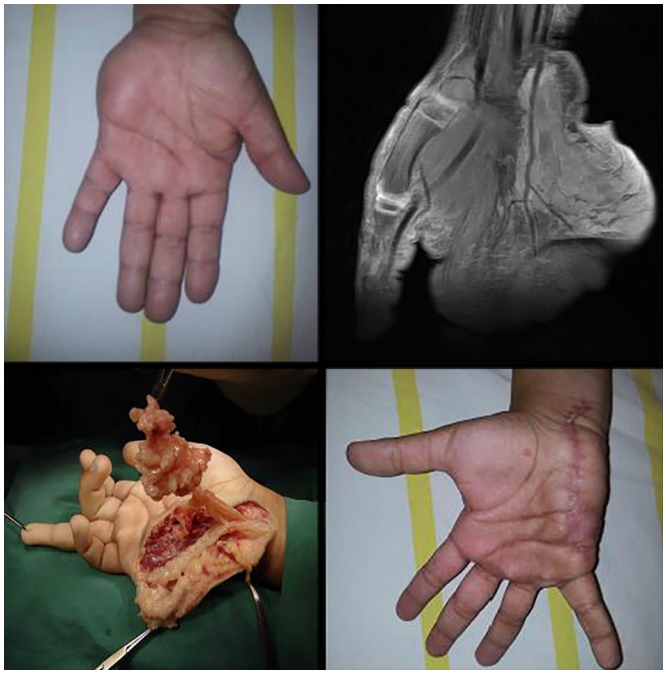

Figure 6. A. Preoperative images showing tumor growth in the ulnar edge of the hand; **B.** Magnetic resonance image of the hand showing an elongated expansive lesion in the ulnar nerve path without individualization extending from the forearm to the subcutaneous layer of the anterolateral surface of the little finger completely involving the ulnar artery with a diagnosis of neurofibroma; **C.** Transoperative image of an incision made in the ulnar edge of the hand, partial excision of the neurofibroma, and preservation of the ulnar nerve; D. Patient in the first postoperative month.

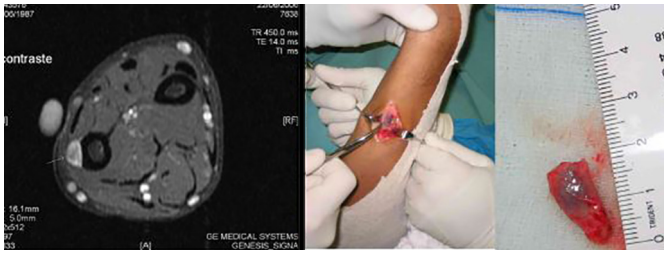

Figure 7. A. Nuclear magnetic resonance image revealing a soft-tissue lesion located on the posteromedial surface of the middle distal segment of the ulna promoting cortical erosion with intense contrast enhancement between the ventral surface of the deep flexor tendons of the fingers and the ulnar neurovascular bundle; **B.** Transoperative aspect of a longitudinal incision in the forearm and identification of a vascular tumor near the ulna; **C.** Macroscopic examination showing a nodule located next to the ulnar neurovascular bundle and ulna measuring 1.7 × 0.9 cm with a histopathological examination indicating a glomus tumor.

used in all surgeries, and no cases required neural reconstruction.

Regarding origin, the tumors evaluated in this series were mainly of a lipomatous nature, followed by those of Schwann cells, synovial cysts, and others. Tumors of vascular origin, as evidenced in 2 cases (hemangioma and glomus tumor), usually originate in the nerve roots and retrobulbar and cranial nerves; there are few reports of hemangiomas arising in the distal peripheral nerves, including the radial and digital nerves. Structurally, they arise from blood vessel dilation[13,14].

Partial resection was performed in cases of hemangioma, glomus tumor, lipofibromatous hamartoma, and neurofibroma, as they compromised the neural fascicles. Surgery was performed in accordance with the microsurgical technique with the aim of reducing the tumor component as well as a histological study and diagnostic confirmation; recurrence was observed in the case of glomus tumor. The surgical approach was specific for each tumor type, with complete or partial tumor excision, associated neural decompression, and neural reconstruction when necessary. In cases of lipofibromatous hamartoma associated with macrodactyly, amputation was necessary to improve functionality.

A prevalence of synovial cysts associated with neural compression in the wrist and elbow is observed in the literature with surgical indication[9-13]; this finding was observed in only 1 case in our study. In cases of intraneural or extrinsic cystic tumors that cause neural compression, the events that follow include nerve compression, followed by endoneurial ischemia, edema, and microcompartment syndrome. This causes nerve damage with segmental demyelination and remyelination; degeneration of axonal regeneration; and proliferation of endoneurial cells, fibroblasts, and capillary endothelial cells; thus, thickening and fibrosis of the perineurium and epineurium occur as evidenced

in the clinical assessment and on imaging examinations and electroneuromyography[15].

CONCLUSION

In this study, we identified good recovery (88%) of the operated cases of tumors involving the ulnar nerve. Although total tumor excision was not possible in cases of neurofibromas and hamartomas, it was possible to control tumor growth and neural compressive symptoms. The worst results were identified in cases of hamartomas and glomus tumor with tumor recurrence. The need for strategies to identify tumor type and location, neurophysiological changes, and the need for a microsurgical procedure for tumor excision was demonstrated.

COLLABORATIONS

KTB	Conception and design study, Project Administration, Writing - Original Draft Preparation
VCSM	Analysis and/or data interpretation, Project Administration
RSS	Conceptualization, Supervision
UPYS	Analysis and/or data interpretation, Methodology
ICC	Resources
CZC	Conceptualization
CFPAS	Writing - Review & Editing

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Original Article

Four-year epidemiological characterization of large burn patients at Celia Sánchez Manduley Surgical Hospital, 2015–2018

Caracterização epidemiológica de 4 anos dos pacientes grandes queimados no Hospital "Celia Sánchez Manduley", 2015 – 2018

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■ **ABSTRACT**

Introduction: A "large burn" patient is defined as a patient who suffers a burn of such magnitude that it carries a major risk of life, defined by different parameters. Burns are a national and worldwide public health problem due to the morbidity and mortality they cause. The objective of this study is to describe the epidemiological and clinical characteristics of hospitalized patients with large burns. **Methods:** A descriptive, retrospective and longitudinal study was carried out at the Plastic Surgery and Burn Service of the Celia Sánchez Manduley Surgical Hospital, Manzanillo - Granma, from January 2015 to December 2018, to understand the epidemiological characteristics of hospitalized large burn patients. **Results:** The largest number of hospitalizations (45 patients [35.16%]) occurred in 2018. There was a predominance of females (74 patients [57.81%]). Accidents were the most frequent cause of burns (71 patients [55.47%]). Severe large burn patients were the most frequently treated (48 [37.50%]). The highest number of cases occurred in the municipalities of Bayamo (40 cases [31.25%]) and Manzanillo (21 cases [16.41%]). **Conclusion:** The highest number of cases occurred in 2018, with a predominance of females between the age of 30–59 years. Accidents were the primary cause for burns, and the survival rate exceeded expectations. The municipalities with the most cases were Bayamo and Manzanillo.

Keywords: Burns; Epidemiology; Severity; Survival; Burn Unit.

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■ **RESUMO**

Introdução: O paciente "grande queimado" é definido como um paciente que sofre uma queimadura de tal magnitude que carrega um importante risco vital, deFInido por diferentes parâmetros. As queimaduras são um problema de saúde pública mundial e nacional, devido à morbidade e mortalidade que produzem. O objetivo é descrever as características epidemiológicas e clínicas relacionadas ao paciente grande queimado hospitalizado. **Métodos:** Estudo descritivo, retrospectivo e longitudinal realizado no Serviço de Cirurgia Plástica e Queimadura do Hospital Estadual Clínico Cirúrgico "Celia Sánchez Manduley", Manzanillo – Granma, no período de janeiro de 2015 a dezembro de 2018, a FIm de conhecer as características epidemiológicas do paciente grande queimado hospitalizado. **Resultados:** O maior número de internações foi em 2018 com 45 pacientes (35,16%). Houve predomínio do sexo feminino com 74 pacientes (57,81%). Os acidentes como modo de produção de queimaduras foram os mais frequentes com 71 pacientes (55,47%). Grandes pacientes queimados relatados graves foram os mais frequentes com 48 (37,50%). O maior número de casos correspondeu aos municípios de Bayamo com 40 (31,25%) e Manzanillo 21 casos (16,41%). **Conclusão:** O ano de 2018 foi o que apresentou maior número de casos, predominantemente o sexo feminino e entre eles os grupos de idade entre 30 e 59 anos. Os acidentes foram o principal modo de produção, a sobrevivência foi acima das expectativas. Os municípios com mais casos foram Bayamo e Manzanillo.

Descritores: Queimaduras; Epidemiologia; Gravidade do paciente; Sobrevida; Unidades de queimados.

INTRODUCTION

Burns are traumatic injuries that cause variable degree of tissue necrosis due to different physical, chemical, or biological agents that cause cell-mediated and humoral changes that can lead to death or leave debilitating or deforming sequelae[1–3].

Injuries caused by burns constitute a health problem that globally affects all age groups, not only in terms of the frequency with which they occur but also their severity; burns can be incapacitating with a high mortality rate, and have an unfavorable nationwide economic impact[4].

Extensive burns involve hospitalization and are usually associated with social, aesthetic, and economic losses[5,6]. A "large burn" patient is defined as a patient who suffers a burn that poses an important risk to life defined by different parameters. Burns are a national and global public health problem due to the morbidity and mortality they entail. According to the World Health Organization, an estimated 265,000 deaths worldwide are annually associated with burns[7].

Globally, the morbidity and mortality rates associated with burns have decreased, with 90% of deaths occurring in low- and middle-income countries, where prevention programs are scarce; when they occur in high-income countries, they mainly affect the socially marginalized classes[8].

The incidence of burns in Germany is 10,000–15,000 hospitalizations per year and 700,000–800,000 new cases in India[9]. In the United States, burns represent a mean 1,230 visits per day at the emergency services. Although many of these lesions heal spontaneously, almost 1 in 10 is severe enough to require hospitalization or transfer to a burn unit[10]. In Brazil, an estimated 1 million burn accidents occur per year; among them, 100,000 patients seek treatment at a hospital, while approximately 2,500 die directly or indirectly due to the injuries[11].

In Cuba, according to the 2013 Statistical Health Yearbook, burns were the seventh leading cause of accidental death with an estimated mortality rate of 0.4 per 100,000 inhabitants[12,13].

Due to economic constraints, different countries display differences in access to health care; therefore, access to specialized care units for burn patients varies widely[14,15].

OBJECTIVE

The objective of this study is to understand the epidemiological characteristics of large burns and to develop preventive measures against these injuries.

METHODS

This descriptive, retrospective, and longitudinal study was performed at the Plastic Surgery and Burns Service of the Celia Sánchez Manduley Surgical Hospital, Manzanillo – Granma between January 2015 and December 2018 and aimed to understand the epidemiological characteristics of large burn patients who required hospitalization. The total sample was composed of all hospitalized patients with extensive large burns.

The following variables were determined: year of burn, age (age groups, with 15 year intervals), sex (female and male), cause of the burn injury (accident, attempted suicide, attempted murder), life expectancy (in accordance with the Cuban classification: severe, very severe, extremely critical), survival, and municipality of origin.

A patient's life prognosis was determined by the burn severity index:[1] mild, 0.1 to 1.49; less severe, 1.5 to 4.99; severe, 5 to 9.99; very severe, 10 to 19.99; critical, 20 to 39.99; and extreme critical, 40 or more.

To calculate the severity index, the total percentage of burns by depth was multiplied by a constant K and then added. This result was indicated as the severity index: for dermal A, the constant is 0.34; for dermal AB, 0.5; and for hypodermic B, 1. In the end, we added these results and obtained the severity index[1].

A form was prepared for data collection after review of the medical records of all patients hospitalized for major burns.

This study data were analyzed on a computer using descriptive statistics in Microsoft Excel 2007, and absolute numbers, percentages, and rates were expressed in tables created for this purpose.

RESULTS

There were a total of 128 hospitalized large burned patients (Table 1), an incidence that has increased since 2017, with the highest number occurring in 2018.

Analysis of the hospitalized large burn patients by age and sex (Table 2) revealed a predominance of females (74 [57.81%]); most patients were 45–59 years of age (15.63%), followed by 30–44 years of age (12.50%).

Accidents were the most frequent cause of burns (Table 3; 55.47%), followed by suicide attempts(40.63%).

A severe large burn (Table 4) was the most frequent (48 cases [37.50%]), followed by extreme critical (36 [28.12%]). Regarding threat to life, the survival rate after severe burn was 100%, that after a very severe burn was 92.30%, after critical burn was 77.78%, and after extreme critical burn was 13.89%.

The majority of patients with large burns (40 cases [31.25%]) were injured in Bayamo, followed by Manzanillo (21 cases [16.41%]) and Bartolomé Masó (11 [8.59%]) (Table 5); however, with regard to the incidence per 10,000 people, most were from the municipality of Buey Arriba with 2.20, followed by Bartolomé Masó and Media Luna at 2.19 and 2.07, respectively.

Table 1. Distribution of hospitalized large burn patients by year.

Year	No.	%
2015	26	20.31
2016	22	17.19
2017	35	27.34
2018	45	35.16
Total	128	100

Table 2. Distribution of large burn patients according to age and sex.

Age range	Sex					
	Female		Male		Total	
	No.	%	No.	%	No.	%
Less than 15 years	5	3.90	12	9.38	17	13.28
15-29 years	15	11.72	13	10.16	28	21.88
30-44 years	16	12.50	7	5.47	23	17.97
45-59 years	20	15.63	14	10.94	34	26.57
60-74 years	15	11.72	4	3.12	19	14.84
75 years and above	3	2.34	4	3.12	7	5.46
Total	74	57.81	54	42.19	128	100

Table 3. Distribution of hospitalized large burn patients in accordance with the cause of burns.

Burn cause	No.	%
Accidents	71	55.47
Suicide attempt	52	40.63
Homicide attempt	5	3.90
Total	128	100

Table 4. Distribution of hospitalized large burn patients by life expectancy and survival.

Life expectancy	Hospitalized		Alive (N = 128)	
	No.	%	No.	%
Severe	48	37.50	48	100.00
Very severe	26	20.32	24	92.30
Critical	18	14.06	14	77.78
Extreme critical	36	28.12	5	13.89
Total	128	100	91	71.09

DISCUSSION

Burns represent one of the most devastating forms of trauma globally[16], being an important public

Tabela 5. Distribuição dos pacientes grandes queimados hospitalizados segundo seu município de origem.

Municipality of origin	No.	%	Population	Incidence per 10,000 population
Manzanillo	21	16.41	130 262	1.61
Niquero	2	1.57	42 870	0.46
Pilón	6	4.69	29 927	2
Media Luna	7	5.47	33 698	2.07
Campechuela	4	3.12	44 568	0.89
Yara	10	7.81	56 880	1.75
Bartolomé Masó	11	8.59	50 110	2.19
Bayamo	40	31.25	238 118	1.67
Rio Cauto	4	3.12	47 381	0.84
Buey Arriba	7	5.47	31 863	2.20
Cauto Cristo	2	1.57	20 664	0.97
Jiguaní	9	7.03	60 751	1.48
Guisa	5	3.90	47 777	1.04
Total	128	100	834 869	1.53

health problem in terms of morbidity and long-term consequences, especially in developing countries[11].

Here we found that the incidence of extensive burns has increased in recent years. Exposure to and the use of combustible liquids in adulthood, especially by women, make it more likely for young women to suffer burns that require hospitalization. This was reflected in our study data and coincides with other authors who obtaine d similar results[17]; other studies reported a higher frequency of burn injuries in male patients[11,18], and described differences in the exposure of individuals of either sex to the possible cause of burn injuries.

Accidents were the main cause of burns, although many suicide attempts were reported, and these two causes represent almost all patients hospitalized with extensive burns. The accidents were related to occurrences in the household as reported by other studies performed in developing countries[19,20].

In our study we observed that severe burn patients had a higher survival than expected based on the Cuban life prediction classification[1]. This is due to medical advances, the individual dedication of doctors and nurses who care for these patients, and their high level of professionalism, which enables the survival of patients with extensive burns and a high mortality risk . Other studies[7] also reported higher rates of survival when applying other measures for for mortality, such as the Garcés index, in agreement with our results.

The majority of extensive burns occurred in the municipalities of Bayamo and Manzanillo, but when the incidence rate per population was determined, higher values occurred in the municipalities of Buey Arriba, Bartolomé Masó, and Media Luna, mainly in rural areas. These results may be related to sociocultural differences among different population groups and the possible causes of burns as reported by some authors[9].

CONCLUSION

In 2018, a significant increase in the number of large burn patients was noted with a predominance of patients of female sex, aged 30–59 years. Accidents were the primary cause, and severe and critical burns were the most frequent in the reports describing survival prognosis and a higher than expected survival rate. The greatest number of cases occurred in the Bayamo and Manzanillo municipalities. As a recommendation we suggest improve the interrelationship between primary care and secondary care, determining the behavior of large burn patients is important to contribute to health promotion and burn prevention actions.

COLLABORATIONS

CMCH Analysis and/or data interpretation, Conception and design study, Conceptualization, Data Curation, Final manuscript approval, Formal Analysis, Investigation, Methodology, Project Administration, Resources, Supervision, Validation, Visualization, Writing - Original Draft Preparation, Writing - Review & Editing

VPN Analysis and/or data interpretation, Conception and design study, Final manuscript approval, Investigation, Project Administration, Supervision, Visualization, Writing - Original Draft Preparation, Writing - Review & Editing

RFB Analysis and/or data interpretation, Data Curation

SRLG Analysis and/or data interpretation, Data Curation

FAPS Analysis and/or data interpretation, Data Curation

MSG Analysis and/or data interpretation, Data Curation

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Chin augmentation with cervical flaps associated with rhytidoplasty

Aumento mentoniano com retalho cervical associado à ritidoplastia

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■ **ABSTRACT**

Introduction: The lack of chin projection in the lower third of the face is sometimes responsible for the breaking of the facial contour harmony. Alloplastic implants, fillers, and osseous advancements have been used to correct these deformities. In this study, we propose a new maneuver to increase chin projection by using a cervical flap associated with rhytidoplasty. **Methods:** We assessed 11 patients who underwent operations using the cervical flap for chin projection between January 2017 and January 2018. The inclusion criteria were only patients who desired chin augmentation without the use of prosthetics, fillers, or osseous approaches, and those who would undergo rhytidoplasty. **Results:** A cephalometric analysis revealed improvements in chin projection and cervical contour, and no complications in the immediate or late postoperative period. **Conclusion:** In addition to presenting satisfactory results and acceptance, the cervical flap used for chin augmentation eliminated the use of synthetic materials, reduced surgical costs, and improved safety and durability, achieving a more refined mandibular contour and natural chin projection.

Keywords: Mentoplasty; Rhytidoplasty; Chin augmentation; Cervicoplasty; Chin.

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■ RESUMO

Introdução: A falta da projeção mentoniana no terço inferior da face algumas vezes é responsável pela quebra da harmonia do contorno facial. A utilização de implantes aloplásticos, preenchimentos submetidos à ritidoplastia para correção destas deformidades. Neste estudo, propomos uma nova manobra para aumento da projeção mentoniana com uso de um retalho cervical associado à ritidoplastia. **Métodos:** Foram avaliados 11 pacientes operados no período de 01/2017 a 01/2018, utilizando-se o retalho cervical para projeção mentoniana, e tendo como critério de inclusão somente pacientes que almejavam um aumento mentoniano, sem utilização de próteses, preenchimentos ou abordagem óssea, e que seriam submetidos à ritidoplastia. **Resultados:** Através da análise cefalométrica evidenciou-se melhora da projeção mentoniana e do contorno cervical, e não houve complicações no pós-operatório imediato ou tardio. **Conclusão:** O retalho cervical utilizado para aumento mentoniano além de apresentar resultados e aceitação satisfatórios, elimina o uso de materiais sintéticos, redução de custos, segurança e durabilidade, alcançando um contorno mandibular mais refinado e uma projeção mentoniana mais natural.

Descritores: Mentoplastia; Ritidoplastia; Aumento de mento; Cervicoplastia; Queixo.

INTRODUCTION

The chin plays a major role in the contour of the lower third of the face; its absence or excess causes an aesthetic rupture and break in facial harmony. The chin morphology is determined by osseous components and soft tissues, which vary with sex and age. Most of the aesthetic changes of the chin are evident mainly in the local osseous component[1].

Generally, most complaints encountered in medical practice emphasize discontent with the cervical region. However, without identifying the disproportions of the chin components in the local context, it is up to the physician to ascertain the correct interpretation and suggest the best management for each patient.

OBJECTIVE

To describe a new technique for chin augmentation using a cervical flap associated with rhytidoplasty.

METHODS

This study was a prospective evaluation of 11 female patients between the ages of 40 and 65 years who underwent a chin augmentation with cervical flaps between January 2017 and January 2018, performed by the author through private services (Ferreira Segantini Plastic Surgery–Day Hospital).

We conducted our analysis with the aid of photographic documentation of the patients who underwent the procedure.

Inclusion Criteria

We included only patients who desired a chin augmentation without using prosthetics, fillers, or osseous approaches, and those who would undergo rhytidoplasty.

Surgical Technique

All the surgeries were performed under local anesthesia with sedation, with the patient in the supine position. The process for making the cervical flap precedes the rhytidoplasty, and in some cases, prior liposuction of the cervical region may be performed.

The flap proposed in this technique is located on the cervical midline and consists of segments of the platysma muscle and fatty tissue of the submental space. The base of the flap measures approximately 2.5 cm and begins in the upper submental region, extending inferiorly by 4 to 6 cm (Figures 1 and 2).

After detaching the cervical skin and making the flap, we began the posterior superior dissection of the flap in the median subperiosteal region of the mandible, 1.5 to 2.0 cm above the mental protuberance[2]. Next, we evaluated the cavity size and volume offered by the flap, which allowed us to make adjustments if necessary (Figure 3).

Having made the flap and cavity, we rotated the flap in a posterior superior direction and then affixed it using a transcutaneous needle (e.g., Reverdin) in the upper midline of the cavity (Figure 4). The suture was made with 4.0 mononylon using only a small hole to bury the suture knot.

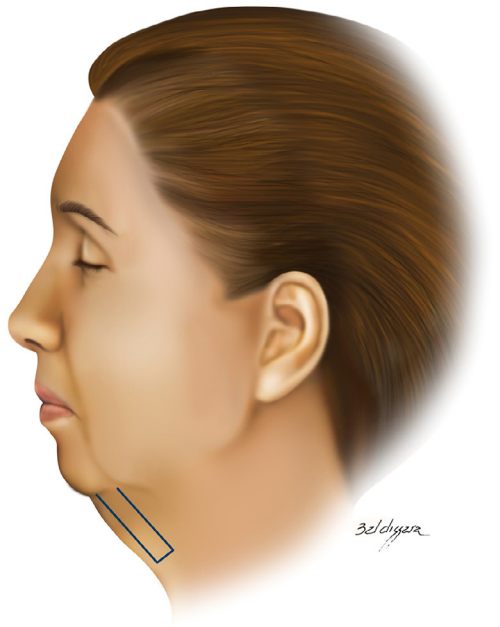

Figure 1. Flap positioning.

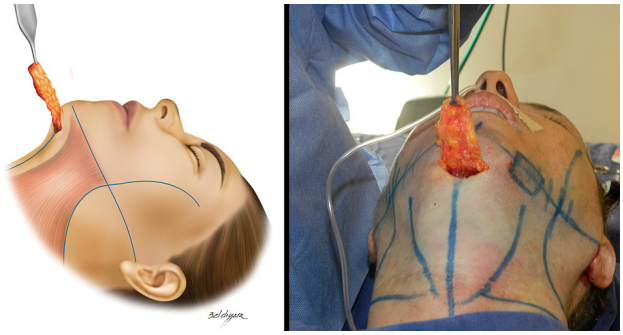

Figure 2. Making the flap.

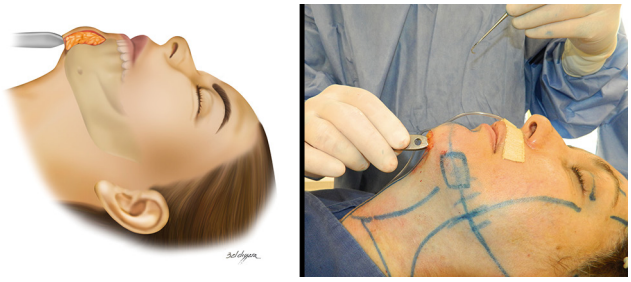

Figure 3. Evaluated the cavity size and volume offered by the flap.

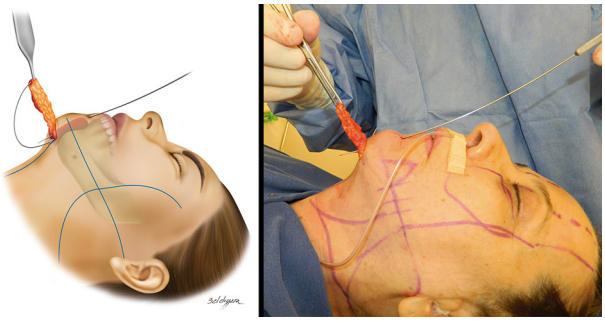

Figure 4. Flap fixation it using a transcutaneous needle.

With the flap attached to the cavity, the base of the flap was stitched to the periosteum of the transition from the mental to submental regions, and the platysmal bands are closed at the midline, where they meet at the base of the flap in a T-stitch (Figure 5), allowing us to proceed to treating the upper and midface (Figure 6).

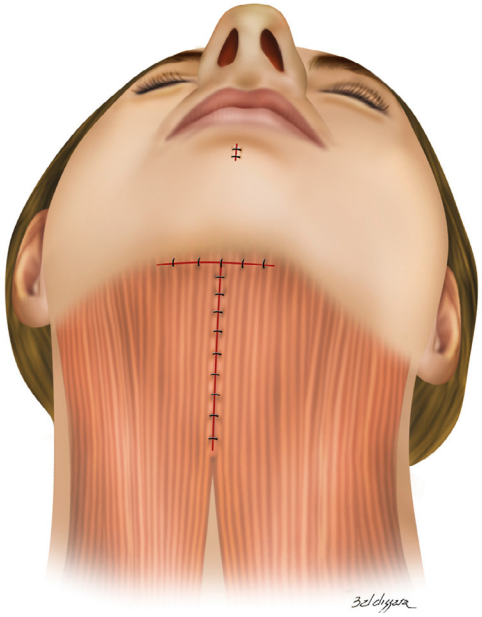

Figure 5. Base the flap was stitched to the periosteum of the transition from the mental to submental

Figure 6. Treating the upper and midface.

Postoperative care was similar to that in conventional rhytidoplasty associated with chin implantations.

RESULTS

All the patients underwent a cephalometric analysis, which, in turn, plays a major role in the assessment of the relationship of the chin with other bone structures and soft tissues of the face.

For this study, we considered the imaginary lines created by Frankfurt (horizontal) and Gonzales-Ulloa (vertical and tangent to nasion) (Figure 7).

All the patients presented good recovery and did not present with any complications in the immediate or late postoperative period.

Figure 7. Cephalometric analysis, lines horizontal created by Frankfurt and vertical of Gonzales-Ulloa.

All the patients evidenced an improvement in chin projection, ranging from 32.5% to 60% in relation to the Gonzales-Ulloa line and cervical contour (Figures 8–10).

Figure 8. Patient 57 years, preoperative and postoperative 21 days, 6 months and 1 year.

Figure 9. Patient 40 years, preoperative and postoperative for 3 months and 6 months.

Figure 10. Patient 58 years, preoperative and postoperative for 21 days and 6 months.

DISCUSSION

Many procedures have been used to aesthetically improve the lower third of the face, producing efficient results with an effective increase in chin projection.

Silicone implants have been applied the most, as it demonstrates efficient results and are easy to handle. However, approximately 50% of the patients present with bone erosion[3] due to local compression of the prosthesis. The most frequent complications include choosing the wrong implant size, prosthetic displacement, infection, extrusion of the implant, sensitive alterations in the lower lip, and impaired chin muscle function, where intraoral access[4] is responsible for most complications.

In well-selected cases without occlusion problems, basilar osteotomy[5] exhibits excellent results. Despite the low incidence of complications[6], patients do not generally accept the procedure owing to fear of bone manipulation.

Despite the easy application, the use of fillers such as hyaluronic acid has temporary results and, in some cases, can cause intense and sometimes prolonged erythema, papulopustular polymorphic acne, intense edema, skin nodules[7], and necrosis[8]. Regardless of their associated low incidence rates of complications and easy treatment, fillers performed with fat grafting[7] may show partial or total reabsorption and asymmetries, and some cases might require several sessions to obtain a good result.

Among the strategies to improve chin contour with autologous tissues is the proposal by Viterbo and Brock in 2013[9] to perform "gliding mentoplasty," which includes intraoral access and easy execution, and can be performed in isolation without a greater approach to the face. Nevertheless, it may be insufficient in cases that require a volumetric increase.

In comparison with the other procedures, chin augmentation with the use of the cervical flap has been shown to be effective, with real gains in anterior projection, durability, and enthusiastic acceptance by the patients. Furthermore, we have yet to observe any complications.

CONCLUSION

Although making the flap requires a little more experience and surgical time, its results and acceptance are encouraging. By eliminating the use of synthetic materials, reducing costs, and improving safety and durability, a more refined mandibular contour and a more natural chin projection can be achieved.

COLLABORATION

MMFC Analysis and/or data interpretation, Data Curation, Formal Analysis, Methodology, Project Administration, Realization of operations and/or trials, Writing - Review & Editing

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Upper Pedicle Breast Flap

Retalho mamário de pedículo superior

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ALEXANDRE CARONI BOZOLA [1]

■ **ABSTRACT**

Introduction: Here we propose a tactic to fill the upper poles of breasts that are emptied by ptosis in primary and secondary cases to obtain anatomically beautiful breasts with sufficient breast volume. **Objective:** To describe breast tissue flaps used to fill the upper breast pole when there is adequate or surplus volume. **Methods:** In primary or secondary cases, if the measurement from point A to the submammary fold is long and that to the upper glandular ridge is short, one obtains from the difference between them a flap with an upper pedicle, termed a "book leaf," and sutured at the upper mammary pole. Glandular detachment preserves the skin's thickness with subcutaneous tissue in all maneuvers similar to the adjacent thorax according to the mammary gland's vascular anatomy, which is irrigated and innervated from the subcutaneous tissue to the gland. **Results:** The six patients presented no complications related to flap irrigation. Adequate mammary shape and volume were achieved by inverting measurements between the lower and upper poles. **Discussion:** Here we proposed an innovative manner to fill the upper pole of the breast with a breast upper pedicle flap. A larger number of cases should be analyzed in the long term. **Conclusion:** The flap is used to fill the upper pole of the breast when the largest volume is in the lower pole.

Keywords: Mammoplasty; Breast; Surgical flaps; Tissue and organ acquisition; Biological tissue flaps.

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■ **RESUMO**

Introdução: É proposto uma tática para preenchimento do polo superior das mamas que se esvaziam pelo processo de ptose em casos primários e secundários, permitindo assim obtenção de mamas anatomicamente bonitas, em casos de volume mamário suficiente. **Objetivo:** Descrever retalho de tecido mamário com a finalidade de preenchimento do polo mamário superior, quando exista volume adequado ou excedente. **Métodos:** Em mamas primárias ou secundárias, se a medida do ponto A até o sulco submamário é longa e deste até o rebordo glandular superior é curta, obtêm-se da diferença entre elas um retalho com pedículo superior, revirado em "folha de livro" e suturado no polo mamário superior. Descolamentos glandulares preservando a espessura de pele com tecido subcutâneo em todas as manobras igualmente à do tórax adjacente. Baseando-se na anatomia vascular da glândula mamária que é irrigada e inervada desde à superfície subcutânea para dentro da glândula. **Resultados:** As seis pacientes não apresentaram complicação na irrigação do retalho. A forma e volume mamários adequados foram alcançados através da inversão de medidas entre polo inferior e superior. **Discussão:** Propõe-se uma ideia e inovação, de preenchimento o polo superior das mamas com tecidos próprios, através de retalho de pedículo superior mamário. Deve ser analisado a longo prazo um maior número de casos para análise dos resultados obtidos. **Conclusão:** O retalho se presta ao preenchimento do polo superior da mama quando o maior volume está no polo inferior.

Descritores: Mamoplastia; Mama; Retalhos cirúrgicos; Obtenção de tecidos e órgãos; Retalhos de tecido biológico.

INTRODUCTION

During the aging process and consequent breast ptosis, emptying of the upper pole occurs. The breast loses its anatomically beautiful shape and its base becomes transversal, inverting its diameters[1]. The more the horizontal direction is elongated, the greater the ptosis. In the frontal view, the vertical diameter of the breast should be aesthetically perfect and longer than the horizontal in the proportion of 1.3:1. This is a frequent complaint in the postoperative period because the possible flaps for upper pole projection and elongation of the vertical diameter and horizontal reduction do not offer full filling in all cases because they do not reach the highest horizontal breast line (HHBL), the connection between the two anterior axillary folds[1].

Breast tissue flaps are used for this purpose. The most commonly used is the lower pedicle axial flap described by Ribeiro et al. in 2002[2] in its various forms[2,3]. However, in some cases, it does not reach the upper pole when the measurement between the submammary groove (at the vascular pedicle) and the areola is insufficient for its end under the breast to reach the HHBL[1]. This excellent flap fills the upper and lower poles, not changing the proportion between them. Crossed flaps of the medial and lateral sides of the breast would have the same purpose: one would fill the upper breast pole and the other assuming the position of the first[4,5,6].

In the breast ptosis process, on breast profiles (Figure 1), the measurement between the cone's apex and the groove expands, while that between the apex and the upper pole ridge shortens. The ratio of the proportion between the lower and upper measurement that should be from 1:1.6 to 1:1.4[1]; as it approaches 1, the breast becomes more flaccid. It also occurs in postoperative techniques that do not model and structure the cone's breast as a fundamental principle with appropriate proportions and measures and use the skin's traction and resistance to provide shape. In the medium term, the breast acquires the shape left by the surgeon and the flap distends the skin, acting as an expander. This elongates the vertical scar even if it is initially short and under tension. The proportion between the upper and lower poles is inverted and the breast loses its original shape in the early postoperative period.

In cases of secondary mammoplasty, where there is enough volume to recreate the proper shape and the proportion between the lower and upper segments is inverted, the proposed tactic will be indicated. This is also true in primary breasts with the same inversion, which is sometimes called pseudoptosis[7].

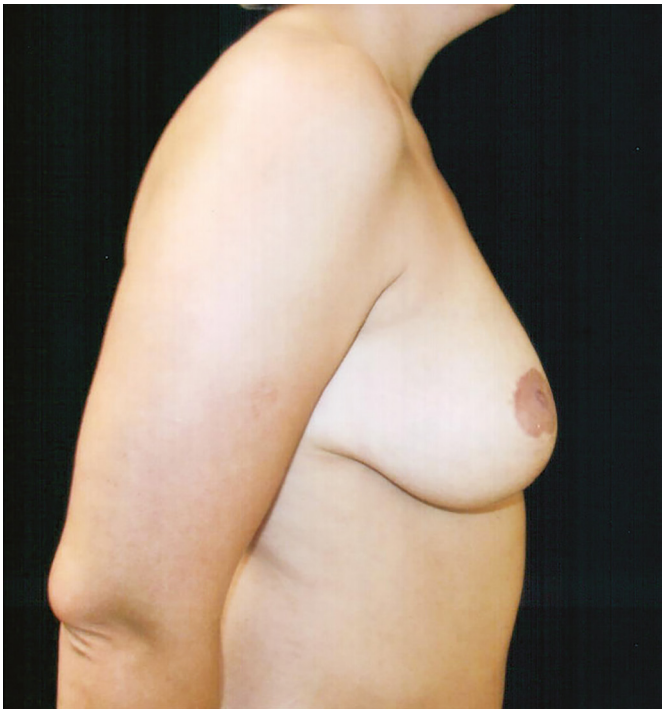

Figure 1. Breast with ptosis and larger volume below the areola; inversion of the measurements between point A to the groove and from it to the upper ridge.

OBJECTIVE

To describe use of the upper pedicle flap to fill the upper breast pole.

METHODS

There is a fundamental principle governing the flap's vascular anatomy. The breasts are considered deeply modified sweat glands that are fundamentally ectodermic, that is, fixed to the skin.

At birth, the mammary glands show the same development in both sexes. In females at puberty or during pregnancy and breastfeeding, they change under hormonal influence.

During female puberty, breast buds develop and distend the skin and subcutaneous tissue, decreasing their thickness from the peripheral adjacent thorax to the gland to the areola. It is in this tissue that blood vessels, lymphatic vessels, and nerves run in a converging network up to the nipple–areola complex (NAC). Degree of breast growth depends on both hormone dosage and number of buds.

Breast shape depends on the skin's distensibility. The more resistant the skin, the less projected the breast will be with a wider base. The thinner the skin, the narrower the base. Therefore, the base's extension and breast cone's projection can be classified into 4 groups of hypertrophies and 4 groups of hypomastia[8,9].

The upper vascularization originates from the perforators of the internal thoracic artery, with its branches of the second and third more calibrous veins. They irrigate the upper internal portion from the subcutaneous tissue inward toward the mammary tissue. In the upper lateral portion, the mammary branches penetrating the gland from the subcutaneous tissue originate from the lateral thoracic artery, an axillary branch. In the upper pole, irrigation comes from the pectoral branches of the thoracoacromial artery, penetrating the gland in the same way as the others through the subcutaneous tissue (Figures 2A, 2B, and 2C)[10].

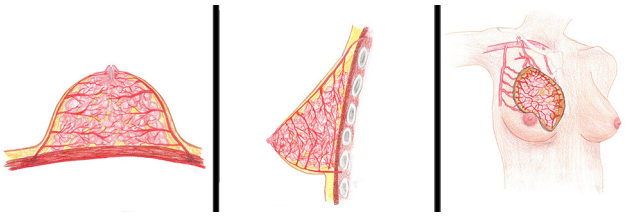

Figure 2. Vascularization scheme of the breast from the surface to the depth with pedicles in all quadrants in network to the papilla.

The thickness of the subcutaneous tissue in the thorax changes only with changes in body weight. It serves as a guide for obtaining flaps or detaching glands without damaging the arterial irrigation, venous drainage, lymphatic system, or innervation.

Surgery

Excess skin markings for resection to correct ptosis should be performed according to the surgeon's experience. This can appear as an inverted T, L, or vertical line depending on the degree of ptosis.

In the breast meridian, the measurement between point A and the upper glandular ridge is equal to or less than that from point A to the submammary groove. In primary or secondary cases, with sufficient volume, the proposed tactic is indicated except in secondary cases in which the primary surgery was performed by techniques that detached the skin from the gland.

The excess skin is de-epidermized from the demarcated area to the submammary groove. Both periareolar and subareolar, this lower region can be removed.

Using Kocher forceps, point A is pulled perpendicular to the thorax until the gland is cone-shaped (Figure 3A).

In the mammary meridian, at point A, the lower measurement is marked for the desired side (6–8 cm) toward the submammary groove. It is from this point to the groove that the possible flap thickness is obtained (it can be reduced if necessary). This represents how much it is possible to increase the upper pole by reducing the lower pole. Mathematically, the proportions can

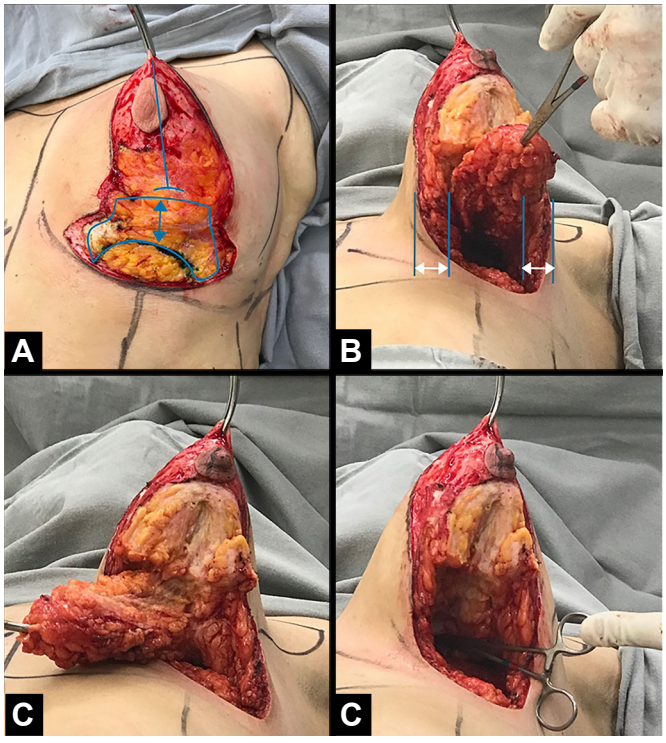

Figure 3. A. Marking of the breast flap to be obtained while preserving the thickness of the subcutaneous tissue equal to that of the adjacent thorax. **B.** The breast's base detached from the pectoral muscles and the flap obtained by preserving the thickness of the subcutaneous tissue of the adjacent thorax. **C.** View of the flap where the excess was removed from its medial and lateral parts and wedge removal at the lower pole to reduce the lateral–lateral diameter. **D.** The flap dipped under the breast with the end reaching the highest horizontal breast line.

be inverted by transporting tissue from the lower pole to the upper pole and the proportion between 1:1.4 to 1:1.6 can be offered between the lower and upper measurements based on the A point of the future papilla.

The breast should be detached from the pectoral muscles. The medial and lateral thickness of the peripheral subcutaneous tissue should be preserved without detachment, avoiding lesions to the vessels that irrigate it. In the upper pole, it detaches until it reaches the upper horizontal breast line without reaching the upper nutrient vessels present in the subcutaneous tissue. In the lower pole, at the meridian, a mini lower pedicle described by Ribeiro et al. in 2002[2] is left to recompose it (Figure 3A). The mammary tissue is detached from the flap at the lateral and medial sides, in the skin and subcutaneous tissue, again preserving the thickness equal to the adjacent thorax (Figure 3B).

The gland is transversally incised where the flap thickness was marked, directing it to the upper pole until just above the transversal diameter of the breast cone base (Figure 3C).

This glandular flap is obtained in a slightly cylindrical way; if reduced in its lateral and medial ridges (Figures 3B, 3C), it resembles a half moon (Figures 4A, 4B). It is turned into what is termed a "book leaf," with the transversal axis of the pedicle above half of the breast base. It is introduced through the upper detached area reaching the HHBL[1] (Figures 3D, 4C, and 4D), where its end is fixed. It redoes the upper breast pole, filling it, reducing the lower one and inverting the measurements between the two segments (Figures 5A and 5B). If there is a need to reduce the lateral diameter of the mammary cone, a vertical wedge can be made in the remaining mammary tissue of the lower pole up to before the flap pedicle (Figures 3C, 3D).

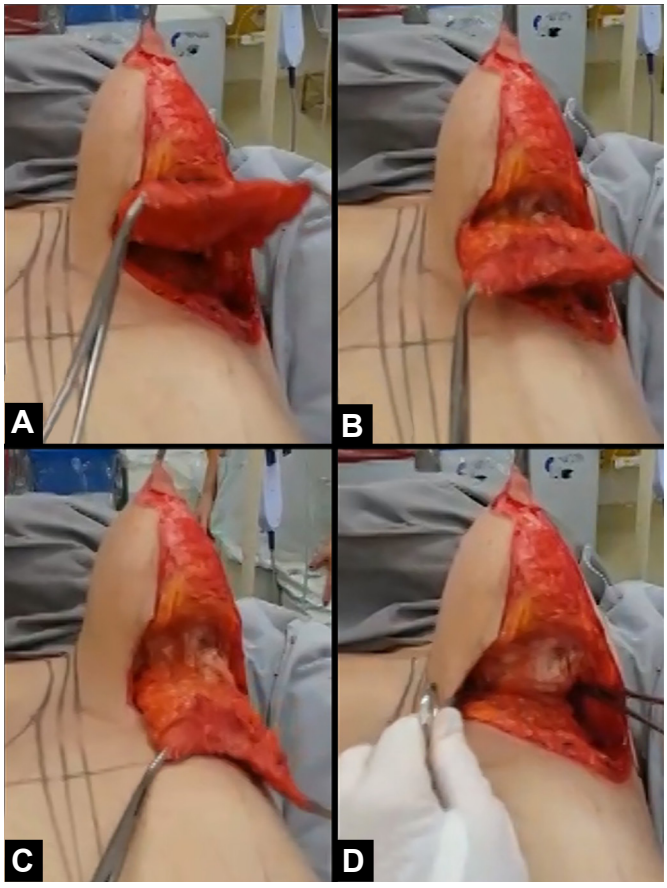

Figure 4. The same half-moon-shaped flap without removal of its lateral and medial parts.

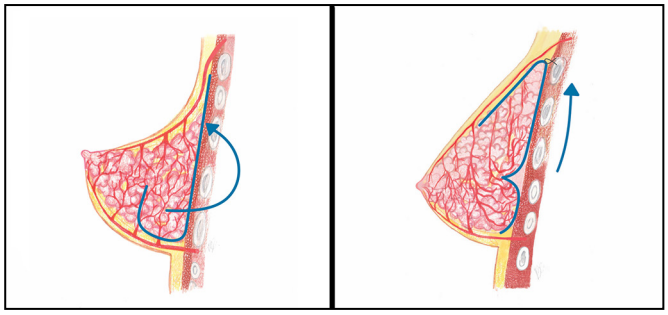

Figure 5. Profile scheme of breast tissue transfer from the lower to upper pole in the form of a mixed axial glandular and randomized flap.

If further volume reductions are required, part of the flaps or tissue of the bottom base will be resected. In all tactical maneuvers, the thickness of the subcutaneous should be preserved equal to that of the thorax except in the upper pole where the flap will be implanted.

RESULTS

The authors operated on six patients at the Base Hospital of the Medical School of São José do Rio Preto. All patients signed an informed consent form prior to participating. The results showed that the upper pole was filled through inversion of the lower and upper pole measurements as well as adequate projection (Figures 6A–6F) and (Figures 7A–7F), and the consequent breast shape improvement. There were no complications related to breast tissue vascularization. This remained natural on palpation without hardening or clinical signs of steatonecrosis. In one case, the implants were removed, the fibrous capsule was recent with no signs of a calcium deposit; its anterior portion was fixed to the flap, facilitating its suture to the upper pole (Figures 8A–8F). Additional cases are needed to analyze the long-term results of the mammary forms obtained as well as possible complications since this is an innovative rather than technical surgical tactic of mammoplasty.

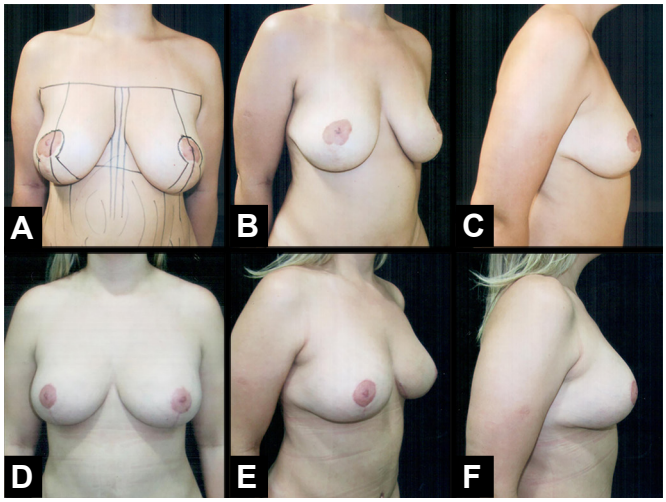

Figure 6. Pre- and postoperative photos of the use of the described procedure.

DISCUSSION

Using our knowledge of ectodermic embryology and breast anatomy, we can make any flap with or without the NAC if the thickness of the subcutaneous is preserved progressively thinner as it approaches it. Glandular flaps can also be created if their pedicles are based on the subcutaneous tissue and skin. They can be axial if they follow the vascular path and are randomized

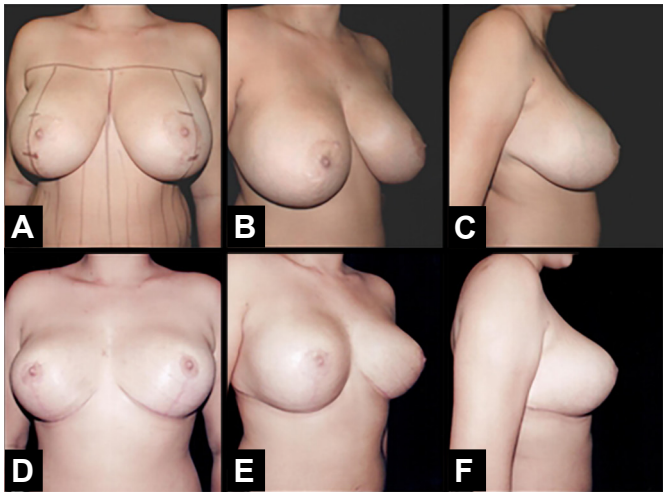

Figure 7. Pre- and postoperative photos of the use of the described procedure.

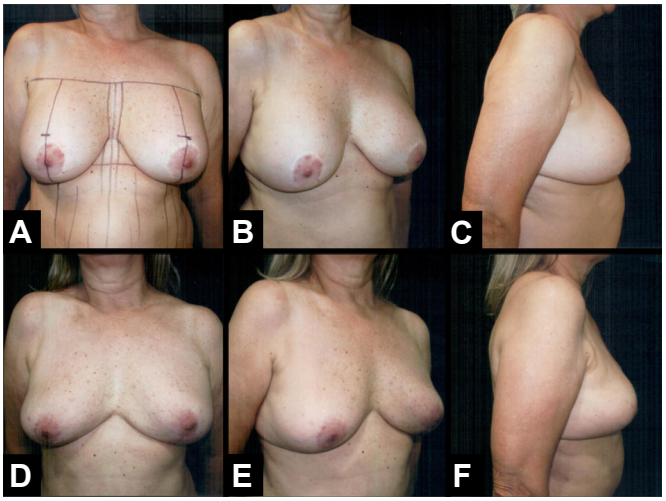

Figure 8. Pre- and postoperative photos of a patient who no longer wished to use implants, which were removed. A flap was made in conjunction with the anterior fibrous capsule.

or mixed (flap of Ribeiro et al. in 2002[2]). If randomized, the appropriate proportions between their widths and lengths are maintained around 1:1.

The mammary gland embryologically originates from the ectoderm, so it is fixed to the skin that covers it. The preservation of the peripheral subcutaneous tissue equal to the thickness of the subcutaneous thorax is fundamental to preserving the vessels and nerves that converge in a network to the NAC because they irrigate and enervate the mammary tissue and the remaining skin surface.

The length of the proposed flap does not exceed its width, so its irrigation is satisfactory, running from top to bottom and from the surface to its depth. Its blood supply is derived from the branches of the pectoral artery of the thoracoacromial artery and the perforating vessels of the internal thoracic artery, the second and third intercostal spaces, and the branches of

the thoracic-lateral artery, as long as the subcutaneous of the thorax peripheral to the gland is preserved, without detachments, except the upper area where the flap will be introduced.

When the breast tissue includes more adipose than glandular tissue, the flap should be shorter with a thick pedicle. This is generally enough to fill the upper mammary pole. If less consistent, it is more difficult to attach it to the appropriate place and may lead to low-quality results.

There were no major complications denoting a lack of adequate irrigation of the proposed flap.

In the frontal view, if the areolas are positioned close to the ideal measurements from the sternal furcula, thus appear too high, the proposed procedure corrects the visual distortion of the inverted proportions between the upper and lower breast poles. This tactic was developed by observing the breasts' vascular behavior during skin-preserving mastectomies and by making flaps with or without NAC transport performed for over 45 years by the authors.

CONCLUSION

The described flap is proposed to fill the upper breast pole and invert the measures and proportions between the upper and lower breast segments in primary or secondary cases, promoting improved breast esthetics.

COLLABORATIONS

ARB Final manuscript approval

ACB Analysis and/or data interpretation

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Review Article

Fat grafting in breast reconstructions with expanders and implants

Lipoenxertia em reconstruções mamárias com expansor e implantes

CARLOS CUNHA OLIVEIRA [1,2]*
CLAUDIO CORTEZ DOS SANTOS [2]

■ **ABSTRACT**

Autologous fat grafting was first described more than 100 years ago by Neuber to correct facial defects. At the same time, Czerney described the use of a lipoma on the back to recreate a post-mastectomy breast. The technique was popularized by Coleman, who described the use of liposuction and adipocyte purification for injecting into the face as a soft tissue filling. Then, Bircoll and Novack (1987 apud Costantini et al.[4]) extended this use to breasts. In 1990, there was a growth in the use of fat grafting after Coleman's technique. This confirmed that adipose tissue could be satisfactorily transferred with the formalization of a restricted protocol for fat injection preparation. Coleman's technique is by far the most commonly used. The adipose tissue is infiltrated with a tumescent solution and then manually aspirated. The liposuction material is subsequently centrifuged to isolate the adipose tissue from the oily and aqueous fraction and was then injected. Transferring fat from an excess area such as the abdomen or thighs to reconstruct or improve the shape and volume of the breast is not a new idea. Later, a study by Illouz on liposuction promoted the widespread use of the technique worldwide. Postoperative mammographic images to control fat absorption and necrosis vary. These can present as lipid cysts, suspected malignant findings such as grouped microcalcifications, spiculated areas of increased opacity, and focal masses.

Keywords: Breast; Allografts; Breast implant; Tissue expansion devices; Review literature as a subject.

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■ **RESUMO**

A lipoenxertia autóloga foi inicialmente descrita há mais de 100 anos por Neuber objetivando correção de defeitos faciais. Ao mesmo tempo, Czerney descreveu a utilização de lipoma nas costas para recriar uma mama pós-mastectomias. A técnica foi popularizada por Coleman, que descreveu o uso de lipoaspiração e purificação de adipócitos para injeção na face como preenchimento de tecido mole. Bircoll e Novack (1987 apud Costantini et al.[4]) expandiram então esta aplicação para as mamas. Em 1990 houve um crescimento no uso da lipoenxertia, após o trabalho de Coleman, que confirmou que o tecido adiposo poderia ser transferido satisfatoriamente com a formalização de um protocolo restrito para preparação e injeção de gordura. A técnica de Coleman é de longe a mais comumente usada. O tecido adiposo é infiltrado com uma solução tumescente e, em seguida, manualmente aspirada. O lipoaspirado é subsequentemente centrifugado para isolar o tecido adiposo da fração oleosa e aquosa e finalmente injetado. A transferência de gordura de uma área em excesso, como o abdômen ou as coxas para reconstrução ou melhorar a forma e o volume da mama, não é uma ideia nova. Seguindo o trabalho de Illouz sobre a lipoaspiração, que levou ao seu uso generalizado em todo o mundo. As imagens mamográficas após lipoenxertia são variadas, a absorção de gordura e sua evolução à necrose gordurosa variam de cistos lipídicos a achados suspeitos de malignidade, como microcalcificações agrupadas, áreas espiculadas de opacidade aumentada e massas focais.

Descritores: Mama; Aloenxertos; Implante mamário; Dispositivos para expansão de tecidos; Literatura de revisão como assunto.

INTRODUCTION

The use of autologous fat grafting to correct defects was first described over 100 years ago when it was used to correct facial defects. Concurrently a back lipoma was also used to recreate a patient's breast after mastectomy[1].

The contemporary evolution of autologous fat grafting was popularized by Coleman et al., in 2010[2], who described the use of liposuction and adipocyte purification for injecting into the face as a soft tissue filling. Then, Bircoll and Novack (1987 apud Costantini et al.), extended this use to breasts[3,4].

The interest in fat injection was revived in the early 1990s by Coleman, who confirmed that adipose tissue could be satisfactorily transferred by stipulating that a strict protocol for fat preparation and injection should be respected[2,5].

Coleman's fat grafting technique is by far the most commonly used. The adipose tissue is infiltrated with a tumescent solution (for example, Klein's solution) and then manually harvested through skin incisions using a 3 mm cannula with two holes and blunt tip connected to a 10 mL syringe. The liposuction material is subsequently centrifuged for three min at 3,000 rpm to isolate the adipose tissue from the oily and aqueous fraction and then injected. The entire procedure can be performed under local anesthesia[2,6].

The analysis of different anesthetic drugs showed greater viability of adipose stem cells in adipose tissue treated with bupivacaine, mepivacaine, ropivacaine, and lidocaine compared to the combined treatment with articaine and epinephrine. Although no variability between amides is expected, epinephrine can affect α1 receptors in adjacent tissues that support the implanted cells. In general, the tumescent solution improved cell viability compared to the dry technique. No significant differences were observed between the commonly used anesthetics, except for articaine and epinephrine[7].

Transferring fat from an excess area such as the abdomen or thighs to improve the shape and volume of the breast is not a new idea. A study by Illouz, in 1983[8], promoted the widespread use of liposuction worldwide, making the use of fat from adipose deposits to increase breast volume.

The injected amounts varied from 100 to 250 mL in each breast[6]. In 2000[9], Fournier carefully affirmed that the fat was only injected in the retro glandular space and not in the mammary parenchyma.

Fat grafting has also been used to treat burn scars. The evolution of the scarring one year after treatment was evaluated using a questionnaire as well as physical and histopathological exams. In the first year of follow-up, all patients reported improved clinical condition. Histological findings showed new collagen deposition, neoangiogenesis, and dermal hyperplasia in the context of new tissue, demonstrating tissue regeneration[10].

Postoperative mammographic images to control fat necrosis vary. These can present as lipid cysts, suspected malignant findings such as grouped microcalcifications, spiculated areas of increased opacity, and focal masses[10].

Fat necrosis is a nonspecific histological finding that involves several processes in its etiopathogenesis. In addition to surgery, the most common causes of fat necrosis are ischemia, radiation therapy, and trauma. There are reports of some other rare occurrences of breast fat necrosis caused by anticoagulant therapy with sodium warfarin (Coumadin) and sodium enoxaparin. Calciphylaxis, which is hypersensitivity to local calcinosis associated with secondary hyperparathyroidism in renal failure, has also been reported[10].

An increased incidence of cancer after fat grafting was reported in reviews of studies with animals, proving this hypothesis, but there was no evidence of this in *in vitro* studies[11].

OBJECTIVE

To conduct a literature review on the use of fat grafting in breast reconstructions with expanders and implants, and report three cases of patients undergoing the procedure in a private clinic in Fortaleza.

METHODS

A bibliographic review was conducted using the scientific research databases, BIREME, NCBI, PubMed, and SciELO, as well as on studies published in the journals of the Brazilian and American Society of Plastic Surgery.

Three cases of patients who underwent breast reconstruction using prostheses and expanders associated with fat grafting will be described. The incisions were made in the fat donor areas using a No. 15 scalpel blade. Abdominal fat was aspirated through two lateral incisions in the flanks using a 3 mm cannula with three holes connected to a 60 mL syringe.

The fat was injected in small amounts in the shape of thin cylinders by retro-infusion. It was necessary to create micro-channels in many directions. The transfer was made from a deep to a superficial plane. Good spatial visualization was necessary to form a kind of three-dimensional honeycomb to avoid fat pockets forming that would lead to fat necrosis.

The fat graft was prepared using the sedimentation method. Fat processing is necessary because the liposuction material contains not only adipocytes but also collagen fibers, blood, and debris.

The preoperative evaluation was based on anthropometric methods, and the patients were followed up monthly with a breast ultrasound to control fat grafting and mammography according to age.

Case 1: Female, 65 years old, married, underwent a total right mastectomy in 2002 and total left mastectomy in 2008, with immediate reconstruction with 200 mL and 250 mL prostheses, respectively. The patient returned in 2016 to correct breast asymmetry. Personal morbid history: nipple-areola complex radiotherapy and hormone therapy for five years. On examination: asymmetric breasts with grade one ptosis with a bilateral contracture (Baker 3), which was more intense on the right side and absence of fat tissue bilaterally. The prostheses were removed and new ones with 332 mL and 350 mL were placed on the right and left breasts, respectively, in addition to fat grafting of 80 mL on the right and 60 mL on the left. Second fat grafting was completed two months later using 70 mL on the right and 80 mL on the left (Figure 1).

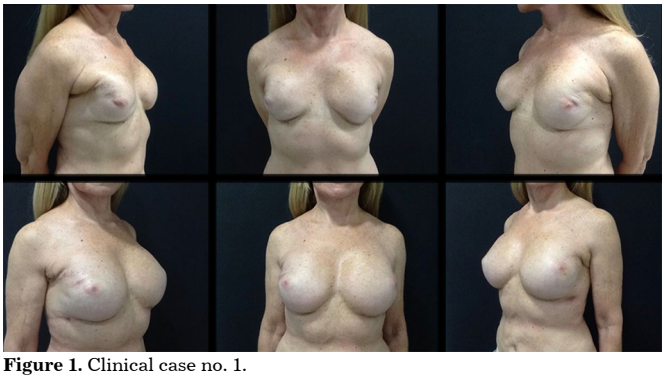

Figure 1. Clinical case no. 1.

Case 2: Female, 75 years old, married, underwent total right mastectomy due to *in situ* ductal carcinoma, with a late reconstruction with transverse rectus abdominis myocutaneous (TRAM) flap in 2007. The patient sought the service due to dissatisfaction with the obtained result. Personal morbid history: mother with lung and breast melanoma. A 350 mL expander prosthesis was placed on the right breast in December

2015. In June 2016, the right expander was replaced by a 350 mL silicone prosthesis and the left by a 332 mL prosthesis, in addition to 120 mL fat grafting in the breasts (Figure 2).

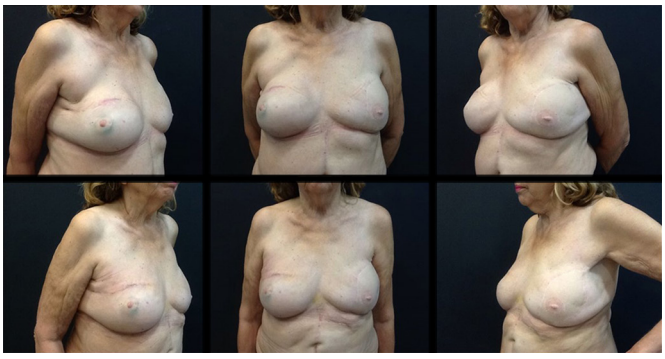

Figure 2. Clinical case no. 2.

Case 3: Female, 38 years old, married, underwent total mastectomy with right axillary emptying due to tumor > 5cm and immediate reconstruction with a 450 mL expander prosthesis in 2013, sought the service for breast symmetrization. Personal morbid history: radiotherapy and neoadjuvant chemotherapy in May 2013. In 2015, the expanders were replaced by silicone prosthesis of 495 mL on the right and 250 mL on the left breast (Figure 3).

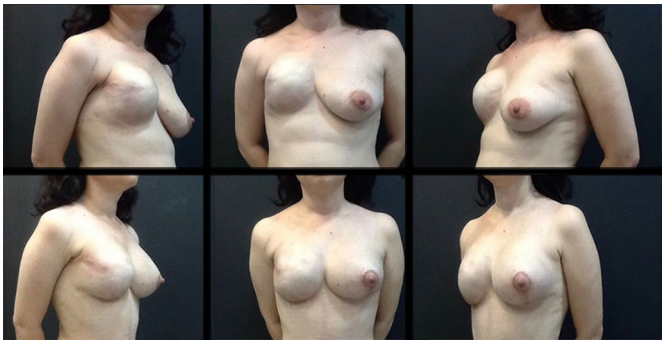

Figure 3. Clinical case no. 3.

DISCUSSION

The ideal augmentation material requires certain qualities, including biocompatibility, lack of toxicity, produces consistent and reproducible results, and is cost-effective. Autologous fat grafts have many of these qualities and also provide a natural feeling, can be personalized for each patient and easily removed in case of complications or dissatisfaction. The biggest challenge in autologous fat transfer is to maintain the longevity and durability of fat grafts. This is related to the fat collection and preparation techniques. Although there are some clinical studies on this subject, some important questions have not been answered: (1) Can any current fat grafting method be considered standard?; (2) Is there a more viable and functional fat preparation method?; and, (3) Can a common fat collection and preparation protocol be found in the light of current information in the literature?

In 2007[2], Coleman et al. questioned a restriction on the use of fat grafting issued by a committee of American experts in 1987, stating that calcifications and liponecrosis observed after fat grafting procedures are also observed in other breast procedures, such as breast reduction and mastopexy.

Many preparation techniques have been suggested in the literature to maintain the viability of fat grafts after being harvested and processed.

A survey by the American Society for Aesthetic Plastic Surgery reports that Coleman's microcannula technique is the most common method of autologous fat collection (54%), followed by standard liposuction cannula (25%), syringe and large needle caliber (16%), and direct excision techniques (5%). The same survey found that, after collecting fat, 47% of respondents perform fat centrifugation, 29% perform fat washing, 12% cite "other" unspecified treatment techniques, and 12% use no preparation method[12].

Other fat collection and processing methods have been reported in the literature and used clinically for structural fat grafting. Har-Shai et al., in 1999[13], used an integrated approach in which the fat grafts were harvested with a syringe and centrifuged at 1,000 rpm. After centrifuging, the aspirate was suspended in an enriched cell culture medium to increase the survival of autologous fat grafts. They used this integrated technique in 15 patients and reported that the amount of graft absorbed varied between 50% and 90% over a follow-up period of between six and 24 months[12,14].

Pu et al., in 2008[15], reported a modified technique that included low-pressure fat aspiration using a 20 mL syringe and separation of adipose tissues using gravity without centrifugation. Additionally, they refined fat packs with gauze and cotton sticks to remove the greasy and non-greasy components. Although they reported that a good volume of fat was maintained in a long-term follow-up, it is important to avoid exposing fat grafts to air to maximize graft viability and minimize contamination.

They also compared their collection technique with conventional liposuction and showed that low-pressure fat collection using a syringe produces more adipocytes with optimal cellular function than the negative pressures greater than 20 cm H_2O generated by conventional liposuction. However, there are no comparative studies[12,13].

As for use, fat grafting in the chest wall and breast deformities is expanding rapidly. They seem to represent a significant advance in the treatment of Poland's syndrome and will probably revolutionize

the treatment of severe cases, producing unparalleled quality reconstruction with short and straightforward postoperative care and less scarring[5].

This same reasoning is used for grafts in tissue that underwent radiotherapy, in which vascularization is scarce and, even so, presents good results. Most of the studies report a high number of complications, with fatty necrosis and images related to it being the most frequent complication in the radiological follow-up of the grafted area[11].

The percentage of patients requiring another fat grafting session showed no significant differences between groups. So far, clinical outcomes, fat necrosis in breast ultrasound, and the need for new fat grafts have demonstrated that fat enriched in platelet-rich plasma is not superior to fat grafting alone[11].

Some positive effects of platelet-rich plasma in angiogenesis and stem cell proliferation derived from fat tissue have been experimentally demonstrated. As for angiogenesis, platelet-rich plasma growth factors stimulate endothelial cells around the injection site, favoring the proliferation and formation of new capillaries. Besides, an *in vitro* study reported that plasma is a potential contributor in initiating the angiogenesis process, recruiting endothelial cells that line blood vessels and initiating bone regeneration[13,15,16,17].

As for cell proliferation, activated platelet-rich plasma contains large amounts of PDGF-AB and TGF-β1 and promoted the proliferation of human stem cells derived from fat tissue and human dermal fibroblasts *in vitro*. Cell proliferation was maximum when 5% activated platelet-rich plasma was added to the culture medium. Paradoxically, the addition of 20% activated platelet-rich plasma did not show the same results[15,16,17].

Lipofilling procedures can modify radiological imaging. However, their interference has been studied in the literature, and radiological studies suggest that imaging technologies (ultrasound, mammography, and magnetic resonance imaging) can identify microcalcifications caused by fat injections. Also, recent follow-up studies have demonstrated the safety of the procedure, with no increased rates of a new disease or tumor recurrence being reported[18,19].

Oncological follow-ups showed no increased risk of local recurrence after mastectomy or conservative treatment. The clinical impression seems to suggest the opposite, but to confirm this, more complex oncological studies comparing populations treated with reference populations with the same oncological status are necessary[5,18,19].

The volume of grafted fat was stable after three to four months and remained constant. If a patient loses weight, the volume of transferred fat decreases, and the resulting smaller breast size can lead to asymmetry. Therefore, it is important for patients to understand the need to maintain a stable weight. Contrastingly, if a patient gains weight, breast volume increases due to the increased fat deposits.

Reabsorption seemed to be less intense (between 20 to 30%) when a second session was needed to obtain sufficient volume. This reduced-fat reabsorption rate has been clinically evaluated. In some cases in which the patients required a second fat transfer session, an interferometric evaluation objectively confirmed this clinical impression.

Latissimus dorsi flaps have gradually replaced TRAM flaps in the last ten years due to more straightforward postoperative care and better use of local thoracic tissue, avoiding a patch effect on the breast. However, in some cases, if the patient is very thin or if there is severe flap atrophy, the reconstructed breast can be very small.

Autologous latissimus dorsal flap is the most suitable tissue to receive a fat transfer, as it is very well vascularized, and large amounts of fat can be injected. In the early stages of this experiment, moderate amounts (100 to 120 mL) were injected but due to the reabsorption rate, this quantity was not enough. Lipomodelling made it possible to correct localized abnormalities or defects in the neckline[6].

Some techniques to evaluate breast volume are described in the literature for historical purposes, and others are modern, practical, and reliable.

1. Anthropometric method

Based on end-to-end measurements, the female breast is geometrically visualized as a half ellipse, and its volume can be calculated using mathematical formulas. Measurements can be performed using photographs or mammograms. It is a practical technique, but it depends on the proficiency of the examiner[20].

2. The Grossman-Roudner measuring device

It is a circular plastic device with a cut along the radius line. It proved to be practical and very profitable, as the cost of time and material total only 1.00 USD. Although it has been used for anthropomorphic measurements of the breast in 50 women, there is no precise validation for this method[20].

3. Archimedes' principle

A simple method of historical value based on the Archimedes' principle of water displacement[20].

4. 3D surface image

The use of 3D imaging devices provides a virtual 3D model of a standing patient that facilitates the elimination of breast tissue compression. It simulates the post-augmentation status and can help patients to define their desired augmentation volume. It is a noninvasive method, and data collection does not depend on the examiner when it is based on standardized protocols. Since magnetic resonance imaging (MRI) is considered the gold standard for non-contact volume measurements, the validity of the 3D image was compared to MR measurements[20].

5. Volume measurement with nuclear MR

Based on a high sensitivity to detect complications in autologous fat transplantation, such as oil cysts, calcifications, or necrosis, MRI has great importance after autologous fat transplantation to the breast. MRI is already considered the gold standard in detecting other breast pathologies such as implant ruptures, and its use in breast imaging is increasing. However, in addition to qualitative assessment, MRI scans of the breast can also be used for quantitative assessment[20].

RESULTS

Case 1. After six years of primary breast reconstruction, the patient presented with a bilateral capsular contracture due to post-adjuvant radiotherapy classified as Baker 3. New 332 mL and 350 mL prostheses were placed on the right and left breasts, respectively, with fat grafting of 80 mL on the right and 60 mL on the left breasts, showing a good breast envelope. After two months, new fat grafting improved the breast contour and corrected the minor deformities. The patient progressed with good surgical acceptance, and an ultrasound follow-up showed no changes resulting from the procedure (Figure 1).

Case 2. Elderly woman who had late breast reconstruction on the right with an ipsilateral rectus abdominis muscle flap. She was dissatisfied with the result obtained due to asymmetry between the breasts. The prosthesis was replaced by a 350 mL expander. After six months, this expander was replaced by an anatomical silicone prosthesis of the same volume and a 332 mL prosthesis with the same profile was placed in the left breast. Fat grafting of 120 mL was used to correct small asymmetries and residual deformities. Edema, pain and mild initial hyperemia disappeared after 15 to 30 days. The patient was satisfied with the result obtained and presented no complications during outpatient follow-up (Figure 2).

Case 3. Young patient who underwent immediate breast reconstruction with a 450 mL expander prosthesis. After the end of adjuvant treatment with radiotherapy, the expander was replaced by a 495 mL silicone prosthesis in the right breast, and a 250 mL was placed in the left breast, with preoperative breast fat grafting for edge refinement and creation of a new nipple-areolar complex (Figure 3).

CONCLUSION

Fat grafting is a noninvasive, safe, simple, and effective procedure. It has an excellent indication in breast reconstruction for post-reconstruction refinements and secondary contour defects. It is also used to improve tissue quality in irradiated breasts and to replace the total volume of the breast, as seen in recent studies[6,18,19].

Breast volume measurement after fat grafting is essential for long-term follow-up. Most of the methods discussed in this review were presented in older publications, including the anthropometric method, the thermoplastic models, and the Archimedes' water displacement principle. These are outdated methods compared to the most modern and reliable volume measurement techniques, such as MR and 3D body surface scanning[20].

Although studies on fat grafting procedures in the last 15 years were successful, no Level I or II data has yet justified the recommendation of a consensual protocol for clinical practice[2,5,8,9,11,12,14,18].

In the reported cases, fat grafting associated with breast expanders and prostheses obtained satisfactory results for the patient and surgical team. It was used to increase breast volume, improve the skin and support tissue structure, as well as refine and correct minor imperfections after surgery.

COLLABORATIONS

CCO Analysis and/or data interpretation, Conceptualization, Data Curation, Final manuscript approval, Formal Analysis, Funding Acquisition, Methodology, Project Administration, Realization of operations and/or trials, Resources, Validation, Writing - Original Draft Preparation, Writing - Review & Editing

CCS Conception and design study, Supervision

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Review Article

Strategies for early detection of psychopathologies in candidates for post-bariatric plastic surgery

Estratégias para detecção precoce de psicopatologias em pacientes candidatos a cirurgias plásticas pós-bariátricas

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■ **ABSTRACT**

Introduction: The increase in demand for post-bariatric plastic surgery has revealed a high prevalence of psychopathologies in patients undergoing the procedure, requiring the need to diagnose these diseases in the preoperative period. The use of specific psychological screening tools has been promoted; however, a gold-standard method has not yet been fully established. **Objective:** To carry out a review of the literature for alternatives available for the preliminary psychological evaluation of patients who are candidates for post-bariatric plastic surgery, presenting the method recommended in the Post-Bariatric Plastic Surgery outpatient clinic of the Federal University of Mato Grosso do Sul (UFMS). **Methods:** We reviewed the clinical trials which employed psychological screening tools preoperatively in patients who were candidates for post-bariatric plastic surgery; the MEDLINE/PubMed database was searched using keywords such as *"bariatric surgery", "body image", "quality of life", "obesity", "plastic surgery" and "psychiatry"*, for clinical trials published in the last 20 years. Herein, we discuss the findings and analyze the most common methodologies used. **Results:** Only four clinical trials used psychopathology screening tools in post-bariatric plastic surgeries preoperatively, and one method could not be identified. **Conclusion:** The use of appropriate strategies to screen for psychopathologies helps prevent significant losses in the postoperative period, but the tools still lack validation in the post-bariatric population. Besides possessing extensive clinical-surgical technical knowledge, the plastic surgeon must remain attentive to the signs and psychopathological symptoms in these patients, referring them for psychological and psychiatric evaluation when indicated.

Keywords: Plastic surgery; Bariatric surgery; Body image; Quality of life; Obesity; Psychiatry.

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■ **RESUMO**

Introdução: O aumento na demanda pelas cirurgias plásticas pós-bariátricas evidenciou a alta prevalência de psicopatologias nessa população, exigindo a necessidade do diagnóstico dessas doenças no pré-operatório. A utilização de ferramentas para triagem psicológica específica, já na primeira consulta, tem sido estimulada pela maioria dos autores, entretanto, um método padrão-ouro ainda não foi plenamente estabelecido e a busca persiste. **Objetivo:** Realizar uma revisão da literatura sobre as alternativas disponíveis para a avaliação psicológica preliminar de pacientes candidatos a cirurgias plásticas pós-bariátricas, apresentando a conduta preconizada no ambulatório de Cirurgia Plástica Pós-Bariátrica da Universidade Federal de Mato Grosso do Sul (UFMS). **Métodos:** Revisão dos ensaios clínicos, que empregaram ferramentas de triagem psicológica pré-operatória em pacientes candidatos à cirurgia plástica pós-bariátrica, nos bancos de dados MEDLINE/PubMed, utilizando os descritores "*bariatric surgery*", "*body image*", "*quality of life*", "*obesity*", "*plastic surgery*" e "*psychiatry*", nos últimos 20 anos, discutindo os achados e analisando as metodologias mais utilizadas. **Resultados:** Foram encontrados apenas 4 ensaios clínicos que utilizaram ferramentas de triagem psicopatológica no pré-operatório de cirurgias plásticas pós-bariátricas, sendo que um método de eleição não pôde ser identificado. **Conclusão:** A utilização de estratégias apropriadas para a triagem das psicopatologias auxilia na prevenção de prejuízos significativos no pós-operatório, porém a construção da ferramenta ideal ainda carece de validação na população pós-bariátrica. Além do amplo conhecimento técnico clínico-cirúrgico, o cirurgião plástico deve manter-se atento aos sinais e sintomas psicopatológicos desses pacientes, encaminhando-os para avaliação psiquiátrica e psicológica quando indicado.

Descritores: Cirurgia plástica; Cirurgia bariátrica; Imagem corporal; Qualidade de vida; Obesidade; Psiquiatria

INTRODUCTION

In recent years, the increase in demand for post-bariatric plastic surgery has presented new and unique challenges to plastic surgeons in Brazil[1]. With the increasing demands for this procedure, new competencies began to be required and new challenges were presented[2]. In general, the clinical management of these patients, often malnourished and anemic, is delicate and laborious; their surgical plans are generally more extensive and detailed, requiring multiple procedures; their scars are usually extensive and postoperative recovery is more prolonged; and in particular, the results are often idealized by the patients, usually far exceeding what is achievable with surgery, adding to the complexity of this treatment[3].

The need for a better preoperative psychological approach was identified recently by plastic surgeons[4]. Several authors have demonstrated that approximately 60% of candidates for post-bariatric plastic surgery present with some type of psychopathology, frequently subclinical or neglected[5,6,7,8], with depression, generalized anxiety disorder, and body dysmorphic disorder being the most prevalent ones [3,9,10,11].

Unlike what was imagined in the past[3,9], the incidence of these psychological disorders tends to increase after bariatric surgery[1,4]. In addition to the intrinsic causes, two factors seem to contribute to the worsening psychological conditions of these patients in the postoperative period: the esthetic loss due to generalized dermatochalasis caused by rapid and significant weight loss and the relative delay between repair procedures, postponing the conclusion of the entire surgical process and the envisioned results [2,3,5,12].

Faced with this emotional instability, post-bariatric plastic surgery, considered by some to be a "life-saver," frequently becomes a point of great frustration and regret for patients[13]. The levels of satisfaction with the procedure are generally lower than those in the general plastic surgery

population, since the evaluation of the quality of the surgical outcome is compromised by an emotionally unstable or psychologically compromised patient[6,14]. Frustration at not obtaining the idealized postoperative result is generally exacerbated in these patients, further aggravating their psychological conditions[5]. Furthermore, in clinical practice, it is observed that patients do not always present the ideal psychological profile for a plastic surgery, even when presenting significant physical indications for the procedure[6,14].

To help with this identification, a professional psychological evaluation is essential for understanding the true motivations of the patient, often subconscious, as well as for the detection of possible eating and mood disorders, which can potentially damage the postoperative and long-term results[15,16]. Currently, several authors recommend the referral of patients to a specialized service for the diagnosis of psychological conditions before performing any post-bariatric surgical procedure, a strategy considered as the first line to prevent psychiatric complications in the postoperative period[1,15,17].

Currently, this preoperative evaluation is common in centers of excellence in plastic surgery in order to minimize psychiatric complications in the postoperative period[1]. However, this practice is still far from a reality for most privately practicing plastic surgeons in Brazil, especially those who work outside major surgical centers[1]. Often, the mere mention of the need for a psychological evaluation places significant stress on the ex-obese, undermining the already fragile doctor-patient relationship[17]. This resistance frequently prevents follow-up treatment, or it requires the plastic surgeon to permit the patient to desist referral to a psychologist[1,17].

One recommended solution is the use of psychological screening tools during the first consultation[1]. With these, the plastic surgeon would be able to more easily identify the patients at risk for psychological disorders and, concomitantly, predict associated complications[1,17]. According to the literature, this process would minimize resistance on the part of patients, as it rationalizes the potential problem, demonstrating the importance of referral to a specialist for assessment[1,5,17].

The challenge of researchers is to develop a simple, quick, and easily applicable tool which provides an efficient psychological screening to be used in plastic surgery clinics without requiring the presence of a mental healthcare professional such as a psychologist or psychiatrist[9]. Several tools have already been proposed; however, a gold standard has not yet been fully established and the search continues[18].

The objective of this study is to conduct a review of the literature on the alternatives available for the preliminary psychological evaluation of patients who are candidates for surgery, presenting the process recommended in the Post-Bariatric Plastic Surgery outpatient clinic of the UFMS.

METHODS

Using the MEDLINE/PubMed database, articles in the medical literature which described the psychological evaluation of patients who are candidates for post-bariatric plastic surgery published in the last 20 years were analyzed.

The keywords used were “bariatric surgery”, “body image”, “quality of life”, “obesity”, “plastic surgery”, and “psychiatry”, terms validated by MeSH through various combinations and their respective translations into Portuguese. From the studies found, clinical trials which used preoperative psychological screening tools in candidates for post-bariatric plastic surgery were selected for analysis.

RESULTS

After excluding the articles that did not address the specific psychological evaluation of post-bariatric patients, only 4 publications were included in this study (Chart 1).

DISCUSSION

In the past, post-bariatric plastic surgery was deemed to benefit the emotional component of patients due to the improvement in body esthetics, relieving some pre-existing psychopathology[4]. Unfortunately, several studies show that this is not true[13,14,19]. Although able to offer a significant improvement in quality of life by enhancing body image and increasing self-esteem, the positive influence of plastic surgery on already established mental illness has not yet been fully elucidated and cannot be guaranteed[5,6,14]. In fact, according to some authors, the more prevalent psychopathologies in this population even tend to worsen in a significant portion of the patients in the postoperative period[1,13,19].

There is no consensus recommendation for plastic surgeries in patients with mental disorders[1,11,13]. According to Ferreira, in 2004[20], plastic surgery contours the body, leading to more pleasant form, but it does not address the emotional problems that already exist. The academic literature is rich in “disastrous cases” involving plastic surgeries and psychopathologies, associating them with higher rates of postoperative complications, surgical failures, and chronic dissatisfaction[11,21].

Chart 1. Preoperative psychological evaluation in patients who are candidates for post-bariatric plastic surgery.

Title	Authors	Publication	Method Used	Findings
Body Contouring Surgery after Bariatric Surgery: A Study of Cost as a Barrier and Impact on Psychological Well-Being	Arash, Azin; Carrol Zhou; Timothy Jackson; Stephanie Cassin; Sanjeev Sockalingam; Raed Hawa	Plast. Reconst. Surg. 133: 776e, 2014	*Patient Health Questionnaire* (PHQ-9); *Generalized Anxiety Disorder* (GAD-7); *Short Form-36*.	Using this association of methods, the authors reported that patients undergoing post-bariatric plastic surgery can present a more satisfactory psychological status.
Body image and quality of life in patients with and without body contouring surgery following bariatric surgery: a comparison of pre- and post-surgery groups	Martina de Zwaan Ekaterini Georgiadou Christine E. Stroh Martin Teufel Hinrich Köhler Maxi Tengler Astrid Müller	*Front Psychol.* 2014;5:1310. Published 2014 Nov 18.	Multidimension al Body-Self Relations Questionnaire (MBSRQ); Quality of life (IWQOL-Lite), Symptoms of depression (PHQ-9), and anxiety (GAD- 7).	Using this association of methods, the authors did not identify any psychological benefit in patients who underwent post-bariatric plastic surgery. However, those who submitted to body contouring surgery reported improvements in body satisfaction, appearance, and functional capacity.
Body Image and Quality of Life in Post Massive Weight Loss Body Contouring Patients	Angela Y. Song; J. Peter Rubin; Veena Thomas; Jason R. Dudas; Kacey g. Marra; Madelyn H. Fernstrom	Obesity (Silver Spring, Md. vol. 14. No.9 - 1626-36. September 2006	Beck Depression Inventory (BDI)	The authors found no benefit in the psychological screening of patients undergoing post-bariatric plastic surgery, since all patients in the study were within the normal range of the screening inventory used at 0, 3, and 6 months post-surgery.
Psychological and Psychiatric Traits in Post-bariatric Patients Asking for Body-Contouring Surgery	Chiara Pavan; Massimo Marini; Eleonora De Antoni; Carlotta Scarpa; Tito Brambullo; Franco Bassetto; Annapina Mazzotta; Vicenzo Vindigni	Aesthetic Plast Surg. 2016 Dec 28 Published online 2016 Dec 28.	Mini International neuropsychiatric interview (MINI); BDI-II.	Using this combination of methods, the authors did not identify any benefit in psychological screening of patients undergoing post-bariatric plastic surgery.

Accordingly, during the routine pre-operative consultation, the mere suspicion of the presence of mental disorders, especially mild disorders, should serve as an impasse to the plastic surgeon[11]. The consultation is generally focused on the technical difficulty of the case, the surgical strategies to be proposed, and the clinical evaluation of the patient; all these aspects present a high degree of difficulty in post-bariatric patients[11]. Therefore, the attention towards the detection of psychiatric alterations usually remains in the background, although it is perhaps the greatest paradigm requiring more qualified care in post-bariatric plastic surgery.

A good anamnesis has been believed by most healthcare professionals to identify most psychological problems; unfortunately, although essential, it is much less effective in individuals with psychological disorders who are eager for a surgical procedure[10]. In general, these patients maintain a positive demeanor during the consultation and the discussion of the surgical plan. They usually conceal their complaints and minimize their expectations, deluding even the most attentive and experienced physician[11,17]. Another factor that hampers a psychological screening is that many of the neurovegetative and somatic symptoms caused by mental illness, such as fatigue, insomnia, and weight loss, can be easily confused with symptoms resulting from the condition of being formerly obese [21].

The diagnostic process of psychiatric disorders is based on the identification of clinical syndromes, which are extremely hindered by the absence of consistent biological markers[22]. Thus, several authors have recommended the use of specific methodologies for psychological screening in the initial consultation: the so-called psychopathology screening tools[17,18]. The purpose of their application would identify the patients more susceptible to mental disorders, sending them for a specialized psychological evaluation[10]. However, as yet

there is no specific and well-validated tool with utility in plastic surgery clinics for post-bariatric candidates for esthetic procedures[9,10,18,21,23].

In the literature review presented here, only four clinical trials (Chart 1) used screening methods in pre-operative consultations in candidates for post-bariatric plastic surgeries. This extremely low number of studies is surprising and worrying, especially since the results are divergent and insufficient to elect, even if superficially, a gold-standard psychological screening method.

Azin et al. in 2014[24] and Zwaan et al. in 2014[25] used a combination of different tools in post-bariatric candidates for body contouring surgery. The authors claimed that this combination would be useful to more easily diagnose psychopathologies. However, despite using similar methods, the authors obtained contradictory results, weakening the thesis that this combination is the ideal screening method. In addition, this strategy with multiple tests has less clinical applicability, requiring more time for the initial preoperative evaluation, and thus it cannot be recommended as an ideal method for initial evaluation. The laborious applicability of the combination of tests also hinders its reproduction in other studies, tending to make its clinical applicability unfeasible. In their conclusions, both authors honestly refer to the difficulties and the limitations of their studies.

In the article by Song et al. in 2006[26], the authors used the Beck Depression Inventory (BDI) to focus more on depressive symptoms without identifying differences between the groups studied. According to the literature, the use of the BDI alone can underdiagnose very prevalent disorders in these patients, such as anxiety and somatoform disorders[27]. In this case, the BDI, when applied alone, does not seem to be the best choice for screening patients who are candidates for post-bariatric plastic surgery. The conclusions of Azin et al. in 2014[24], Zwaan et al. in 2014[25], and Song et al. in 2006[26] underline the weaknesses of the study and the long road to be traveled until the ideal screening tool for the post-bariatric population is defined.

Pavan et al. in 2017[28] combined the BDI II with the Mini International Neuropsychiatric Interview (MINI) Plus method. The conclusion of the study reveals a discrepancy in the results obtained and the psychopathologies analyzed, as the authors themselves failed to outline a clear strategy of the screening method they advocate. According to Pavan et al. in 2017[28], the combination of multiple instruments seems to be the current trend for the psychological screening of candidates for post-bariatric surgeries, especially due to the emotional complexity of the ex-obese patient and the absence of a comprehensive tool to assess a wide range of all possible components.

As seen here, the literature on the subject is still emerging, requiring more studies and a greater acknowledgement of its importance in plastic surgery. The literature review is completely different when we analyze obese patients who have not yet had bariatric surgery. In these cases, the literature produced by digestive tract surgery teams is abundant in studies, and the production of knowledge is continuous and well-founded.

One of the tools most commonly used in research evaluating candidates for bariatric surgery is the BDI[10,21,23]. This tool evaluates the intensity of depressive symptoms, and it can be easily executed during pre-operative consultations[9,17]. It is a quick and practical instrument with a high rate of acceptance, credibility, and accuracy in screening for depressive symptoms[22]. Although it does not have diagnostic assertions, its use facilitates the screening of psychopathologies with a high level of sensitivity and specificity[21,22,23]. The patient responds to 21 statements in a questionnaire, correlated with depressive symptoms and attitudes[29] determining the intensity of responses that vary from 0 to 3, suggesting increasing degrees of severity of the disease[30]. The final score is the sum of the responses, with a minimum score of zero and maximum of 63 points[18]. According to the authors, a score ≥ 17 classifies the patient as "at risk"[30]. In 1996, the BDI was significantly revised, which resulted in its second edition (BDI-II), which is more straightforward and easier to understand[31], approaching the new diagnostic criteria for Major Depression present in 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V)[8].

Another widely used method in studies with pre-bariatric patients is the Patient Health Questionnaire (PHQ-9). It is a rapid application tool, widely used for the evaluation and screening of depressive disorders. Based on the diagnostic criteria of the DSM-5, it has 9 dimensions, evaluated by a scale that ranges from 0 ("not at all") to 3 ("nearly every day"), corresponding to the frequencies of the signs and symptoms of depression, which could result between 0 and 27 points. When the sum is ≥ 10, it is a positive indicator of the disorder. The PHQ-9 is derived from the Primary Care Evaluation of Mental Disorders (PRIME-MD), which was created to screen for major mental disorders in primary care, such as alcohol abuse, depression, anxiety, eating, and somatoform disorders[32].

Despite their widespread applications, the PHQ and BDI are not free from criticism[18,22]. Some authors claim that they are too specific to depression, not evaluating the other psychopathologies prevalent in ex-obese patients[22]. In addition, the tools would

still need adaptation for post-bariatric patients, with different cut-off levels and application and control strategies. Some authors even recommend that screening tools less focused on depressive symptoms and more on personal interrelationships and quality of life analysis be associated with these methods[22]. Examples include the Medical Outcomes Study Short Form, the Adaptation Self-Evaluation Scale, the Social Adjustment Scale Self-Report, the Multiple Affective Adjective Check List, the Brief Symptom Inventory, the Hamilton Depression Rating Scale, and the Zung Self-Rating Depression Scale[21,22,23].

Specifically related to plastic surgery, Sarwer et al. in 2008[33] developed a questionnaire that assesses the motivations and expectations of patients, their perceptions of body self-image, as well as their psychiatric status at the time of the consultation. Pinho et al. in 2011[1] recommended the use of the Sarwer questionnaire, giving it an excellent rating. D'Assumpção, in 2017[11] changed the Pisa Scale, a practical tool for this population, to be diagnostic of Body Dysmorphic Disorder[8]. However, the validation of these methods in the post-bariatric population still needs confirmation and further studies.

The development of the ideal tool still seems far from a reality in clinical practice and merits more questions[18]. In the Post-Bariatric Plastic Surgery outpatient clinic of the University Hospital of the UFMS, we utilize a Multiaxial Screening[22], based on the triad of humanized anamnesis, detection of "risk markers", and the BDI score.

At the first pre-operative consultation, we pay attention to the biopsychosocial aspects of the patients, valuing a humanistic and committed doctor-patient relationship, sharing with patients the complexity of the process and the challenges to be faced[20]. We believe that gaining the trust of this complex patient must occur in this first meeting, and the analysis of technical-surgical aspects, previously the major focus of interest, should now be reserved for the final part of the consultations.

In this initial part of the first consultation, we conduct an anamnesis directed at specific psychiatric aspects, taking a detailed history, highlighting the individual and not the physical symptoms, offering the chance to expose feelings, complaints, and expectations. We investigate the patient's personal and relational life, habits, sources of pleasure, and sorrows[13]. Then we present the BDI, explain its motivations, and ask the patient to respond the inventory.

While the patient analyzes the BDI, we assess the findings of the anamnesis, seeking to identify the so-called "markers of psychopathology", risk factors related to a poor postoperative outcome: a) patients with many unrealistic demands and expectations about the procedure; b) patients very dissatisfied with a prior esthetic surgery (with good results); c) patients with minimal bodily deformities but many complaints; d) patients with intellectual conditions limiting their understanding of the complexities and technical limits of the surgeries; e) patients with vague motivations due to relationship problems; f) patients with extremely low self-esteem; g) patients with a history of depression or psychiatric hospitalizations; h) solitary patients; i) patients with personality disorders; j) and patients with suicidal ideation[29].

In the presence of at least one of these markers or if the BDI score is ≥ 17, we initially counsel against the procedure and forward the patient to an assessment by a mental health professional[9,13,27]. We explain that the future implementation of the procedure shall be subject to the release of this professional and that this will be attached to the Informed Consent Form (ICF)[17]. Pinho et al. in 2011[1] recommended a complete documentation of the pre-operative psychological/psychiatric approach, with the presence of reports of specialized professionals, as a measure of protection for the plastic surgeon. Some patients dissatisfied with their post-bariatric plastic surgeries have used their preoperative psychiatric condition in medical error litigation as a justification for not understanding the terms of consent and guidelines about the procedure[1].

Even in those patients without identified risk factors (markers and/or BDI ≤ 16), we devote substantial time to the consultation, explaining the details of the pre-, trans-, and post-operative periods[34]. Unfortunately, this approach, although very effective, cannot prevent all disappointments. Even with a negative screening and all the care dispensed, some patients develop psychiatric issues during the postoperative period. In these cases, it is essential to refer them immediately to a psychiatrist to minimize losses, controlling the situation as quickly as possible[13], in addition to psychological, cognitive and behavioral interventions.

CONCLUSION

The use of appropriate strategies for pre-operative screening of psychopathologies of post-bariatric plastic surgeries can assist in the prevention of significant losses during the postoperative period. The ideal tool still lacks validation in the post-bariatric population, requiring more accurate development and validation by the scientific community. In addition to extensive clinical and technical surgical knowledge, the plastic surgeon must remain attentive to the psychopathological signs and symptoms of these patients, being prepared to refer them to psychiatric and psychological evaluation when indicated.

COLLABORATIONS

DNS Analysis and/or data interpretation, Conception and design study, Conceptualization, Data Curation, Final manuscript approval, Formal Analysis, Investigation, Methodology, Project Administration, Realization of operations and/or trials, Resources, Supervision, Validation, Visualization, Writing - Original Draft Preparation, Writing - Review & Editing

MR Analysis and/or data interpretation, Conception and design study, Conceptualization, Final manuscript approval, Formal Analysis, Project Administration, Validation, Writing - Review & Editing

KFMV Analysis and/or data interpretation, Conception and design study, Conceptualization, Final manuscript approval, Project Administration, Realization of operations and/or trials, Supervision, Writing - Review & Editing

AABMR Analysis and/or data interpretation, Conceptualization, Final manuscript approval, Project Administration, Realization of operations and/or trials, Validation, Writing - Original Draft Preparation, Writing - Review & Editing

EGB Analysis and/or data interpretation, Conceptualization, Data Curation, Final manuscript approval, Investigation, Methodology, Realization of operations and/or trials, Writing - Review & Editing

TRA Analysis and/or data interpretation, Conception and design study, Data Curation, Final manuscript approval, Investigation, Methodology, Realization of operations and/or trials, Writing - Review & Editing

HJOC Analysis and/or data interpretation, Conception and design study, Data Curation, Final manuscript approval, Methodology, Realization of operations and/or trials, Writing - Original Draft Preparation, Writing - Review & Editing

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Case Report

Association of the Tripier myocutaneous flap to scapha cartilage graft: a surgical resource for reconstruction of full thickness defects of lower eyelids

Associação do retalho miocutâneo de Tripier a enxerto de cartilagem da escafa: um recurso cirúrgico para reconstrução de defeitos de espessura total da pálpebra inferior

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ABSTRACT

The reconstruction of the secondary lower eyelid to a resection of skin cancer is a challenging surgical procedure that must be carefully planned with regards to issues related to lamella and extension of the resection. We present the case of a 69-year-old male patient who, after oncologic resection, presented a total thickness defect greater than 60% in the lower eyelid. For reconstruction, it was indicated that the use of Tripier's unipedic myocutaneous flap with scapha cartilage graft produced favorable results, which confirms that it is worthwhile using these techniques when planning lower eyelid reconstruction.

Keywords: Basal cell carcinoma; Skin neoplasia; Myocutaneous flap; Ear cartilage; Eyelids.

RESUMO

A reconstrução da pálpebra inferior secundária à ressecção de câncer de pele é um desafio cirúrgico e sua abordagem deve ser planejada por lamelas e extensão da ressecção. Apresentamos o caso de paciente do sexo masculino, 69 anos, que após a ressecção oncológica apresentou defeito de espessura total maior de 60% na pálpebra inferior. Para reconstrução foi indicada a associação do retalho miocutâneo unipediculado de Tripier com enxerto de cartilagem da escafa obtendo resultados favoráveis, mostrando que a associação destas técnicas é uma boa prática na hora de planejar a reconstrução da pálpebra inferior.

Descritores: Carcinoma basocelular; Neoplasias cutâneas; Retalho miocutâneo; Cartilagem da orelha; Pálpebras.

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INTRODUCTION

Basal cell carcinoma (BCC) is the most common cancer among humans. In Brazil, it is estimated that there are 165,580 new cases of non-melanoma skin cancer per year [1]. Its growth is slow and rarely produces metastasis. However, when located on the eyelids, reconstruction after surgical treatment can pose a challenge to the plastic surgeon. The lower eyelid reconstruction should be planned to follow its anatomical limit; particularly, reconstructing the anterior and posterior lamella as two independent structures. Hence, the different prevailing techniques for either procedure should be studied, and there must be a safety recommendation regarding using both to optimize aesthetic results while preserving the functionality of either procedure[2].

Within the lower eyelid reconstruction techniques, the Tripier myocutaneous flap offer several advantages; it is well known to be a good option for anterior lamella cover, which can be associated with cartilage grafts for posterior lamella reconstruction with or without mucosa cover.

OBJECTIVE

To report a case of lower eyelid reconstruction with the association of the Tripier myocutaneous flap to scapha cartilage graft and demonstrating a therapeutic option in reconstructions of defects of total thickness and extensions over 60% of the lower eyelid.

CASE REPORT

We present the case of a 69-year-old male patient diagnosed with nodular basal cell carcinoma recurring in the lower right eyelid. He was referred for resection with freezing through horizontal cuts (en face or CCPDMA) intraoperatively at the Hospital AC - Camargo Cancer Center.

Under general anesthesia, in the dorsal decubitus position and with ophthalmic protection with ointment, the edges of the lesion were marked with 4 mm of safety to be sent for freezing. After resection by hemostatic infiltration, the freezing reportedly compromised lateral and deep margins that required enlargement.

After obtaining free margins, the final defect showed a loss of lower eyelid continuity affecting 70% of its extension, covering skin, tarsal plate, and conjunctiva, from the lateral corner to the medial corner therearound. The final size of the defect was 3.0 x 0.5 cm (Figure 1).

For the reconstruction of the defect, a myocutaneous Tripier monopediculated lateral flap was chosen, using an advancing flap of the conjunctiva and an auricular scapha cartilage graft.

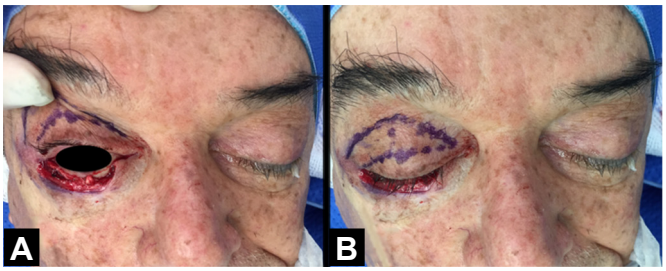

Figure 1. A. Final defect after margin enlargement; **B.** Tripier flap demarcation.

The flap was marked on the ipsilateral upper eyelid similarly to a blepharoplasty marking. The lower flap edge in the eyelid groove and the upper edge were marked leaving 1 cm of flap width corresponding to the excess skin amount, without compromising ocular occlusion; in the lateral corner, a 0.5-cm wide base was preserved. Using local infiltration, the myocutaneous flap was raised from the medial corner, leaving it pediculated at the base. The defect was sutured using a 6-0 Mononylon thread continuously.

After local infiltration, we obtained a fragment of cartilage and perichondrium, from the right scaphoid fossa using a previous approach, with the dimensions of the new tarsal plate being 3 cm long and 4 mm wide. The skin of the scaphoid was sutured with 4-0 Mononylon thread. The scapha cartilage graft was positioned so that its upper edge was at the level of the lower sclerocorneal limb, fixed with two points of 5-0 Mononylon at the lateral end using the lateral cantal ligament and two points in the medial portion, fixed to the tarsus. After fixation, the upper portion of the Tripier flap was sutured to the upper portion of the conjunctiva flap using Vicryl Rapid 6-0, supported on the cartilage graft (Figures 2 and 3).

The patient recovered satisfactorily after reconstruction, without recurrence of the lesion and showing adequate aesthetic and functional results of the lower eyelid (Figure 4). There was adequate eyelid occlusion and no complaints of dry eye. No physiotherapy was indicated.

DISCUSSION

The reconstruction of the lower eyelid should be planned to follow its anatomical limits, particularly the anterior and posterior lamella must be reconstructed as two independent structures. Hence, the different techniques already pertaining to both lamellas should be studied, and there must be a safety recommendation regarding using both lamellas to optimize aesthetic results while preserving their functionalities[2].

Figure 2. A. Immediate postoperative of lower eyelid reconstruction with a monopediculated Tripier flap associated with scapha cartilage graft - frontal view; **B.** Side view.

Figure 3. The position of the final flap postoperative.

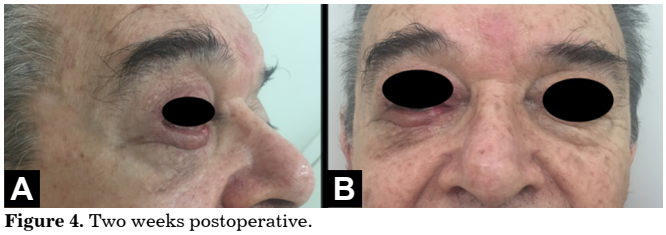

Figure 4. Two weeks postoperative.

Among the options for the reconstruction of defects with an extension greater than 60% of the anterior lamella is the Mustardé[3] rotation flap, which requires a wide area of detachment or local periorbital flaps; some well-known flaps are due to Blasius, Imre, Fricke, and Tripier[4]. The Tripier flap, originally described in 1889, describes two types of bipediculated myocutaneous flaps based on the *orbicularis oculi* muscle drawn in the shape of a bucket handle, considered in the literature as the first description of a myocutaneous flap preserving its innervation. One of the flaps described was applied to the lower eyelid reconstruction after resection of a tumor[5].

The Tripier flap has been used in a very versatile way and different variations of the technique have been published for both upper eyelid reconstruction and lower eyelid ectropion correction[6].

Siegel, in 1987[7], who called his description "Blepharoplasty flap", describes the aesthetic and functional advantages of this flap for lower eyelid reconstruction, because he reports that it allows a transfer of muscle tissue that provides adequate support vectors to the eyelid edge, with an optimal compatibility in texture and color of the donor area that leaves the scar on the eyelid fold.

Other modifications have been reported, such as performing a monopediculated lateral flap transposition to correct lateral eyelid defects and also avoiding a second surgical time to section the pedicles[8].

Thus, the Tripier myocutaneous flap has advantages such as contribution of muscle tissue to the defect, similarity in color and skin thickness to the recipient area, minimal morbidity of the donor area with minute apparent scar, adequate aesthetic and functional result in the recipient area, less surgical detachment, and a single surgical time.

Posterior lamella reconstruction requires a fibrous tissue support that maintains the eyelid edge at a sufficient height to avoid sclera exposure. Hence, different reconstruction techniques have been proposed using chondromucous grafts of hard palate[9,10] and nasal septum[11,12], as well as simple conchal or scaphoid auricular cartilage grafts,[13] which are well tolerated when used in along with myocutaneous flaps such as the Tripier flap. This offers a benefit in terms of limited movement of the lower eyelid against the corneal surface[14] with ease of surgical access.

In this case report, we demonstrate the use of two techniques by a simple execution in a single surgical time: the posterior lamella requires a structure that offers adequate support to the eyelid edge, obtaining a complete occlusion of the eyeball; the cartilage graft from the scapha is sufficiently rigid and still offers a convexity similar to the normal anatomy of the lower eyelid edge, adequately recreating the tarsal plate structure. The difference in the conchal cartilage is that it has a more pronounced curvature; moreover, the perichondrium preservation in the graft allows for conjunctiva mucous reintegration, thereby avoiding direct contact of the cartilage with the sclera. In our case, we use the remaining local conjunctiva to advance cartilage by covering the sclera to position the cartilage graft.

The association of this posterior lamella reconstruction technique with the Tripier flap, which offers well-known advantages, produced a favorable

aesthetic result, similar color and texture with adequate functionality, correct positioning of the eyelid edge, and complete sclera occlusion.

CONCLUSION

The monopediculated Tripier myocutaneous flap and scaphoid cartilage graft are two technical resources that, used together, offer a practical approach in planning the reconstruction of defects of total thickness and length greater than 60% of the lower eyelid, thereby offering satisfactory aesthetic and functional results.

COLLABORATIONS

CGM Analysis and/or data interpretation, Data Curation, Final manuscript approval, Methodology, Writing - Original Draft Preparation, Writing - Review & Editing

MC Conception and design study, Final manuscript approval, Methodology, Project Administration, Realization of operations and/or trials, Writing - Original Draft Preparation, Writing - Review & Editing

ACC Conception and design study, Data Curation, Writing - Review & Editing

AOE Conception and design study, Final manuscript approval, Methodology, Writing - Original Draft Preparation

LG Conception and design study, Writing - Original Draft Preparation, Writing - Review & Editing

OS Project Administration, Supervision, Validation

ERB Conception and design study, Final manuscript approval, Realization of operations and/or trials, Supervision, Visualization, Writing - Original Draft Preparation, Writing - Review & Editing

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Case Report

The use of reverse abdominoplasty for treatment of chemical burn in the thoracoabdominal region

O uso da abdominoplastia reversa para o tratamento de queimadura química em região toracoabdominal

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■ **ABSTRACT**

Chemical burn is a challenge owing to its severity compared to thermal burns. The depth and extent of lesions in different areas of the body lead us to look for different possibilities for the best treatment of the patient. A reverse abdominoplasty surgical technique was proposed; this involves a skin flap that could reduce the exposed area of a chemical burn. The result was satisfactory, reducing the patient's treatment, surgical and hospitalization time, highlighting the proposed technique as an important tool for thoracoabdominal reconstruction.

Keywords: Chemical burns; Surgical flaps; Burns; Abdomen; Sodium hydroxide.

■ **RESUMO**

A queimadura química é um desafio devido à sua agressividade em comparação com as queimaduras térmicas. A profundidade e extensão das lesões em diferentes áreas do corpo nos levam a buscar diferentes possibilidades para auxiliar no melhor tratamento do paciente. Foi proposto, a partir da técnica cirúrgica abdominoplastia reversa, um retalho cutâneo que pudesse reduzir a área exposta de uma paciente vítima de queimadura química. O resultado foi satisfatório, reduziu tempo de tratamento, cirúrgico e de internação da paciente, evidenciando uma ferramenta importante de reconstrução toracoabdominal.

Descritores: Queimaduras químicas; Retalhos cirúrgicos; Queimaduras; Abdome; Hidróxido de sódio.

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INTRODUCTION

Chemical burns account for 4 to 5% of total burns, 25% of which are caused by an alkaline agent. Fifty percent of chemical burns are associated with accidents in the workplace, 30% are related to domestic accidents and 20% are caused by aggression[1]. Chemical injuries are more likely to be deeper owing to prolonged exposure to the agent in contrast to thermal injuries, which generally have shorter exposure to intense heat.

Third degree burns are treated by early tangential debridement and dressings, followed by skin grafting or flaps depending on the affected area, for better results[2]. However, complications and deformities such as infections, contractures, and graft hyperpigmentation[3] can make the treatment and prognosis of an extensive chemical burn a challenge. Currently, the different strategies to minimize these complications is actively being researched and supported, such as the use of topical heparin in burns[4] and studies on the use of flaps, which have proven promising[5].

Reverse abdominoplasty is a procedure developed in 1972 with the purpose of aesthetic resection of skin excesses located in the epigastrium, which causes a single scar line in the inframammary groove. Later, the extended reverse abdominoplasty was developed with the purpose of aesthetic improvement to the entire anterior wall of the abdomen, with ample dissection to the pubis[6].

Using these concepts, surgery with a reparative concept was proposed for a burn case in the thoracoabdominal region of a patient with excess skin, minimizing healing time, hospitalization, and procedures needed for completion of the treatment.

CASE REPORT

A 33-year-old woman, Caucasian and primigravida, who suffered a burn by a chemical product (sodium hydroxide, "caustic soda") in thoracoabdominal region. On examination, she presented second degree superficial burns in the anterior region of the face, as well as in the back, both breasts, abdomen, and perineal. The deep second degree burns were located in the posterior cervical region, inframammary, and upper abdomen, totaling approximately 14% of the burned body surface (Figure 1). No history of smoking or alcoholism was indicated.

The initial appointment was based on ATLS protocols. It was performed using the emergency hydrotherapy and four-layer dressing. In the first days of admission, surgical tangential debridement to the devitalized tissues and dressings with chemical debridement were performed to prepare the wound for definitive treatment.

Figure 1. Chemical burn in the thoracoabdominal region.

After improvement of the burn injuries, resection of all burned tissues was performed, followed by supraumbilical detachment of the abdominal flap (Figure 2). The flap was advanced, followed by plane suturing. The operative preparation involved all routine measures, including thromboembolic prophylaxis.

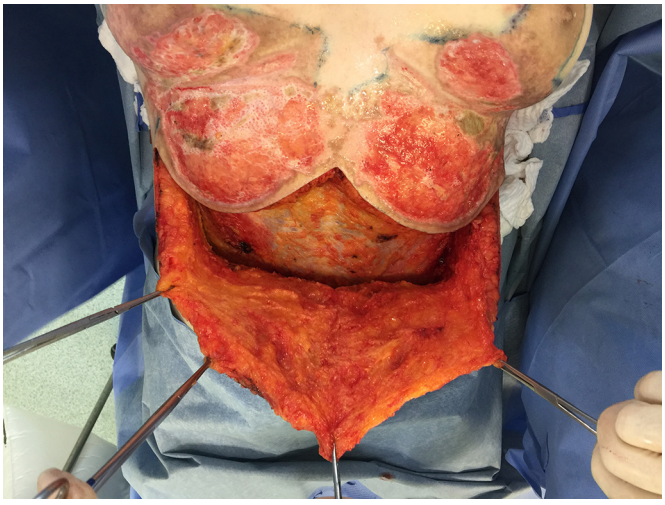

Figure 2. Reverse abdominoplasty flap.

The most severe lesions were found in locations where the chemical agent remained in greater contact with the skin because of impregnation on the clothes, which were in the posterior cervical, inframammary, and upper abdomen regions. After the first debridement, a necrosis process was observed requiring a second complementary procedure.

After the definitive procedure (mammoplasty with reverse abdominoplasty and abdominal grafting of small

areas), the patient recovered with slight dehiscence of bilateral inframammary suture on the 10th postoperative day (PO), and she was treated in the ambulatory with chemical debridement until complete epithelialization. We obtained reduced scars and with a pleasant appearance in the long term (Figures 3, 4, 5 and 6).

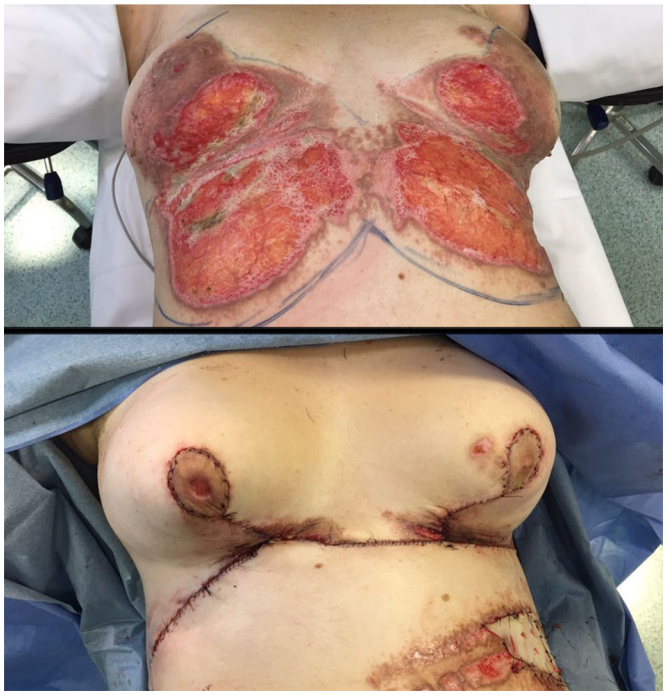

Figure 3. Immediate postoperative.

Figure 4. Final appearance after a year.

Figure 5. Final appearance after 1 year.

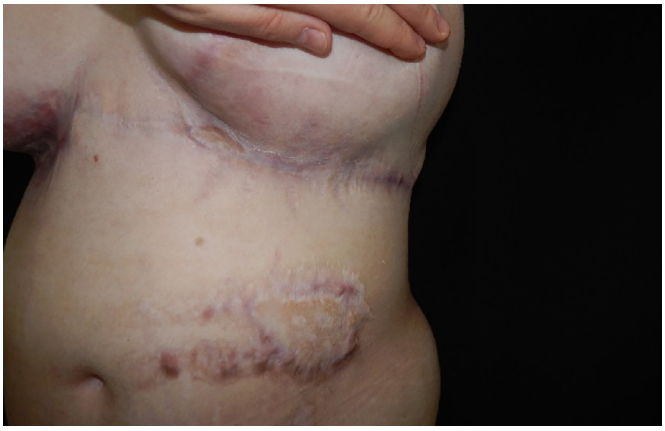

Figure 6. Final appearance after 1 year.

DISCUSSION

Alkaline burns are the second most common category of chemical burns, with sodium hydroxide (caustic soda) being the most frequent etiological agent in this group. The mechanism of tissue injury by chemical burning by a basic agent comprises three factors: 1) intense cell dehydration, 2) saponification of fat (which generates the loss of the body's thermal insulation) and 3) inactivation of enzymatic proteins, which form bonds in parallel with the alkali, giving rise to proteinates in an exothermic reaction, thereby further aggravating the initial injury[7]. Alkali burns penetrate deeper into the skin compared to thermal or acid burns. Because of this great penetration capacity, there is a tendency for the lesions to become chronic as elimination of the chemical agent is difficult. Thus, there is usually the need for several tangential debridement until the tissue becomes viable[8].

The patient presented with deep lesions caused by the chemical agent and the location propitiated

the reverse abdomen flap. The choice of a definitive treatment (as graft or flap) should be evaluated on a case-by-case basis.

The surgical choice in this case was due to the severity caused by the chemical burn because of its extension and depth, in addition to the location of these lesions. The region is favorable for the reverse abdomen flap (Figure 3). We saw an opportunity to use the reverse abdominal flap as there was excess abdominal dermis-fat. This option gives aesthetically much better results than partial or total skin grafting and leaves no additional scars. In contrast, with the flap use, there is always the risk of necrosis and dehiscence—this did not occur in our case—which additionally brings the risk of morbidity to the procedure.

Most patients complain about scars and aesthetic quality of grafts after burns. In this case, if we had opted for graft, in the future, we could correct using the reverse abdomen. Although the primary goal was not an aesthetically pleasing result, we did skip a step, and the result was quite satisfactory.

Reverse abdominoplasty is an unusual aesthetic procedure. It has already been proposed for the reconstruction of chronic scars from previous burns[9], however our proposal differs from other cases in the literature because it involves the reconstruction of the immediate region of the burn, thereby shortening treatment time and preventing future procedures.

The flap vascularization is maintained by three circulatory systems bilaterally: 1) perforating branches of the inferior epigastric arteries, as the main cutaneous source, which emerge from the rectum's sheath; 2) perforating branches formed by anastomoses of lumbar arteries, deep circumflex iliac arteries, remnants of intercostal arteries, and remnants of subcostal arteries, which emerge from the external oblique fascia; 3) superficial inferior epigastric arteries, superficial iliac circumflex arteries, and superficial external pudendal arteries, originating from the femoral arteries[10].

Other types of flaps have already been used for the treatment of a burned patient with fewer complications; moreover, knowledge of an unusual abdomen flap can help in the arsenal of burned area coverage, thereby reducing the exposed area and, consequently, reducing hospitalization time, complications, and number of procedures.

CONCLUSION

Reverse abdominoplasty has recently gained popularity for both aesthetic and reconstructive purposes. Although unusual, the use of this surgical technique for reconstruction of thoracoabdominal lesions is feasible and safe because it presents good vascularization and excellent aesthetic results. It can become an important tool for the plastic surgeon in the reconstruction of large lesions. In the case of a patient with chemical burns requiring a significant number of procedures and treatment time, the knowledge of different flap techniques can contribute effectively in the prognosis of the burn.

COLLABORATIONS

GGAT	Conception and design study, Conceptualization, Data Curation, Final manuscript approval, Project Administration, Realization of operations and/or trials
BOB	Analysis and/or data interpretation, Conception and design study, Conceptualization, Data Curation, Final manuscript approval, Formal Analysis, Funding Acquisition, Investigation, Methodology, Project Administration, Realization of operations and/or trials, Supervision, Validation, Visualization, Writing - Original Draft Preparation, Writing - Review & Editing
GCT	Realization of operations and/or trials
RBR	Realization of operations and/or trials
RU	Realization of operations and/or trials
ACF	Realization of operations and/or trials
HTR	Realization of operations and/or trials

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Case Report

Breast implant-associated anaplastic large cell lymphoma: a diagnostic challenge

Linfoma anaplásico de células grandes associado a implante mamários: um desafio diagnóstico

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■ **ABSTRACT**

Breast implant-associated anaplastic large cell lymphoma (BIA-ALCL) is a provisional entity with morphological and immunophenotypic characteristics indistinguishable from ALK-negative anaplastic large cell lymphoma (ALCL). Unlike ALCL, BIA-ALCL arises mainly in association with breast implantation. Diagnostic confirmation of BIA-ALCL can be difficult and associating morphological and pathological hallmarks with flow cytometry and immunohistochemistry can assist in the diagnosis. The objective of this report is to describe a case of BIA-ALCL in which cytological and immunophenotypological analysis using flow cytometry suggested the presence of large CD30-positive cells in the effusion fluid.

Keywords: Anaplastic large cell lymphoma, Flow cytometry, Breast implant, Cytology, CD30 ligand.

■ **RESUMO**

O linfoma anaplásico de grandes células associado a implantes mamários (BI-ALCL) é uma entidade provisória com características morfológicas e imunofenotípicas indistinguíveis do linfoma anaplásico de grandes células ALK-negativo (ALCL), porém surge principalmente em associação com um implante mamário. A confirmação do diagnóstico pode ser difícil, e a associação da presença das células típicas na morfologia e anatomia patológica com exames de citometria de fluxo e imunohistoquímica pode auxiliar no diagnóstico. O objetivo deste estudo é descrever um caso de BI-ALCL em que a citologia e a análise da imunofenotipagem por citometria de fluxo sugeriram a presença de células grandes positivas para CD30 no fluido de efusão.

Descritores: Linfoma anaplásico de células grandes; Citometria de fluxo; Implante mamário; Citologia; Ligante CD30.

Institution: Hospital Nossa Senhora das Graças, Curitiba, PR, Brazil.

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INTRODUCTION

The 2016 World Health Organization's (WHO) *Classification of Tumors of Hematopoietic and Lymphoid Tissues*[1] recognizes Breast Implant- Associated Anaplastic Large Cell Lymphoma (BIA-ALCL) as a provisional entity, with morphological and immunophenotypic features indistinguishable from those of ALK-negative anaplastic large cell lymphoma (ALCL). Unlike ALCL, BIA-ALCL arises primarily in association with breast implantation[2].

BIA-ALCL is a very rare disease (1 case per 1-3 million women with implants), which may be localized to the seroma cavity, or may involve the pericapsular fibrous tissue. Most patients present with a peri-implant effusion, and present less frequently with a mass. Diagnosis is performed by aspirating the effusion around the implant and confirming the CD30-positivity of cells within the sample. However, confirming the diagnosis may be difficult. Associating of presence of hallmark cells with the results of flow cytometry and immunohistochemistry can aid accurate diagnosis[3-4].

Most patients have an excellent prognosis upon complete removal of the capsule, and upon surgically implanting a prosthesis with negative margins.[5-6].

OBJECTIVE

To describe a BIA-ALCL case in which cytology and flow cytometry analysis suggested the presence of CD30-positive large cells in the effusion fluid.

CASE REPORT

A 52-year-old woman with a history of breast cancer presented with left breast swelling and local pain. Seven years before, she had undergone a modified radical mastectomy of her left breast and had thereafter undergone immediate breast reconstruction with tissue expander. She had then developed a surgical infection, and shortly thereafter had the expander removed. Six months after completing radiotherapy, she had undergone another breast reconstruction using a latissimus dorsi flap and textured anatomical-shaped implant. Upon presentation, imaging revealed a peri-implant effusion. Approximately 100 ml of cloudy, yellow fluid was collected and immediately sent to the flow cytometry lab. Cytological examination revealed numerous large, anaplastic cells with pleomorphic nuclei, prominent nucleoli, and moderate basophilic cytoplasm with frequent vacuoles (Figure 1). Multiparametric flow cytometry (MFC) immunophenotyping revealed large tumor cells (increased FSC/SSC scatter) with bright expression of CD30, CD45, CD25 and HLA-DR, as well as the absence of CD3 expression within T-lineage cells and a lack of the B-cell antigens CD19 and CD20 (Figure 2). The patient underwent a bilateral breast implant removal and a total capsulectomy. Pathological examination of the seroma then confirmed the presence of clustered large lymphoma cells that were immunohistochemically positive for CD30 and negative for CD20 and CD3 (Figure 3). However, histologic sections of the breast capsule showed only fibrin admixed with infiltrating reactive lymph histiocytes.

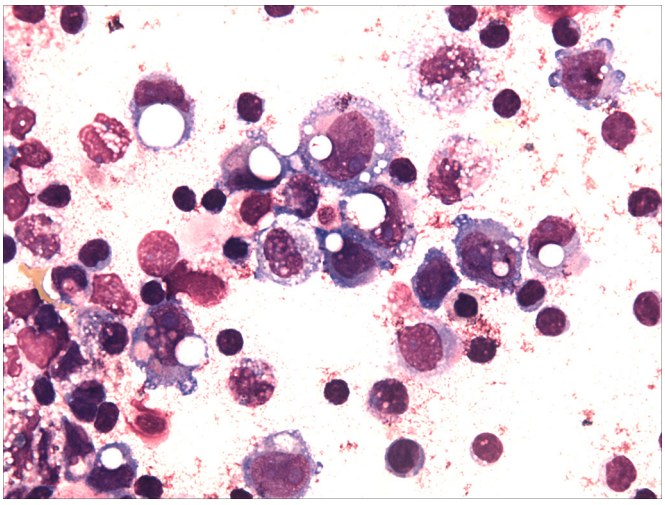

Figure 1. Cytomorphology revealed diffuse infiltration by hallmark anaplastic lymphoma cells.

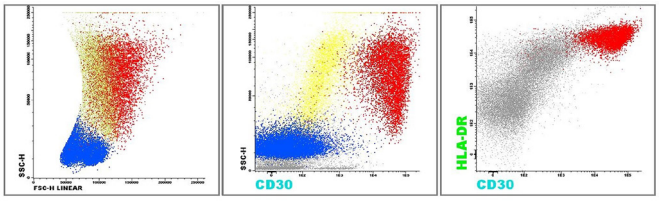

Figure 2. Multiparameter flow cytometry showing abnormal large cells (red) that were positive to CD30 and HLA-DR. Normal T lymphocytes (blue) and monocytes (yellow) are also shown.

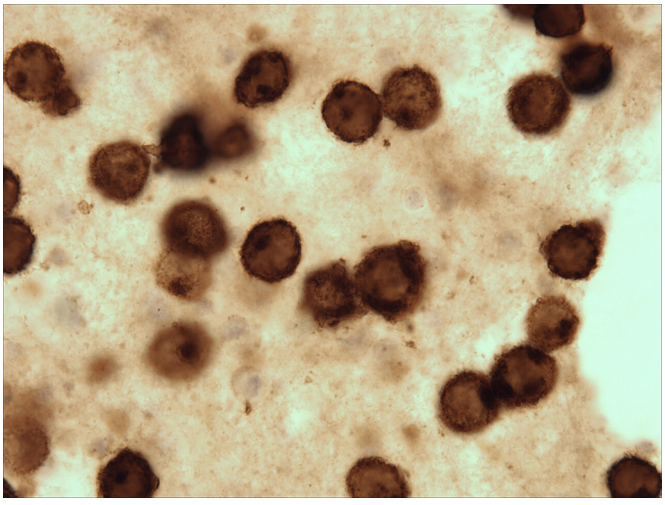

Figure 3. Immunohistochemical analysis of seroma fluid revealed strong CD30 positivity.

MFC was performed using an 8-color Becton Dickinson FACS Canto II cytometry system with FACS Diva 8 software for data acquisition, and Infinicyt™ for flow cytometry analysis. The neoplastic cell population exhibited bright co-expression of CD30, CD25 and HLA-DR, which was confirmed by immunohistochemistry of the seroma fluid. While this bright expression pattern may not be specific for ALCL, it is easily identifiable and may thus increase the sensitivity of BI-ALCL detection.

It is important to emphasize that the flow cytometry sample was immediately sent to the laboratory, *in natura* and at room temperature, and was immediately processed to prevent cell destruction and the loss of antigen strength.

CONCLUSION

CD30-positive BI-ALCL is a rare type of T-cell lymphoma that remains a diagnostic challenge. The challenging nature of BI-ALCL diagnosis underscores the importance of correlating precise immunophenotypic analysis with morphologic evaluation and clinical pathology. Multiparameter flow cytometry can aid in the diagnostic evaluation of effusions or tissue samples in association with breast implantation/prostheses.

COLLABORATIONS

APDA Analysis and/or data interpretation, Conception and design study, Conceptualization, Data Curation, Final manuscript approval, Realization of operations and/or trials, Resources, Writing - Original Draft Preparation, Writing - Review & Editing

AG Analysis and/or data interpretation, Conception and design study, Data Curation, Final manuscript approval, Writing - Review & Editing

JJ Analysis and/or data interpretation, Data Curation, Writing - Review & Editing

FG Analysis and/or data interpretation, Data Curation, Final manuscript approval

SKN Analysis and/or data interpretation, Data Curation, Final manuscript approval, Resources

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Case Report

Pyoderma gangrenosum after trauma to the dorsum of the hand

Pioderma gangrenoso em dorso de mão pós-trauma

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■ **ABSTRACT**

Introduction: Cullen's postoperative gangrene, also called pyoderma gangrenosum (PG) or sterile neutrophilic abscess, was first described in the medical literature by Cullen in 1924. Later Brusting et al., in 1930, described PG in more detail. **Objective:** To report a rare case of pyoderma gangrenosum (PG) in an extraneous limb that was triggered by blunt trauma to the dorsum of the hand. **Discussion:** A histopathological exam is not sufficient to diagnose PG, Therefore, a PG diagnosis is based on clinical evidence. The clinical presentation is variable and includes rare bullous, pustular and vegetative forms. Other rare forms of PG occur at sites of pathergy (20-30%), periostomal skin, the dorsum of the hand, the head and neck. PG can also be multisystemic and paraneoplastic. **Conclusion:** The appearance of sudden-onset PG is rare in the dorsum of the hand. It is important to classify PG's clinical forms, and to establish associations between PG and underlying pathologies. It is also very important to avoid surgery during early PG. The many drugs used to treat PG, and the multiple patient responses, demonstrate the difficulty of standardizing treatment. Physicians may have to use an empirical approach to select the appropriate drug for each patient.

Keywords: Pyoderma gangrenosum; Wounds and injuries; Multiple trauma; Upper extremity; autoimmune diseases.

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■ **RESUMO**

Introdução: A gangrena pós-operatória de Cullen, também denominada de pioderma gangrenoso (PG) ou abscesso neutrofílico estéril, pelo fato das lesões cutâneas não conterem micro-organismos patogênicos teve sua primeira aparição na literatura médica no ano de 1924, pelo relato feito por Cullen, segundo Schofer e Baur. Mais tarde Brusting et al., em 1930, acrescentaram maiores detalhes a descrição inicial. **Objetivo:** Relatar um caso raro de pioderma gangrenoso (PG) em extremidades de membros desencadeado por um trauma contuso em dorso de mão. **Discussão:** O exame histopatológico do PG não é diagnóstico, portanto, a elucidação do quadro se baseia em evidências clínicas. A apresentação clínica é variável: a bolhosa, pustulosa e vegetante. Outras formas raras incluem o PG em locais de patergia (20-30%), periostomal, dorso da mão, PG maligno ou da cabeça e pescoço, multisistêmico e paraneoplásico. **Conclusão:** O aparecimento do PG é de início súbito e raro em dorso de mão. É importante classificar sua forma clínica, estabelecer associações com patologias de base. A diversidade de drogas para a terapêutica demonstra a dificuldade de padronização de tratamento com variadas respostas, que pode ser empírico e evitar abordagem cirúrgica precoce.

Descritores: Pioderma gangrenoso; Ferimentos e lesões; Traumatismo múltiplo; Extremidade superior; Doenças.

INTRODUCTION

Postoperative Cullen gangrene, also called pyoderma gangrenosum (PG)[1] or sterile neutrophilic abscess (because lesions do not contain pathogenic micro-organisms) was first described in the medical literature by Cullen in 1924[1]. Brusting et al. then described PG in greater detail in 1930[2].

The etiology of PG is unknown. In most cases, PG is related to malignant neoplasms, rheumatologic diseases, arthritis, inflammatory bowel diseases such as ulcerative colitis or Crohn's disease, monoclonal gammopathies, collagenosis, Behcet's disease, Wegener's granulomatosis, myeloproliferative diseases, and infectious diseases, especially hepatitis and Acquired Immunodeficiency Syndrome (AIDS)[2].

PG is characterized by painful ulcers of various sizes and depths with ill-defined borders. PG has no neoplastic origin, nor is it associated with primary vasculitis. Though PG lesions may suffer from secondary infection, the underlying pathology of PG is unrelated to infection[3].

Pyoderma gangrenosum is a rare inflammatory neutrophilic dermatosis occurring in 3 to 10 cases per million per year. In most cases, PG is chronic and relapsing. The condition commonly affects adults between 20 and 50 years old, and is more common in women than men. Children and adolescents constitute only 4% of cases[1-5]. One retrospective study found that the incidence of PG in Brazil was 0.38 cases per 10,000 hospital visits[6].

In this report we detail a rare case of pyoderma gangrenosum caused by blunt trauma to the dorsum of the hand. The patient was treated in the Plastic Surgery Unit of t he Regional Hospital of Asa Norte (HRAN), Brasília-DF.

CASE REPORT

A 33-year-old male Caucasian patient was the victim of a work-related accident with a sledgehammer, resulting in trauma to the dorsum of the right hand (Figure 1). The patient was a mechanic and did not report having any comorbid conditions.

Edema appeared immediately after the trauma, which developed into a large hematoma over the next few days. The hematoma was surgically drained at the patient's local health clinic. After the drainage, a chronic wound formed on the dorsum of the patient's hand (Figure 1).

The patient was referred to a specialist in Goiânia, and was subjected to a Chinese flap procedure (Figure 2). Ten days after the surgery, the edge of the flap detached from the wound bed. Necrosis at the wound edges soon spread, resulting in the total loss of the flap (Figure 2). After debridement and wound preparation, a biopsy of the exudative found signs of chronic inflammation and negative cultures.

Figure 1. Traumatized region with ecchymosis.

Figure 2. Chinese flap with necrosis.

A new flap procedure was performed 36 days after the loss of the first. The new posterior interosseous fasciocutaneous flap underwent the same evolution as the first. The edge of the flap detached from the wound bed, after which necrosis spread outwards from the wound's edges. Although without any early suffering in the two vascular procedures, a new wound reopened (Figures 3 and 4).

The patient was then referred to our Plastic Surgery Unit at the HRAN in Brasilia. A superficial debridement of the necrotic tissue was performed, and new tissue and bone samples were collected for culture and biopsy. The resulting histopathological tests were inconclusive. An AFB test was negative, microscopy

Figure 3. Peripheral detachment of the posterior interosseous flap from the wound bed.

Figure 4. Distal necrosis of the posterior interosseous flap.

for leishmania was negative, and cultures for fungus, tuberculosis, and aerobic bacteria were negative. The patient only displayed signs of acute chronic inflammation without signs of neoplasia.

After clinical discussion within the unit and exclusion of other diagnoses, we suspected pyoderma gangrenosum. No further surgical debridement was performed in the HRAN. The patient began systemic corticosteroid therapy (maximum dose of prednisone: 70 mg 1x/day) and triamcinolone was applied to the edge of the wound. The patient's condition improved,

and the wound almost spontaneously closed after showing signs of granulation (Figure 5). A few months after the patient was discharged, he once again experienced necrosis resulting in joint pain and bone exposure. Administration of morphine in the patient's home city resulted in only partial analgesia.

Figure 5. Almost total wound closure after systemic corticosteroids and local infiltration.

The patient was treated by his local rheumatologist and orthopedist, who treated him with corticosteroid therapy. The patient then suffered from a bone infection. Complementary radiological exams were performed. The patient showed signs of acute osteomyelitis with onset of sepsis, and reported that his joint pain did not respond to intravenous morphine. Physicians therefore opted to amputate the patient's hand at the wrist (Figure 6).

The patient symptoms significantly improved after surgery, and the patient did not experience further pain. However, the patient showed signs of pathergy in his lower limbs after a mild local trauma to his ankle. The trauma triggered the opening of new wounds in the dorsum of the foot and in the

Figure 6. Amputation of the hand.

anterior portion of the thigh. The patient was treated with the immunomodulator Adalimumab along with Methotrexate, after which the patient's wounds improved (Figures 7 and 8).

DISCUSSION

Because a histopathological exam is not sufficient evidence to diagnose PG, a PG diagnosis is based on clinical evidence. Edema, signs of massive inflammation caused by neutrophils, engorgement, thrombosis of small and medium vessels, necrosis, and hemorrhage are often seen in PG patients. The formation of abscesses and necrosis results in tissue liquefaction and secondary thrombosis of venules, allowing PMN leukocytes to infiltrate the region. The lesions originate

Figure 7. Pathergy on the dorsal aspect of the foot after mild trauma.

Figure 8. Pathergy in the thigh after trauma to the foot (pustules).

from suppurative granulomatous dermatitis, and regress with remarkable fibroplasia[6].

There is evidence to suggest that PG is an autoimmune disease, specifically caused by immune-induced cellular autophagy. This explanation is consistent with this case, and would help explain the loss of the two flaps constructed to cover the patient's initial wound[6,7].

The immunological reaction involves capillary vasodilation, causing a cutaneous rash. This process initiates a sequence of reactions, resulting in intense neutrophil migration to the region. The neutrophils remain in the basal layer of the skin and produce large amounts of collagenase, which degrades both the collagen and the capillaries of the basal layer. The bonds holding the basal layer together then degrade, opening the skin and causing necrosis. Necrosis, in turn, attracts even more neutrophils and macrophages to the site. These neutrophils produce more collagenase that destroys more cutaneous tissue, resulting in a positive feedback cycle[6,7].

The clinical presentations of PG are variable, and include the rare bullous, pustular, and vegetative forms of PG. Even more uncommon forms include PG at sites of pathergy (in 20-30% of cases), the periostomal skin, the dorsum of the hand, and the head and neck. PG can also be multisystemic and paraneoplastic[6,7].

PG usually begins as a deep and painful nodule or a superficial hemorrhagic pustule, sometimes resulting from minor trauma. A painful and ulcerated lesion with irregular borders then forms. These lesions have an inflammatory and elevated aspect, appear dark reddish or purple, and have a granular necrotic background with slight abscesses[6,7].

In their ulcerated form, the interiors of PG lesions produce a hemorrhagic, purulent exudate. These lesions spread in a serpiginous pattern through the excavation of lesion edges or the appearance of new hemorrhagic pustules.

When superficial, PG lesions can be confined to the dermis. However, more commonly PG lesions expand into subcutaneous tissue and fascia, ultimately exposing muscle and bone.

Multiple PG lesions can appear gradually and simultaneously in different locations, especially in the lower limbs, abdomen and buttocks. Interestingly, the mucous membranes are usually spared. However, aphthous lesions may occur in the oral cavity, sometimes massively involving the pharynx and larynx.

PG can progress in two main patterns: (1) an explosive beginning involving the rapid spread of lesions, pain, fever, systemic toxicity, hemorrhagic phlyctenae, suppurations, and an inflamed halo around wound edges; or (2) a slow progression involving massive granulations inside ulcers, crust and

hyperkeratosis at wound edges, and the spontaneous regression of some lesions while other lesions progress eventually spreading to extensive areas[8,9].

The four distinct clinical and histopathological forms of PG are:

- Propagation - corresponding to 12.5% of cases[10]: Also called *superficial granulomatous pyoderma*, this is the most localized and least aggressive form of PG. Patients present with superficial lesions that have verrucous aspects and non-purulent backgrounds. Lesions occur on the torso, head and neck. Rapidly responds to appropriate therapy.
- Bullous - 6.25% of cases[10]: lesions have an acute onset and are associated with leukemic frameworks. Lesions are superficial and involve papules, purpura and bluish bullae, and hemorrhaging.
- Ulcerative - 81.52% of cases[10]: lesions begin as small pustules surrounded by an inflammatory halo. Lesions are painful and evolve rapidly. As lesions resolve, an atrophic scar and an epidermis with a "cigarette paper-like" aspect are visible[11].
- Pustular – a rare presentation associated with fever, arthralgia, and intestinal inflammatory diseases. Lesions occur mainly in the extensor surface of the extremities. After the intestinal pathology is controlled, the disease may regress without leaving scars, although the lesions may coexist with the ulcerative form[10,11].

PG is diagnosed clinically, mostly by excluding similar presentations. Cultures for fungi and bacteria are generally negative, and the results of histopathological examination are compatible with neutrophilic dermatosis[6-11]. These general clinical features were consistent with this case, and the results of multiple biopsies and negative cultures are consistent with a diagnosis of ulcerative and pustular PG (Figure 8).

PG may appear after trauma or surgery, and is often confused with the infection of a surgical wound. Proper treatment for PG is performed systemically, and importantly surgical debridement is not recommended due to its potential to promote pathergy[12,13].

To illustrate this principle, the two surgical procedures performed in this case resulted in flap loss, and local debridement reactivated and worsened the patient's necrosis.

In 50 to 70% of patients, PG is associated with an underlying disease such as inflammatory bowel disease, rheumatic diseases, hematological diseases or malignancy, hepatitis B and C, AIDS, systemic lupus erythematosus, psoriasis, or reactive arthropathies[3,14,15]. In this case, there was no other pathology associated with PG.

Fever, malaise and myalgias have been reported in some PG patients. Variable presentations of arthritis are present in 37% of cases, which include classic arthritis, asymmetric arthritis in the lower limbs, and monoarthritis[3]. In this case, the patient presented with high intensity arthralgia and fever, and myalgia that was unresponsive to morphine.

Pathergy can occur in up to 25% of cases, in which new lesions appear as a result of trauma such as insect bites, intravenous injections, debridement, and even biopsy. Pathergy can also occur after gynecological surgical procedures as reported by Meyer et al. in 2006[16], after partial thickness skin grafts as reported by Coltro et al. in 2006[17], and after mammoplasty as reported by Soares et al. in 2013[18].

Pathergy was also observed in this case. Specifically, the patient's condition deteriorated after surgical trauma and debridement. Pathergy was also observed after mild trauma to the foot, which led the emergence of a new lesion next to the trauma site (Figures 7 and 8).

The bullous form of PG is also associated with hematological disorders such as leukemia and myelodysplastic syndrome (MDS). Indeed, 54% of bullous PG cases are associated with leukemia[18].

Therapeutic alternatives include immunomodulators, corticosteroids, and immunosuppressants. The patient's treatment depends on the specific presentation of PG, as well as the doctor's experience regarding proper drug selection[19].

PG is treated through immunosuppression. Local treatments should only be used for very small and early lesions. The affected area should be kept clean and moist. Occlusive dressings or hydrogel can be used.

Surgical debridement should be avoided, since the resulting pathergy can worsen the patient's condition.

Intralesional triamcinolone infiltration (20 mg/mL in monthly applications) can lead to remission after five to eight weeks[3]. While such treatment improved our patient's condition initially, his condition worsened near the end of triamcinolone treatment (Figure 5).

Biweekly intralesional injections of cyclosporine (1:3 solution in saline) are another alternative treatment for PG.

The vast majority of PG patients undergo systemic treatment, while local therapy is used as adjuvant. High doses of corticosteroids (prednisone or prednisolone orally, 1-3 mg/kg/day) can be administered during the early stages of PG. Corticosteroids can also be administered in the form of pulse therapy (methylprednisolone 1 g/day for three days). After the

disease has been controlled, the dose of corticosteroids is gradually reduced. However, in this case the patient did not respond to corticosteroid therapy[20-23].

Cyclosporine is the gold standard treatment for PG. The majority of PG cases respond well to relatively low doses of cyclosporine (3-6 mg/kg/day). It is important to monitor blood pressure, renal function, hepatic function, and triglyceride levels during cyclosporine therapy. Other options include tacrolimus, azathioprine, dapsone, thalidomide, and clofazimine[21].

Recent reports show that Infliximab can successfully treat cases of PG that were resistant to other therapies[21]. A combination of methotrexate and adalimumab produced a good clinical response in our patient.

Because the fundamental therapeutic principle PG treatment is immunosuppression, the possibility of infection must be completely excluded before commencing treatment.

Surgery has therapeutic value in the final stages of PG. After total remission of PG, grafts or flaps may be required to close large areas affected by skin loss[23].

Pyoderma gangrenosum of the hand is rare and is usually confused with infection. In a series of seven cases published by Huish et al. in 2001[24], PG was misdiagnosed 13 times (ranging from 1-3 times per patient) resulting in 16 unnecessary surgeries (an average of 2.2 per patient) including four amputations and two failed skin grafts. Incorrect diagnoses lead to unnecessary treatments, surgeries, and even the appearance of sudden-onset PG [24].

It is important to classify PG's clinical forms, establish associations between PG and underlying pathologies, and to evaluate the immune response in PG. The many drugs used to treat PG demonstrate the difficulty of standardizing treatment. Physicians can use an empirical approach to select the appropriate drug for each patient. The administration of corticosteroids, immunosuppressants and immunomodulators (combined with local care) can stop the progression of the disease. There are also rare reports of resistance to these medications. Such patients have a reserved prognosis, as in our case, in which worsening PG eventually led to amputation.

COLLABORATIONS

AVRFN	Conception and design study, Final manuscript approval
JLM	Project Administration
SCR	Analysis and/or data interpretation
HGY	Conceptualization
TGRF	Investigation
JEFG	Visualization, Writing - Original Draft Preparation
GDC	Visualization
FFG	Data Curation

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Case Report

Peculiarities of cutaneous angiosarcoma

Angiossarcoma cutâneo e suas peculiaridades

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■ **ABSTRACT**

Cutaneous angiosarcoma is a rare soft tissue sarcoma with a poor prognosis and an incidence of approximately 2.0%. This entity manifests as bruises, violaceous nodules and plaques, and diffuse hemorrhagic lesions with infiltrative growth. Here we report a case of an 80-year-old Caucasian man who presented with a nodular, hard, and dark lesion present in the upper third of the right ear for more than 1 year. The treatment of cutaneous angiosarcoma is multidisciplinary, including surgery alone or combined with radiotherapy for early lesions and chemotherapy for disseminated lesions. Cutaneous sarcomas are rare, and their appropriate treatment and follow-up are critical.

Keywords: Hemangiosarcoma; Sarcoma; Skin neoplasms; Skin; Prognosis.

■ **RESUMO**

O angiossarcoma cutâneo é um sarcoma raro de tecido mole com prognóstico ruim, tendo a incidência em torno de 2,0% entre os sarcomas. Esta entidade pode se apresentar de várias formas clínicas, quais sejam, como lesão com aspecto de local contundido, nódulo, placa violácea e áreas hemorrágicas infiltrativas planas. Relatamos um caso de um homem leucoderma de 80 anos, cuja história se iniciou há mais de um ano com o surgimento de lesão nodular, rugosa e escura em terço superior da orelha direita. O tratamento do angiossarcoma cutâneo é multidisciplinar, sendo a cirurgia isolada ou associada à radioterapia (RT) usada para lesões iniciais e quimioterapia (QT) recomendada em lesões disseminadas. Os sarcomas cutâneos são tumores raros na rotina do cirurgião plástico, sendo crucial que, mediante suspeita, seja realizado tratamento e seguimento de maneira adequada.

Descritores: Hemangiossarcoma; Sarcoma; Neoplasias cutâneas; Pele; Prognóstico.

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Conflicts of interest: none.

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INTRODUCTION

The term "sarcoma" is derived from the Greek "sarkos" (flesh) and "oma" (tumor). Sarcomas comprise a heterogeneous group of mesenchymal neoplasms and are classified into primary bone sarcomas and soft tissue (cutaneous) sarcomas[1].

Among soft tissue sarcomas, cutaneous angiosarcomas deserve special attention and can be divided into:

- **Idiopathic angiosarcoma:** the most common type, especially in the elderly, characterized by ecchymotic plaques and/or friable violaceous nodules, ulcerated or not, usually on the head and neck;
- **Angiosarcoma secondary to chronic lymphedema:** a violaceous nodule or infiltrated plaque more common in mastectomized patients who underwent axillary clearance (Stewart-Treves syndrome);
- **Post-radiation angiosarcoma:** a rare sarcoma associated with conservative treatment of breast cancer usually presenting as infiltrated plaques or nodules adjacent to the irradiated area; and
- **Low-grade angiosarcomas**[1].Cutaneous angiosarcoma is a rare tissue soft tissue sarcoma with an incidence of approximately 2% and a poor prognosis[2].

This disease is most common in the age group >60 years and in men (2:1 ratio)[3]. Its clinical forms include bruises, violaceous nodules and plaques, and diffuse hemorrhagic lesions with infiltrative growth[3]. These lesions are histologically indistinguishable and comprise a network of dermal vascular channels varying in size from small capillaries to sinusoidal spaces interspersed with normal endothelium[4]. One study showed that clinical outcomes were not favorable even after complete tumor resection, as for other sarcomas [5].

OBJECTIVE

To describe the surgical approach and other treatment options for cutaneous angiosarcoma.

CASE REPORT

An 80-year-old man presented with a lesion present in the upper third of the ear for more than 1 year (Figures 1, 2, and 3). The patient reported no itching or pain. He reported that the lesion growth was slow and progressive, which motivated him to seek a specialized evaluation.

Figure 1. Lesion in the upper third of the right ear.

Figure 2. Lesion in the upper third of the right ear.

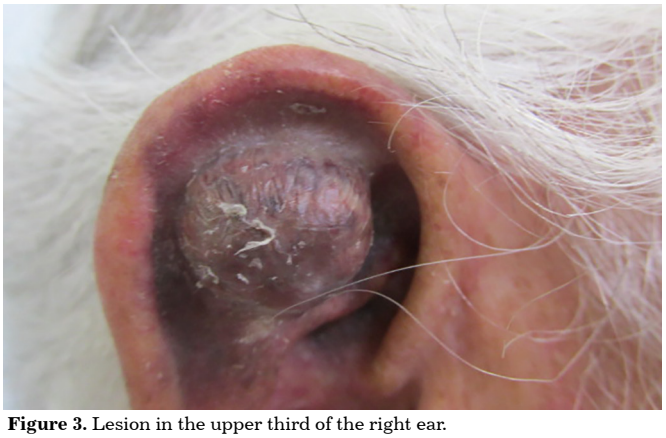

Figure 3. Lesion in the upper third of the right ear.

The examination showed a hyperchromic, nodular, and hard lesion in the upper third of the right ear. The lesion had regular borders but no inflammatory signs or secretions. There was no evidence of enlarged cervical lymph nodes.

Surgical resection of the upper third of the right ear was performed under local anesthesia (Figures 4 and 5) and the wound edges were sutured. Surgical reconstruction was scheduled for a later date (Figure 6) because of the uncertain nature of the lesion and a high suspicion of malignancy.

A histopathological examination showed the presence of tumors with poorly differentiated mesenchymal cells compatible with cutaneous angiosarcoma. An immunohistochemical examination showed positive human anti-CD34.

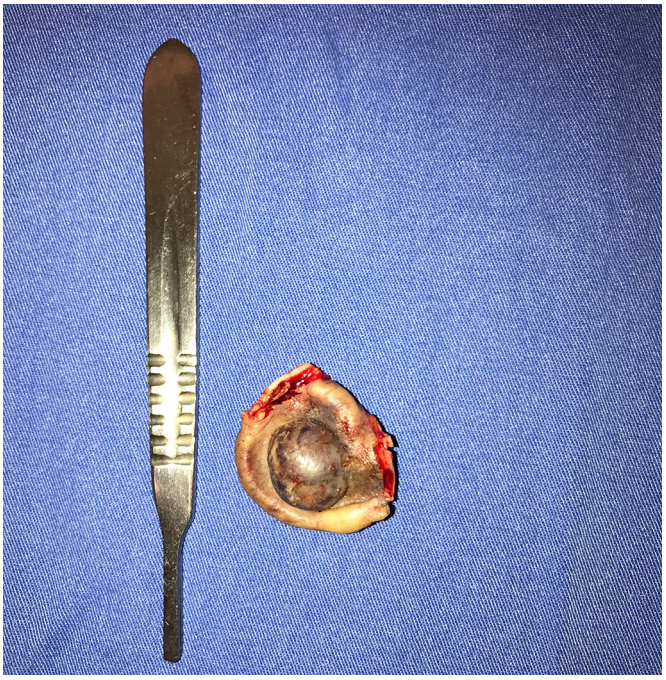

Figure 4. Surgical specimen (anterior view).

Figure 5. Surgical specimen (posterior view).

Figure 6. Aspect at 6 months after surgery.

DISCUSSION

Cutaneous angiosarcoma should be treated by a multidisciplinary team according to the lesion extent, anatomical location, and patient preferences. Surgical resection alone or in combination with radiotherapy is used for early lesions, although wide-margin resection is not always feasible.

Chemotherapy is indicated for disseminated tumors and can be combined with radiotherapy for the locoregional treatment of extensive lesions or as neoadjuvant therapy. The most commonly used chemotherapeutic agents are doxorubicin, cyclophosphamide, methotrexate, and vincristine. The concomitant use of alpha-interferon and 13-cis-retinoic acid in advanced disease is reportedly effective.

Treatment should be aggressive in previously irradiated areas. Despite this wide range of treatment options, recurrence is common and the prognosis is poor.

Angiosarcoma originating from chronic lymphedema is aggressive, and complete amputation of the affected limb increases patient survival.

Among soft tissue sarcomas of the head and neck, angiosarcoma has a high rate of lymph node and distant metastases, corresponding to 50% of cases; the most commonly affected organ is the lung. The prognosis is poor, and the 5-year survival rate is less than 10–30%.

CONCLUSION

Cutaneous sarcomas are rare; however, aggressive treatment and adequate follow-up are crucial in suspected cases. Complete tumor resection, chemotherapy, and radiotherapy are the primary treatments for angiosarcoma depending on patient preference.

COLLABORATIONS

SSC Analysis and/or data interpretation, Data Curation, Final manuscript approval, Realization of operations and/or trials, Supervision, Visualization, Writing - Review & Editing

VPB Analysis and/or data interpretation, Realization of operations and/or trials, Writing - Original Draft Preparation, Writing - Review & Editing

NCNC Writing - Original Draft Preparation, Writing - Review & Editing

AMM Writing - Original Draft Preparation

DMAP Writing - Original Draft Preparation, Writing - Review & Editing

ARD Writing - Original Draft Preparation, Writing - Review & Editing

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Special Article

Protocols and complications in the reconstruction of major scalp defects

Condutas e intercorrências na reconstrução de grandes defeitos do couro cabeludo

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MICHAEL HIKARU MIKAMI [2]

■ **ABSTRACT**

Introduction: This study aimed to analyze the protocols and complications in four unusual cases of large and complex scalp defects, in which conventional, non-microsurgical flaps were used. **Methods:** This was a critical and retrospective analysis of four cases. Three immunosuppressed patients had squamous cell carcinomas (SCC) (one underwent liver transplant, one underwent renal transplant, and one had rheumatoid arthritis). The other patient had sequelae of head trauma and multiple neurosurgeries using self-polymerizing acrylic, followed by osteomyelitis and fistula. **Results:** The cases of large carcinoma were reconstructed with rotation large scalp flaps. Two of them had epidermolysis/necrosis in a small distal portion of the flaps, which were treated, with excellent aesthetic results. The case of sequelae of trauma was reconstructed with expanded advancement scalp flap over cranioplasty using ribs. Despite the extrusion of one osteosynthesis, the patient healed without recurrence of the fistula, with an excellent aesthetic result. **Conclusion:** The analysis of these complex and unusual cases indicates that temporal pedicles are preferred in the planning of flaps for the conventional reconstruction of large scalp defects. The treatment employed for the possible epidermolyses and distal necroses in these flaps led to satisfying aesthetic and functional results.

Keywords: Scalp; Reconstructive surgical procedures; Head and neck neoplasms; Penetrating head trauma; Organ transplantation.

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■ **RESUMO**

Introdução: Estudar as condutas e as complicações em quatro casos infrequentes de grandes e complexas deformidades do couro cabeludo, em que retalhos convencionais, não microcirúrgicos, foram empregados. **Métodos:** Análise crítica e retrospectiva de três casos de carcinomas espinocelulares (CEC) em pacientes imunossuprimidos (transplantado renal, hepático e paciente com artrite reumatoide) e um caso de sequela de trauma cranioencefálico, decorrente de múltiplas neurocirurgias com emprego de acrílico autopolimerizável, seguido de osteomielite e fístula. **Resultados:** Os casos de extensos carcinomas, foram reconstruídos com a rotação de grandes retalhos de couro cabeludo, havendo em dois deles epidermólise/necrose em pequena porção distal dos retalhos, que foram tratadas com excelente resultado estético. O caso sequela de trauma, foi reconstruído com retalho expandido de couro cabeludo, avançado sobre cranioplastia com costelas, que apesar da extrusão de uma osteossíntese, cicatrizou sem recidiva da fístula com excelente resultado estético. **Conclusão:** A análise destes casos complexos e invulgares, indica preferencialmente os pedículos temporais no planejamento de retalhos para a reconstrução convencional de grandes defeitos do couro cabeludo. As possíveis epidermólises e necroses distais nestes retalhos, tratadas da forma apresentada, levaram a gratificantes resultados estéticos e funcionais.

Descritores: Couro cabeludo; Procedimentos cirúrgicos reconstrutivos; Neoplasias de cabeça e pescoço; Traumatismos cranianos penetrantes; Transplante de órgãos.

INTRODUCTION

The outer table of the calvarium receives nutrition through the periosteum. Large scalp defects owing to trauma or neoplasms can endanger the vitality of the bones of the neurocranium, dura mater, and underlying brain. The loose connective tissue between aponeurotic galea/epicranium muscle and periosteum favors intracranial metastases, thrombi, and infections[1].

Large scalp defects are a major challenge for reconstruction, and in the absence of periosteum, these impair the use of skin grafts. Decortication of the outer table for skin grafting of the diploe provides aesthetically poor results, leading to fragility and susceptibility to malignancy. Romero et al., in 2018[2], published an algorithm recommending microsurgery for defects larger than 5 cm. Although vascular microsurgery provides the best results in the repair of large scalp defects[3], it requires adequate team and resources. Souza, in 2012[4], used local flaps and emphasized the importance of superficial temporal vessels in maintaining the viability of these flaps.

CASE REPORTS

CASE 1

A 69-year-old male patient with hypertension and diabetes underwent kidney transplant 17 years ago and regularly uses immunosuppressants. He had actinic keratoses on the face, scalp, and limbs, which were treated with cryotherapy and fluorouracil. In 2015, he had large moderately differentiated squamous cell carcinoma (SCC) with muscle invasion in the dorsum of the nose and was treated by excision and coverage using midline forehead flap. He had multiple and recurrent moderately differentiated multifocal SCC in the parietal regions (Figure 1).

CASE 2

A 68-year-old male, white patient with diabetes and rheumatoid arthritis regularly uses corticosteroids and methotrexate. He had multiple actinic keratoses on the bald scalp and was initially treated with

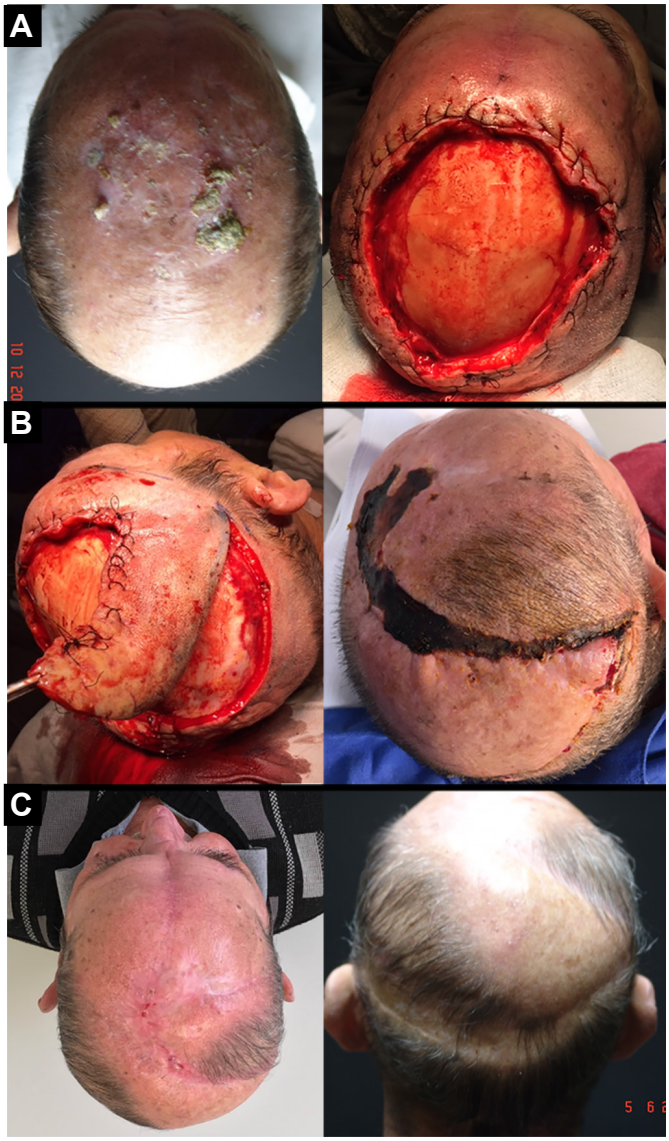

Figure 1. A: (Case 1) Recurrent squamous cell carcinomas in a renal transplant patient and defects after excision. **B:** (Case 1) Intraoperative period showing the anterior flap with later distal epidermolysis. **C:** (Case 1) Late postoperative appearance.

cryotherapy. After 4 years, he returned with a recent, rapid-growth, infiltrate, vegetative, painful, ulcerated lesion in the frontoparietal region of the scalp measuring 4.5 x 4.0 x 1.5 cm. A biopsy revealed a well-differentiated, ulcerated SCC extending up to the hypodermis (Figure 2).

CASE 3

A 68-year-old male patient who underwent a liver transplant nine years ago and continuously uses immunosuppressants. He had a large vegetative lesion in the left parieto-occipital region. A biopsy revealed exophytic SCC (Figure 3).

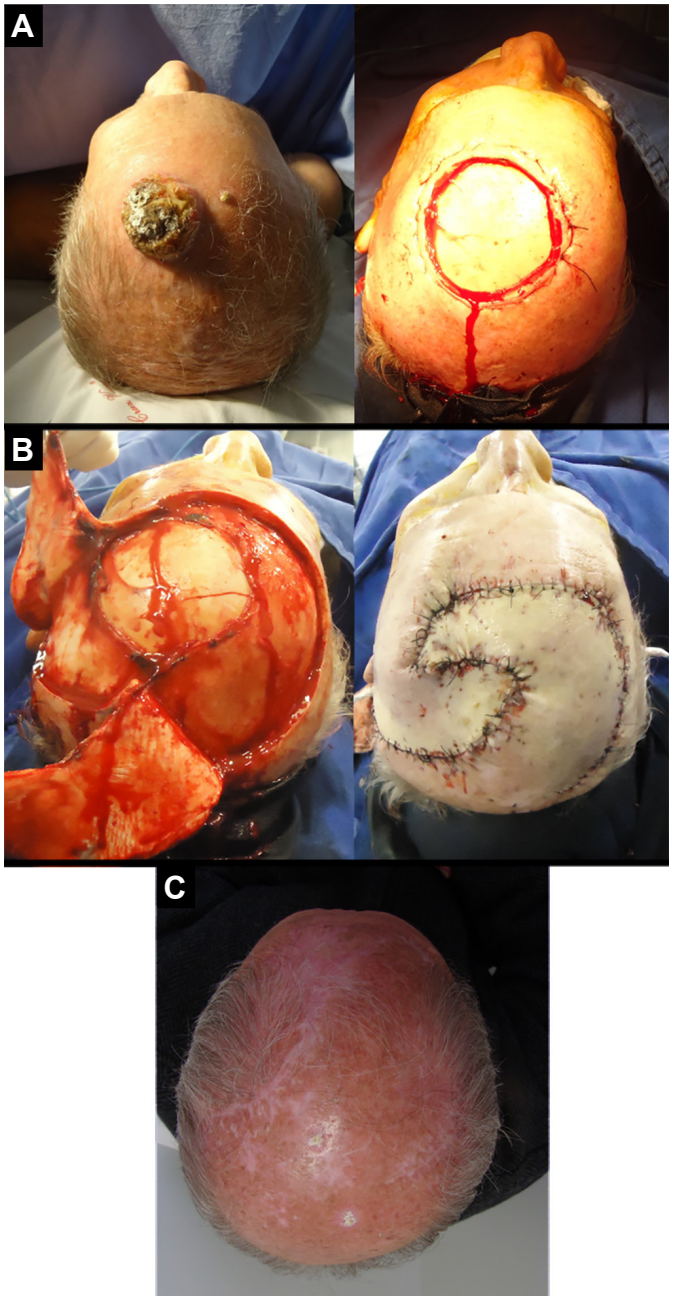

Figure 2. A: (Case 2) Vegetating squamous cell carcinoma in an immunosuppressed patient and the defect after excision. **B:** (Case 2) Transoperative appearance: flap rotation and final aspect. **C:** (Case 2) Late postoperative appearance.

CASE 4

An adult male patient who was struck with an ax seven years ago suffered head trauma. He was operated four times at Neurosurgery Services. For more than once, cranioplasty was performed with self-polymerizing acrylic, followed by subsequent infection and frontoparietal osteomyelitis, requiring the removal of the implant and new bone debridement (Figure 4).

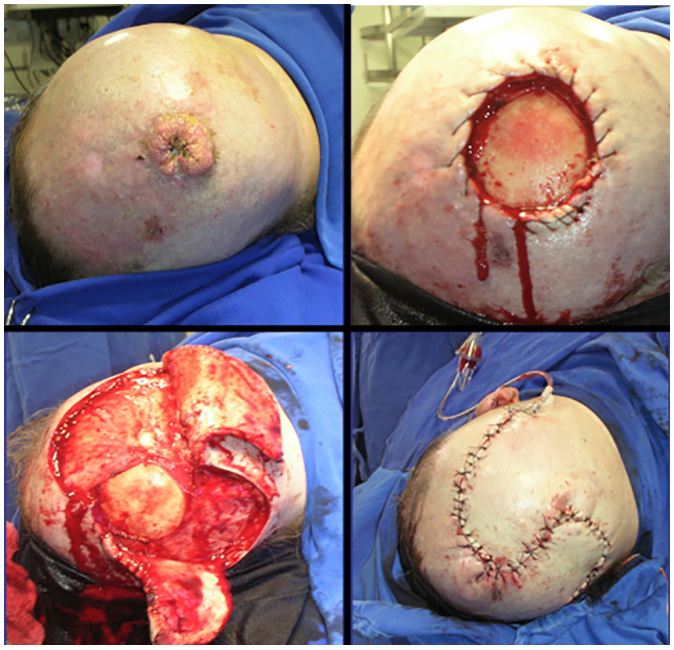

Figure 3. (Case 3) Squamous cell carcinoma in a renal transplant patient: initial lesion, deformity after excision, flap rotation, and final appearance.

Figure 4. (Case 4) Sequelae of head trauma: frontoparietal bone loss with skin graft over the dura mater and fistula. Tissue expansion, cranioplasty, and immediate and late postoperative period.

At another service, he received partial skin graft placed directly on the remaining dura mater and the presumably performed galeal flap. Initial examinations revealed a frontoparietal defect, subdural clamps, and a clinically significant fistula draining serous material over the brain mass precariously protected by the graft. He had convulsive episodes after suffering minor trauma in the graft region during his work as a car mechanic.

DISCUSSION

The low elasticity, thickness of the skin and subcutaneous tissue, and presence of a thick aponeurotic galea on a convex surface make the reconstruction of large scalp defects a challenging task. Abundant anastomoses between the temporal, supraorbital, supratrochlear, posterior auricular and occipital vessels usually allow scalp flaps with only a small pedicle to survive and large flaps to recover without complications[5,6].

Most published cases of SCC have reported occurrence in the head and neck, with 8.3%–25.2% lesions occurring in the scalp. The current large numbers of living patients who underwent transplantation require more attention since immunosuppressants contribute to the formation of skin neoplasms.

The clinical recommendation for the margin of excision of SCC is 4 mm for low-risk patients and 6 mm for high-risk patients[7]. We use about 10 mm of margin based on the pathology, frequently removing the periosteum.

In case 1, local relapses and coalescence of premalignant lesions required a large excision. Although the large defect (16 x 16 cm) indicated the need for a microsurgical free flap, the chronic use of immunosuppressants, diabetes, and hypertension increases the risk of compromising the kidney transplanted 17 years ago in a longer surgery. We used two temporal-parietal-occipital rotation flaps for the reconstruction. The first, with a pedicle in the right temporal region, was rotated to cover the earliest portion of the defect. The second, lower and longer, with pedicle in the left temporal region, was rotated to occlude the posterior portion. The secondary occipital defect, with intact periosteum, received an inguinal total skin graft. In the postoperative period, epidermolysis and superficial necrosis occurred on the distal margin of the first flap. They were treated by debridement with hyaluronidase and outpatient cleaning, followed by dressings with Rifamycin and, finally, by colloidal occlusive dressings, showing excellent results.

Chronic use of methotrexate in patients with severe rheumatoid arthritis causes immunosuppression (case 2). After excision of the lesion, two randomized flaps were used: one larger and longer on the right with occipital pedicle, and one smaller on the left with temporal pedicle.

Distal suffering occurred in the flap on the right, leading to bone exposure and gap. With local anesthesia, a small flap of adjacent galea was rotated and sutured over the exposed bone. Using occlusive hydrocolloid dressings, epithelialization from the galea completely repaired the defect. This case illustrates the high safety of the pediculated flap in the temporal vessels and the high epithelization capacity of the galea.

Case 3, who underwent liver transplantation, received surgical treatment similar to case 2. But in this case, the right flap of the occipital pedicle was shorter, and there were no complications.

In case 4, temporal, frontal, and occipital scars limited the use of flaps. Tissue expansion was the option chosen in the absence of microsurgical

resources in a local public hospital in the 1980s. This technique was recommended by Sasaki in 1985[8], Anger in 1988[9], and other authors[10], followed by cranioplasty Korloff et al., 1973[11] and some osteosyntheses with steel wires. Despite the extrusion of one synthesis and a small bone fragment, it had no relapse of the fistula, with adequate protection to the brain and excellent aesthetic results. This case illustrates the use of an expanded advancement flap in the unpredictability of temporal flaps.

CONCLUSION

The experience gained in the surgical treatment of these complex and unusual cases indicates the preferred choice of random-pattern large fasciocutaneous flaps with temporal pedicles in the reconstruction of large scalp defects over microsurgery. Distal ischemic suffering may occur in these flaps, but when they are adequately treated, as in the cases presented, excellent aesthetic and functional results are achieved.

COLLABORATIONS

JWF Analysis and/or data interpretation, Conception and design study, Conceptualization, Data Curation, Final manuscript approval, Investigation, Methodology, Project Administration, Realization of operations and/or trials, Supervision, Validation, Visualization, Writing - Original Draft Preparation, Writing - Review & Editing

KSMP Data Curation, Investigation, Realization of operations and/or trials, Writing - Original Draft Preparation, Writing - Review & Editing

MHM Writing - Original Draft Preparation, Writing - Review & Editing

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What is the role of plastic surgery in the health of post-bariatric patients?

Qual é o papel da cirurgia plástica na saúde de pacientes pós-bariátricos?

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Dear Editor,

The benefits of bariatric surgery in the treatment of morbid obesity have been widely presented and include significant weight loss, remission of obesity-related comorbidities, and improved quality of life. Nevertheless, treatment for obesity should be multidisciplinary, and the benefits of post-bariatric plastic surgery are important and have been well documented.

The common sequelae of successful weight loss remain stigmatized in the form of excess skin and soft tissue. Post-bariatric plastic surgery helps to promote the social and psychological reintegration of these patients, who have already endured the long-standing effects of obesity. In addition, after gastroplasty, these plastic surgery procedures are aimed at optimizing the functional results obtained from bariatric surgery by removing excess skin[1].

Bariatric patients' quality of life stabilizes or even declines after the second year of gastric bypass surgery. This can be attributed to the changes in their physical appearance and the decline linked to their dissatisfaction of their own body image. Reconstructive plastic surgery plays an important role in the long-term stabilization of the quality of life of patients with massive weight loss after bariatric surgery[2].

Like generalized dermatochalasis resulting from expressive weight loss, bariatric surgery also leads to other medical implications such as intertrigo, fungal infections, and functional limitations to locomotion, urination, and sexual activity.

Post-bariatric plastic surgery may also improve functional results and increase physical activity, as observed in patients who had undergone reduction mammoplasty. In connection to this benefit, significant evidence suggests that post-bariatric plastic surgery helps maintain the weight loss achieved with bariatric surgery[3]. Inadequate weight control or regain is associated with the recurrence of comorbidities and negative impact on patient health; therefore, maintaining weight loss is of utmost importance.

The American Society of Plastic Surgeons reports that post-bariatric body contouring procedures correspond to the fastest growing sector in plastic surgery. Similarly, studies show that 75% to 84.5% of post-bariatric patients wish to undergo plastic surgery

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procedures. However, the percentage of patients who actually undergo a reconstructive surgical procedure is <21%, even in developed countries such as Austria, where the public health system funds the procedure. In this country, 14.9% of 622 post-bariatric patients underwent reconstructive plastic surgery. Therefore, only 1 (14.9%) in 6 post-bariatric patients underwent plastic surgery procedures[4].

In the United States, Altieri et al.[5] demonstrated that only 6% of patients who had undergone bariatric procedures (gastric bypass or band, or sleeve) subsequently underwent reconstructive plastic surgery within the first 4 years after the bariatric procedure. Of these post-bariatric patients who underwent plastic surgery, 93% underwent only one reconstructive procedure.

The reasons why many post-bariatric patients do not undergo plastic surgery procedures include the lack of disclosure of the benefits of post-bariatric plastic surgery, the lack of coverage by health insurance plans for body contouring procedures, the patients' inability to pay for such procedures, and fear of complications from such surgeries. In Brazil, we can add to these reasons the inability of the Unified Health System to meet the huge and growing demand for these procedures.

The benefits of plastic surgery procedures for post-bariatric patients are significant and need to be documented and presented so that patients, health professionals, health insurance plan managers, and the public health system are made aware of the importance of plastic surgery in the multidisciplinary treatment of morbid obesity.

COLLABORATIONS

JLSM Analysis and/or data interpretation, Final manuscript approval, Writing - Original Draft Preparation, Writing - Review & Editing

SCR Analysis and/or data interpretation, Conception and design study, Methodology, Writing - Review & Editing

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