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Av. Rio Branco, 39 18º andar
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Fone: 55 (21) 2253-6747
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d- Descrição dos métodos utilizados para avaliação dos resultados.

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Resultados: descrever os principais resultados que devem ser acompanhados de estimativas pontuais e medidas de dispersão (p.ex., média e erro padrão) ou de estimativas intervalares (p.ex., intervalos de confiança), bem como os níveis descritivos dos testes estatísticos utilizados (p.ex. "p-value"). Esses achados também devem ser interpretados sob o ponto de vista clínico.

Discussão: enfatizar os novos e importantes resultados encontrados pelo estudo e que farão parte da conclusão. Relatar observações de outros estudos relevantes. Mencionar as limitações dos achados e as implicações para pesquisas futuras.

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Sumário / *Table of contents*

High-frequency ultrasound (22MHz) in the evaluation of malignant cutaneous neoplasms

Ultrassonografia de alta frequência (22MHz) na avaliação de neoplasias cutâneas malignas

ABSTRACT

Dermatologists have recently been incorporating diagnostic imaging techniques in the investigation of cutaneous lesions. The development of ultrasound devices with a frequency greater than 15MHz has led to the creation of the high-frequency ultrasound (HFUS), which enables the identification of the skin's different layers and structures as well as appendages. This has expanded its use considerably in various dermatological conditions, particularly in cutaneous neoplasms. Its association with color Doppler allows the study of tumor microcirculation. In the present paper, the authors discuss the main clinical characteristics of malignant cutaneous neoplasms and how high-frequency ultrasound allows a better pre-operative evaluation of those lesions.

Keywords: ultrasonography; skin neoplasms; diagnosis.

RESUMO

Recentemente os dermatologistas vêm incorporando técnicas de diagnóstico por imagem na investigação das lesões cutâneas.

O desenvolvimento de aparelhos de ultrassom com frequência superior a 15MHz originou o ultrassom de alta frequência (USAF) que torna possível a identificação das diferentes camadas e estruturas da pele e anexos, ampliando consideravelmente seu uso nas diferentes condições dermatológicas, particularmente nas neoplasias cutâneas. Sua associação com Doppler colorido permite o estudo da microcirculação tumoral.

Neste trabalho, abordaremos as principais características clínicas das neoplasias cutâneas malignas e como o USAF possibilita melhor avaliação pré-operatória dessas lesões.

Palavras-chave: *ultrassonografia; neoplasias cutâneas; diagnóstico.*

INTRODUCTION

The skin is an extensive organ that, due to its function as a surface covering for the body, enables the performance of non-invasive diagnostic and investigative procedures. With the increasing incidence of malignant neoplasias (melanoma and non-melanoma), especially in relatively young individuals, it has become a challenge to establish correct diagnoses that serve to identify malignant lesions, eliminate unnecessary surgical procedures, and minimize unsightly problems arising from therapeutic approaches. Within this context, new methods of imaging for diagnosis have been developed. Techniques such as dermoscopy, confocal microscopy, and high frequency ultrasound (HFUS) enable the real-time study of cutaneous lesions, making them excellent pre-operative tools. However, these methods vary con-

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Autors:
Elisa de Oliveira Barcaui[1]
Antonio Carlos Pires Carvalho[2]
Juan Piñeiro-Maceira[3]
Paulo Marcos Valiante[4]
Carlos B Barcaui[5]

[1] MSc in Radiology Candidate from the Universidade Federal do Rio de Janeiro (UFRJ) - Rio de Janeiro (RJ), Brazil

[2] Associate Professor, Department of Radiology, Deputy Coordinator of Postgraduate Medicine Program (Radiology) at UFRJ

[3] Collaborating Instructor of Dermatology and Pathologic Anatomy, Faculdade de Ciências Médicas da Universidade do Estado do Rio de Janeiro (UERJ) – Rio de Janeiro (RJ), Brazil

[4] Assistant Instructor, Department of Pathology, UFRJ

[5] Associate Professor of Dermatology, Faculdade de Ciências Médicas da Universidade do Estado do Rio de Janeiro (UERJ)

Correspondence:
Dr. Elisa Barcaui
Rua Farme de Amoedo, 106 - Ipanema
Cep: 22420-020 - Rio de Janeiro – RJ, Brazil
E-mail: ebarcaui@gmail.com

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siderably as far as their penetration, resolution, and applicability are concerned. Dermoscopy is a complementary exam of great impact in dermatological practice, allowing early differentiation of benign and malignant cutaneous lesions. With this resource, it is possible to assess the extent of a lesion in its longitudinal and transverse axes. It is impractical, however, for determining the depth and possible invasion of adjacent structures such as cartilage and muscle, based solely on clinical-dermoscopic evaluation.

The recent development of ultrasound devices with a frequency greater than 15MHz have made it possible to identify the skin's different layers, structures, and appendages, thus considerably expanding the use of this technology in the investigation of dermatologic lesions. HFUS allows for the delimiting of the margins of the neoplasia, due to the difference in echogenicity between the hypoechoic tumoral area and the hyperechoic perilesional area.

Used in tandem, Color Doppler examination allows the assessment of a tumor's vascularization, nature, and distribution. In this way, HFUS facilitates the study of cutaneous neoplasms, due to the fact that it recognizes the lesion, provides its exact size, location, and vascular pattern, in addition to identifying involved cutaneous layers and adjacent structures, all in a non-invasive manner.

The incidence of cutaneous malignant neoplasias – melanoma and non-melanoma – has been increasing steadily in recent years. The precise statistics related to this development are difficult to determine due to varying data records, structures, and data acquisition protocols.[1,2]

Of all the tumors that affect humans, non-melanoma cutaneous cancer is the most common.[3] Most of the neoplasias of this type are derived from alterations in the skin's basal and squamous cells, resulting in basal cell carcinoma (BCC) and squamous cell carcinoma (SCC), respectively. Malignant lesions originating from other cell types present in the cutaneous structure, such as Merkel cells, lymphocytes, vascular endothelial cells, cell forming adnexal structures and mesenchymal stromal cells, can also be classified as non-melanoma skin cancer. However, due to their low frequency, the present study will only cover BCC and SCC.[4]

It is estimated that the incidence of BCC – in its isolated form – has been increasing 10% annually, on a universal basis. [1] In Brazil, according to the National Cancer Institute (INCA), 63,280 new cases were diagnosed in 2012.[5]

Melanoma is the most aggressive tumor occurring in the human species. Its incidence has grown more than that of any other solid tumor in recent decades.[6] It is estimated that 200,000 new cases and 48,000 deaths resulting from this neoplasia occur worldwide every year.[2] The best current strategy to reduce the death rate is early diagnosis.[7]

MAIN CUTANEOUS NEOPLASIAS

Basal Cell Carcinoma

BCC is the most common cutaneous neoplasia (75-90%).

Approximately 40% of patients diagnosed with BCC will present one or more lesions belonging in that category in the subsequent 10 years.[8] Statistically, 80% of cases occur in people over 60 years old.[1] Epidemiological studies however, show that its incidence has been increasing drastically in younger individuals.[4] Factors such as a predilection for having body areas exposed to the sun, and the higher prevalence in countries near the Equator, confirm the role of solar radiation in tumoral genesis. Intense and intermittent exposure to the sun, particularly during childhood and adolescence, increases the risk of the disease.[1] Immunosuppression also predisposes BCC. In immunocompetent individuals, the BCC to SCC ratio is 4:1, whereas in transplanted patients that ratio is inverted. The mutation of the tumor suppressor genes p53 and PTCH (hedgehog signaling pathway) can be found in BCC cases.[9]

Clinically, recent lesions are small, translucid or pearly, with telangiectasias. They do not have precursor lesions. The most common subtypes are: nodular, superficial, pigmented, ulcerated, and morpheaform. The nodular type is the most frequent and is located preferentially in the head and neck. The nodule grows slowly and may undergo central ulceration. The superficial type consists of a plaque with peripheral growth and occurs predominantly in the trunk. The pigmented type, owing to the fact that it contains melanin, must be differentiated from melanoma. Due to the fact that it has imprecise limits, the morpheaform type can be difficult to diagnose clinically.[8,9]

Regarding the histopathological classification, the World Health Organization (WHO) suggests that subtypes be differentiated according to the growth pattern: nodular (solid, adenoid and cystic), superficial, micronodular, and infiltrative.

Due to the high recurrence rate, the last three sub-types are considered high risk.[8] The association of two or more histopathological subtypes is common in the same lesion, (10-40% of cases).[1]

BCC grows through direct invasion and appears to require that the adjacent stroma support its growth, which would explain its low capacity for metastasizing through blood and lymphatic vessels.[10] When they occur, metastases are derived from primary tumors located typically on the face and ear, and affect regional lymph nodes, bones, lungs, and liver.[9]

Studies indicate a high rate of recurrence for lesions located on the face (mainly on the eyelids, nose, and ears) and those that were incompletely excised at an earlier time.[11] As a result, therapeutic measures – such as wide surgical resection, which can lead to functional and aesthetic problems – are often adopted. On the other hand, incomplete excisions are to blame for changes in the structure of tumors, which cause a more aggressive behavior.[12,13]

Sartore et al. suggest that 5-50% of BCCs are incompletely excised.[10] The determination of the tumor's extension and correct safety margin is instrumental when selecting the therapeutic choice, as the ultimate goal is the complete elimination of the tumor with maximum preservation of function and aesthetics.[9,10]

Squamous Cell Carcinoma

Originating in the epithelial cells of the skin and mucosa, SCC has the capacity for local invasion and metastasiz-

ing from a distance. In accordance with their malignant potential, SCCs are frequently classified into two groups: those originating from skin with actinic damage (less aggressive, metastasizing in less than 1% of cases) and those originating from areas of ionizing and non-ionizing radiation, chronic fistulae tracts, and areas of burns or chronic ulcers (typically more aggressive).

Etiopathogenic factors are similar to those of BCC. Immunosupression – both in transplanted patients and in those undergoing phototherapy for long periods – significantly increases the risk of developing SCC. In such cases, the disease is more aggressive. Human papillomavirus types 16 and 18 are found in squamous neoplasias in the genital area. Arsenic can be responsible for in situ and invasive lesions.[1, 14]

Lesions on the genitalia, mucosa, and ears that are greater than 2cm in size and located in sites of chronic inflammation, such as burn scars, have a higher risk of metastasizing.[1, 15]

The initial lesion, both in healthy skin and in that affected by a pre-malignant disease, appears as a papule, nodule, or redish plaque, in general keratotic or ulcerated. SCC has rapid growth when compared to BCC. In Caucasians, the main location is in body areas exposed to the sun, while in dark-skinned individuals it most commonly arises in the lower limbs (trauma). As in most cases SCC metastasizes first to regional lymph nodes, thus the latter should be always examined in the presence of a clinically suspected lesion.[16]

Melanoma

Originating from melanocytes, melanoma in general arises in primary cutaneous sites. Nevertheless it can occasionally occur in the eyeball, meninges, and mucous membranes. It affects both genders.

The prevalence is higher in fair-skinned individuals, in bearers of dysplastic nevus syndrome, and in patients with more than 50 melanocytic nevi.[2, 6]

The risk of developing melanoma depends on genetic and environmental factors. Although pathogenic mechanisms are not fully understood, genetic factors such as mutations of the gene MC1R associated with environmental factors, especially exposure to the sun, predisposes individuals to the disease. The mutation of the gene CDKN2A is present in cases of familial melanoma and in patients with multiple melanoma. Although rare, the mutation of the gene CDK4 substantially increases susceptibility to the disease.[6]

The manner in which patients undergo exposure to the sun affects the clinical course of melanoma: intense intermittent exposure on the trunk of patients with multiple nevi is associated with the disease in middle-aged individuals (there is a correlation with the mutation of BRAF), while in elderly individuals, the association is made with chronic exposure to the sun. Alterations in the immune system also precipitate the genesis of melanoma: congenital or acquired immunodeficiency and immunosuppression (chemotherapy for neoplasias or in transplanted patients) are associated with multiple or metastatic lesions. Melanoma can develop from a preexisting nevus lesion (20 to 40% of cases) or *de novo*.[2]

Clinically and pathologically, melanoma can be classified into: superficial extensive, nodular, lentigo maligna, and acral. The extensive superficial type corresponds to 70% of cases and often affects the trunk in men and the lower limbs in women. From a clinical point of view, the lesions are maculopapular with different hues. The nodular type of melanoma has a hemispheric appearance – pedunculated or not. The lentigo maligna type has a better prognosis and its incidence increases with age, influenced by exposure to the sun. The acral type of melanoma is more frequent in dark-skinned individuals. In general it has a late diagnosis, which results in a worse prognosis.[6]

Regardless of its clinical form, the lesion is characterized as being asymmetric and having irregular borders, varied colors, and a diameter in excess of 6mm, all of which adheres to the *ABCD rule*. Despite presenting well-established criteria for the clinical/morphological diagnosis, one in every three cases is diagnosed incorrectly.[17]

HIGH FREQUENCY ULTRASOUND

Used in dermatology since the 1970s, ultrasonography is a painless non-radioactive imaging diagnostic method based on the reflection of sound waves through body tissues.[12, 18] According to the anatomical structure, vascularization, and density, ultrasonic waves are reflected back to the transducer, which turns them into a grayscale that can be observed on a screen. The images are visualized through vertical sections.[19]

The higher the frequency of the waves emitted by the transducer, the greater the spatial resolution and resulting visualization of the structures close to them. The introduction of transducers with a frequency greater than 15MHz has originated the high frequency ultrasound (HFUS). The shorter wavelength obtained with this frequency allows better evaluation of superficial structures, significantly expanding its use in skin conditions.[20]

Equipment with frequencies above 15MHz facilitates studying the skin and its annexes because it makes it possible to distinguish the skin's layers and structures. However, equipment with frequencies above 20MHz has better resolution for studying the superficial structures.[21]

In the cutaneous ultrasound analysis, it is recommended that a thick layer of gel be used between the skin and the transducer in order to obtain a better focal point.[12]

It is important to use a sensitive transducer, which adapts to the cutaneous contour of the different body regions, such as the face and distal phalanx. Contact between the transducer and the skin should be as gentle as possible, avoiding the compression of anatomical structures, which are superficial and thin in this tissue. In normal skin, the echogenicity of each layer depends on its respective main component, which is the keratin in the epidermis, collagen in the dermis, and fat lobules in the subcutaneous tissue.

In ultrasound imaging, the epidermis appears as a hyperechoic line, the dermis as a hyperechoic band (not as smooth as the epidermis), and the subcutaneous layer as a hypoechoic layer (with the presence of hyperechoic fibrous septa within).[18] (Figure 1)

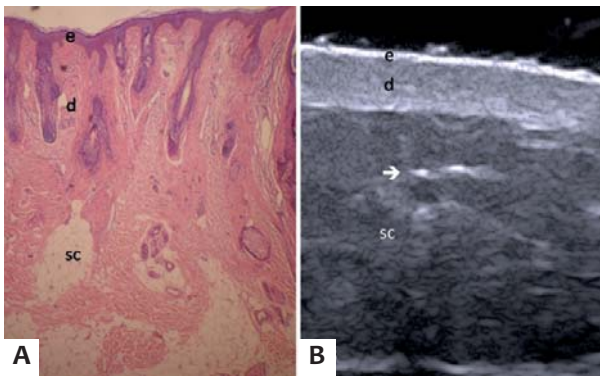

Figure 1: Cutaneous anatomy. **(A)** Normal cutaneous histology, **(B)** HFUS, transverse view, epidermis **(e)**, dermis **(d)** and subcutaneous **(sc)** with the presence of fibrous septa

Under ultrasound, cutaneous neoplasms usually present as homogeneous hypoechoic areas contrasting with the adjacent healthy tissue.[22] In addition to the echogenicity, it is possible to measure the borders longitudinally, transversely, and axially, as well as the contour and the involvement of deep layers such as muscles, cartilage, and bones. The study of vascularization can be carried out in combination with the assistance of a Color Doppler or PowerDoppler, which allows the observation of the type, size, and nature (arterial or venous) of the tumor's vessels.[12] (Figure 2)

As cutaneous lesions can be asymmetric, the measurement of tumor thickness must be based on the location of greatest invasion.[23]

Under HFUS, BCC appears as a well-defined hypoechogenic area with irregular contour, usually located in the dermis – nevertheless it can reach deeper planes.[11]

The presence of hyperechoic spots can often be observed within the tumor. (Figure 3A) These images are attributed to the presence of corneal cysts, microcalcifications, or clusters of apoptotic cells within the tumor mass.[22, 24] (Figure 3B) There are reports in the literature of subclinical satellite lesions that were diagnosed using HFUS.[11] Intra- and peritumoral blood flow is minor, consisting of low-flow arteries and veins.[12]

Although BCC and SCC are similar in appearance under HFUS, it is possible to distinguish between these two tumors,

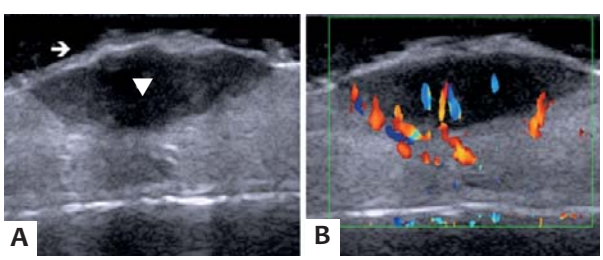

Figure 2: **(A)** USAF, transverse view. Hypoechoic lesion located in the dermis (▼). Epidermis showing ulceration (arrow). **(B)** Color Doppler, presence of intra- and perilesional blood vessels, in a mixed-pattern configuration

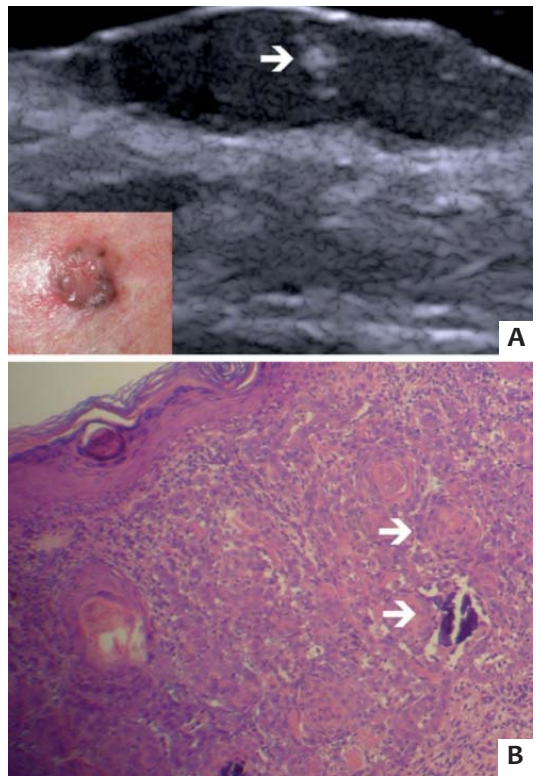

Figure 3: **(A)** HFUS, transverse view. Hypoechoic dot within a hypoechoic lesion **(B),** Corneal cysts and microcalcifications within the tumor mass; BCC (arrows).

since the latter does not have the hyperechoic spots within the neoplasm. Due to SCC's more aggressive behavior, is more likely to invade adjacent soft tissues, cartilage, and bones. Color Doppler based mapping displays a mixed pattern, with internal and peripheral vascularization (Figure 4). Marmur et al. point out that due to the fact that SCC generally presents hyperkeratosis and has a greater associated inflammatory process, the tumoral area can be overestimated when assessed with ultrasound.[22]

With melanoma, HFUS is used to establish the tumoral thickness, margins, and vascularization. Nevertheless, although nevus lesions present irregular echogenicity (while the appearance of melanoma is homogeneous), these lesions cannot be differentiated under HFUS, which may overestimate the tumor's size.[7, 25, 26] (Figure 5) In an ultrasound image, melanoma usually appears as a homogeneous hypoechoic area, oval or fusiform in shape.[27] (Figures 6 and 7) In ulcerated lesions, the epidermis may be irregular.[19] The mapping of melanocytic lesions with Color Doppler demonstrates that, in melanoma, vascularization is more intense than in benign lesions, with the predominance of low-flow arterial vessels. The metastatic potential of these lesions can be estimated by studying the angiogenesis.[28, 29] The sonographic evaluation of involvement of regional lymph nodes shows better outcomes for detection of metastases than that of the clinical examination.[23]

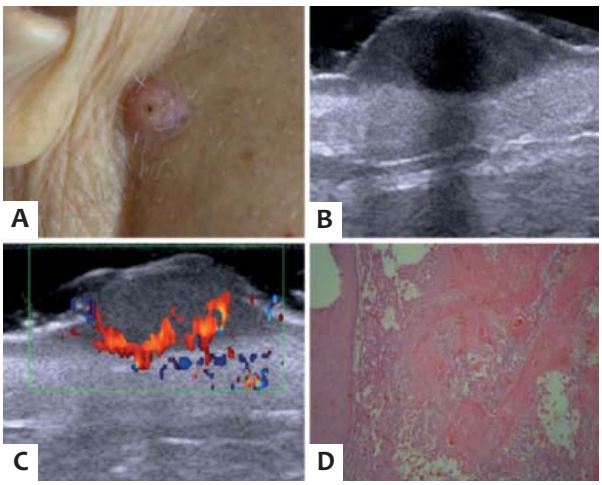

Figure 4: (A) Nodular lesion in the pre-auricular region. **(B)** HFUS, transverse view. Hypoechoic lesion located in the dermis **(C)** Color Doppler.Mixed-pattern vascularity **(D)** Epithelial neoplasm formed by atypical cells with squamous differentiation (corneal pearls present in the tumor); Hematoxylin & eosin 40X

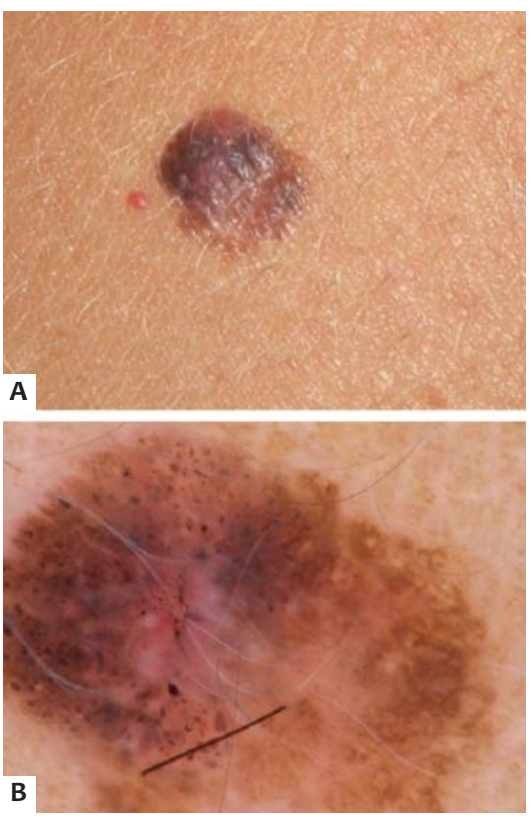

Figure 5: (A) Irregularly pigmented papular lesion. **(B)** Dermatoscopy showing overall multicomponent pattern, with amorphous areas, pigmented network, irregular dots and globules, and erythema

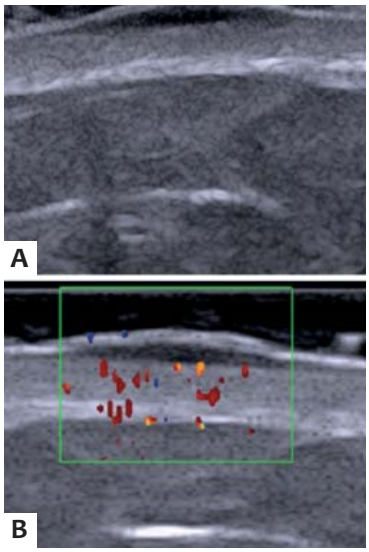

Figure 6: (A) Irregularly pigmented papular lesion. **(B)** Dermatoscopy showing overall multicomponent pattern, with amorphous areas, pigmented network, irregular dots and globules, and erythema

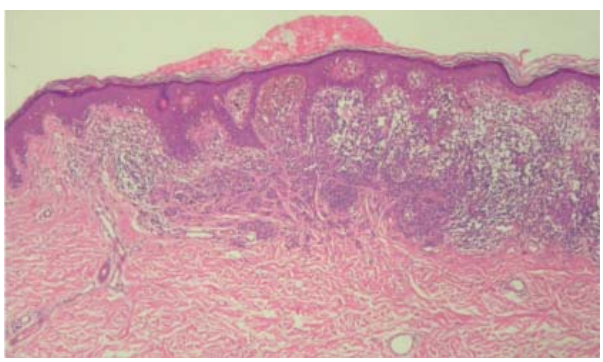

Figure 7: Central area of involvement in the epidermis and upper dermis by proliferation of anaplastic melanocytic cells, with irregular distribution of the melanin pigment. Extensive superficial type melanoma; Breslow = 0.62mm and Clark level III; Hematoxylin & eosin 10X

Some factors may lead to errors in the measurement of tumoral thickness with HFUS; an inflammatory process associated with neoplasia, procedures prior to the examination, a presence of perilesional hypertrophic glands and association with nevus/melanoma can induce the overestimation of their size.On the other hand, the presence of ulceration can induce underestimation. As limitations of the method, the authors cite the inability to detect epidermal lesions and those with diameters less than 1mm, in addition to the fact that it is operator-dependent.[10, 12, 21, 24]

FINAL CONSIDERATIONS

To date, histology is the gold standard for diagnosis and structural morphological evaluation of cutaneous neoplasms.

However, new techniques for in vivo diagnosis have been used to streamline diagnosis and optimize pre-operative evaluation. HFUS examination exists as a great method to evaluate skin cancer. As it is incapable of assessing tumor cellularity, it cannot be used to confirm diagnosis.However it does allow for the performing of detailed pre-operative study, examination of the different skin layers and their respective thicknesses, indicating the tumor nature (cystic or solid), and providing their size, exact location and the involvement of adjacent structures.

In combination, the blood flow of the lesion and its surrounding area can be estimated by Color Doppler ultrasonography. This analysis provides important parameters for the guidance of the therapeutic approach. ●

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Questions for continuing medical education – CME

1) Regarding dermoscopy, it can be stated that:
- **a.** it is a non-invasive method aimed at replacing histology
- **b.** it should only be used in the evaluation of pigmented cutaneous tumors
- **c.** it is not a method suitable for assessing the involvement of structures adjacent to the tumor, such as cartilage and muscle
- **d.** it allows the histological type of cutaneous tumor lesions to be defined
- **e.** it must always be performed with interface liquid

2) Regarding skin cancer, it is incorrect to state that:
- **a.** non-melanoma cutaneous cancer is the most common in humans
- **b.** melanoma is the most aggressive type of tumor in humans
- **c.** since the last decade the incidence of skin cancer has been stable due to the reduction in size of the hole in the ozone layer
- **d.** melanoma is the leading cause of death in skin cancer
- **e.** the best strategy for decreasing the mortality rate is early diagnosis

3) Select the correct statement:
- **a.** eighty percent of basal cell carcinomas occur in individuals who are under the age of 50.
- **b.** the type of exposure to the sun that is most frequently associated with basal cell carcinoma and melanoma is intermittent intense
- **c.** the hedgehog signaling pathway is linked to the etiopathogeny of the melanoma
- **d.** ulceration occurs more often in the superficial basal cell carcinoma variety
- **e.** HIV-positive patients have a higher incidence of melanoma

4) Regarding the images obtained through ultrasonography, select the incorrect statement:
- **a.** the ultrasonic waves are reflected back to the transducer, which turns them into a grayscale
- **b.** the higher the frequency of the waves emitted by the transducer, the better the visualization of superficial structures
- **c.** transducers with frequencies above 15MHz emit short length waves
- **d.** neoplasms usually appear as hyperechoic areas
- **e.** in the ultrasound image, the epidermis appears as a hyperechoic line, the dermis as a hyperechoic band that is not as smooth as the epidermis, and the subcutaneous layer as a hypoechoic layer with the internal presence of hyperechoic fibrous septa

5) For ultrasound cutaneous analysis, one recommendation is:
- **a.** the use of a thick layer of gel between the skin and the transducer
- **b.** firm contact of the transducer with the skin in order to avoid distortions
- **c.** carrying out the measurement of tumor thickness in the central portion of the lesion
- **d.** the size of the transducer is not relevant for the examination
- **e.** that it not be performed on pregnant patients

6) Regarding the presence of hyperechoic dots observed in a cutaneous tumor through HFUS, it is correct to state that:
- **a.** it is more frequently observed in squamous cell carcinomas
- **b.** when found in the context of a melanoma, they indicate a better prognosis
- **c.** these images are attributed to the presence of corneal cysts, microcalcifications, or clusters of apoptotic cells
- **d.** it is linked to the degree of differentiation of the tumor
- **e.** it is indicative of malignancy

7) Regarding the use of HFUS in the management of melanoma, it can be stated that:
- **a.** it enables an accurate analysis of pre-operative tumor thickness when associated with nevus/melanoma
- **b.** in general, the tumor appears as a heterogeneous and hyperechoic area
- **c.** with the use of Color Doppler it is possible to observe an atypical vascular pattern composed of irregular and punctiform linear vessels
- **d.** the evaluation of regional lymph nodes offers better results for the detection of metastases than those of the clinical examination
- **e.** it allows the visualization of a possible nevic component in the lesion

8) Among the factors that can compromise the analysis of tumor thickness, the following stand out, except for:
- **a.** association with the inflammatory process
- **b.** the presence of perilesional hypertrophic glands
- **c.** ulceration
- **d.** association with other tumors
- **e.** intense exposure to sunlight prior to the examination

9) Regarding the use of HFUS in the evaluation of cutaneous cancer, it can be stated that:
- **a.** it is an excellent method for defining cellularity of the tumor
- **b.** it allows for the determination of the size and the cystic or solid nature of the tumor
- **c.** it eliminates the use of dermoscopy and histology
- **d.** it is less sensitive than the laser confocal microscopy in deep tumors
- **e.** it should not be used in cases of suspected melanoma

10) In normal skin, the echogenicity of each layer depends on its main component. As for the sonographic appearance of normal skin, it is incorrect to state that:
- **a.** the epidermis appears as a hyperechoic line
- **b.** the dermis appears as a hyperechoic band that is not as smooth as the epidermis
- **c.** the subcutaneous appears as a hypoechoic layer with the internal presence of fibrous septa
- **d.** the dermal-epidermal junction appears as a hypoechoic band
- **e.** the dermis is less echogenic than the epidermis

Key
Deep phenol *peeling*: how to control pain during application and during the twelve hours following(1):11-5.

1B, 2D, 3E, 4D, 5C, 6D, 7D, 8E, 9E, 10E

Answers must be submitted online using the website www.surgicalcosmetic.org.br.
The deadline for submitting answers will be provided by e-mail with a direct link for accessing the journal.

Nasolabial interpolation flap for alar reconstruction after Mohs micrographic surgery

Retalho interpolado do sulco nasogeniano para reconstrução da asa nasal após cirurgia micrográfica de Mohs

ABSTRACT

Introduction: The nasolabial interpolation flap is an essential flap in nasal reconstruction. Its main indications are deep and extensive defects of the nasal ala.

Objectives: To evaluate the usefulness of the nasolabial fold interpolation flap for alar reconstruction after Mohs micrographic surgery—especially in an outpatient setting and under local anesthesia—as well as to discuss refinements in its design and execution.

Methods: Retrospective study of patients with nasal ala defects resulting from Mohs micrographic surgery repaired with nasolabial interpolation flap.

Results: Eighteen patients were included in the study; 7 (39%) had localized defects in the ala only and were reconstructed with an isolated nasolabial interpolation flap; however 11 (61%) had defects involving both the ala and some adjacent anatomical subunit. These patients underwent a combined reconstruction. Resection of the remaining portion of a subunit was performed in 14 (78%) cases. There were no complications or recurrence after an average follow up of 29 months. Excellent functional and aesthetic results were achieved in all patients.

Conclusions: The nasolabial interpolation flap is essential in the reconstruction of alar defects after Mohs micrographic surgery. If adjacent subunits are involved—such as the medial cheek or nasal sidewall—the nasolabial interpolation flap must be combined with another method of repair. The flap can be safely performed in an outpatient setting.

Keywords: Mohs surgery; surgical flaps; nose neoplasms.

RESUMO

Introdução: *O retalho interpolado do sulco nasogeniano é retalho essencial em reconstrução nasal. Suas principais indicações são defeitos extensos e profundos da asa nasal.*

Objetivos: *avaliar a utilidade do retalho interpolado do sulco nasogeniano para reconstrução alar após cirurgia micrográfica de Mohs, sobretudo em ambiente ambulatorial e sob anestesia local, bem como discutir refinamentos em seu design e execução.*

Métodos: *Estudo retrospectivo de pacientes com defeitos de asa nasal decorrentes de cirurgia micrográfica de Mohs reparados com retalho interpolado do sulco nasogeniano.*

Resultados: *18 pacientes foram incluídos no estudo; sete (39%) tinham defeitos localizados apenas na asa e foram reconstruídos com retalho interpolado do sulco nasogeniano isoladamente; 11 (61%), entretanto, tinham defeitos envolvendo a asa e alguma subunidade anatômica adjacente. Esses pacientes foram submetidos a reconstrução combinada. Ressecção da porção remanescente de alguma subunidade foi realizada em 14 (78%) dos casos. Não houve complicações ou recorrência após seguimento médio de 29 meses. Ótimos resultados funcionais e estéticos foram alcançados em todos os pacientes.*

Conclusões: *O retalho interpolado do sulco nasogeniano é retalho fundamental na reconstrução de defeitos alares após cirurgia micrográfica de Mohs. Se subunidades adjacentes como bochecha medial ou parede nasal estiverem envolvidas, o retalho interpolado do sulco nasogeniano deve ser combinado com outro método de reparo. O retalho interpolado do sulco nasogeniano pode ser realizado com segurança em ambiente ambulatorial.*

Palavras-chave: *cirurgia de Mohs; retalhos cirúrgicos; neoplasias nasais.*

Original Articles

Authors:
Felipe Bochnia Cerci[1]
Tri H Nguyen[2]

[1] Dermatologist. Dermatology fellowship at Wake Forest University - North Carolina, USA. Dermatologic and Mohs surgery faculty at Santa Casa de Curitiba - Curitiba, PR, Brazil.

[2] Dermatologist in private practice. Previous Director of Mohs Surgery Fellowship at the MD Anderson Cancer Center - University of Texas, Houston (TX), USA.

Correspondence:
Hospital Santa Casa de Misericórdia de Curitiba
Departmento de Dermatologia
A/C. Dr. Felipe Bochnia Cerci
Praça Rui Barbosa, 245 - Centro
Cep: 80010-030 - Curitiba – PR, Brazil
E-mail: cercihc@hotmail.com

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INTRODUCTION

The nasolabial fold interpolated flap or *cheek to nose interpolation flap* (CNIF) is an instrumental flap in nasal reconstruction. The skin of the donor area (medial cheek) is very similar to that of the nasal ala.[1] Its main indications are extensive and profound defects of the nasal ala and, less often, small defects of the lower portion of the nasal tip and columella.[2] Proper training, good surgical technique, and careful planning are necessary to achieve optimal results.

The CNIF is classified as an interpolated flap done in stages due to the following characteristics: vascular pedicle based on a specific artery and/or on its tributaries, distant donor area and not contiguous to the defect, and more than one stage to complete implementation.[3] Other interpolated flaps, such as the paramedian frontal flap (PFF), are capable of repairing distal nasal defects.[4]

Chart 1 compares CNIF's and PFF's characteristics in nasal reconstruction. One of the CNIF's advantages as compared to other flaps employed in alar reconstruction is the preservation of the alar groove, for which restoration is challenging when it is eliminated by single stage flaps (transposition of nasolabial fold), resulting in asymmetry of the alar grooves and an unfavorable outcome.[5] The disadvantages are related to the fact that it needs two stages to be implemented, the post-operative care required for the exposed pedicle and, in men, the potential transfer of facial hairs to the nasal ala.[2] The scar in the donor area is usually imperceptible. However, asymmetry of nasolabial folds may occur.[6]

The purpose of the present study is to evaluate CNIF's usefulness in alar reconstruction after Mohs micrographic surgery, especially in an outpatient setting under local anesthesia, as well as to discuss refinements in its design and implementation.

METHODS

Patients

A retrospective study was carried out with 18 patients whose alar defects resulting from Mohs micrographic surgery were repaired with CNIF. The cases were selected from a private practice Mohs clinic in the period 2010-2013. Through the review and analysis of medical records and extensive photographic documentation, the following demographic and surgical data was evaluated: age, gender, tumor type, size of defect and involved subunits, number of Mohs stages, additional measures for the patient's comfort, cartilage grafts, pedicle design, post-operative complications, smoking habits, and follow-up and outcomes.

Prior to the surgery, all patients signed a Free and Informed Term of Consent allowing the publication of photographs in scientific journals. All procedures (Mohs surgery to remove the tumor and subsequent reconstruction) occurred in an outpatient setting. Nerve blocks (infraorbital) supplemented local anesthesia in some cases. Before the procedure, patients were given analgesics, benzodiazepines or oral antibiotics, as necessary. Most of the reconstructions occurred on the same day after Mohs surgery. Typically, the second stage was performed at three to four weeks after the first.

Design and implementation of the flap

CNIF requires significant knowledge of anatomy, surgical planning, and surgical skills in order to achieve a correct design and successful implementation. The pedicle is marked close to the lateral portion of the alar groove. Unlike the pedicle of the PFF, which contains the supratrochlear artery, CNIF depends on the angular artery's myocutaneous perforators and tributaries for its viability, making it a random flap. As a result, its vascularization is lower than that of the PFF.[2] Charts 2 and 3 describe the design and implementation of the flap step-by-step. (Figures 1-5) A variation of the traditional design is an option for patients whose terminal hairs might be transferred from the medial cheek. In this case, the pedicle is based inferiorly in order to recruit tissue from the upper and medial portions of the cheek, adjacent to the nasal wall.

RESULTS

Eighteen patients were included in the study. Demographic and surgical data is shown in Table 1. Patients ranged in age from 46 to 82 years (mean = 69 years), with no differences by gender (9 men X 9 women). Basal cell carcinoma was the most common cancer found (n = 16), followed by squamous cell carcinoma (n = 2). The number of Mohs stages required to obtain free margins ranged from 1 to 6 (average = 2.55). The size of the surgical defect ranged from 1.5 cm X 1.0 cm to 2.0 cm X 1.8 cm (average = 1.8 X 1.4 cm). Data concerning additional measures for greater patient comfort were available in 14 patients. Six (33%) patients received anxiolytics or oral analgesics as adjuvants to local anesthesia. Infraorbital block was performed in 8 (57%) patients. Only one participant was a smoker.

Seven patients (39%) had defects located only in the nasal wing, having been reconstructed with CNIF alone. However, 11 patients (61%), had defects involving the nasal wing and some adjacent anatomical subunit. Those patients underwent combined reconstruction, most commonly secondary intention (n = 7), due to the favorable location and small size of the non-alar defect. For the remaining patients, primary closure (n = 2), advancement of the cheek (n = 1), and bovine dermal collagen (n = 1) were combined with CNIF. The most frequently affected adjacent subunit was the nasal wall (n = 7), followed by the medial cheek (n = 3). Resection of the remaining portion of any subunit was performed in 14 (78%) of cases.

Structural support provided by auricular cartilage was necessary in 17 (94%) patients. The cartilage graft was removed from the scaphoid fossa/antihelix (n = 16) or concha (n = 1), through posterior incision in 15 (83%) patients. Bovine dermal collagen was used in three (17%) patients to cover the exposed surface of the pedicle.

There were no complications, such as post-operative bleeding, infection, or necrosis. No recurrence was observed after the follow-up, which ranged from 5 to 49 months (mean = 29 months). Optimal functional and aesthetic results were achieved in all patients.

DISCUSSION

The nasal ala is a common site for the occurrence of skin cancer and often presents challenging surgical defects following Mohs micrographic surgery.[7] Repair options should be individ-

Chart 1: Comparison between CNIF and PFF

Parameters	Nasal Fold Interpolated Flap (CNIF)	Paramedian Frontal Flap (PFF)
Indications	Nasal ala. Less frequently: nasal tip, columella, and root. Minor defects. Reduced complexity.	Nasal tip, wing. Less frequently: nasal wall and dorsum, periorbital. Larger defects, multiple subunits.
Varcularization and pedicle preparation	Random: angular artery's tributaries and muscular perforators. Preparation of the pedicle may be more difficult. Less reliable vascularity. Flap at higher risk in smokers.	Axial pattern: contains the supratrochlear artery and its tributaries. Dorsal nasal artery as secondary blood supply. Predictable identification of the vessel and easier maintenance. Robust vascularization, allowing revisions in intermediate stages and repair of the nasal lining with skin grafts.
Post-operative morbidity	Less pain, usually related to the cartilage donor area. Rare nausea, headache and vomiting. Patients can wear glasses to drive. Generally, it is possible to work.	Pain is variable, usually related to the cartilage donor area. Rare, but more frequent than in CNIF. Difficult to wear glasses without customized devices. Continued working can be difficult (after the 1st stage).
Cartilage graft	Patency of the nasal valve should be preserved. Cartilage is required in most cases to balance the contraction forces of healing.	Patency of the nasal valve should be preserved. Need for cartilage is variable.
Limitations (patients)	Young patients with less prominent nasolabial folds can develop more visible scars. Transfer of facial hairs is more likely (originally from the beard area in men).	Forehead's vertical extent determines the reach of the flap, which is quite variable. Transfer of hairs varies according to the PFF's length and hair density in the frontal part of scalp.

ualized according to each patient and surgical defect. For extensive and profound defects of the nasal wing, however, options that promote good functional and aesthetic results are limited. Although other options could be considered for such defects, CNIF has the advantage of preserving the alar groove and concealing the donor scar in the melolabial fold.[5] The "soft" and fibrofatty nature of the donor area of the cheek is an additional advantage of the CNIF. The tissue of the cheek tends to contract and trapdoor. While this might be unfavorable in other places, it can effectively recreate the alar lobule's convexity. PFF is thicker and more rigid, and less capable of simulating the smooth and convex contour of the wing.[8]

The principle of anatomical subunits is a key concept in reconstruction. If a defect involves more than half of the subunit, excising the remaining portion and repairing it as a whole can provide better results.[9] (Figure 1) In the present study, 14 (78%) patients had their remaining alar subunit resected with excellent results. This principle, however, is not absolute.[10] Through careful selection, some defects can be repaired without the complete resection of the subunit.

When different subunits are affected, independent closure options should be considered. This is especially true for subunits separated by concavities, such as the alar crease. The attempt to repair the nasal ala and medial cheek/nasal wall with CNIF can result in an enlarged nasal ala besides eliminating the alar groove. Small defects in these adjacent areas should be left to heal by secondary intention, which helps in recreating the alar groove's concavity. For medium to large defects, cheek advancement flaps are a sensible option. Following that principle, all patients with defects that extended into the medial cheek or nasal wall were reconstructed with combined options. (Figure 1)

The CNIF provides thickness of soft tissue, however it does not provide structural support. The nasal mucosa (nasal lining) and cartilage are the infrastructures that must be intact or be supplemented or repaired prior to the implementation of CNIF.[11] Given that the CNIF is most often used for partial thickness alar defects, the repair of the nasal lining will not be discussed in the present article.

Cartilage grafts can be structural (native cartilage is present however there is need for additional cartilage for support) or

Chart 2: CNIF Stage 1 – Steps and Comments

STEPS	comments
1 - Mark the natural limits before anesthetizing	Mark the nasolabial folds and the nasal subunit. Consider resecting the remaining portion of the alar subunit, except for 1 mm adjacent to the borders of the alar base and rhyme (Figure 1).
2 –Create a template of the repair (defect + / - adjacent subunits) beforehand	Create the template before excising any subunit in order to avoid artificially larger dimensions due to the contraction of the defect. Use the packaging of the suture as the material for the template. The template can be based on the unaffected contralateral half.
3 - Transfer the model to the cheek	Place it with its longer extent on the line of the oral commissure (Figure 2). The flap's movement is counterclockwise when the defect is on the right nasal ala (and clockwise, when on the left). Position the flap anticipating the movement it will cause. Confirm the flap's reach using a suture or gauze.
4 - Draw the pedicle	Draw triangles medially and laterally to the flap creating an ellipse. The proximal triangle must be at least 0.5 cm below the alar groove in order to keep it from being deleted. Although the medial triangle has a narrow drawing, the underlying pedicle is wide and deep so as to maximize the blood supply (myosubcutaneous pedicle) (Figure 2).
5 – Anesthesia	Local anesthesia with nerve block (infraorbital nerve). Consider benzodiazepines or oral analgesics for patient comfort. Avoid anesthetizing all areas at the same time. Set the order of the local anesthesia aiming at maximizing patient comfort. First, anesthetize the cartilage donor area, then the cheek. Remove the cartilage and start to detach the flap. Only after the flap has been partly detached, anesthetize the nose. Regarding the nose, consider supplementing with bupivacaine for longer lasting action.
6 (#) - Repair of nasal overlay	The CNIF is more effective when the nasal overlay is untouched.
7 (*) – Removal of the cartilage graft	The antihelix and concha are ideal areas. The cartilage of the antihelix (Figure 3A) is most often used in CNIF. However, where more rigidity is required, the concha's cartilage can be used. The grafts must be longer than the horizontal lengths of the defects in order to be properly fixed. If necessary, sculpt the cartilage in order to avoid sharp edges. Apply temporary pressure on the donor areas.
8 (*) – Closing/Closure of the ear	The ear is a common site of hematoma after the removal of the cartilage graft. Suture it first by placing a brown bandage before incising the cheek.
9 (*) - Suture the cartilage to the nose	Create "pockets" on each side of the defect with the scalpel blade. The cartilage must be inserted in these pockets (Figure 3B). Carry out a figure eight suture, which helps to stabilize the free end of the cartilage. "U" suture or simple suture help to stabilize the cartilage over the underlying cartilage or to stabilize the cartilage in the nasal free margin.
10 - Incise the flap	At the flap's upper border, tilt the incision inwards in order to create a delicate border (better fit for the alar free border). In the other borders, incise vertically.
11 – Detach the flap	The flap is elevated in two different planes. At the distal margin, raise it to the superficial subcutaneous tissue (subdermal, 3 mm). In the pedicle's margin, elevate it to a deeper plane in a way that includes the deep subcutaneous and fibers of the elevator of the upper lip and nasal ala (Figure 4). Partial inclusion of the muscle is essential to preserve the perforating arteries in order to supply the flap.
12 - Prepare the defect	Trim the edges in a way that they become perpendicular, except for the nasal free border, which must have an inwards slanted border, in order to allow a better fit of the inclined border of the flap. The remaining portion of the alar subunit must not be resected up to the pedicle's division (unless it is the ala's medial portion).
13 – "Thin out" in the distal part of the flap	When necessary, remove excess subcutaneous tissue of the distal part of the flap, leaving a thin layer of subdermal fat. Evaluate the vascularization (bleeding at the flap's borders) as it becomes thinner.
14 - Suture the donor area	Suture the cheek primarily, directing the vector supero and obliquely, in two layers. This will gradually move the flap to the defect.
15 - Suture the flap to the nose	Start at the medial portion of the ala with superficial interrupted sutures aiming at aligning and inserting the flap. Once aligned, the remaining must be sutured in two planes in order to minimize the incision lines.
16 - Cover the pedicle	Unlike the PFF's pedicle, the CNIF's pedicle is less likely to bleed in post-operatively. If necessary, the exposed pedicle may be coated with bovine dermal collagen or Surgicel R in order to reduce the possibility of bleeding.
17 – Apply the dressing to the pedicle	Wrap the pedicle with a gauze impregnated with Vaseline, without excessive pressure.

Step # 6: necessary for full-thickness defects.

* Steps 7, 8, and 9: cases requiring cartilage graft. The cartilage graft in the cheek to nose interpolation flap is structural and non-repairing since there is no cartilage in most of the nasal ala's fibrofatty tissue.

Chart 3: CNIF Stage 2 – Steps and Comments

Steps	Comments
1 - Division of the pedicle	Incise the pedicle near the base in the shape of a "V".
2 - Suture the base of the pedicle	Primary closure or in the shape of a "V" using the proximal portion of the pedicle.
3 - Excise the remaining portion of the subunit	Excise the remainder of the subunit, except for 12 mm from the base of the ala, which serves to anchor the flap and preserve the lateral alar groove. If a cartilage graft was inserted, extra care must be taken.
4 - Trim and "thin out" the flap	Carefully lift the flap's lateral portion incising the suture lines from Stage 1 (Figure 5). Mark the excess skin to be excised. "Thin out" and trim the flap as needed.
5 - Suture the flap	Carefully move the borders closer to each other, in two planes.

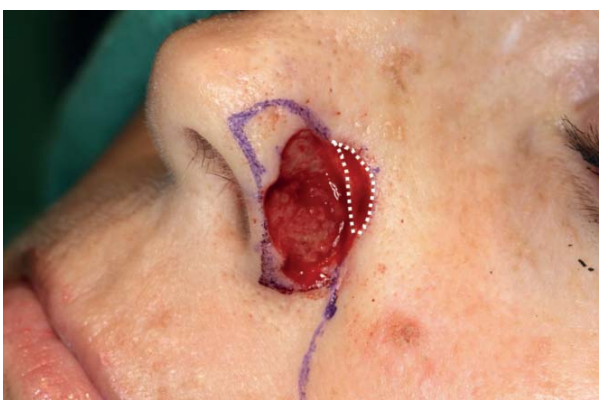

Figure 1: Defect involving more than 50% of the left nasal ala. The remaining portion of the ala has been removed. The portion involving the inferior nasal wall (dotted) was allowed to heal by second intention.

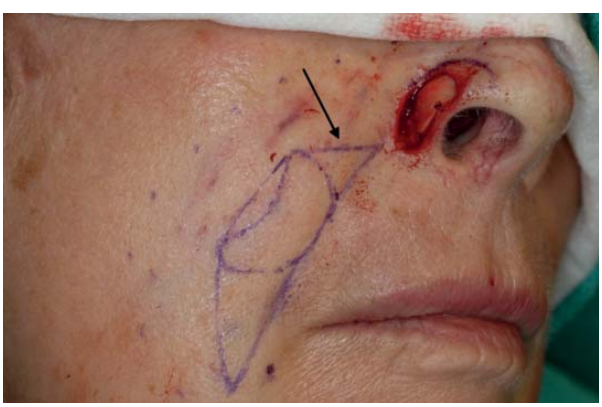

Figure 2: *Design* of the flap with the wider part positioned above the lip commissure. The proximal triangle (arrow) is purposefully smaller on the surface for better mobility of the pedicle. The distal triangle must be large enough to allow the resection of the excess tissue.

restorative (replacement of removed cartilage). Cartilage grafts for CNIF are usually structural and not restorative, since there is no cartilage in most of the nasal ala, but only adipose and fibrous tissue. The structural functions of cartilage include: 1) preventing tissue contraction and distortion, 2) supporting "heavy" flaps, 3) maintaining nasal patency and widening the internal nasal valve, and 4) providing support for the contour.[3] Donor areas of cartilage include the scaphoid fossa/anti-helix and auricular concha.[12, 13]

The incisions for the harvesting of cartilage can be either anterior or posterior. Anterior incisions are easier to access, however result in more visible scars. Cartilage of the anti-helix is ideal for long, flexible, and straight segments (Figure 3), while that of the concha is ideal for grafts that require more curvature, substance, and rigidity. Concha's grafts are more suitable for avoiding the collapse of the nasal valve and lobe. Anti-helix's grafts are more suitable for preventing the contraction of the free nasal border.[12, 13] It is often necessary to sculpt the graft in order to obtain the desired thickness, shape, borders, and contour. This must be done carefully as the cartilage is a fragile structure and may fracture during the process.

Traditionally, a scalpel blade n. 15 is used to sculpt, however a shaving blade allows a more gentle sculpting of the graft's contours. Cartilage grafts can be removed safely under local anesthesia and with a low complication rate.[14, 15] Post-operative pain is variable. Nonetheless, if cartilage grafts were performed, the auricular donor region is likely to be more painful than that of the cheek. For patient comfort, injection of a long duration anesthetic (bupivacaine) is recommended, after suturing the auricular donor area, in addition to administering post-operative analgesia (combined anti-inflammatory/narcotic combination).

The pedicle of the CNIF can be myocutaneous (skin portion of the pedicle connected) or myosubcutaneous (epidermis and dermis are completely incised proximally and released).[3] (Figure 6) myosubcutaneous design is preferable since it makes the flap island flap release the restriction of the epidermis and dermis, and reduces tension and twists the pedicle. Furthermore, the

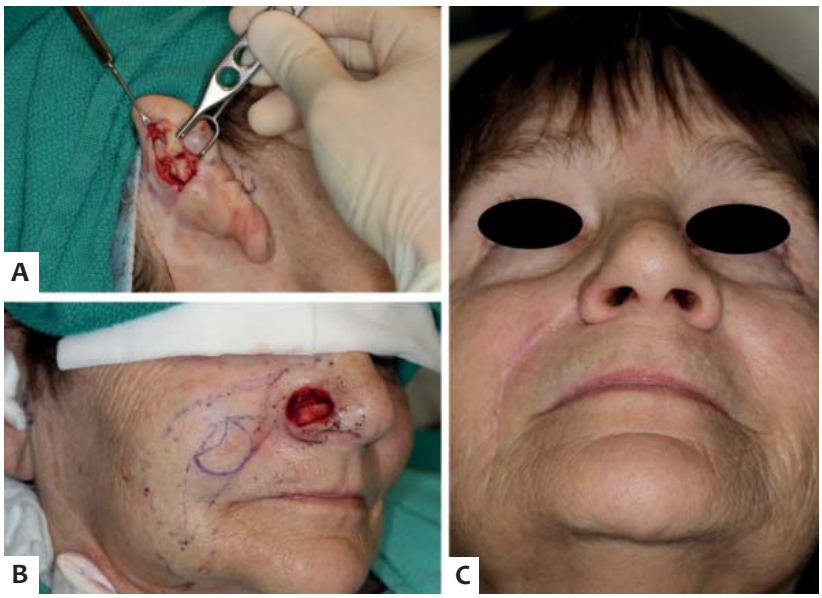

Figure 3: A) Cartilage graft taken from the scaphoid fossa through a posterior incision.
B) Fixed graft cartilage.
C) Four months post-operatively. Preserved alar contour without compromise of the nasal vestibule.

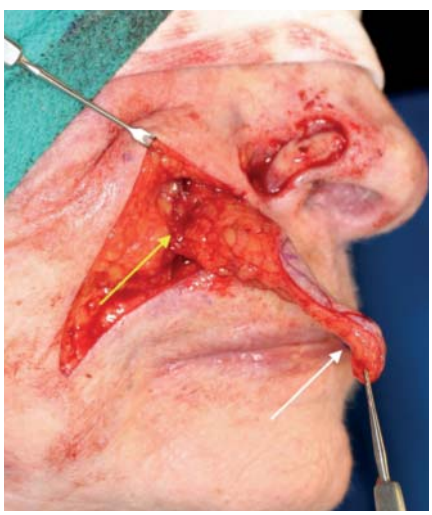

Figure 4: Flap elevated in the superficial subcutaneous in its distal half (white arrow) and deep subcutaneous in its proximal half. Notice the wide myocutaneous pedicle with fibers of the elevator muscle of the upper lip and nasal ala (yellow arrow)

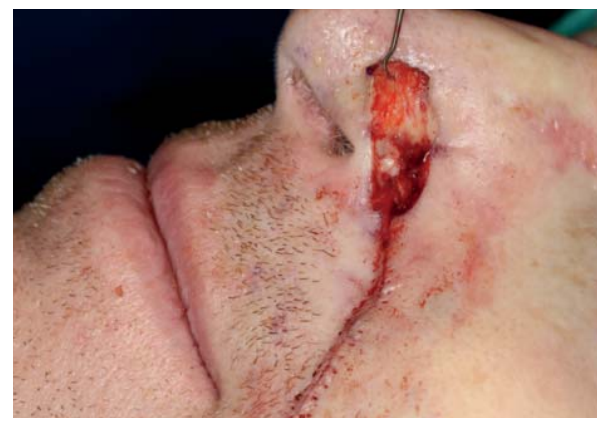

Figure 5: Flap elevated for "thinning out" during the 2nd stage. The hook is used to pull gently.

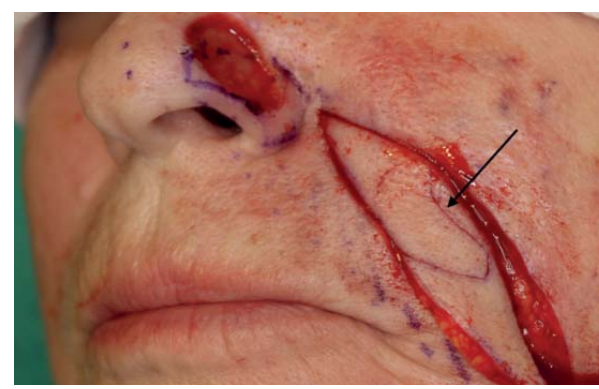

Figure 6: Myocutaneous pedicle. Epidermis and dermis are completely incised in the portion that is close to the alar groove. The flap is incised superficially (arrow), prior to its mobilization.

design in the shape of an "island", allows dissection of a wider pedicle, with a smaller proximal triangle, increasing mobility.

Regardless of design, both pedicles should contain muscle fibers of the elevator of the upper lip and nasal ala. In this study, all pedicles were myosubcutaneous. Potential complications include CNIF post-operative bleeding, improper healing, infection, dehiscence, distortion-free margins, and necrosis.[16] In a recent study by Newlove and Cook,[17] the CNIF complication rate when performed by dermatologic surgeons in an outpatient setting under local anesthesia, was equal to or lower than in studies of other surgical specialties. In this study there were no complications, possibly due to the smaller number of patients.

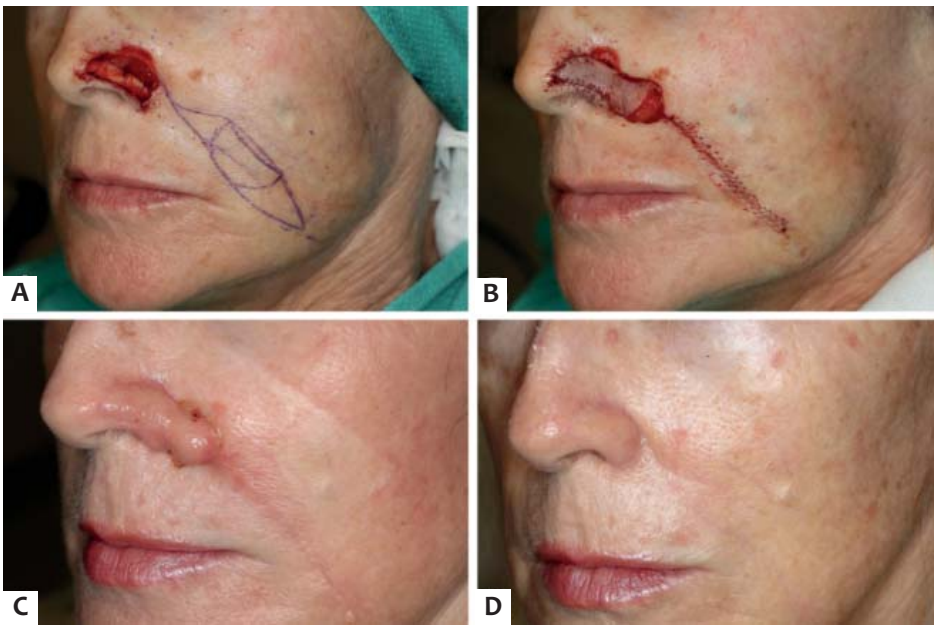

Figure 7: **A)** Defect with cartilage fixed.
B) Sutured flap. The inferior nasal wall was allowed to heal by second intention.
C) Flap before the division of the pedicle.
D) Seven-months post-operatively with repair of the alar convexity and preservation of the alar groove.

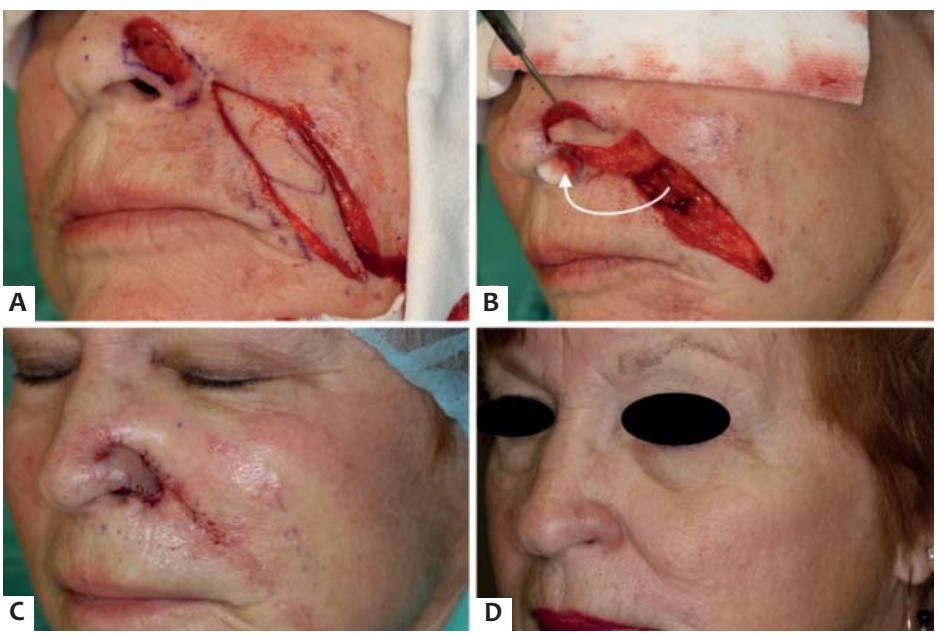

Figure 8: **A)** Flap's design.
B) Flap's movement (clockwise for defects on the left hand side – arrow).
C) Flap after the division of the pedicle.
D) Three-months post-operatively.

CONCLUSION

The CNIF is crucial in reconstructing alar defects after Mohs micrographic surgery. If adjacent subunits such as the medial cheek or nasal wall are involved, the CNIF must be combined with another repair method for best results. With proper planning and meticulous surgical technique, the CNIF can be safely performed in an outpatient setting. (Figures 7 and 8) ●

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Article Original

Treatment of pincer nails with the Fanti's technique

Tratamento de unha em pinça pela técnica de Fanti

Authors:
Guilherme Bueno de Oliveira[1]
Natalia Cristina Pires Rossi[2]
Doramarcia de Oliveira Cury[2]
Julia Maria Avelino Ballavenuto[3]
Roberto Carlos Antonio[4]
João Roberto Antonio[4]

[1] Collaborating Instructor at the Dermatologic Surgery Ambulatory, Faculdade de Medicina Estadual de São José do Rio Preto (FAMERP) – São José do Rio Preto (SP), Brazil

[2] Dermatology Resident Physician at FAMERP

[3] Medical student at FAMERP

[4] Head of the Department of Dermatologic Surgery, FAMERP

[5] Emeritus Professor and Head of the Dermatology Department, FAMERP

Correspondence:
Dr. Guilherme Bueno de Oliveira
Rua Dr. Fernando Magalhães - 315
Cep: 15091-095 - São José do Rio Preto – SP, Brazil
E-mail: mggbueno@uol.com.br

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ABSTRACT

Introduction: Pincer nails are characterized by an over-curvature of the nail in the transverse axis, causing the pinching of the nail bed at its distal portion. It most commonly affects the toes, occurring rarely in the fingers.

Objective: To demonstrate the Fanti's technique for the treatment of pincer nails.

Methods: Eleven patients from the Hair and Nails Ambulatory, bearing pincer nails, underwent surgery for the correction of the condition with the Fanti's technique.

Results: All patients had complete clinical improvement during the 14-month follow-up period.

Conclusions: The present study demonstrates the Fanti's surgical technique for the correction of pincer nails, where anatomical and functional improvement of the operated nails could be observed.

Keywords: nail diseases; nails; nail biting.

RESUMO

Introdução: *A unha em pinça caracteriza-se pela hipercurvatura da unha no eixo transversal, o que provoca o pinçamento do leito ungueal em sua porção distal. Acomete mais comumente os dedos dos pés, podendo ocorrer, mais raramente, nos dedos das mãos.*

Objetivo: *Demonstrar a técnica de Fanti para tratamento de unha em pinça.*

Métodos: *Onze pacientes com unha em pinça do Ambulatório de Cabelos e Unhas se submeterem a cirurgia para correção dessa patologia pela técnica de Fanti.*

Resultados: *Todos os pacientes apresentaram melhora completa do quadro clínico no período de seguimento de 14 meses.*

Conclusões: *Este trabalho demonstra a técnica cirúrgica de Fanti para correção da unha em pinça, podendo-se observar melhora anatômica e funcional das unhas operadas.*

Palavras-chave: *doenças da unha; unhas; unhas encravadas.*

INTRODUCTION

The transverse over-curvature of the nail is clinically classified into three types: 1) Pincer nail – where the over-curvature is increased along the axis in the proximal to distal direction (most common); 2) Tile nail – where there is a transverse over-curvature, however with the lateral margins remaining parallel; and 3) Folded nail –where there is moderate convexity on one or both sides of the lateral margins, which abruptly changes the angle, piercing in a cutting manner, on the lateral portion of the nail bed.[1-3]

The pincer nail most commonly affects the toes, occurring rarely in the fingers. 2, 3 Its etiology has not yet been fully elucidated, being attributed to several factors and diseases. As it

evolves, the over-curvature can cause pain, discomfort when using closed shoes, and secondary infections.[3-5]

Several surgical techniques have been proposed to correct deformities of the nail, varying according to the purpose of the treatment.[6-8] Although not having yet been enshrined in the technical literature, Fanti's technique is an alternative proposed for the treatment of pincer nails.

METHODS

Eleven patients with pincer nails were selected from the Hair and Nails Ambulatory of the Dermatologic Clinic of the The Faculdade de Medicina Estadual de São José do Rio Preto São José do Rio Preto (SP), Brasil. All patients underwent surgical and radiological evaluation with X-ray before undergoing surgery. The study was conducted according to the norms established by the Declaration of Helsinki 2000.

The goal of the surgical Fanti's technique is to widen the nail bed, decreasing the existing constriction. The complete technique consists of the following steps: 1) Asepsis of the finger; 2) Nerve block anesthesia with 2% lidocaine without epinephrine; 3) Placement of the tourniquet; 4) Total removal of the nail plate (Figure 1A); 5) Phenolization of the nail matrix (bilateral); 6) Median longitudinal incision of the nail bed up to the bone plane –from the free border up to the point just before the lunula – and excision in a "U" shape of the lateral and distal borders (Figures 1B, 1C and 1D); 7) Detachment of the nail bed close to the bone, creating two flaps; 8) Osteotomy of the ventral surface of the distal phalanx if necessary and diagnosed in the radiological evaluation (Figure 2); 9) Suture of the flap's tip with 4-0 monofilament nylon thread, laterally, in the nail fold (Figure 1D); 10) Hemostatic running sutures in the lateral and distal folds with 4-0 monofilament nylon thread (Figure 1F); 11) Removal of the tourniquet; 12) Application of dressing. The dressing is kept for 48 hours and then changed daily. The stitches are removed within 7 to 14 days.

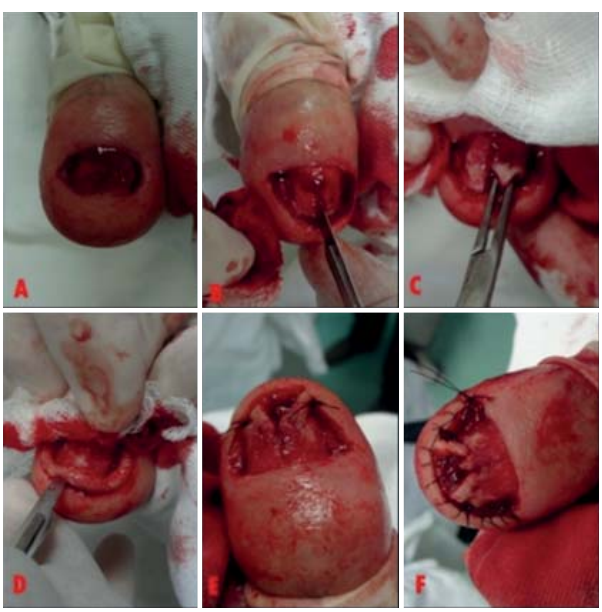

Figure 1: Surgical technique of Fanti

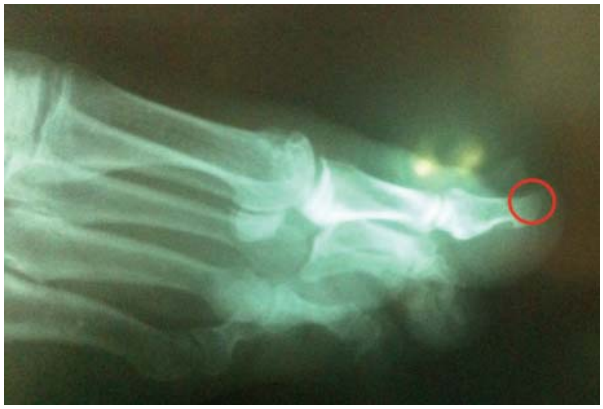

Figure 2: Osteophyte in the distal phalanx

RESULTS

Patients undergoing Fanti's technique surgery had a thickened nail plate, clamping all along the longitudinal axis, mainly distal, and atrophy with keratinization of the nail bed. (Figures 3 and 4) After 14 months of observation there was significant improvement in the function of the nail, with an absence of symptoms and normalization of the local appearance, rectification of the nail plate and lengthening of the bed (Figures 5 and 6).

Post-operatively, all patients had moderate pain for a week, being more intense in the first 24 hours. After the removal of the stitches (7 to 14 days after the surgery), there were no reports of pain. The removal is allowed when the aspect of the nail is that of an adherent hematic crust (Figure 7).

The nail's function and aesthetics begin 21 days after the procedure and become complete in three months. In the third week, patients were allowed to use closed shoes with dressings dampened with oils, with an absence of reports of pain.

DISCUSSION

Pincer nails can be inherited or acquired. The hereditary type, where family history and symmetry are present, usually affects the hallux but can affect any of the other toes or fingers.[1, 2, 6] The acquired type, where a main feature is the asymmetry, can be further subdivided into: a) secondary to orthopedic defect (when it is often caused by the deviation of phalanges due to the use of tight or inadequate shoes; b) secondary to chronic dermatoses (such as psoriasis, subungual exostosis, epidermal and myxoid cyst, onychomycosis, implantation of arteriovenous fistulas in the forearm – hemodialysis, medications – beta-blockers, association with metastatic adenocarcinoma of the sigmoid colon – marker, Kawasaki's disease, or the association with epidermolysis bullosa simplex; c) secondary to degenerative osteoarthritis of the distal interphalangeal joint of the fingers.[2, 3] The congenital pachyonychia has a differential diagnosis with the pincer nail, being distinguished from the latter by not usually

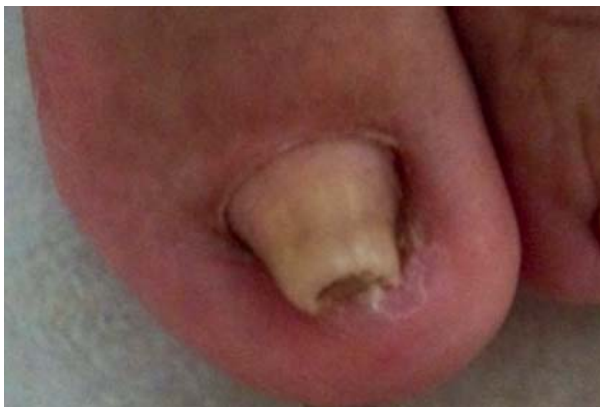

Figure 3: Nail plate – pre-treatment

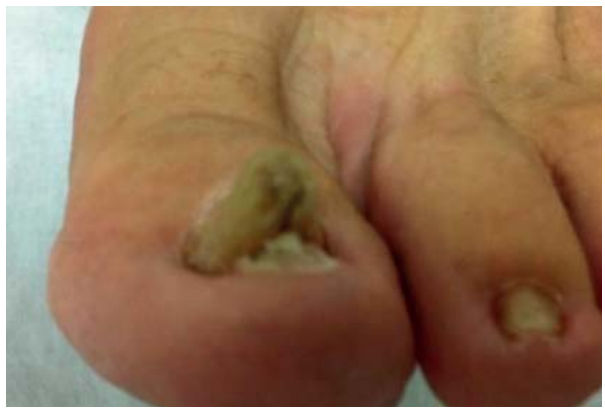

Figure 4: Nail plate – pre-treatment

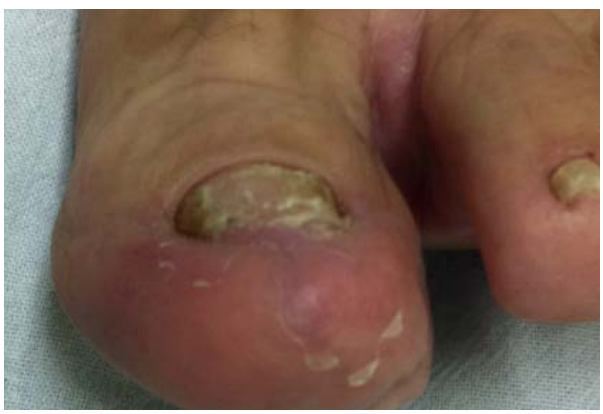

Figure 5: Nail plate – post-treatment

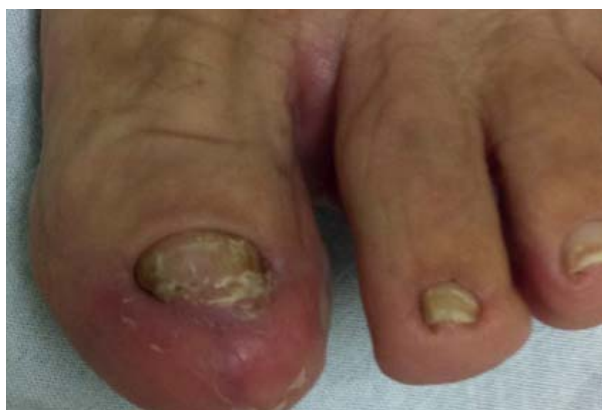

Figure 6: Nail plate – post-treatment

causing pain and by affecting the fingers and toes.[3]

In order to perform the surgical treatment, the main indications are for patients suffering from pain and inflammation. Patients who have already undergone conservative treatment without success also provide indications for the procedure. Another major complaint reported by patients is the loss of quality of life: there is aesthetic embarrassment, in addition to the limitation of the use of certain types of footwear, mainly the closed type.[4, 6, 7]

Many surgical techniques have been reported in the literature for the treatment of pincer nails.[8] The most important options for the surgical treatment of over-curvature, are those with techniques aimed at reducing the width of the matrix and the proximal nail plate: the phenolization of the lateral over-curved horns, which eliminates the pain caused by the clamping of the bed, thus bringing immediate improvement to the pain; the technique described by Haneke, which combines the phenolization with the median incision of the nail bed; the detachment, which reduces the traction of the periosteum on the same; the removal of osteophytes, if required; and the reverse suture, seeking the rectification of the nail bed.[3, 6, 7]

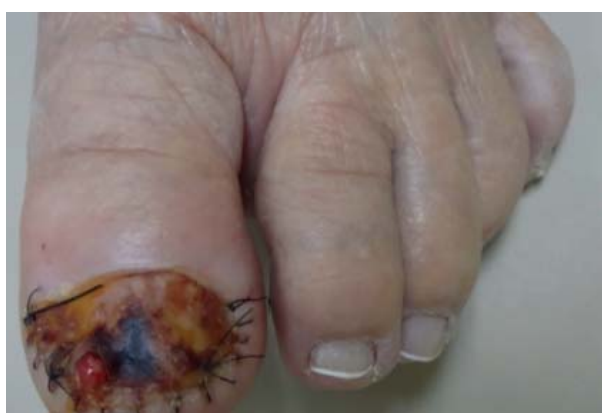

Figure 7: Ideal post-operative clinical aspect for the removal of the sutures

CONCLUSION

The present work demonstrates the surgical Fanti's technique for the correction of pincer nails, where the anatomical and functional improvement of the operated nail can be observed. ●

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Article Original

Analysis of the effect of topical oestradiol and progesterone in wound healing in rats

Análise do efeito do estradiol e progesterona tópicos na cicatrização de feridas em ratos

Authors:
Juliana Augusta Zeglin Nicolau [1]
Paula Foresti Faria [1]
Luciana de Oliveira Marques [2]
Deyse Fabiane Hoepers [1]
Andressa Dias Rocha [3]
Ana Cristina Lira Sobral [4]

[1] Medical Student at the Faculdade Evangélica do Paraná (FEPAR) – Curitiba (PR), Brazil

[2] MSc, Full Professor of Experimental Medicine at FEPAR

[3] Physician at private practice - Curitiba (PR), Brazil

[4] MSc, Assistant Instructor of the Histology and Pathological Anatomy disciplines of the Medicine Program of FEPAR

ABSTRACT

Introduction: Studies have shown that oestradiol and progesterone influence wound healing, angiogenesis, and remodeling.

Objectives: To evaluate the topical effects of oestradiol and progesterone—isolated and associated—on healing wounds of menopausal rats.

Methods: Forty Wistar rats were randomly divided into 4 groups with the same number of animals: Group C) control group, using only the vehicle; Group E) oestradiol 0.5mg; Group P) 15mg progesterone; Group E+P) 0.5mg oestradiol and 15mg progesterone. Initially the rats underwent bilateral oophorectomy. On the 30th post-operative day, a circular wound 1cm in diameter was inflicted, and the topical applications carried out for 7 days. Biopsies were performed at days 3, 7, and 14, followed by excision of the wound. Biopsies were stained with Sirius-Red (collagen analysis) and Hematoxylin-Eosin (morphometric analysis). The P-values <0.05 were considered statistically significant.

Results: Only in Group P there was an acceleration of re-epithelialization observed from the 7th to the 14th day ($p = 0.016$) and increased fibrosis from the 3rd to the 7th day ($p = 0.008$). Groups E and E+P, presented inhibited formation of type III collagen in the three study time points ($p < 0.001$).

Conclusions: Treatment with topical oestradiol, and topical oestradiol associated with progesterone inhibited the formation of type III collagen. The isolated progesterone only contributed to the process of re-epithelialization of wounds.

Keywords: estrogens; progesterone; collagen; wound healing.

RESUMO

Introdução: *Estudos demonstram que estradiol e progesterona influenciam a cicatrização de feridas, angiogênese e remodelamento.*

Objetivos: *Avaliar os efeitos tópicos de estradiol e progesterona isolados e associados na cicatrização de feridas de ratas menopausadas.*

Métodos: *Utilizaram-se 40 ratas linhagem Wistar, divididas aleatoriamente em quatro grupos com o mesmo número de animais: C: controle, utilizando o veículo; E: estradiol 0,5mg; P: progesterona 15mg; E+P: estradiol 0,5mg e progesterona 15mg. Inicialmente as ratas foram submetidas à ooforectomia bilateral, e no 30o dia do pós-operatório, confeccionou-se ferida circular com 1cm de diâmetro, e iniciou-se a aplicação dos tópicos, mantidos durante sete dias. Realizaram-se biópsias no terceiro, sétimo e 140 dias, seguidas de exérese da ferida. As biópsias foram coradas com Sirius-Red (análise colágena) e hematoxilina-eosina (análise morfométrica). Valores de $p<0,05$ indicaram significância estatística.*

Resultados: *Apenas no Grupo P observou-se aceleração da reepitelização do sétimo ao 14o dia ($p=0,016$) e aumento da fibrose do terceiro ao sétimo dia ($p=0,008$). Grupo E e grupo E+P inibiram a formação do colágeno tipo III, nos três momentos do estudo ($p<0,001$).*

Conclusões: *A terapia tópica com estradiol, e estradiol associado à progesterona inibiram a formação do colágeno tipo III. A progesterona isolada apenas contribuiu no processo de reepitelização das feridas.*

Palavras-chave: *estrogênios; progesterona; colágeno; cicatrização.*

Correspondence:
Dr. Juliana Augusta Zeglin Nicholau
Av. Iguaçu, 3.001, apto. 2.303 – Bairro Água Verde
Cep: 80240031 - Curitiba – PR, Brazil
E-mail: ju_augusta@hotmail.com

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INTRODUCTION

Cutaneous wounds are the result of multiple factors, such as hypoxia, trauma, or pressure. Their development often follows an already established order: inflammation, proliferation, and remodeling.[1] The healing process involves blood cells, extracellular matrix, cell mediators, and parenchymal cells. [2] Several factors, such as malnutrition, various drugs, radiation, and hypoxia may hinder that process.[1]

The skin is composed primarily of collagen fibers, elastic fibers, and glucosamine protein glucans.[3] Particularly in the dermal matrix there are essentially two types of collagen: type I and type III, corresponding to about 80-85% and 15-20% of the total of amount of that protein, respectively. Type I collagen is mainly located in the reticular dermis, the deepest layer of the skin. Type III collagen is present mostly in the papillary dermis, located more superficially. Contrary to what occurs in the untouched dermis, there is a greater proportion of type III collagen in wounds than type I collagen.

Hormones are potentially determining factors in the aging process, and estrogen was shown to be beneficial in accelerating tissue repair related to aging in both genders.[4]

Some studies show that topical and systemic estrogen therapy stimulates the healing process as it reduces inflammation. In vitro studies also suggest that progesterone can modulate inflammation. Estrogen and progesterone would contribute to macrophage activation in an alternative route, leading to wound healing, angiogenesis, and remodeling.[5]

In the face of increasing life expectancy, an aging global population, and an increase in cutaneous conditions and healing deficits typical of advanced age, there is a need for research on the effect of progesterone and estrogen as adjuvants in the treatment of skin wounds.[5]

Therefore, the objective of the present study was to evaluate the effects of topical estrogen and progesterone, isolated and in combination, in healing the wounds of menopausal female rats.

METHODS

Forty adult female *Rattus norvegicus albinus rodentia mammalia,* rats from theWistar lineage, originally from the Central Animal Facility of the Faculdade Evangélica do Paraná (FEPAR) in the southern Brazilian State of Paraná, Brazil, were used. All animals were kept in the animal facility of the institution and received water and proper food for the species. The Ethical Principles for handling animal experimentation set by the Ethics Committee on Animal Experimentation (CEEA) were observed.

The project was approved by the Ethics and Research Committee of the institution, registered under the number 4723/11 dated 20th May 2011.

The sample was divided into 4 groups of 10 animals each, according to the proposed treatment, as described below:

Group C (control): received only the vehicle, consisting of non-ionic cream.

Group E (Estradiol): received topical treatment with a cream containing 0.5mg of 17-beta-estradiol in a vehicle consisting of non-ionic cream.

Group P (Progesterone): received topical treatment with ointment containing 15mg of natural progesterone in a vehicle consisting of non-ionic cream.

Group E + P (Estradiol and Progesterone): received topical treatment with an ointment containing 0.5 mg of 17-beta-estradiol, associated with 15mg of natural progesterone in a vehicle consisting of non-ionic cream.

In the first phase of the experiment, all animals were weighed, identified with picric acid and assembled into cages, each with 5 randomly chosen individuals. They were then anesthetized with inhaled isoflurane until deep plane, and underwent bilateral oophorectomy, according to surgical standard technique, for the inductions of the menopausal state.

In the second phase of the experiment, on the 30th day after surgery and under the anesthetic procedure already described, a circular wound of 1cm in diameter was inflicted on the dorsum of each animal, for the removal of the skin and subcutaneous tissue, without damaging the adjacent aponeurosis. From that point on, all animals received the daily topical treatment proposed for each group, always at the same time of day and for 7 continuous days. The animals received a daily dose of morphine (10% solution, 0.1ml/100g of weight), intramuscularly as an analgesic during the healing process.

Biopsies were performed on the 3rd, 7th, and 14th days after the beginning of the treatment. Figures 1 and 2 show the appearance of the cutaneous wound on the 14th day of the experiment, in the Group Progesterone and Group Estradiol (Group P and Group E).

In the third phase of the experiment, on the 14th day after the beginning of the treatment, the animals were weighed again and euthanized by anesthetic overdose with inhaled isoflurane.

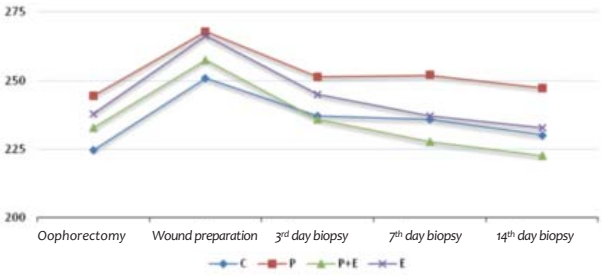
As for the weight analysis, the groups of animals were compared in order to evaluate the hormonal influences at the three separate biopsy points of the experiment (3rd, 7th, and 14th days).

For the histology and collagen evaluations, the cutaneous scars of the euthanized animals were dissected and fixed in buffered formalin. The preparation of the slides was carried out at the laboratory of histotechnique of the FEPAR through hematoxylin and eosin (HE) staining method (for the histological analysis) and through Sirius Red staining (for the collagen analysis).

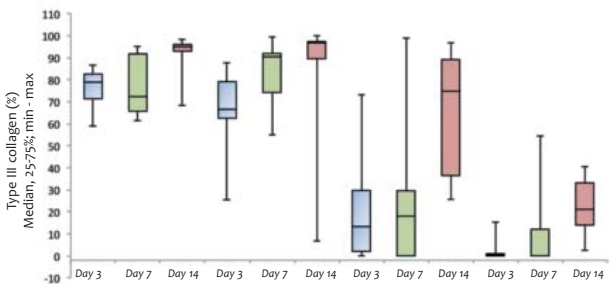
Under the first staining technique, the following were analyzed: epithelialization, classification and degree of inflammation, and vascularization. Under the second staining technique,

Figure 1: Rat from Group P on the 14th post-operative day

Figure 2: Rat from Group E on the 14th post-operative day



Graph 1: Weight analysis of the groups from the point of the oophorectomy biopsy to the 14th day



Graph 2: Percentage of type III collagen at the study's three timepoints (3rd, 7th, and 14th day), according to the groups

the collagen was quantified and qualified. Microscopic analyses were performed, always by the same pathologist. The total time of study was 44 days.

Statistical tests used for quantitative variables were: ANOVA, and non-parametric tests of Kruskal-Wallis and Friedman. For the analysis of qualitative variables the following were used: the Fisher's exact test, and the binomial test. Finally, the Shapiro-Wilk test was used for analyzing the normality condition of the variables.

All results received statistical treatment at a 0.05 significance level. The data were analyzed with the software Statistica v. 8.0.

RESULTS

During the study, 3 animals belonging in the control group died: the first died during the preparation of the wound, and the other 2 on the 7th day of the development of the wound. The causes of deaths were linked to the inhalation sedation used during the procedures. The remaining animals were euthanized on the days previously scheduled for the measurement. By the end of the experiment, all wounds had healed.

According to Graph 1, and regarding the weight analysis, the vehicles containing isolated estradiol, estradiol plus progesterone, or isolated progesterone, did not cause changes in the weight of the animals during the study, in the analysis of the 3rd day ($p = 0.435$), 7th day ($p = 0.120$) and 14th day ($p = 0.130$). Due to surgical stress, the occlusive dressings and daily handling, all elements of the 4 groups lost weight significantly ($p < 0.05$) after the oophorectomy and during the healing process, with an absence of statistically significant differences between groups.

In the histological analysis (HE), regarding the development of the re-epithelialization, Group P showed higher and significant re-epithelialization of the wound on the 14th day ($p = 0.01$).

As for the inflammatory process, there was no significant difference in the three groups at the three time points. The same occurred for the neovascularization, fibrosis, and number of macrophages and fibroblasts in the wounds.

In the intra-group analysis, only progesterone accelerated the re-epithelialization from the 7th to the 14th day ($p = 0.016$) and increased fibrosis from the 3rd to the 7th day ($p = 0.008$).

Regarding the analysis of collagen, Group E and Group E+P inhibited the formation of type III collagen in the study's three time points ($p < 0.001$), as can be seen in Graph 2. The group that obtained the highest percentage of formation of new collagen between the 7th and the 14th day was Group E+P. In Figures 3 to 6, it is possible to note the formation of collagen in the Sirius Red coloration in the different study groups.

DISCUSSION

According to Brincat, estrogen has many beneficial and protective effects on the skin's physiology and function, including maintenance of its hydration and thickness, elasticity, and wound healing capacity, in addition to reducing the risk of skin cancer.[6]

Also, according to Ashcroft, a reduction in estrogen levels leads to impaired quality of skin healing in postmenopausal women and in oophorectomized rats. Topical application of estrogen was also linked to an acceleration of cutaneous healing.[7] According to the authors' study, it was not possible to observe such effects as described in the literature, since only in Group P was there an acceleration of fibrosis and re-epithelialization at certain instances during the study.

Nonetheless, according to Ashcroft, systemic hormone replacement in menopausal females was associated with accelerated wound healing as compared to topical application. On the other hand, estrogen applied topically immediately after the infliction of the wound reduced the incidence of dehiscence and infection.[8]

In a study of oophorectomized rabbits, chronic therapy with estradiol dipropionate was evaluated, considering the thickness of the skin layers, the percentage of dermal collagen and elastic fibers, and areas of sebaceous glands. Bearing in mind that the thickness of the epidermis varies considerably in different body sites, and that sex steroid hormones are involved in regulating the development and function of the skin, in this study the absence of estradiol decreases the mitotic activity in the basal layer of the epidermis.[9]

It was observed that estrogens stimulate the synthesis, maturation, and renewal of collagen in rats,[10] a fact that is in line with the present study, since an increase of type III collagen in the intra-group analysis was observed. There was an increase in collagen type III from the 7th to the 14th day ($p = 0.006$) within Group E and within Group E+P ($p = 0.001$), in the same period.

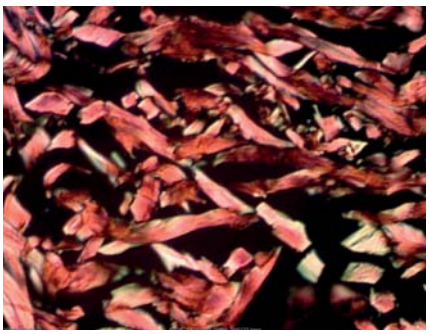


Figure 3: Collagen on the 14th post-operative day in the control group. Sirius-red staining. 400x magnification in polarized light microscopy

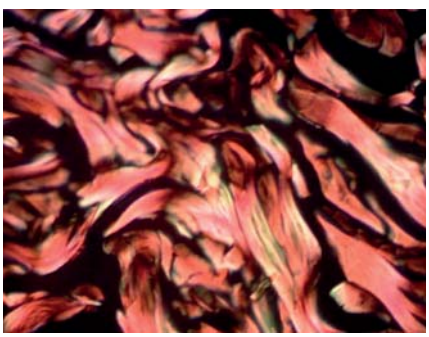


Figure 4: Collagen on the 14th post-operative day in Group P. Sirius-red staining. 400x magnification in polarized light microscopy

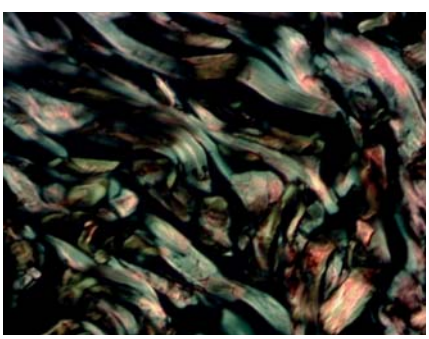


Figure 5: Collagen on the 14th post-operative day in Group E+P. Sirius-red staining. 400x magnification in polarized light microscopy

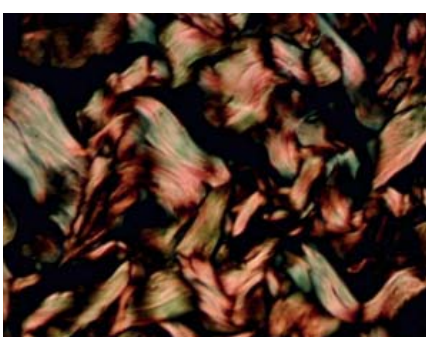


Figure 6: Collagen on the 14th post-operative day in Group E. Sirius-red staining. 400x magnification in polarized light microscopy

According to Isaac, there is a higher proportion of type III collagen relative to type I in the wound, meaning that myofibroblasts bind to collagen type III fibers, promoting wound contraction.[11] Thus, the higher the number of present type III collagen fibers, the greater the contraction of the wound. Therefore, the present study corroborates the information found in the literature, since Group E and Group E+P inhibited the formation of collagen type III, and only Group P significantly accelerated the wound's re-epithelialization.

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Topical therapy with estradiol and progesterone associated with estradiol inhibited the formation of type III collagen. The isolated progesterone only contributed to the re-epithelialization process of the wounds. ●

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Article
Original

Influence of nutritional supplementation in the treatment of telogen effluvium: clinical assessment and digital phototrichogram in 60 patients

Influência da suplementação nutricional no tratamento do eflúvio telógeno: avaliação clínica e por fototricograma digital em 60 pacientes

Authors:
Flávia Alvim Sant'Anna Addor[1]
Patricia Camarano Pinto Bombarda[2]
Mario Sergio Bombard Júnior[3]
Felipe Fernandes de Abreu[4]

[1] Dermatologist Physician, Technical Director at Medcin Instituto da Pele – Osasco (SP), Brazil

[2] Pharmaceutical Biochemist, Clinical Research General Manager at Medcin Instituto da Pele

[3] Chemist, Innovation & IT Manager at Medcin Instituto da Pele

[4] Pharmacist, Research Manager at Medcin Instituto da Pele

Correspondence:
Dr. Flavia Alvim Sant'Anna Addor
Alameda das Bauhinias, 176 - Residencial Tamboré
Cep: 06544-540 - Santana de Parnaíba – SP, Brazil
E-mail: flavia@medcinonline.com.br

ABSTRACT

Introduction: Telogen effluvium is a chronic progressive alopecia of multifactorial etiology. Nutritional deficiency—sometimes subclinical—can trigger it.

Objective: To evaluate the influence of a nutritional supplementation at physiological doses in patients with telogen effluvium.

Methods: The supplementation of nutrients in food doses was carried out in 60 female patients for 180 days.

Results: There was a significant improvement ($p < 0.05$) in hair loss, which was confirmed by digital phototrichogram, where there was a significant increase in anagen hairs and reduction of telogen hairs.

Conclusion: The present study demonstrated that in cases of telogen effluvium without an apparent cause, the replenishment of nutrients related to the hair cycle has a significant benefit in the regression of the picture as soon as after three months of treatment.

Keywords: alopecia; nutrients; hair.

RESUMO

Introdução: *O eflúvio telógeno (ET) é alopecia de evolução crônica e de etiologia multifatorial. A carência nutricional, por vezes subclínica, pode desencadeá-la.*

Objetivo: *Avaliar a influência de uma suplementação nutricional em doses fisiológicas (IDR) sobre pacientes com eflúvio telógeno.*

Métodos: *A suplementação de nutrientes em doses alimentares (IDR) foi realizada em 60 pacientes do sexo feminino durante 180 dias.*

Resultados: *Houve melhora significativa da queda de fios ($p<0,05$), que foi confirmada pelo fototricograma digital, apontando aumento significativo dos fios anágenos e redução dos fios telógenos.*

Conclusões: *O presente estudo demonstrou que nos casos de ET sem causa aparente, a reposição de nutrientes relacionados ao ciclo capilar apresenta benefício significativo na regressão do quadro, já a partir de três meses de tratamento.*

Palavras-chave: *alopecia; nutrientes; cabelo.*

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The present study was carried out at Medcin Instituto da Pele - Osasco (SP), Brazil.

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Conflict of interest: None

Conflitos de interesses: Nenhum

INTRODUCTION

Described in 1961 by Albert Kligman, Telogen Effluvium (TE) is one of the most frequent etiologies of non-scarring alopecia.[1]

It manifests as diffuse hair loss due to some stimulus that alters the hair cycle, causing the acceleration of the anagen phase into the telogen phase (telogenization). This phenomenon alters the ratio of hair present between the two phases, leading to significant losses in relatively short intervals, causing great aesthetic displeasure to the patient.[2]

Nutritional deficiencies – such as protein, iron,[2] and biotin[3] deficiencies, which are important elements in the synthesis and quality of the hair fiber – are among the most relevant factors in the genesis of TE. Nutritional supplementation can be promising in conditions where the presence of TE is linked to eating disorders, such as malabsorption, diets for weight loss, etc. Other etiological factors described, such as childbirth and systemic diseases, may produce a deficit of certain nutrients, leading to a worsening of the alopecic picture. The present study evaluated the use of nutritional supplements in monotherapy in the treatment of TE, independent of its etiology.

OBJECTIVE

To investigate the effect of a nutritional supplement commercially known as Exímia Fortalize® (Laboratório Farmoquímica S/A - Rio de Janeiro, Brazil) in improving the signs and symptoms of TE through clinical assessment and phototrichogram (TrichoScan® PhotoFinder dermoscope – FotoFinder Systems GmbH, Bad Birnbach, Germany).

ETHICAL ASPECTS

The present study was conducted after ethical approval (CAEE: 13216113.7.0000.5514 of 18 February 2013). Following recruitment, all volunteers received a detailed explanation of the study and were fully informed about the Free and Informed Term of Consent approved by the Research Ethics Committee.

METHODS

A prospective, randomized, blinded study analyzed 60 female patients (aged 18-60 years), with complaints of hair loss for at least one month, according to the inclusion and exclusion criteria, during the year of 2013, at the Clinical Research Laboratory of the Dermatology Department - Medcin Instituto da Pele (Osasco, São Paulo, Brazil).

All patients underwent dermatological examination for the clinical verification of TE with at least a one-month history, however without having undergone any related treatment or medication for the 3 months prior to inclusion in the study.

Patients with diffuse alopecia, active endocrine diseases, systemic diseases, going through a post-surgery period, pregnant or lactating, were excluded. Those who were using drugs with a potential for interference in the hair cycle, such as antineoplastic and corticosteroids, were also excluded.

After verification of inclusion and exclusion criteria, all patients underwent the first phase of the digital phototrichogram examination. This examination was conducted in two steps:

- Initial: standardized shaving of hair in the frontoparietal region in preparation for photographic documentation with 20X magnification dermatoscopic lens. This photograph was appropriately archived.

A macro photographic record was carried out in the area being evaluated. This record allowed for the identification of the evaluated area on subsequent visits.

- 48 hours after: a new photograph of the same area was taken with previous dying of hairs with an appropriate substance for this purpose. An evaluation with the TrichoScan® PhotoFinder dermoscope® device (Tricholog GmbH & Datinf GmbH, Germany) was carried out.

This equipment employs imaging software that determines:

- anagen hairs: indicates the percentage of hairs in the growth stage;
- telogen hairs: indicates the percentage of hairs in the dormant stage.

Next, the patients carried out a subjective evaluation of the intensity of the perceived hair loss, attributing scores from zero (meaning "absence of hair loss") to three ("presence of intense hair loss").

After the collection of the data, the product was provided and the patients were instructed to take 1 tablet a day for six months.

The evaluated product had the following composition: 5mg calcium pantothenate (vitamin B5), 130mg magnesium, 45mg ascorbic acid (vitamin C), 7mg iron, 10mg vitamin E, 16mg nicotinamide (vitamin B3), 3.5mg Zinc, 600mcgRE beta carotene (vitamin A), 2.4mcg cyanocobalamin (vitamin B12), 1.2mg thiamine (vitamin B1); 1.3mg pyridoxine (vitamin B6), 1.3mg riboflavin (Vitamin B2), 240mcg folic acid and 30mcg biotin.

Patients were evaluated after 90 and 180 days, with new images being taken with the TrichoScan® device. At the same intervals, the patients answered the questionnaire about the perceived intensity of hair loss – exactly as they had done in the initial visit.

The success of treatment was measured in the final evaluation through a subjective questionnaire with a scale that ranged from 1 (meaning a "very good" outcome) to 5 (meaning "very bad" outcome). Both the evaluator physician and the patient answered this questionnaire.

STATISTICAL EVALUATION

The treatment was compared at each of the evaluation's experimental intervalsthrough the Student's t-test.

RESULTS

Of the 60 patients included in the study, 51 completed the evaluations and had their data analyzed. Withdrawals from the study occurred due to loss of follow-up or lack of adherence to the treatment – none were motivated by any reported or observed discomfort or adverse effects.

The product was well tolerated. Three patients reported adverse events: seborrheic dermatitis, anxiety, and migraine –

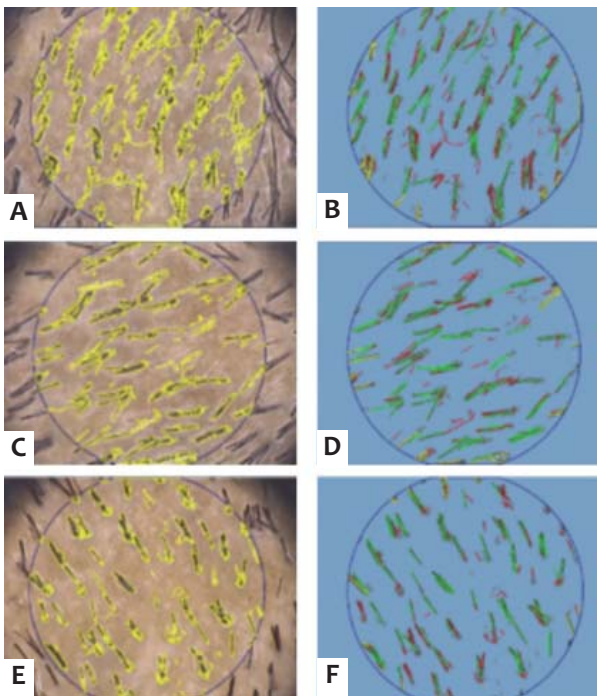


Figure 1: To the left: tonsured area. In yellow, highlighting of the hairs to be counted. To the right: anagen hairs are represented in green, telogen in red. A and B: interval D0: baseline; C and D: interval D90: after three months of treatment; D and E: interval D180: after six months of treatment.

which, however, were not deemed as serious correlated to the use of the product.

EVALUATION OF EFFICACY

1. Subjective questionnaire on the perception of hair loss

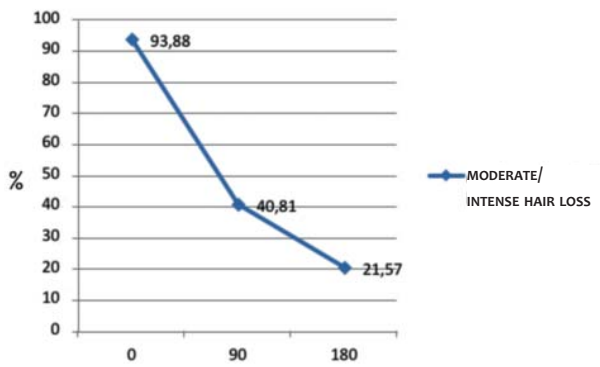
At baseline, around 6% of the volunteers were considered to have mild hair loss, 39% with moderate hair loss, and 55% with intense hair loss. At the end of the study, 20% were considered not to suffer from hair loss, 59% had mild hair loss, 22% had moderate hair loss, and 0% intense hair loss. These results are depicted in Table 1.

It is possible to observe a reduction to 21.57% from 93.88% of patients complaining of moderate to intense hair loss, suggesting there was an improvement of 72.31% regarding hair loss, as shown in Graph 1.

When analyzing the average performance of the product at the final visit as compared with the baseline, it was possible to verify that the mean ratings fell from 2.49 to 1.00, showing there was an improvement of 59.84% regarding hair loss, as shown in Graph 2. Such data were subjected to the Student's t-test, which indicated a statistical significance at both intervals, with $p < 0.001$. There was a significant reduction in the moderate and intense hair loss ratings during the study period.

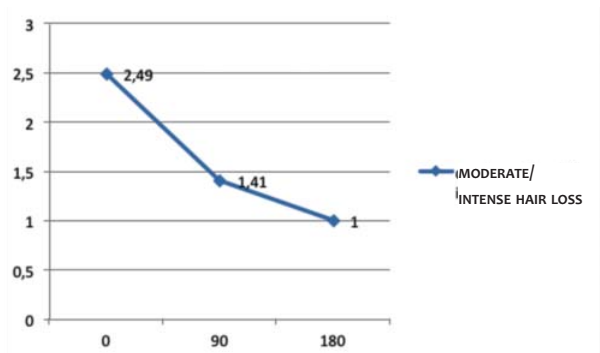
Table 1: Evaluation of the perception of hair loss during the treatment (%)

Answers	D0	D90	D180
0 = there is hair loss	-	4.08	19.61
1 = there is mild hair loss	6.12	55.10	58.82
2 = there is moderate hair loss	38.78	36.73	21.57
3 = there is intense hair loss	55.10	4.08	-
Mean values	**2.49**	**1.41**	**1**



Graph 1: Percentage of patients with alleged moderate to intense hair loss complaint at the study's intervals (in days)

n = 51; D0: initial assessment; D90: intermediate evaluation; D180: final evaluation



Graph 2: Mean values of ratings according to the intensity of hair loss at the study's intervals (in days)

n = 51; D0: initial assessment; D90: intermediate evaluation; D180: final evaluation ($p < 0,001$) queda moderada/intensa = moderate/intense hair loss

2. Subjective questionnaire on the perception of improvement

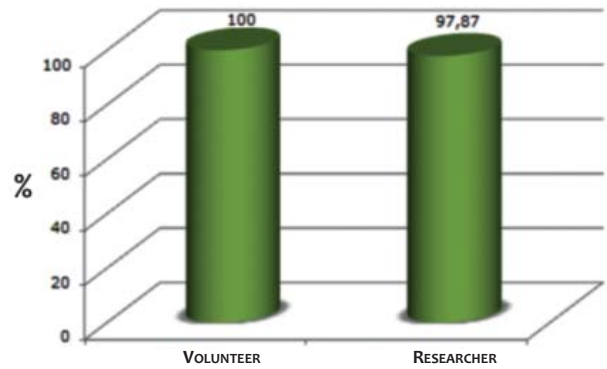
Regarding the perception of improvement evaluated 180 days after the treatment through a subjective questionnaire, the data showed clinical improvement, observed by 97.8% of resear-

chers. In the subjective evaluation, 100% of volunteers noticed improvement, as shown in Graph 3. Table 2 shows in detail the levels of improvement observed.

3. Instrumental evaluation through the TrichoScan® device

The percentage of hairs in the telogenic and anagenic stages was determined at each experimental interval, with their mean values evaluated statistically through the Student's t-test, as shown in Table 3.

There was significant improvement, evidenced by a 10% reduction in telogenichairs (dormant stage) and an 8% increase in anagenic hairs (growth stage) in 90 days. This reduction in telogenic hairs and increase in anagenic hairs continued progressively for 180 days (22. 6% and 17.2% respectively). (Graphs 4 and 5) Figures 1 to 3 represent images collected by TrichoScan®, a reduction in telogenic hairs is perceived and is represented in red.



Graph 03: Average performance of the product rated as "good" or "very good" by patient and researcher

DISCUSSION

Telogen effluvium is one of the most frequent causes of alopecia seen in medical practice. Its occurrence is common at any age, and some factors, such as systemic disease, postpartum, emotional stress, and nutritional deficiency, as described in the literature, are strongly associated with its onset.[4-6]

However, about one third of cases remain without clear etiology.[7]

During the last decade, studies of the nutritional profile and specific nutritional deficiencies have demonstrated a higher than previously thought correlation with the condition's etiology and the worsening of dermatoses. The deficiency of trace elements, such as iron and zinc, has been demonstrated to cause or aggravate telogen effluvium. A recent study has demonstrated that zinc levels were significantly lower in a group of 320 patients with TE.[8]

Zinc is involved in the synthesis of proteins and nucleic acids, and has an important role in several metabolic routs and cellular functions. Specifically in the hair follicle, zinc is a powerful inhibitor of the hair follicle's regression in animal models.[8,9] Likewise, iron plays a fundamental role in the nutrition of the hair follicle and women with iron deficiency are at risk of hair loss with telogenization.[10]

Vitamins such as ascorbic acid, folic acid, vitamin E and biotin also exert direct or indirect roles in the hair cycle for they act on metabolic processes involving protein synthesis or hormone expression, or are synergistic with other trace elements, such as zinc and vitamin C.[11-13]

Of the nutrients studied in alopecia, biotin has shown particular importance. The presence of a link between biotin deficiency and the loss of hair and body hair is a known fact.[14]

Table 2: Perception of subjective and clinical improvement after the treatment (%) (n = 51)

Answers	Patient	Researcher
1 = The outcome was very good	48.94	2.13
2 = The outcome was good	51.06	95.74
3 = No changes were seen	-	2.13
4 = The outcome was bad	-	-
5 = The outcome was very bad	-	-
Mean values	**1.51**	**2**

Biotin is a water-soluble vitamin that acts as an essential cofactor for carboxylases, being also responsible for catalyzing essential steps in cell metabolism, in addition to interfering in the differentiation of epidermal cells.[15]

Biotin supplementation improves the quality of keratin in the hair of animal models, even in the absence of apparent deficiency.[16]

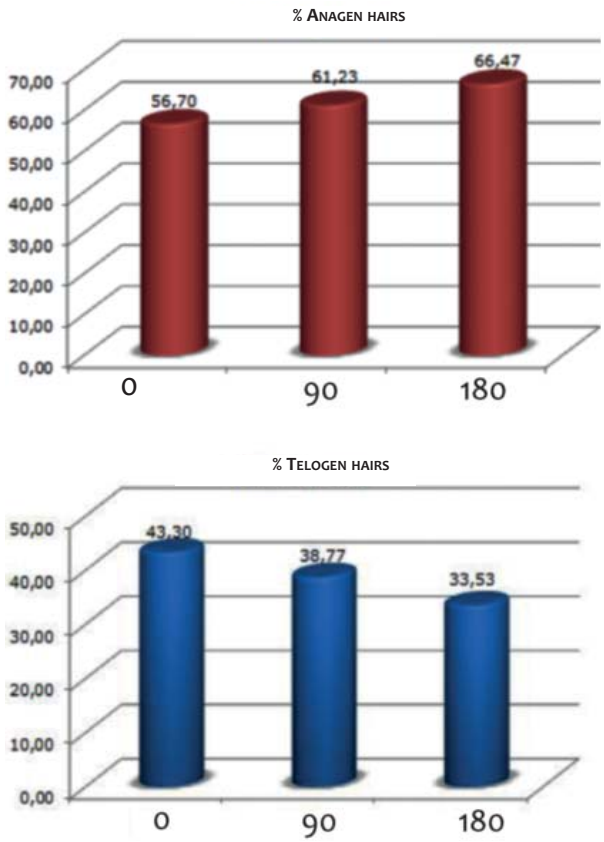
In diffuse hair loss associated with telogen effluvium, the combination of biotin and zinc was studied with favorable results.[17]

Ironically, "modern" eating habits aimed at losing weight and at "detoxifying" can greatly reduce the intake of nutritious foods, with borderline deficiencies being capable of leading to pictures of progressive however slower developing alopecia.

From a practical point of view, it is important that the dermatologist remember to evaluate the patient's dietary profile, especially in cases that do not respond to traditional treatments.

Table 3: Change in the percentage mean amount of telogen and anagen hairs at the study's intervals (n = 49)

	Initial Assessment	Final Assessment after 90 days	Change	p-value	Final Assessment after 180 days	Change	p-value
Anagen hairs	56.7	61.2	+8%	0.025	66.47	+17.2%	0.001
Telogen hairs	43.3	38.7	-10%	0.025	33.5	-22.6%	<0.001



Graphs 4 and 5: Percentage of anagen and telogen hairs at different experimental intervals

Mild and occasional nutritional deficiencies, sometimes hardly detectable in routine laboratory tests, can be responsible for the low level of response to pharmacological therapy.[18-20]

Diagnosis and monitoring of TE are sometimes hampered, especially in chronic states, because the improvement is slow and often imperceptible in the early months. In the same way that the picture settles in insidiously, consistent results may require months to emerge. Although TE is self-limited, treatment or removal of the inducing factor leads to resolution within three to six months, while if left untreated, the prognosis is 3 to 10 years for a spontaneous resolution.[17]

For a more accurate and noninvasive quantitative assessment of this development, the phototrichogram rendered by the TrichoScan® device allows a hair count, while its morphological analysis recognizes anagen and telogen hairs through the combination of epiluminiscence microscopy and digital automatic image analysis.[21, 22]

As there is no specific treatment for TE, the empirical use of minoxidil has already been suggested in the literature, nevertheless there are no clinical studies to prove its effectiveness.[23]

Likewise, there are no studies on TE with nutrients at the recommended daily intake (RDI) and its combined use – in which the ingredients would act synergistically – have been poorly studied.[24, 25]

Data obtained in the present study demonstrate that, in idiopathic TE, the supplementation of a specific set of nutrients can lead to a significant improvement of the picture from the first quarter of use, at RDI doses, which makes them safer for prolonged use.

CONCLUSION

TE is a chronic alopecia disease, whose etiology is often difficult to establish. In such cases, micronutrient deficiencies at minimum levels should always be considered. The present study has demonstrated that in cases of TE with no apparent cause, nutrient replenishment related to the hair cycle shows significant benefit in the regression of the picture as early as after three months of treatment.

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Article Original

Effects of high-frequency ultrasound treatment on human skin tissues

Efeitos do tratamento de ultrassom de alta freqüência sobre os tecidos da pele humana

Authors:
Daniele Bani[1]
Laura Calosi[2]
Lara Faggioli[3]

[1] MSc, Full Professor of Histology at the University of Florence - Florence, Italy

[2] Histology Technician, University of Florence - Florence, Italy

[3] Engineer at the Research and Development Department, General Project Ltda. - Montespertoli (Florence), Italy

ABSTRACT

Introduction: Transcutaneous ultrasound procedures are viewed as the most effective non-surgical treatment for facial skin rejuvenation, although their mechanisms of action are poorly understood.

Objective: This study aims to evaluate the morphological changes induced by ultrasound treatments on skin tissue: epidermis, papillary and reticular dermis, and subcutaneous fat. To evaluate the clinical efficacy of ultrasound treatment for facial skin tightening.

Methods: Ex vivo human skin samples were sham-treated or treated with high-frequency ultrasound using MedVisageTM (General Project Ltd.). Different parameters of power output (1.5 and 3.0 W) and frequency modulation (100, 500, 3,000, 3,500 Hz) were compared. Clinical efficacy was evaluated based on a single 5-minute ultrasound treatment (3.0 W, 3,000 Hz) on 4 volunteers.

Results: Ultrasound treatment caused significant compaction of collagen and elastic fibers in the reticular dermis, whereas less prominent changes occurred in the papillary dermis. The overall effects varied depending on energy output and modulation frequency. No changes to subcutaneous adipocytes, blood capillaries, epidermal keratinocytes, dermal fibroblasts and mast cells were observed. Clinically, ultrasound treatment consistently resulted in a well-tolerated, objective reduction of facial skin wrinkles.

Conclusion: High-frequency ultrasound treatment is an effective and safe noninvasive technique for skin-tightening purposes.

Keywords: high-intensity focused ultrasound ablation; skin aging; histology; dermis.

RESUMO

Introdução: *A ultra-sonografia transcutânea é vista como o tratamento não-cirúrgico mais eficaz para o rejuvenescimento da pele facial, muito embora seus mecanismos de ação sejam pouco compreendidos.*

Objetivo: *O presente estudo tem como objetivo avaliar as alterações morfológicas induzidas pelo tratamento de ultrassom em tecidos cutâneos (epiderme, derme papilar e reticular, e gordura subcutanea) e a eficacia clinica do tratamento de ultrassom para o tratamento da flacidez da pele facial.*

Métodos: *Amostras de pele humana ex-vivo foram tratadas com simulador ou com ultrasson de alta freqüência usando o equipamento MedVisageTM (General Project Ltd.). Diferentes parâmetros de potência (1,5 e 3,0W) e modulação de frequência (100, 500, 3.000, 3.500 Hz) foram comparados. A eficácia clínica foi avaliada após uma única sessão de 5 minutos de tratamento de ultrasson (3,0W, 3.000 Hz) em 4 voluntários.*

Resultados: *O tratamento de ultrasson causou compactação significativa de fibras colágenas e elásticas na derme reticular, enquanto que alterações menos importantes ocorreram na derme papilar. Os efeitos globais variaram dependendo da energia e da frequência de modulação. Não foram observadas alterações em adipócitos subcutâneos, capilares sanguíneos, queratinócitos epidérmicos, fibroblastos dérmicos e mastócitos. Clinicamente, o tratamento de ultrasson resultou na redução objetiva de rugas da pele da face, com consistência e boa tolerância.*

Conclusões: *ultrasson de alta freqüência é uma técnica não invasiva segura e eficaz para tratar a flacidez cutânea.*

Palavras-chave: *ablação por ultrassom focalizado de alta intensidade; envelhecimento da pele; histologia; derme.*

Correspondence:
Dr. Daniele Bani
Full Professor of Histology
Dept. Experimental & Clinical Medicine, Sect. Anatomy & Histology, University of Florence
Viale G. Pieraccini 6
I-50139, Florence, Italy
E-mail: daniele.bani@unifi.it

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Financial support: None
Conflict of interest: Dr. Lara Faggioli works at the Research and Development Department of General Project Ltda., which has supplied the MedVisageTM equipment for the study free of cost.

INTRODUCTION

In aesthetic medicine, surgical lifting has long been the treatment of choice for facial skin laxity and rejuvenation purposes. In recent years, there has been an increasing demand for alternative noninvasive treatments that can overcome the drawbacks of surgery (1). The most promising and effective treatments are based on the principle that tissue tightening can be achieved through the delivery of controlled dermal heating, which in turn activates a controlled wound healing/collagen remodeling process resulting in dermal tightening (2-4). Chiefly, radiofrequency and laser light have been used to this aim, although with different degrees of success (5,6). The major shortcomings are modest clinical results, poor patient compliance—e.g. slow post-operative recovery and dyspigmentation upon laser treatments (6)—and the need for multiple treatment sessions to consolidate the improvements.

More recently, ultrasound-emitting instruments have been used to deliver thermal energy to the deep dermal connective tissue in addition to the superficial dermis, thus inducing more complete collagen remodeling than the previous methods (1,7). At present, ultrasound methodology is supported by clinical evidence indicating that, if properly executed, it can result in an appreciable and durable reduction of skin wrinkles due to ageing. Moreover, ultrasound treatments have negligible side effects, chiefly consisting in transient erythema, edema, and moderate pain, and therefore have excellent compliance with the treated patients (8-14).

The exact mechanisms that may explain the beneficial effects of ultrasound treatment are still a matter of investigation. It appears that ultrasound waves penetrate into tissue and cause vibration of the molecules at the site of the beam focus. The friction between tissue molecules produces focal overheating and thermal injury (15). Moreover, penetration depth can be modulated by wave frequency: the higher the frequency, the shallower the thermal effect on the dermis (1). Information on the structural changes induced by ultrasound treatment in skin tissues is scarce because of obvious ethical limitations with biopsy. Only in one study was a histologic examination performed before and 2 months after ultrasound treatment: this study showed increased dermal collagen with thickening of the dermis and straightening of elastic fibers (11). In fact, a detailed knowledge of the tissue/cell events underlying the positive clinical effects of ultrasound treatment on the skin, as well as of the possible noxious effects on the different skin tissue components (epidermis, dermis, subcutaneous fat pad), is currently lacking.

The present study was designed to investigate these issues. Using *ex vivo* full-thickness human skin samples, we aimed at evaluating and quantifying the histological changes directly induced by transcutaneous ultrasounds, delivered with different settings, on the various skin tissues, namely the epidermis, the papillary and reticular dermis, and the subcutaneous fat. The histological study was paralleled by evaluation of clinical efficacy for facial wrinkle reduction on 4 volunteers.

METHODS

Ex vivo experiments

Tissue sampling and treatments—Abdominal full-thickness skin biopsies, approximately 10 mm thick and including the epidermis, dermis, and subcutaneous adipose tissue, were taken during surgical sessions for reductive abdominoplasty. The specimens were cut in two parts of similar size and weighed. Each specimen was placed in a Petri dish on ice, the subcutaneous tissue facing downwards, and combined with 2 ml of incubation medium (Dulbecco's modified Eagle medium, DMEM, Gibco Invitrogen, Milan, Italy). Treatments were performed using the MedVisage™ high-frequency ultrasound device (General Project Ltd., Montespertoli, Italy), which has been designed for skin-rejuvenating purposes. This instrument emits a main frequency of 5 MHz, which can be modulated between 10 Hz and 3.5 KHz. Multiple ultrasound pulses were delivered in continuous mode and were interspersed with pauses to prevent excessive tissue heating, considering the lack of intrinsic temperature homeostatic mechanisms in the blood flow-deprived tissue explants. Heating of the samples during the treatment was monitored and recorded using a thermocouple placed in contact with the bottom of the specimens. Four different instrument settings were used in 4 independent experiments, as described in Table 1. In a typical experiment, the emission plate of the MedVisage™ was placed in direct contact with the epidermis of a skin specimen through a thin layer of Aquasonic Clear™ ultrasound gel (Parker, Fairfield, USA). A parallel specimen was sham-treated (i.e. subjected to the same handling procedure but with no ultrasound emission) and used as control. After the treatments, fragments of skin tissue and subcutaneous fat from the treated and control specimens were cut, fixed in 4% glutaraldehyde in cacodylate buffer (0.1 M, pH 7.4), post-fixed in OsO_4 in phosphate buffer (0.1 M, pH 7.4) dehydrated in graded acetone and embedded in epoxy resin (Epon 812, Fluka, Buchs, Switzerland) for light and electron microscopic studies. Others were fixed in 4% formaldehyde in a phosphate-buffer (0.1 M, pH 7.4), dehydrated in graded ethanol and embedded in paraffin for light microscopic analysis.

Morphometry of dermal collagen and elastic fibers—Histological sections, 6 mm thick, from formalin-fixed, paraffin-embedded specimens were stained with either anilin blue for collagen fibers, using a modified Azan staining method (16), or paraldehyde-fuchsin for elastic fibers. Digital photomicrographs of papillary and reticular dermis were separately taken under a light microscope equipped with x40 objective for papillary dermis (test area per microscopical field: 21,800 mm^2) or x20 objective for reticular dermis (test area per microscopical field: 82,000 mm^2) and an Eurekam 9 high-resolution video camera (BEL Engineering, Monza, Italy) interfaced with a PC by a dedicated software (BELview, BEL Engineering). From each specimen, 10 randomly chosen micrographs were collected. The overall surface area of collagen or elastic fibers per micrograph was measured using the free-share ImageJ 1.33 image analysis

Table 1: Settings of MedVisage™ high-frequency ultrasound device

Experiment #	Output power (W)	Modulation frequency (Hz)	Timing (pulse x sec.)	Pulse interval (sec.)
1	1.5	500	4 x 5	5
2	3	3.000	4 x 10	10
3	3	100	4 x 5	10
4	3	3.500	4 x 5	10

program (http://rsb.info.nih.gov/ij), upon setting an appropriate threshold to exclude the amorphous ground substance.

Morphometry of subcutaneous adipose cells—Digital photomicrographs of semi-thin sections, 2 mm thick, from glutaraldehyde/OsO_4-fixed, Epon-embedded specimens were taken using the same light microscope, x20 objective and video camera as above. From each specimen, 5 randomly chosen micrographs (test area per microscopical field: 82,000 mm^2) were collected. The cross-sectional surface area of adipocyte lipid vacuoles was measured using an ImageJ 1.33 program upon setting an appropriate threshold to include only the osmiophilic lipid vacuoles. Vacuolar profiles ≤ 1,000 mm^2, consistent with polar cross-sections, were discarded.

Ultrastructural analyses of skin tissues—Ultrathin sections, 800 nm thick, cut from glutaraldehyde/OsO_4-fixed, Epon-embedded specimens were stained with aqueous uranyl acetate and alkaline bismuth subnitrate. They were viewed and photographed under a JEM 1010 transmission electron microscope (Jeol, Tokyo, Japan) equipped with a MegaView III high resolution digital camera and imaging software (Jeol). The different cell components of the epidermal and dermal tissue were examined in the control and ultrasound-treated samples (each group, n=3).

Clinical assay

Based on the data of the *ex vivo* experiments, we then aimed at testing the clinical efficacy of MedVisage™ for skin compaction using appropriate settings (ranges: 2-3 W, modulated frequency 2,000-3,000 Hz). The experiments complied with the guidelines of the Declaration of Helsinki, as amended in Edinburgh, 2008. Four healthy volunteers (3 males aged 45-51, 1 female aged 42), who gave written informed consent for their participation in the study, underwent a 5-minute session of facial rejuvenation. Prior to the treatment, macro photographs of details of the right periocular-zygomatic region were taken with a digital camera (Canon EOS) placed on a tripod. Distance from the target was measured with a laser meter. Fifteen minutes after the treatment, additional macro photographs from the same skin areas were taken under similar lighting and distance. The paired photographs were transformed with Adobe Photoshop CS4 using the filter sketch photocopy effect, which yielded a high contrast image of skin wrinkles and facilitated an examination of their length and thickness. The overall surface area of wrinkles before and after the treatment was then calculated using ImageJ 1.33 program after appropriate thresholding. Before performing morphometry, unwanted details that could have biased the measurements, such as hairs, eyelid profiles and nasolabial folds, were canceled from the images.

Statistics

Data were reported as mean values (± SEM) of the control and treated groups. Significance of differences was assessed by Student's t-test using Graph Pad Prism 4.03 statistical software (GraphPad, San Diego, CA, USA). $p \leq 0.05$ was considered significant.

RESULTS

Ex vivo experiments

In a first experiment, the MedVisage™ was set at 1.5 W Power, 500 Hz modulated frequency, 4 ultrasound pulses (5 sec./5 sec. intervals). Visual examination of the aniline blue-stained histological sections showed that ultrasound treatment caused a slight increase in the density of collagen fiber framework in both the papillary and reticular dermis (Figure 1). Similarly, the paraldehyde-fuchsin-stained sections showed a modest increase in the density of elastic fibers, especially in the reticular dermis (Figure 1). Morphometric analysis confirmed the visual observations and showed that the differences did not reach statistical significance. Thermometric analysis of the skin specimens performed during each ultrasound application showed that their temperature remained low (subsequent values in °C were: 18.0, 20.5, 25.2, 25.9, 28.0).

In a second experiment, the MedVisage™ was set at 3 W Power, 3,000 Hz modulated frequency, 4 ultrasound pulses (5 sec./10 sec. intervals). Visual examination of the aniline blue-stained sections showed that this treatment did not cause appreciable changes in collagen fiber density per microscopic field in the papillary dermis. Morphometric analysis confirmed that the differences were not statistically significant (Figure 2). On the other hand, a marked, statistically significant increase in the density of collagen fiber framework was found in the reticular dermis (Figure 2). Similarly, the paraldehyde-fuchsin-stained sections showed a statistically significant increase in the density of elastic fibers in the reticular dermis (Figure 2).

Robust clinical and histological evidence indicates that ultrasound delivery to the skin has liporeductive effects on the

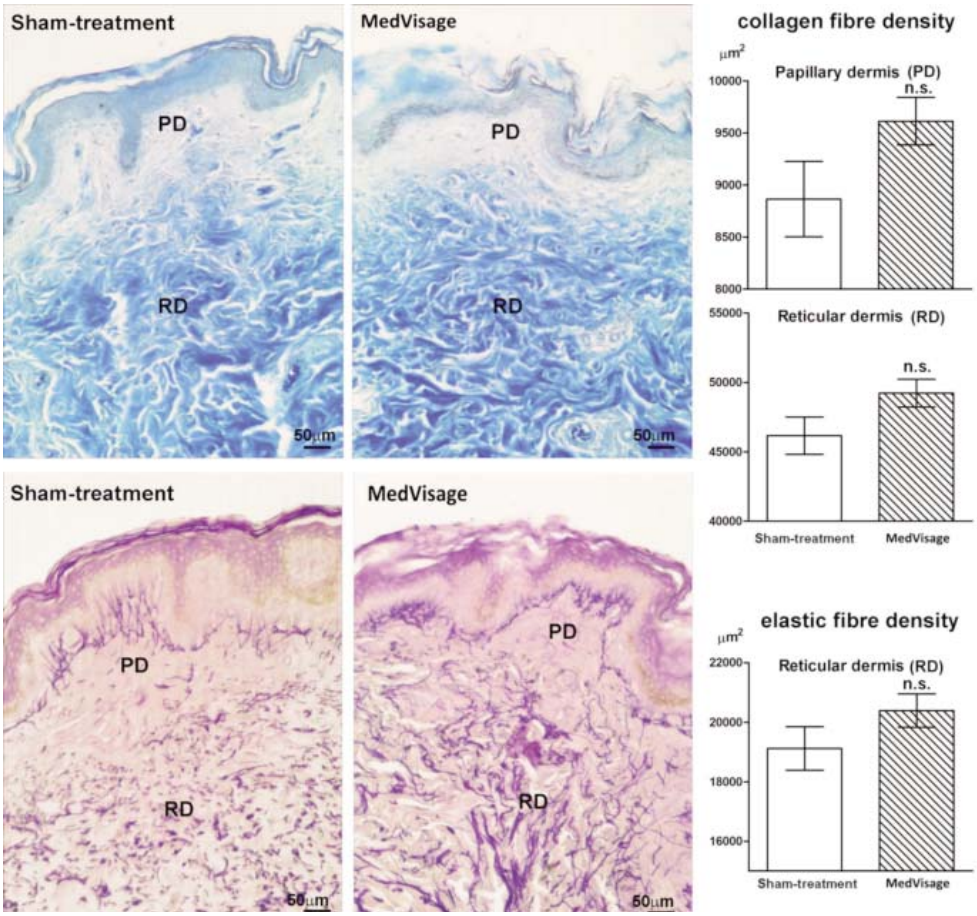

Figure 1: Light micrographs of anilin blue staining for collagen fibers (top) and paraldehyde-fuchsin staining for elastic fibers (bottom) from ex vivo human skin samples, sham-treated or treated with high-frequency ultrasounds (1.5 W, main frequency 5 MHz, modulated frequency 500 Hz, 4x5 second pulses, 5 second intervals). Bar graphs show the results of morphometric analysis (each group: n=3; Student's t-test for unpaired values).

subcutaneous fat tissue, mainly ascribable to the induction of cavitation phenomena at the fat droplet/cytoplasmic interface of adipocytes (17-19). For this reason, we investigated whether the subcutaneous fat in the skin specimens was also affected by ultrasound treatment. Of note, no significant changes of the size of lipid vacuoles in the adipocytes were detected (Figure 2).

Thermometric analysis of the skin specimens performed during ultrasound delivery showed that the temperature remained below 50°C, i.e. under the tissue damage threshold (subsequent values in °C were: 18.9, 32.0, 41.0, 46.0, 50.9).

In a third experiment, the MedVisage™ was set at 3,0 W Power, 4 ultrasound pulses (5 sec./10 sec. intervals) and either 100 or 3,500 Hz modulated frequency. Examination of aniline blue-stained sections showed that the treatment with MedVisage™ set at 100 Hz caused a slight albeit significant increase in the density of the collagen fiber framework in both the papillary and reticular dermis (Figure 3). On the other hand, the treatment with the instrument set at 3,500 Hz caused a statistically significant increase in the collagen fiber density in the reticular but not the papillary dermis (Figure 3). At either modulated frequencies, no appreciable changes in the density of paraldehyde-fuchsin-stained elastic fibers were found in the papillary or reticular dermis (Figure 3), nor in the size of subcutaneous adipocytes (Figure 3).

We next performed an ultrastructural analysis of sham- and MedVisage™-treated skin specimens, using the instrumental setting that gave the most prominent effects, i.e. 3.0 W Power, 3,000 Hz modulated frequency, 4 ultrasound pulses (5 sec./10 sec. intervals). As expected from the light microscopical findings, the collagen framework in the reticular dermis appeared denser in the samples treated with MedVisage™ than in the sham-treated ones (Figure 4, upper panels). Conversely, no differences were observed in the morphology of dermal blood capillaries between the two experimental conditions (Figure 4, lower panels). In particular, endothelial cells show a normal organelle complement and no signs of cell damage. Dermal fibroblasts and perivascular mast cells in the treated samples also showed a nor-

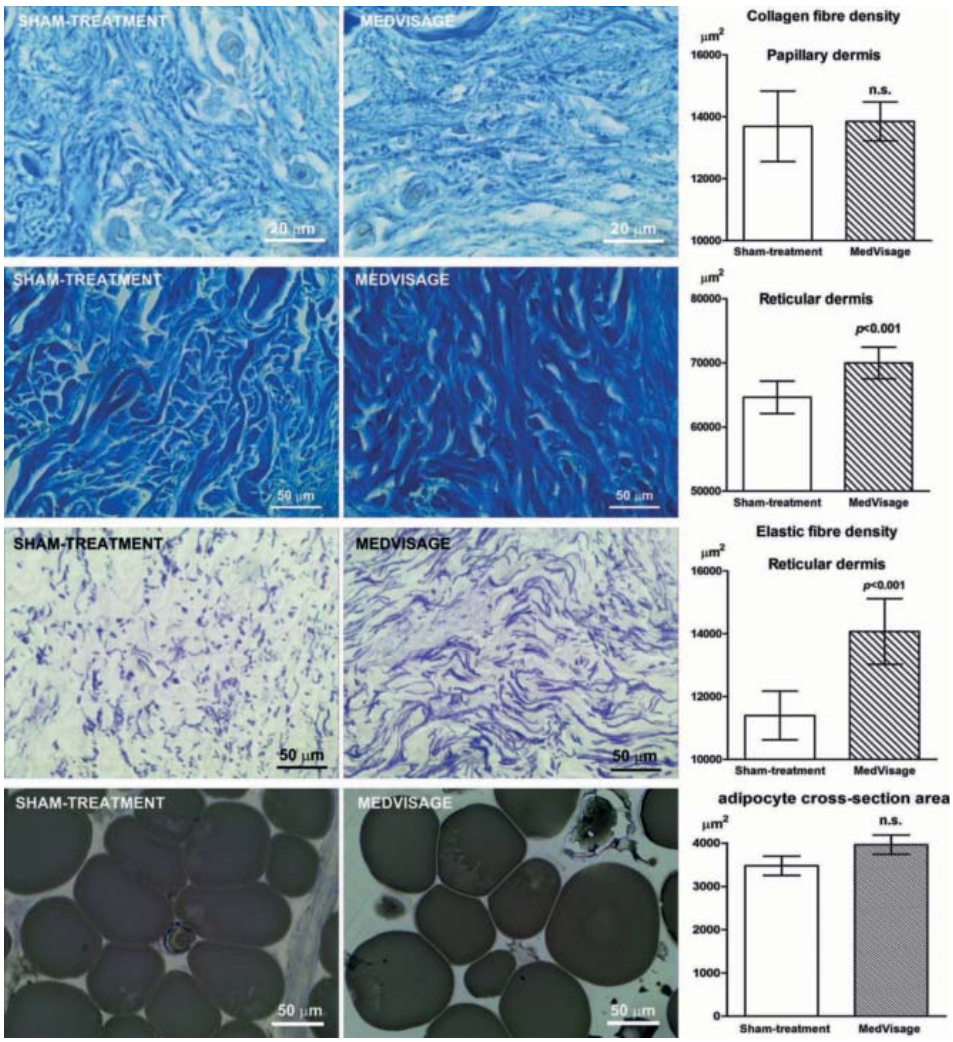

Figure 2: Light micrographs of anilin blue staining for collagen fibers (top), paraldehyde-fuchsin staining for elastic fibers (centre) and OsO4-stained subcutaneous adipocytes (bottom) from ex vivo human skin samples sham-treated or treated with high-frequency ultrasounds (3.0 W, main frequency 5 MHz, modulated frequency 3,000 Hz, 4x5 second pulses, 10 second intervals). Bar graphs show the results of morphometric analysis (each group: n=3; Student's t-test for unpaired values)

mal ultrastructure, indicating that ultrasound treatment did not cause cell injury nor direct activation of mast cell granule release (Figure 5). Analysis of the epidermis and papillary dermis also indicated that MedVisage™ treatment did not induce any morphological abnormality that could be an index of cell injury (Figure 6). In particular, keratinocytes of the superficial and deep epidermal layers were similar in both groups, as was the overall appearance of the extracellular matrix and stromal cells in the papillary dermis.

Clinical assay

Finally, we evaluated the clinical efficacy on facial skin tightening of a single 5-minute ultrasound treatment, setting the MedVisage™ on a range of efficacy parameters deduced from the results of the *ex-vivo* experiments (2,0-3,0 W energy output, 500-3,500 Hz modulated frequency). Morphometric analysis of the same periocular skin areas performed before and after the treatment showed an appreciable, statistically significant reduction of skin wrinkles (Figure 7), ranging from 20.6-35.0% of the pre-treatment measurements. Moreover, the treated subjects reported no troublesome sensations during or after the treatment, especially with the higher modulation frequency settings.

DISCUSSION

In the present study we have evaluated the skin tightening efficacy of high frequency ultrasounds delivered by the MedVisage™ device, characterized by adjustable power output (set at 1.5-3.0 W), frequency modulation on a main frequency of 5 MHz (set at 100-3500 Hz), and pulse duration (set at 5-10 seconds for 4 repeated applications). With the tested

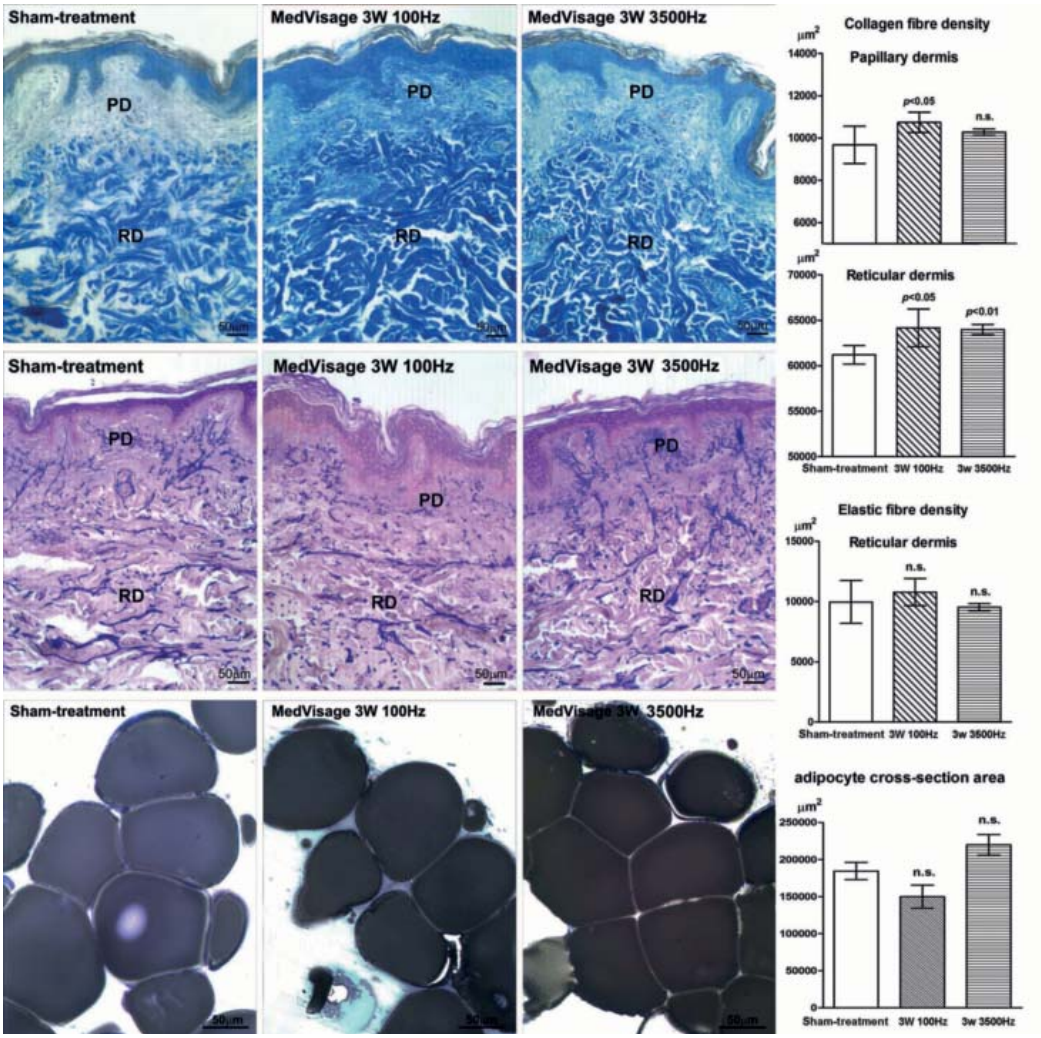

Figure 3: Light micrographs of anilin blue staining for collagen fibers (top), paraldehyde-fuchsin staining for elastic fibers (centre) and OsO4-stained subcutaneous adipocytes (bottom) from ex vivo human skin samples sham-treated or treated with high-frequency ultrasounds (3.0 W, main frequency 5 MHz, modulated frequency 100 or 3,500 Hz, 4x5 second pulses, 10 second intervals). Bar graphs show the results of morphometric analysis (each group: n=3; Student's t-test for unpaired values).

instrument settings, an appreciable compaction of dermal connective tissue fibers was consistently observed, in keeping with previous reports (11). Of note, the overall effects varied depending on energy output and modulation frequency. In general, ultrasound energy transfer and biological effects seemed to be mainly exerted on the reticular dermis, in which the three-dimensional fiber framework showed the most evident increase in density, whereas less prominent changes occurred in the papillary dermis. When MedVisage™ was set at lower power output (1.5 W), the tightening effect on connective tissue fibers was slight and did not reach statistical significance, although it was evenly distributed in the papillary and reticular dermis. Instead, when MedVisage™ was set at a higher power output (3.0 W), a marked compaction of collagen and elastic fibers occurred, particularly in the reticular dermis.

Frequency modulation and pulse duration also appear to influence the results, especially the skin depth at which the effects are fully manifested. Taken together, the light microscopic findings from the different experiments suggest that MedVisage™ can be properly tuned to exert selective effects at different skin levels. The ultrastructural analysis confirmed that MedVisage™ could induce a compaction of dermal collagen

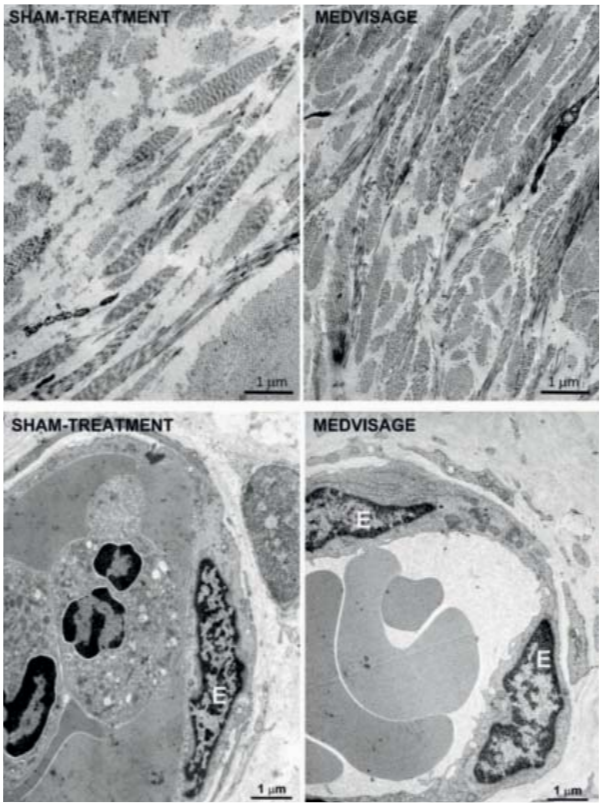

Figure 4: Representative electron micrographs of collagen fibers in the reticular dermis (top) and blood capillaries in the papillary dermis (bottom) from ex vivo human skin samples sham-treated or treated with high-frequency ultrasounds (3.0 W, main frequency 5 MHz, modulated frequency 3,000 Hz, 4x5 second pulses, 10 second intervals). Consistently with the light microscopic findings, collagen fibers are more densely packed in the ultrasound-treated samples. Conversely, in both cases, blood capillaries show normal features. E: endothelial cells.

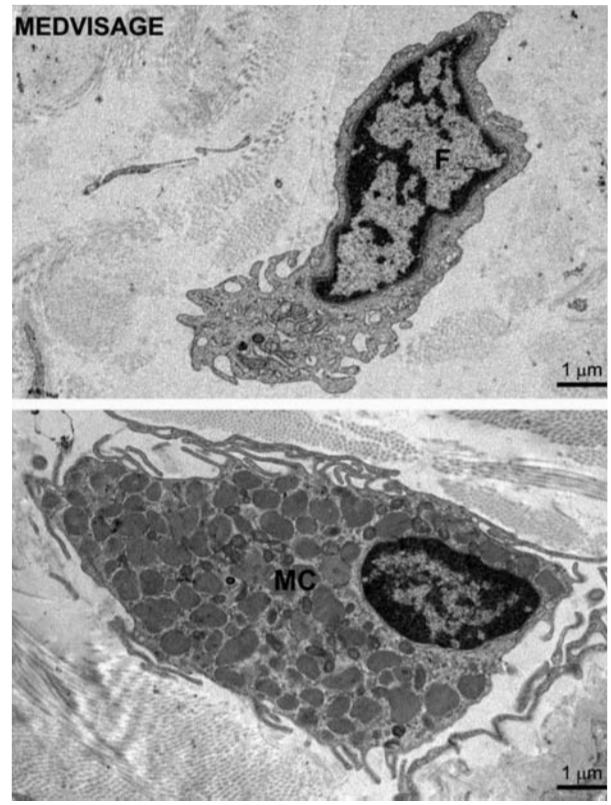

Figure 5: Representative electron micrographs showing a fibroblast (top, F) and a mast cell (bottom, MC) in the reticular dermis from ex vivo human skin samples treated with high-frequency ultrasounds (3.0 W, main frequency 5 MHz, modulated frequency 3,000 Hz, 4x5 second pulses, 10 second intervals). Both cells have normal features and the mast cell does not show any sign of granule discharge.

fibers. Moreover, it offered evidence that high-frequency ultrasound treatment is safe and well tolerated by the skin tissues. In particular, epidermal keratinocytes, dermal fibroblasts, mast cells and endothelial cells of blood capillaries showed normal features, similarly to the sham-treated specimens, with no signs of cell injury such as mitochondrial swelling or plasma membrane rupture. Of note, perivascular mast cells did not appear to undergo cell activation and granule release, accounting for the absence of direct pro-inflammatory effects of ultrasound treatment. Measurement of tissue temperature by a probe placed at the bottom of the specimens, corresponding to the subcutaneous layer, indicated that, even upon repeated ultrasound applications lasting up to 10 seconds, the temperature did not exceed 50°C, thus remaining below the thermal damage threshold. Of note, these values were reached in *ex vivo* explants, where the intrinsic thermoregulatory effect of blood circulation was not operating. Therefore, it can be assumed that actual skin warming in subjects undergoing MedVisage™ treatment may be substantially lower than in our experimental conditions.

Our findings provide new mechanistic insight into the clinical efficacy of high-frequency ultrasounds for skin tightening and rejuvenation purposes (1,8-14). In fact, dermal compaction was immediately achieved upon ultrasound delivery, i.e. before the occurrence of putative heat-induced focal wound healing/collagen remodeling processes that have been postulated to underlie the observed clinical effects (2-4). It can be postulated that this immediate effect of an ultrasound may result from the squeezing of interstitial fluids and the three-dimen-

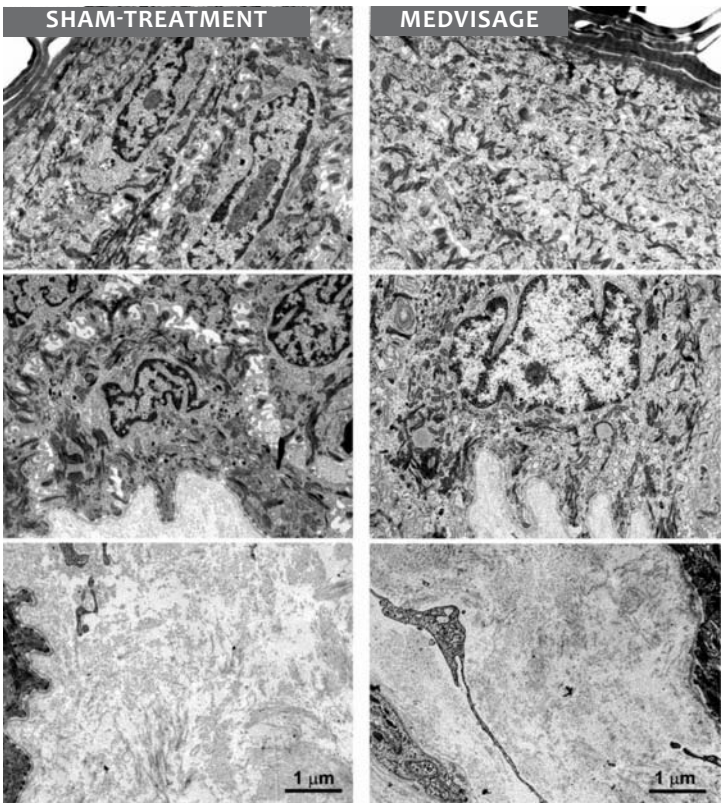

Figure 6: Representative electron micrographs of the surface epidermis (top), deep epidermis, and dermo-epidermal junction (center) and the underlying papillary dermis (bottom) from ex vivo human skin samples sham-treated or treated with high-frequency ultrasounds (3,0 W, main frequency 5 MHz, modulated frequency 3,000 Hz, 4x5 second pulses, 10 second intervals). In both instances, keratinocytes show normal features. Collagen fibrils in the papillary dermis appear more closely packed in the ultrasound-treated sample than in the sham-treated sample.

sional reorganization of the connective fiber meshwork. Conceivably, in the subjects treated for skin rejuvenation, focal wound healing and collagen remodeling may occur in a later phase, thereby providing an explanation for the reported long-lasting beneficial effects of ultrasound treatment (1,7).

Clinically, we observed that a single 5-minute treatment with MedVisage™ at similar energy output and frequency modulation as those used in the *ex vivo* experiments induced a rapid, objective reduction of the overall extension of facial skin wrinkles. The subjects perceived the treatment as comfortable and no side effects occurred. However, as this assay has been performed soon after ultrasound delivery, we cannot rule out that skin edema may have contributed to at least part of the noted wrinkle-reductive effects.

The present histo-morphometrical findings also indicate that the treatment of full-thickness skin explants with MedVisage™ at settings, which can induce dermal connective fiber compaction, did not cause appreciable changes of subcutaneous adipocytes. In fact, ultrasound-induced adipocyte cavitation has been demonstrated to cause destabilization of the adipocyte plasma membrane, focal ruptures of the adipocyte cytoplasm, and extracellular leakage of triglycerides (19,20). These effects account for the liporeductive properties of ultrasound-induced cavitation reported clinically. Conversely, MedVisage™ appears to be suited only for skin-tightening effects on the superficial skin layers, mainly the reticular dermis, with no risk of undesired liporeductive effects on the underlying subcutaneous fat pad. This is particularly important in view of the possible use of MedVisage™ on the skin of the face because, in this anatomical site, integrity of the subcutaneous fat tissue is mandatory for the best aesthetic results.

In conclusion, this study provides additional experimen-

Figura 7: Macro-fotografias representativas da pele periocular (acima) tiradas antes e 15 min. após uma única sessão de 5 min. de tratamento com ultrassom de alta freqüência (3,0W, principal freqüência 5 MHz, freqüência modulada de 3.000 Hz) e correspondentes imagens de alto-contraste (centro), adaptadas para análises morfométrica da extensão das rugas através da exclusão de detalhes indesejados (abaixo). Observou-se redução significativa das rugas da pele periocular. Os gráficos de barras mostram os resultados das análises morfométricas (n = 4, teste t de Student para valores pareados).

tal and clinical evidence that high frequency ultrasounds are an effective and safe noninvasive technique for skin-tightening purposes in aesthetic medicine. ●

ACKNOWLEDGMENTS

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Article Original

Evaluation of the knowledge and photoprotection habits of children and their caregivers in the city of Porto Alegre, Brazil

Avaliação do conhecimento e hábitos de fotoproteção entre crianças e seus cuidadores na cidade de Porto Alegre, Brasil

Authors:
Raquel Bonfá[1]
Gabriela Mynarski Martins-Costa[1]
Barbara Lovato[2]
Raissa Rezende[2]
Camila Belletini[2]
Magda Blessman Weber[3]

[1] Dermatologist Physician from the Universidade Federal de Ciências da Saúde de Porto Alegre (UFCSPA) – Porto Alegre (RS), Brazil
[2] Medical Student at UFCSPA
[3] PhD, Professor at UFCSPA

Correspondence:
Dr. Magda Weber Blessmann
Av. Neuza Goulart Brizola, 495/301
Cep: 90460-230 - Porto Alegre – RS, Brazil
E-mail: mbw@terra.com.br

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ABSTRACT

Introduction: Childhood is considered a critical period for photoprotection, since approximately 80% of the exposure to the sun occurs during this phase of life.

Objectives: To evaluate the characteristics of the knowledge and sun protection habits of children and their caregivers.

Methods: A cross sectional study was conducted with questionnaires from October 2011 to July 2012.

Results: 177 children (mean age = 7.66 years); 64.9% of children assessed exposure to the sun as dangerous, 88.7% knew what sunscreen is, and 94.3% considered its use important; however, 66.6% believed it was necessary only in summer. Regarding photoprotection habits, 37.3% reported exposure to the sun between 10a.m. and 4p.m. Among caregivers, 81.3% reported an absence of daily application of sunscreen on their children, and 33.9% reported that their children had already had some type of sunburn.

Conclusions: Strong dissociation between knowledge and practice regarding exposure to the sun was observed in the present study. The discrepancy between knowledge and habits that was observed in the two groups can be explained by the quality of information on exposure to the sun. The present study's data point to the need for a wider dissemination of adequate knowledge, both by the media and by physicians, to nurture healthy practices regarding exposure to the sun.

Keywords: solar activity; sun protection factor; sunscreening agents; child restraint systems; caregirves

RESUMO

Introdução: *A infância é considerada período crítico para fotoproteção, pois aproximadamente 80% da exposição solar ocorre nessa fase da vida.*

Objetivos: *Avaliar o perfil dos conhecimentos e hábitos de fotoproteção entre crianças e seus cuidadores.*

Métodos: *Estudo analítico transversal, realizado por meio de questionários aplicados de outubro de 2011 a julho de 2012.*

Resultados: *177 crianças, com média de idade de 7,66 anos; 64,9% das crianças avaliaram a exposição solar como perigosa, 88,7% sabiam o que era fotoprotetor, e 94,3% consideraram seu uso importante; entretanto, 66,6% acreditavam ser necessário apenas no verão. Quanto aos hábitos, 37,3% relataram exposição solar entre 10h e 16h. Entre os cuidadores, 81,3% afirmaram não passar filtro solar diariamente em seus filhos, e 33,9% relataram que seu filho já havia tido alguma queimadura solar.*

Conclusões: *No presente estudo, observou-se forte dissociação entre conhecimentos e práticas no que se refere à fotoexposição. A discrepância entre conhecimentos e hábitos, observada nos dois grupos pode ser explicada pela qualidade das informações sobre fotoexposição. Os dados da presente pesquisa apontam para a necessidade de divulgação mais ampla de conhecimentos adequados, tanto pela mídia quanto pelos médicos, que consolide práticas saudáveis em relação à exposição solar.*

Palavras-chave: *atividade solar; protetores solares; hábitos; sistemas de proteção para crianças; cuidadores*

INTRODUCTION

Childhood is considered a critical period for photoprotection, since approximately 80% of the exposure to the sun occurs during that phase of life.[1-3] Furthermore, early exposure to the sun has a greater influence on the development of cutaneous neoplasias as compared with the exposure that happens later in life, meaning that photoprotection from the first years of life reduces the risk of melanoma.[4, 5]

The association between exposure to the sun and skin cancer is well known, being publicized in various media. [6] Research demonstrates that the population has significant knowledge about the subject, nevertheless it is not reflected in appropriate protective measures and practice.[7-9]

METHODS

A cross-sectional study was conducted with the aim of evaluating the knowledge profile and sun protection habits among children and their caregivers, and promoting education on measures aimed at preventing skin cancers.

The sample consisted of children aged five to ten years old and their caregivers, treated at the Dermatology and Pediatrics services of the Universidade Federal de Ciências da Saúde de Porto Alegre (UFCSPA), between October 2011 and July 2012, who agreed to participate in the research project and signed the Free and Informed Term of Consent. The study was approved by the UFCSPA's Research Ethics Committee under the number 1432/11.

The data was collected with questionnaires applied by medical students. Two questionnaires – one directed to caregivers and the other to children – were used. Data on phenotypic characteristics, level of education, and knowledge and habits of photoprotection was collected. After the questionnaires were administered, an explanation was given on the subject, with the aid of informative and clear material suitable for each age group, with potential doubts on the part of the participants being clarified. The data was stored and analyzed using Stata software.

RESULTS

Children

One hundred and seventy-seven (177) children, with a mean age of 7.66±1.62 (min = 5 years old, max = 10 years old) were interviewed. Half of the sample (50.8%) was female. Skin phototype II was predominant (38.4%), and most study subjects (89.3%) did not have freckles. (Table 1)

When asked about the activities they engaged in on a sunny day, the most cited were: swimming in the pool (17.5%), playing ball (17.5%), and cycling (15.8%). (Table 2)

A significant proportion of the children (65%) assessed exposure to the sun as dangerous, showing that they knew what sunscreen was (88.7%). The vast majority (94.4%) considered the use of sunscreen important, nonetheless 66.7% answered that its use was only necessary in the summer. The use of hat and shirt and staying in the shade were cited as measures of photoprotection by 80.2% and 88.1% of children, respectively. On being asked about the influence of tanning on health, 68.9% of children rated it as healthy or indifferent, and only 31.1% rated it as harmful (Table 3). Regarding habits of exposure to the sun, most children (61%) described their exposure as being during appropriate times of the day, however 37.3% reported exposures between 10:00 and 16:00. A total of 44.6% of the children described frequent sunbathing in the summer, while 10.7% described doing the same year-round. (Table 4) The daily use of sunscreen was evaluated by means of information provided by parents and will be discussed in the next section. As for sunburns, 33.9% of parents reported that their children had already suffered some. (Table 4)

Table 1: Characteristics of children participating in the study

Variable	% of participants	N.
Gender		N=177
Female	50.8	90
Male	49.2	87
Average age (years)	Mean ± SD	
	7.66±1.62	
Phototype	**% of participants**	**N.**
I	5.60	10
II	38.4	68
III	21.50	38
IV	20.30	36
V	14.10	25
Presence of freckles	**% of participants**	**N.**
Yes	10.7	19
No	89.3	158

Table 2: Activities performed by children on a sunny day

Activity	% of participants N=177	N.
Swimming in the pool	17.5	31
Playingball	17.5	31
Cycling	15.8	28
Playing with dolls	5.7	10
Playing catch	5.1	9
Going to the park	4.0	7
Swimming in the sea	3.4	6
Other	23.7	42
Not informed	7.3	13

Caregivers

One hundred and seventy-seven individuals (mean age = 35.84±9.47 years, females = 89.8%) were interviewed.

Regarding the level of education, about half of the sample (56.4%) had completed primary school. Skin phototype III was predominant, corresponding to 44.6% of the sample. Eighteen point six percent (18.6%) of the individuals had freck-

Table 3: Knowledge of photoprotection among participating children

Question	% of participants N=177	N.
Do you think it is dangerous to stay in the sun?		
Yes	65	115
No	34,4	61
Does not know	0,6	1
Do you know what sunscreen is?		
Yes	88,7	115
No	11,3	20
Acha importante usar filtro solar?		
Yes	94,4	167
No	2,2	4
Does not know	3,4	6
When should sunscreen be used?		
Only in summer	66,7	118
Only in winter	1,1	2
Always	24,9	44
Never	2,8	5
Does not know	4,5	8
Being tan is considered:		
Healthy/Indifferent	68,9	122
Unhealthy	31,1	55
Does the use of hat and shirt provide protection from the sun?		
Yes	80,2	142
No	19,7	35
Does staying in the shade provide protection from the sun?		
Yes	88,1	156
No	11,9	21

les. (Table 5) Among the interviewees, 15.8% reported a family history of cutaneous neoplasia, and rare individuals (1.7%) had a personal history of skin cancer.

Most respondents had already heard about the risks of exposure to the sun (97.7%), with the media being the information source most frequently cited (74.6%). Only 22.6% reported having obtained information about exposure to the sun from their own physicians. A large portion of the sample rated the risk associated with exposure to the sun as high (88.1%), and all respondents considered the use of sunscreen important (100%). Among the protections provided by the use of sunscreen, protection against skin cancer was recognized by 93.8%, while protection against sunburn and skin aging was recognized by 63.8% and 53.6% of the sample, respectively. Regarding the appropriate time of day for exposure to the sun, only a third of the caregivers (32.6%) described it as the time period before 10:00 and after 15:00 (Table 6). Most respondents (76.3%) deemed their knowledge of photoprotection as appropriate.

Among the interviewed caregivers, 70.6% said that sunscreen should be used daily, although only 29.4% stated using it with such frequency (Table 6). The main reasons cited were: sporadic exposure to the sun (15.8%), forgetfulness (13.5%) and

Table 4: Photoprotection habits among participating children

Question	% of participants N=177	N.
At what time you are you usually exposed to the sun?		
Before 10:00 and/or after 16:00	61	108
Between 10:00 and 16:00	37.3	66
Does not know	1.7	3
Do you usually get suntanned?		
Never	44.6	79
Only in the summer	44.6	79
All year round	10.7	19
Have you ever had a sunburn? *		
Yes	33.9	60
No	61.6	109
Did not answer	4.5	8

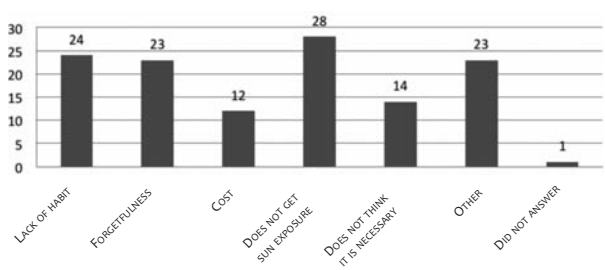
* Information provided by parents/caregivers

lack of habit (13%). (Graph 1) Of the parents who use sunscreen daily, 75% do it once or twice a day, and 7.3% apply the product three or more times per day. Most respondents (77.5%) did not deem the use of self-tanners as a measure of protection against sunrays. Tanning was considered detrimental to good health by 58.2% of the sample, while 62.5% declared not engaging in the habit of sunbathing – though most had previously already undergone some type of sunburn that required medical attention (21.5% of cases).

When asked about the use of sunscreen in children, 22% of the respondents reported applying it always, 40.1% often, 9.6% rarely, and 5.6% never. The sun protection factor (SPF)that was most frequently used in children was SPF30 (27.1%). Most parents (75.1%) resort to other measures of photoprotection regarding their children, the most cited being the use of a hat (65%). The regular screening of children's skin is carried out by 82.5% of the respondents.

DISCUSSION AND CONCLUSIONS

In the present study, a strong dissociation between knowledge and practice regarding exposure to the sun was observed. Almost all of the children interviewed (88. 7%) were aware of what sunscreen is and deemed its use important (94.3%), nevertheless only 18.3% used it daily. Similarly, a study conducted in



Graph 1: Reasons mentioned for not using sunscreen every day

Table 5: Characteristics of adults and children participating in the study

Variable	% of participants N=177	N.
Gender		
Female	89,8	159
Male	10,2	18
Education		
Incomplete primary education	36,1	64
Completed primary education	20,3	36
Incomplete secondary education	9,6	17
Completed secondary education	28,2	50
Incomplete higher education	3,9	7
Complete higher education	1,7	3
Predominant skin phototype		
Adults		
I	1,70	3
II	22,60	40
III	44,6	79
IV	16,9	30
V	12,4	22
VI	1,1	2
Not recorded	0,5	1
Presence of freckles		
Yes	18,6	33
No	80,2	142
Did not answer	1,13	2
Average age (years)	mean ± SD	
	35,84±9,47	

the southern Brazilian State of Minas Gerais with elementary school children demonstrated that only 13.4% applied sunscreen on a daily basis.[10] A European multicenter study on photoprotection in childhood with 631 children, revealed the routine use of sunscreen by only 25% of respondents.[11] A survey with 503 adults conducted in the USA showed that, even in summer, 24% never applied sunscreen on their children.[12]

A study carried out in Lithuania with 5th graders revealed that 66.7% knew that prolonged exposure to the sun was associated with skin cancer whereas only 18.8% reported using sunscreen "almost always".[13] As in the present study, it was possible to observe in these studies that adequate knowledge about the harmful effects of the sun do not translate into appropriate photoprotection behavior. It is important to note, however, that the difficulty in turning knowledge into healthy practice is a medical challenge that transcends national and cultural barriers.

Among parents, the risks of exposure to the sun were well known (97.7%), as well as the benefits of using sunscreen – especially the prevention of skin cancer. Contrary to the children's opinion –most of whom felt sunscreens should be used only in the summer – most parents (70.6%) considered it important to use the product throughout the year.

Nonetheless, that difference did not significantly translate into changes in habits, since only 29.4% of parents made daily

Table 6: Conhecimentos e hábitos de fotoproteção dos adultos participantes

Knowledge	% of participants N=177	N.
Has already heard about the risks of sun exposure		
Yes	97,7	173
No	2,26	4
Parents' source of information about the risks of sun exposure		
Media	74,6	141
Family	9	16
Friends	9	16
Physician	22,6	40
Other	10,1	18
Deems the risks associated with sun exposure to be high		
Yes	88,1	156
No	11,8	21
Considers it important to use sunscreen		
Yes	100	177
No	-	
Considers sunscreens to provide protection against:		
Cancer	93,8	166
Sunburns	63,8	113
Skin aging	53,6	95
Time considered appropriate for exposure to the sun		
Before 10:00	32,7	58
Between 10:00 and 15:00	3,4	6
After 15:00	26,5	47
Before 10:00 and after 15:00	32,6	63
It does not matter	1,7	3
Frequency at which its considered important to use sunscreen		
Daily	70,6	125
Only during the summer	29,4	62
Believes that self-tanners protect the skin from the sun		
Yes	11,3	20
No	77,5	137
Does not know	10,2	18
Did not inform	1,1	2
Believes tanning is unhealthy		
Yes	58,2	103
No	17,5	31
It does not matter	23,7	42
Did not inform	0,5	1
Habits		
Uses sunscreen daily		
Yes	29,4	52
No	70,6	125
Frequency of getting suntanned		
Never	62,5	111
Only during the summer	30,7	54
All year round	5,7	10
Did not answer	1,1	2
Frequency with which applies sunscreen on their children		
Always	18,6	33
Frequently	22	39
Sometimes	40,1	71
Rarely	9,6	17
Never	5,6	10
Did not answer	3,9	7
Uses other photoprotection measures in their children		
Yes	75,1	133
No	20,9	37
Did not answer	3,9	7
Photoprotection measures used		
Hat	65	115)
T-shirt	23,1	41
Long sleeves	3,4	6
Sunglasses	6,2	11
Lip sunscreen	2,2	4

use of sunscreen. Even among them, only a small portion (7.3%) reported applying the product three or more times per day. Among those who did not apply sunscreen daily, the most commonly cited reasons were: sporadic exposure to the sun, forgetfulness, and lack of habit. However a predominant, single explanation was not possible to ascertain, which highlights the level of complexity involved in the educational process of the population regarding photoprotection. Limited adhesion by adults has already been observed in previous studies. A study carried out with 1,143 individuals in Chile noticed the prevalence of appropriate use of sunscreen among 70% of adults.[15] Those results, however, appear to be associated with the study's methodology, in which data collection was carried out in the summer, at leisure resorts.

Regarding the use of sunscreen among children, 81.3% of parents reported that they did not apply it on their children daily. In the present study, as in previous research, there was a statistical association between parental photoprotection habits and those of their children ($p < 0.001$). With similar data, a Spanish study published in 2000 considers parental habits as the strongest determining factor of the children's photoprotection.[16] However, bibliographic production on the subject is diverse, to the extent that while such a correlation is observed in some studies,[14] it is not in others.[12]

Previous research has shown an association between the use of sunscreen and family income, sunny weather conditions, family history of skin cancer, and fairer skin tones.[12] In the present study, it was not possible to observe association between the use of sunscreen and the socioeconomic or phenotypic variables of the sample.

Interestingly enough, the prevalence of daily sunscreen use in the present study was higher among parents than among children. Additionally, there is evidence that the caregiver's age and gender were associated with greater use of sunscreens in children,[17] a fact that could not be verified in the environment where the present study was carried out. In line with that finding, it is therefore important to note that in the present study, the child's caregiver was often not a parent, but a grandparent or other family member, a fact that may have influenced the present analysis. Likewise, the high prevalence of female caregivers in the present study (89.8%) hampers the analysis of the impact of the caregiver's gender on the photoprotection care of their children.

Still, regarding the caregivers' knowledge, it is worth analyzing the recognition of the protections provided by sunscreen. As in previous studies,[15] although almost all (93.8%) adults recognize the benefits of the protection against skin cancer, a significantly smaller portion acknowledges its protective properties against sunburns (63.8%) and the aging of the skin (53.5%). Even among medical students and resident physicians, this knowledge is scarce – especially regarding photodamage.[18] In light of this data, it is worth highlighting the necessity for photo-education campaigns to focus on aspects other than exclusively cutaneous neoplasias.

The appropriate time of day for exposure to the sun – a frequent theme in photoprotection campaigns – was correctly identified by about two-thirds of adults. Data from previous studies suggested there is less knowledge on that subject among the adult population, with this finding possibly being associated with methodological differences among studies.[15]

In the present study, tanning was considered harmful by a significant portion of the sample (37.3% of children and 58.2% of adults). Nevertheless, tanning behavior – whether in summer or throughout the year – was reported by 55.3% of children and 37.5% of adults. The persistence of the habit of sunbathing, as well as its association with good health, could be observed in previous research. In a Spanish study published in 2009, 50.7% of parents stated they enjoyed being suntanned.[14] In a research study conducted in 2004, 38.1% of boys and 40% girls associated having a suntan with good health.[13]

Sunburns are still common, having occurred in 33.9% of children in the present study's sample, indicating improper exposure to the sun in childhood. This data corroborates the information found in the literature regarding high rates of sunburn in children. Previous studies showed a sunburn prevalence of up to 80%,[13,18,17] suggesting there is a possibility for the present study's data to be underestimated. A tendency for parents to underestimate the number of sunburns suffered by their children has already been suggested in previous studies.[16] In the present study, there was no association between the occurrence of sunburn and the sample's variables, both in adults and in children. In contrast, previous studies have shown a higher incidence of sunburns in adults younger that 25 years old and in women.[15]

The gap found between knowledge and sun exposure habits, observed both among caregivers and among children, however, can be explained – at least partially – by the quality of information on exposure to the sun. It is important to highlight the central role played by the media in informing the population, cited by 79.6% of adults as a source of knowledge in the present study – a finding that is in line with previously conducted research.[15] Thus, it is worth highlighting and observing the quality of the information conveyed by the media. In a study on the subject, it was found that although almost half of the articles on the theme of cancer address the importance of prevention, only 24.1% explained the methods to achieve that.[6]

It is also important to take into consideration that less than one fifth of the articles analyzed had more than one opinion on the subject matter and that less than one third made reference to scientific publications. In addition to the information provided by the media, it is also important to emphasize the role of physicians in the transmission of knowledge about photoprotection. In a study with pediatric resident physicians, it was found that they do not consider themselves informed enough about photoprotection and skin cancer.[19] Aligned with this data, only 22.6% of adults surveyed in the present study stated they had obtained information about photoprotection through physicians – similar to what was found in previous studies.[14, 17]

It is also important to note that educational programs on photoprotection with students at school age lead to improved knowledge and practices related toexposure to the sun.[13, 20] In particular, the importance of creating educational programs

guided by teachers and involving parents on a frequent basis, stands out.[20, 14]

The data of the present research – as well as that available in the literature,[5, 21] – points to the need for a wider dissemination of proper knowledge about photoprotection in order to consolidate healthy practices regarding the exposure to the sun. Therefore, it is important that campaigns focus not only on the use of sunscreen, but also on other measures of photoprotection, in addition to a wider dissemination of the various harmful effects of the exposure to the sun, besides cancer. Changing ingrained habits is undoubtedly a slow process, however it is only possible with the active participation of society, despite the responsibility of physicians, regardless of their area of expertise.

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Treatment of onychomycosis with Nd:YAG laser: results in 30 patients

Tratamento da onicomicose com laser Nd-YAG: resultados em 30 pacientes

Author:
Claudia Maria Duarte de Sá Guimarães[1]

[1] Dermatologist Physician at private practice - Rio de Janeiro (RJ), Brazil

ABSTRACT

Introduction: Onychomycosis is responsible for over 50% of the conditions affecting fingernails. Several factors contribute to poor topical or systemic therapeutic response.

Objective: A retrospective, monocentric study was carried out with the aim of observing the effects of Nd:YAG laser in patients who had not responded to other previous treatments.

Methods: Thirty patients were photographed and subsequently underwent collection of material for fungi culture, and then treated with sub-millisecond 1,064nm Nd:YAG laser sessions with real time temperature control.

Results: Clinical improvement of the treated nails was observed, with minimal discomfort.

Conclusions: 1,064nm Nd:YAG laser promotes the acceleration of growth and improves the clinical appearance of the treated nails.

Keywords: lasers; lasers, solid-state; onychomycosis; phototherapy;spectrum analysis; trichophyton.

RESUMO

Introdução: *A onicomicose é responsável por mais de 50% das doenças que afetam as unhas. Vários fatores contribuem para a má resposta terapêutica tópica ou sistêmica.* ***Objetivo:*** *O presente trabalho monocêntrico, restrospectivo, visa observar a resposta ao laser ND-YAG 1064nm por parte de pacientes que não responderam a tratamentos anteriores.*

Métodos: *30 pacientes foram fotografados e submetidos a sessões de laser Nd-YAG 1064nm submilissegundo com controle de temperatura em tempo real, após a coleta de material para cultura para fungos.*

Resultados: *Observou-se melhora clínica das unhas tratadas, com mínimo desconforto.* ***Conclusões:*** *O laser Nd-YAG 1064nm promove o aceleramento do crescimento das unhas e melhora o aspecto clínico das unhas tratadas.*

Palavras-chave: *lasers; lasers de estado sólido; onicomicose; fototerapia; análise espectral; trichophyton.*

Correspondence:
Dr. Claudia Maria Duarte de Sá Guimarães
Av. Nossa Senhora de Copacabana, 435 / sala 903
Cep: 20031-000 - Rio de Janeiro – RJ, Brazil
E-mail: doctorsa@uol.com.br

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INTRODUCTION

Onychomycosis is a pathology that is responsible for over 50% of the diseases that affect the nails.[1] Despite the treatment advances that have taken place with the introduction of antifungal drugs in the 1990s, its treatment remains a challenge.[2]

Onychomycosis in the halluces is difficult to treat and prone to recurrences. Dermatophyte fungi, non-dermatophyte fungi, and *Candida spp*[3] constitute its primary causes. Some factors pertaining to the host have an influence on the treatment – age, gender, vascular disease, diabetes, hypertension, number of infected toenails, duration of infection, history of previous treatment, type of onychomycosis, percentage of involvement of the nail, nail thickness, presence of dermatophytoma, involvement of the matrix, lateral involvement, and growth rate of the nail.[3] Other mentioned factors are inadequate hygiene, frequent trauma to the nail, athlete'sfoot, prolonged hydration of the skin, excessive sweating of the feet, a habit of walking barefoot, use of open-toed shoes, frequent swimming, the sharing of bathing facilities, and warm weather.[4] The evaluation of these factors helps to guide treatment and indicates the need for combined therapies. In particular, it is possible to observe the increase of microorganisms such as *Candida* (*albicans* and *parapsilosis*) and *Fusarium spp*, in immunocompromised individuals.

The 1,064nm Nd:YAG laser lies in the vibrational spectroscopy range of the near infrared (NIR), corresponding to a 750 to 2,500nm wavelength. According to the physical characteristics of that range (studied through analytical methods), it is fast (one minute or less), non-destructive, non-invasive, promotes a high penetration of the radiation beam, is suitable for universal use.[5,6] The use of devices that emit NIR wavelengths has caused the photoinactivation of fungi and other microbial pathogens without damaging adjacent healthy tissues. The hypothesized action on the microorganisms is that of the interaction of the plasma and mitochondrial membranes, with the generation of oxygen radicals and the destruction of *Staphylococcus aureus*, *Escherichia coli*, *Candida albicans* and *Trichophyton rubrum*, among others.[7,8]

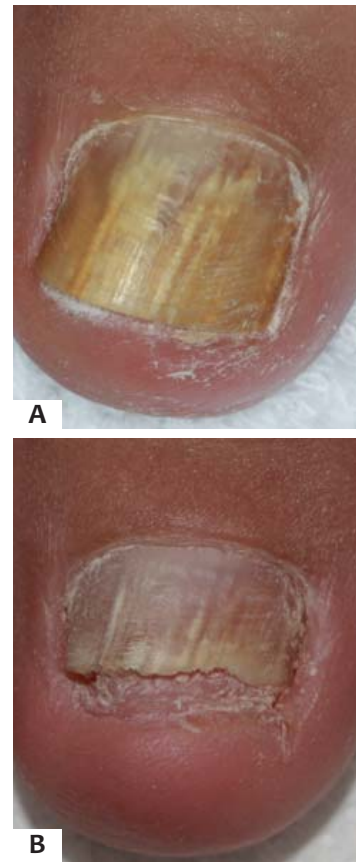

Figure 1 (Case 4): **A** Total dystrophic onychomycosis caused by T. rubrum. **B:** After 14 Nd:YAG laser sessions.

METHODS

A monocentric, retrospective, non-comparative clinical open study was conducted at a private practice in Rio de Janeiro, Brazil, to assess the effectiveness of 1,064nm sub-millisecond (0.3ms) Nd:YAG in the treatment of chronic onychomycosis. The study was conducted according to the ethical principles of the Helsinki Declaration of 1975, updated in 2000 and revised in Edinburgh in 2008.

Of the ninety-seven cases followed up, 30 patients were included. The study group consisted of individuals aged between 25 and 80 years, who bore onychomycosis in the right and/or left hallux – of mild, moderate, or severe intensity – for more than 3 years, and had undergone systemic and/or topical treatment for over a year without clinical improvement. The volunteers signed a free and informed consent term after receiving information about the disease and preventive care. Patients with a negative culture, use of systemic medication for less than one year, and who did not complete the course of treatment were excluded. The recommendations made to participants were: to use antifungal powder in the shoes (2mg undecylenic acid, 150mg zinc undecylenate, 60mg calcium propionate, 0.5mg hexylresorcinol), to wash socks in hot water, and to avoid using scissors to remove cuticles and trim nails (replacing the latter with disposable nail files).

Standardized photographs for clinical control were taken with a CanonT1i camera, 60mm fixed lens, flash, and white background. After collecting material for a culture, the 1,064nm Nd:YAG laser Joule (Sciton) was applied with a ClearSense handpiece at between 42-44°C, in spiral movements on the external border towards the center of the nail. Energy was set at 5-7j/cm^2, pulse duration at 0.3ms and repetition rate at 4.0Hz in three initial sessions at weekly intervals. The initial sessions were followed by further sessions up until the diseased nail had completely grown.

Patients with less than 50% involvement of the nail were followed up with every three months while those with more than 50% were seen monthly.

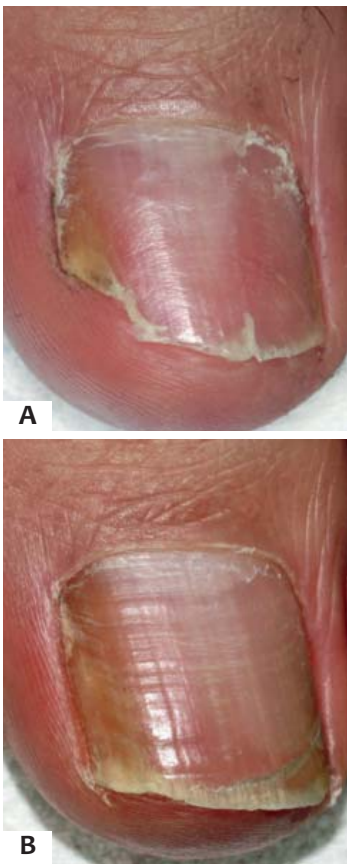

Figure 2 (Case 7): **A** Total dystrophic onychomycosis caused by Trichosporon spp, T. mentagrophytes
B: After 14 Nd:YAG laser sessions

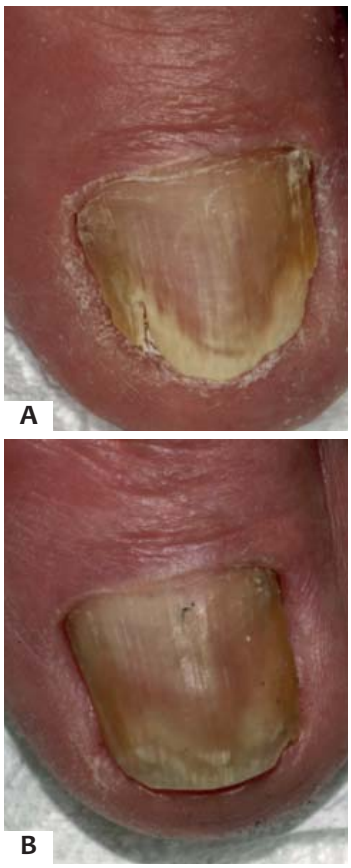

Figure 3 (Case 11): **A** Distal and lateral onychomycosis, Fusarium spp.
B: After 8 Nd:YAG laser sessions

RESULTS

The treatment was well tolerated by patients, who showed only transient discomfort during laser application. No adverse effects were observed. The treatment duration and the number of sessions required were influenced by the intensity of involvement of the nail plate (Table 1). Of the 30 included patients, 18 were more than 50 years of age and 12 were younger than 50 years of age (6 were under 35 years of age). The involvement of the nail plate was greater than 50% in 23 cases and less than 50% in 7 cases. Pathogens found were *Trichophyton mentagrophytes* (4 cases), *Trichophyton rubrum* (5 cases), *Trichosporon spp* (8 cases), *Candida spp* (7 cases), *Fusarium spp* (5 cases), *Scytalidium dimidiatum* (1 case), and mixed infections (4 cases of association of fungi and/or bacteria). The number of sessions ranged from 3 to 16 for each case. Variable clinical improvement was observed in the treated nails. (Figures 1 to 5)

DISCUSSION

Light has been used since ancient times to treat diseases. The first experiments with phototherapy date back 100 years, when Raab and Von Tappeiner studied the action of red acridine on the culture of paramecium.

Since then, several types of dyes (including toluidine blue, methylene blue, eosin, 5-ALA etc), were tested in the elimination of microorganisms through photodynamic therapy.

However, some of the dyes used have considerable toxicity, and the absorption by the target requires the removal of the nail plate, hindering its clinical use. Currently, with the gradual increase of resistance of microorganisms to medications, other treatment methods, such as tests with less toxic dyes and the use of lasers in the NIR range (870/930nm, 1,064nm, 1,444nm), are being studied with the objective of destroying pathogenic fungi and bacteria with a minimum of damage to the host.

Onychomycosis is a difficult to treat disease that is influenced by factors pertaining to the host and the pathogen. The penetration of topical medications in the affected nail bed can be increased with the abrasion of the nail[9] or with the use of strategies to improve the permeation of the drug through the use of sulphites, hydrogen peroxide, urea, and salicylic acid, among others.[10] Among the substances mentioned, hydrogen peroxide and urea – in addition to the abrasion of the affected nail – are allies in the fight against dermatophytomas and very thick nails. The slow growth of nails due to the use of tight shoes or circulatory problems can be approached with guidance on

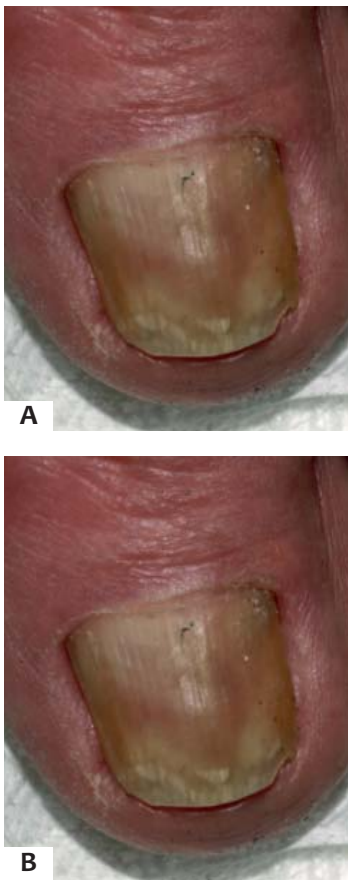

Figure 4 (Case 15): **A** Distal and lateral subungual onychomycosis caused byFusarium spp. **B:** After 3 Nd:YAG laser sessions

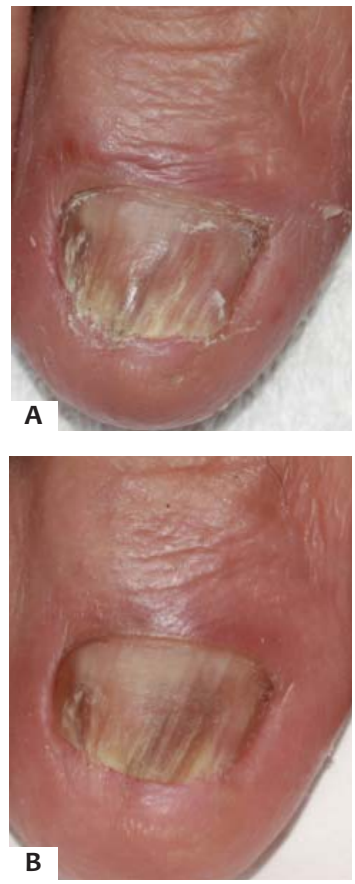

Figure 5 (Case 20): **A** Distal and lateral subungual onychomycosis caused by Trichosporon spp. **B:** After 4 Nd:YAG laser sessions

the use of appropriate footwear, hygiene, and stimulation from a 1,064nm Nd:YAG laser.

The 1,064nm Nd:YAG laser, applied with low energy levels and short duration pulses, promotes angiogenesis, stimulates the production of collagen fibers[11,12] and promotes the alteration of the microorganisms' walls. Furthermore, it improves microcirculation of the extremities, accelerates nail growth and inhibits the multiplication of microorganisms without the inconvenience of the mutagenic effect of ultraviolet light. There is also the added advantage of not needing the use of photosensitizers – such as in photodynamic therapy, which combines the LED light (light-emitting diodes) in the NIR range.[13-14]

Carney et al., resting on the assumption that the effect of Nd:YAG laser could be due to the thermal effect or direct action of the viability of fungi, conducted a study to evaluate in vitro and in vivo three different pathogens –*Trichophyton rubrum*, *Epidermophyton floccosum,* and *Scytalidium dimidiatum*. The authors observed clinical improvement of 10 studied patients for 24 weeks, however could not confirm whether the action of hyperthermia would be sufficient to explain the reduced intensity of onychomycosis in the nails treated.

They used an energy level of 16 J/cm^2, a pulse duration of 0.3 milliseconds, a spot size of 5mm and a repetition rate of 2.0Hz (500 shots per session on the ten nails) in all sessions, and have considered that the treatment caused pain and a burning sensation.[15-21]

In the experience of the author of the present article, the use of 5-7 J/cm^2, pulse duration of 0.3 milliseconds, a 6mm spot size and a repetition rate of 4.0Hz are well tolerated, in several passes. Using the measurement of the handpiece's thermometer as the end point for the session, with enough accumulated energy to reach between 42-44°C (indicated by the yellow light), it is possible to reach a higher number of shots (between 1,200 - 1,600) in the 10 nails treated. Real time temperature control is important to avoid onycholysis due to the coagulation of proteins, which happens at temperatures close to 50ºC.

Table 1: Patients treated

Case	Male	Female	Age	Pathogen	Diagnosis	Sessions	>50%	<50%
1		1	34	*Kleb.pneum. T. rubrum*	TDO	16	1	
2		1	55	*Citrobacter farmeri*	PSO	9		1
3		1	29	*Candida spp*	DLSO	3	1	
4	1		71	*T.rubrum*	TDO	14	1	
5		1	69	*T.mentagrop.*	DLSO	8		1
6		1	64	*Fusarium*	DLSO	7	1	
7		1	40	*Trichospo T. menta*	TDO	14	1	
8		1	41	*Candida spp*	DLSO	5		1
9		1	47	*Trichosporon spp*	DLSO	5		1
10		1	54	*T.rubrum*	DLSO	14	1	
11	1		40	*Fusarium spp*	DLSO	8	1	
12	1		74	*Trichophiton spp*	DLSO	7	1	
13	1		31	*S. dimidiatum*	TDO	10	1	
14		1	56	*Pseudomonas spp*	TDO	6	1	
15		1	65	*Fusarium*	DLSO	3	1	
16		1	50	*Trichosporon*	DLSO	10	1	
17		1	69	*pseud candida*	DLSO	8	1	
18	1		69	*T.rubrum*	DLSO	8		1
19		1	56	*T.rubrum*	TDO	8	1	
20		1	65	*Trichosporon spp*	DLSO	4	1	
21		1	40	*Candida sp*	DLSO	3		1
22	1		44	*Trichophiton spp*	TDO	4	1	
23	1		67	*Trichosporon spp*	TDO	7	1	
24		1	25	*Candida spp*	DLSO	3		1
25	1		64	*T.rubrum*	TDO	3	1	
26		1	80	*T.mentagrophytes*	DLSO	4	1	
27		1	67	*Trichosporon spp*	DLSO	6	1	
28		1	33	*Candida spp*	DLSO	12	1	
29		1	52	*Fusarium spp*	TDO	9	1	
30		1	30	*Fusarium spp, Candida spp*	TDO	19	1	
						23	7	

DLSO - Distal and lateral subungual onychomycosis
PSO - Proximal subungual onychomycosis
TDO - Total dystrophic onychomycosis
Gender: male or female
Involvement: >50% or <50%

CONCLUSIONS

The treatment of onychomycosis with 1,064nm Nd:YAG proved to be well tolerated. The treated cases showed acceleration of nail growth and improvement of the clinical aspect of the nails. Taking into consideration that only chronic cases already treated with other therapeutic modalities were selected, it can be stated that the use of the laser in question is an option valid for cases of treatment failure or those for which systemic medication is contraindicated. ●

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Pre-operative care in dermatologic surgery

Cuidados pré-operatórios em cirurgia dermatológica

Review article

Authors:
Jules Rimet Borges[1]
Luiz Fernando Fróes Fleury Junior[2]
Ana Maria Quinteiro Ribeiro[3]

[1] Dermatology Resident Physician at the Hospital das Clínicas da Universidade Federal de Goiás – Goiânia (GO), Brazil

[2] MSc, Assistant Instructor of Dermatology, Department of Tropical Medicine, Institute of Tropical Pathology and Public Health (IPTSP), Universidade Federal de Goiás

[3] PhD, Assistant Professor of Dermatology, Department of Tropical Medicine, Institute of Tropical Pathology and Public Health (IPTSP), Universidade Federal de Goiás

ABSTRACT

Pre-operative care in dermatologic surgery is aimed at preventing complications intra-and post-operatively. The clinical history will determine the need for additional tests for prophylaxis of bacterial endocarditis, infection at the surgical site, and valvular and orthopedic prostheses. Diabetes mellitus and systemic arterial hypertension should be under control. Warfarin (keeping the INR within the therapeutic range) and acetylsalicylic acid (for secondary prevention of cardiovascular events) should be maintained. Other drugs should be evaluated. Monopolar electrosurgery should be avoided in patients using implantable electronic devices.

Keywords: preoperative care; antibiotic prophylaxis; anticoagulants; electrosurgery.

RESUMO

Os cuidados pré-operatórios em cirurgia dermatológica visam prevenir complicações nos períodos intra e pós-operatório. A história clínica irá determinar a necessidade de exames complementares de profilaxia de endocardite bacteriana, de infecção no sítio cirúrgico e em próteses valvares e ortopédicas. Diabetes mellitus e hipertensão arterial sistêmica devem estar controlados. A varfarina (mantendo o RNI dentro da faixa terapêutica) e o ácido acetilsalicílico para prevenção secundária de eventos cardiovasculares devem ser mantidos. Outros medicamentos devem ser avaliados. Eletrocirurgia monopolar deve ser evitada em pacientes que utilizam dispositivos eletrônicos implantáveis.

Palavras-chave: *cuidados pré-operatórios; antibioticoprofilaxia; anticoagulantes; eletrocirurgia.*

The pre-operative consultation is intended to assess the patient's state of health, in addition to clarifying details about the surgery and treatment options.[1-4] During this consultation, the physician must gather information on the patient's full medical history, perform a physical examination, and explain the procedure to the patient.[1-5] Moreover, taking photographs of the area to be operated on, and obtaining informed consent are desirable.[2] Although about two-thirds of patients prefer to undergo pre-operative consultation on the same day as the surgery, those with little education or previous surgical complications require that the pre-operative consultation be carried out on a different day.[6]

MEDICAL HISTORY

It is important to assess the history of the present illness, current medication, allergies, clinical and surgical medical antecedents, family history, and lifestyle habits.[2]

It is also crucial to investigate prevalent illnesses or those with potential for surgical complications, such as diabetes mellitus, arterial systemic hypertension, coronary disease, heart fail-

Correspondence:
Hospital das Clínicas da UFG
Ambulatório 21A – Dermatologia
A/C. Dr. Jules Rimet Borges
1ª Avenida, s/n - Setor Leste Universitário
cep: 74605-020 - Goiânia – Goiás, Brazil
E-mail: rimetborges@hotmail.com

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ure, liver and kidney disease, and psychiatric disorders. It is necessary to evaluate and verify both the presence of and management of those conditions,[2] staying in contact with the assistant physician when necessary. The patient must also be questioned on the use of heart valves or orthopedic prostheses in order to implement prophylaxis for infection when indicated. Likewise, the patient has to be questioned on the use of implantable electronic devices, with which electrosurgery can interact. Pregnancy, in turn, requires some special care, which will be discussed later on.

DIABETES MELLITUS

Diabetes mellitus (DM) must be well controlled. If decompensated, treatment before surgery should be optimized. Cardiovascular disease, autonomic neuropathy, and immune deficiency are responsible for major surgical risk factors related to diabetes,[7] those being infection and hypoglycemia. Strict control of DM reduces peri-operative morbidity and mortality with major surgeries.[7] However, more recent studies – randomized and with a great number of patients –have shown that intensive control of DM increases mortality due to increased risk of hypoglycemia.[8] Comparisons of intensive control (glycemia levels near normal) with conventional treatment have suggested that the risk of hypoglycemia is greatest in the first.

Nevertheless, other outcomes assessed (mortality, cardiovascular disease, and renal failure) did not differ between the two groups according to a systematic review of the Cochrane database.[9] Some authors consider reasonable levels of glycemia less than or equal to 200 mg/dL during and after surgery.[10] If the patient uses long-acting insulin, it is recommended that 50% of the dose be administered the morning of the surgery, with a mixed solution of glucose 5% and saline 0.9% administered during the procedure,[1] checking capilary glycemia every hour.[8] During surgery, the goal is to maintain a glycemic level between 100 and 200 mg/dL.[8] Hypoglycemic agents with a short half-life should be suspended on the day of surgery. On the other hand, those with a long half-life – such as clorpropramida – must be suspended 48 hours before in order to avoid hypoglycemia, toxicity, and drug interactions.[11] Classically, delayed wound healing has been associated with diabetes mellitus decompensation.[1,2]

In a prospective study carried out by Dixon JA et al.,[12] the risk of infection in patients with DM (4.2%, 23/551) was higher compared with those without the disease (2%, 235/6673). However, there was no difference in the incidence of non-infectious surgical complications – including suture dehiscence – between the two groups.[12] The combination of intravenous and subcutaneous insulin decreases the incidence of post-operative infections as compared with the use of intravenous insulin alone.[8]

In most cases, regional anesthesia should be preferred to general anesthesia in diabetic patients due to the increased risk of neurological deficit associated with the latter.[10] Anesthetics with epinephrine should be used with caution due to the high prevalence of microangiopathy.[1]

SYSTEMIC ARTERIAL HYPERTENSION

Uncontrolled systemic arterial hypertension (HTN) increases the risk of bleeding during and after surgery.[1,2] However, in a study with 924 patients, Penington observed increased risk of infections in patients using antihypertensive drugs after cutaneous excisions (odds ratio = 2.5, p = 0.006), however there was no statistical significance of the increase of post-operative bleeding.[13] If the patient uses antihypertensives, they must be taken even on the day of surgery. It is recommended that the procedure be postponed if blood pressure levels are above 180x110 mm Hg.[2]

CORONARY ARTERY DISEASE

In patients with coronary heart disease, epinephrine may cause concern due to its vasoconstrictor and cardio stimulating effect.[2] The patient should be evaluated by a cardiologist pre-operatively, and the dermatologic surgeon must be capable of recognizing complications during ambulatorial procedures, providing initial care in cases of angina. However, as dermatologic surgeries are mostly carried out in ambulatorial settings, they are considered of low surgical risk.[14]

HEART INSUFFICIENCY

Pain and anxiety can cause exacerbations of the clinical picture in patients with heart insufficiency.[2] The dermatologic surgeon should be aware of this possibility.

LIVER DISEASE

The presence of coagulopathy should be evaluated, as decompensated liver disease may extend the prothrombin time. In addition, portal hypertension and hypersplenism as well as chronic Hepatitis C can lead to thrombocytopenia. It is also important to avoid hepatotoxic drugs in these patients.

RENAL DISEASE

Adjustment of doses of antimicrobial agents according to the patient's renal function must be carried out if needed.

ANEMIA

Although bleeding is the main complication in dermatologic surgery,[15] its incidence is low, occurring in fewer than 3% of cases.[16,17] The level of desirable hemoglobin pre-operatively varies according to the patient's clinical picture. Young patients without cardiopulmonary diseases tolerate lower hemoglobin levels.[4] It is important to assess whether the anemia is symptomatic (asthenia, palpitations, and fatigue on exertion, for example), as well as whether it may have systemic effects (tachycardia, dyspnea, impairment of general conditions). It is prudent to estimate the expected blood loss in the procedure in order to decide on the need for a pre-operative red blood cells.. It is important to note that the cause of anemia should never be neglected by the physician, who must refer the patient to the general practitioner or hematologist, if necessary.

PSYCHIATRIC DISORDER

Patients with unrealistic expectations about the outcome of surgery, or those reluctant to accept explanations from the doctor, are not good candidates for elective procedures. Excessive concern with small benign lesions or even imagined defects in one's appearance, with compromise to social or occupational relationships, can characterize body dysmorphic disorder. On the other hand, it can be part of other psychiatric pictures[2] and requires referral to a specialist.

PATIENT'S AGE

There are peculiarities regarding the age group of the patient. With children, it is important to await until he or she is emotionally able to undergo elective procedures. On the other hand, the elderly should not be excluded based exclusively on age.[3] Clinical evaluation is essential, as well as the functional capacity of elderly patients. It is important to analyze the surgery's impact on their quality of life. A patient with advanced age and dementia, for instance, bearing a bleeding neoplastic lesion that has to be frequently manipulated due to his or her low cognitive ability, will mostly enjoy a positive leap in his or her quality of life with the excision of the lesion – provided that the surgical risk does not surmount those benefits.

PREGNANCY

Elective procedures should be postponed to the postpartum stage.

Lidocaine is safe in low doses (Class B).

Epinephrine is a class C drug; Silva[3] cautions that it can be used in the first trimester rat low doses, and after the fifth month, without risk of decreased placental flow.[3]

Penicillin and erythromycin stearate are acceptable, provided that there is no hypersensitivity to such drugs.

PROPHYLAXIS OF HERPES SIMPLEX

There is a risk of reactivation of the herpes simplex virus after resurfacing with CO_2 laser, dermabrasion, medium and deep peels, genital and oral surgery, and is also sometimes reported following Mohs micrographic surgery.[18,19] The occurrence of herpetic infection after surgical/cosmiatric procedures exposing the dermis in patients with a history of viral infection can reach 50% to 70%. However, it can be reduced with prophylactic measures.[19] There can also be a primary herpetic infection, although it is less common.[19] (Table 1) In cases where there is dermal injury, involvement is more extensive than usual and there is an increased risk of secondary bacterial infection and scarring.[19]

Therefore, in cases using fractional lasers, dermabrasion, medium and deep peels, or application of fillers to increase perioral volume, antiviral prophylaxis is recommended in patients with a history of herpes simplex. The same should be done in cutaneous reconstruction after excision of neoplasia with extensive flaps (particularly in regions innervated by the second and third branches of the trigeminal nerve). In cases of resurfacing and full face or deep perioral peels, even if the personal history is negative, prophylaxis is recommended.

There are no standardized doses. There are treatments with 200mg of acyclovir five times per day and 400-800mg three times a day; Famciclovir 250-500mg twice daily and valaciclovir 500mg twice or three times per day.[2,18,19] Whether a patient starts to take the drug one day before or on the morning of the procedure does not show different outcomes, and the time of use should continue until reepithelialization. The latter time period varies among patients, however it can last roughly seven to ten days, or less.[19] During this period, contact with relatives who have active lesions should be avoided.[19]

INFECTIVE ENDOCARDITIS PROPHYLAXIS

Bacteremia after manipulation of the skin occurs in 38% of cases where a skin infection is present, and in 3% of cases where it is absent.[20] There are only four reported cases of infective endocarditis after cutaneous surgery.[20]

The following characterize a high risk for developing infective endocarditis, according to the American Heart Association, in 2007:[21] bearing a prosthetic heart valve, bearing valvular heart disease corrected with prosthetic material, having a history of infective endocarditis, acquired valvular heart disease in heart transplant patients, uncorrected cyanotic congenital heart disease, cyanotic congenital heart disease corrected but progressing with residual lesion, or cyanotic congenital heart disease corrected with prosthetic material. Prophylaxis is recommended for high-risk patients in surgical procedures involving the oral mucosa, respiratory tract, infected skin, skin structures, and musculoskeletal tissue.[21] Local injection of an anesthetic into the oral mucosa does not require prophylaxis.[20-23] A 2005 consensus[24] cited in several dermatology books recommends prophylaxis of infective endocarditis also in cases of Mohs micrographic surgery in high-risk patients and in cases of excision of eroded skin in patients with prosthetic heart valves. Nonetheless, such guidelines are not upheldin more recent articles.[20-23]

The antibiotic chosen in cases of dermatological surgery should cover *Staphylococcus aureus*, and beta hemolytic streptococci and, in the oral region, *Streptococcus viridans*.[21] (Chart 2) In skin infected by *Staphylococcus epidermidis*, methicillin-resistant *S. aureus* (MRSA) or in cases of recently implanted prosthetic valves, there are recommendations in the literature for the use of 1g IV vancomycin for adults.[23] The antibiotic should be administered 30-60 minutes prior to the procedure. In cases where it is not administered beforehand, it can be administered within two hours of the end of the procedure.[23]

Short duration procedures do not need a post-operative dose (the estimated time of bacteremia is only 15 minutes). If the surgery duration needs to be prolonged,half the initial dose is usually administered six hours after the procedure.[23]

Chart 1: Occurrence of herpes simplex after dermatological procedures that reach the dermis[19]

Personal history of herpes simplex	Without prophylaxis	Prophylaxis with antivirals
Negative	10%	6%
Positive	50%	12%

Chart 2: Choice of antibiotic for infective endocarditis prophylaxis in high-risk patients, in cases of cutaneous surgery [21,23]

		Adults	Children
Oral, 1ª line	Amoxicillin	2g	50mg/kg
Oral, allergy to penicillin	Cephalexin	2g	50mg/kg
	Clindamycin	600mg	20mg/kg
	Azithromycin	500mg	15mg/kg
	Clarithromycin	500mg	15mg/kg
Unable to use medications orally	IM or IV Ampicillin	2g	50mg/kg
Unable to use medications through orally and allergy to penicillin	IM or IV Cefazolin	1g	50mg/kg
	IM or IV Ceftriaxone	1g	50mg/kg
	IM or IV Cefazolin	1g	50mg/kg
	IM or IV Ceftriaxone	1g	50mg/kg
	IM or IV Clindamycin	600mg	20mg/kg

It is important to highlight that amoxicillin, clindamycin, and azithromycin are classed as category B drugs for use during pregnancy, while clarithromycin and vancomycin are category C. The patient must be instructed on the fact that good oral hygiene is more important than antibiotic prophylaxis, given that bacteremia resulting from daily activities is more likely to cause infective endocarditis than the bacteremia associated with dental procedures, for example.[21]

In turn, the British Association of Dermatologists (BAD)[20] states that antibiotic prophylaxis in cutaneous surgery is not routinely indicated, even in high-risk patients. Nonetheless, this guideline should be properly discussed with the patient's cardiologistpriorto the procedure.

PREVENTION OF HEMATOGENOUS JOINT INFECTION IN PATIENTS WITH INTERNAL PROSTHESIS

The use of antibiotic prophylaxis is indicated in high-risk cases: prosthesis for less than two years (new or replacement), previous infection at the site of the prosthesis, hemophilia, immunosuppression (diabetes mellitus, AIDS, malnutrition, malignant neoplasias, use of immunosuppressive therapy), oral procedures involving bleeding, orpotentially contaminated orofacial procedures. The prevention of infection of the skin and soft tissues is important in patients who have already undergone total arthroplasty, since it represents the main sourceof delayed infectionatthe site of the prosthesis. The choice of the antibiotic is similar to that of the prevention of infective endocarditis.[23]

PREVENTION OF INFECTION IN THE SURGICAL SITE

The rate of infection atthe surgical site in the presence of a clean surgical technique is very low (0.91%).[25] Moreover, pre- and post-operative antibiotics increase both the cost and bacterial resistance in the community.[26] Thus, the use of antibiotics for prophylaxis of infection atthe surgical site should be restricted. Bathing before surgery decreases the rate of infection.[3]

Trichotomy 24 hours before should be avoided (if necessary, trimming with scissors must be carried out in the operating room).[3]

The following are risk factors for the infection of the surgical site:[3,22,23] location (below the kneeor on the lips, ears, or groin), smoking habits, immunosuppression (including diabetes mellitus), colonization.

According to the likelihood of infection, cutaneous surgeries can be classified as: clean, clean-contaminated, contaminated, and infected. (Chart 3)[3,5]

The following are indications for antibiotic prophylaxis in dermatologic surgery:[3]

Flap or graft in the nose or ear;

Closure under tension;

Inflammation (class III) or infection (class IV) at the surgical site;

Multiple simultaneous procedures;

Procedures below the knee;

Surgery on the hands;

Decompensated diabetes mellitus;

Immunodeficiency

The choice of antibiotic is similar to that of endocarditis prevention. Oral 800/160 mg trimethoprim-sulfamethoxazole, 500mg ciprofloxacin and 500mg levofloxaxina 30-60 minutes before surgery are also options in cases of surgery on the ears, groin,or lower extremities (below the knee).[23]

Topical antibiotics are not more efficient in preventing wound infection[27] than white petrolatum,[24] besides increasing the risk of bacterial resistance in the community[24,25] and that of contact dermatitis,[24] and therefore should not be used for this purpose.[24-27]

Nonetheless, in a recent well-conducted study with 693 patients, topical decolonization with mupirocin in nasal carriers of *S. aureus* resulted in lower rates of surgical site infection than those caused by oral antibiotics after Mohs micrographic surgery.[28]

Chart 3: Classification of cutaneous surgery according to the potential for infection`.[35]

	Clean (Class I)	Clean contaminated (Class II)	Contaminated (Class III)	Infected (Class IV)
Characteristics	Absence of inflammation	Oral, axillary, and inguinal regions and airways	Acute traumatic non-penetrating wound	Presence of pus, necrosis, or foreign body
	Non traumatic	Second intention	Breach of aseptic techniques	Penetrating trauma for more than 4 hours
	Primary closure			
	Aseptic technique			
Infection rate	<2-5%	5-10%	20-30%	30-40%
Antibiotic prophylaxis	None	*Not routinely	Yes	Antibiotic therapy

***** The patient's surgical conditions should be used as a base.

ELECTROSURGERY AND ELECTROMAGNETIC INTERFERENCE IN ELECTRONIC IMPLANTABLE DEVICES

Implantable electronic devices include the following: heart pacemakers (PM), implantable cardioverter defibrillator (ICD), cochlear implants, deep brain stimulators, vagus nerve stimulators, sacral nerve stimulators, phrenic nerve stimulators, spinal cord stimulators, gastric pacemakers, and bone growth stimulators. Electrocautery is safe in patients with implantable electronic devices because the patient's body does not conduct electric current. Bipolar electrosurgery is safer than monopolar electrosurgery, because with the former the positive and the neutral electrodes are separated by a small space, limiting the flow of electric current.[29,30] Electrosurgery should not be performed within 15cm of implantable cardiac devices.[31] Whenever possible it is important to connect the vessels.

In cochlear implant patients, monopolar electrosurgery is strictly forbidden as it may cause damage to the device, requiring its replacement, or necrosis of cells of the basilar membrane, thereby preventing reimplantation. Bipolar electrosurgery can be used while maintaining at least a 3cm distance between the electrodes and the implant; removing the external components.[31]

Deep brain, sacral nerve, and spinal cord stimulators, as well as gastric pacemakers, can be turned off prior to surgery. In the case of the vagus nerve stimulator, deactivation is not necessary. Regarding bone and phrenic nerve stimulators, there are no specific recommendations in the literature.[31]

MEDICAMENTS

Adrenaline

Among the contraindications to the use of adrenaline are: recent[2] acute myocardial infarction, unstable angina, recent myocardial revascularization, refractory cardiac arrhythmia, uncontrolled hyperthyroidism. Drug interactions:[2] monoamine oxidase inhibitors, tricyclic, phenothiazines, oxytocin, and beta-blockers.

Lidocaine

Among the medicaments that predispose toxicity to lidocaine are:[2] amiodarone, cimetidine, and midazolam.

Immunosuppressants

Immunosuppressants predispose patients to infections and can lead to delayed healing.

BIOLOGICAL AGENTS

The Brazilian Consensus on Psoriasis 2012[32] highlights that surgical reactions of patients using biological agents are not well established, however it recommends suspension for a period of at least two times the half life of the drug before elective procedures, since they could theoretically affect wound healing and hemostasis, thereby increasing the risk of post-operative infection. For patients with rheumatoid arthritis (RA) under treatment with anti-tumor necrosis factor (anti-TNF), an encompassing retrospective study[33] noted that the continuation of biologicals was not a major risk factor for soft tissue infections post-operatively. On the other hand, a systematic review published in 2012[34] concluded that studies on the discontinuation of anti-TNF agents in RA patients undergoing elective orthopedic surgery are conflicting. Nevertheless, it is argued that because of the existence of records showing increased risk of infection with anti-TNF – especially in the skin and subcutaneous tissue – which may affect the healing process, current guidelines suggest such drugs be suspended before elective surgery and restarted in the immediate post-operative period in order to prevent the exacerbation of the basic disease.[34]

In patients with inflammatory bowel disease, anti-TNF agents do not increase the risk of post-operative complications, except when evaluating patients with Crohn's disease in isolation (excluding ulcerative colitis),[35-39] in which there is an increased risk of post-operative infection,[35-38] especially in sites distant from the operated area.[36] Billioud et al. observed an

increased risk of post-operative complications in patients with nonspecific inflammatory bowel disease.[38]

Regarding dermatological surgery, there isan absence of published data.

Beta Blockers

Malignant hypertension and bradycardia associated with adrenaline (alpha-adrenergic stimulation without beta-adrenergic stimulation) although uncommon, may occur.[2]

The indication for betablockers pre-operatively for the prevention of acute myocardial infarction is controversial, however it does not have major implications for dermatologic surgeries, since they have a low surgical risk due to the fact that they are mostly carried out in ambulatorial conditions. It is recommended that these drugs be continued in patients who have used it before the surgery.[40]

Isotretinoin

It imposes a risk of irregular healing, and it is preferable to postpone elective procedures for at least six months after discontinuing the use of this drug.[2]

Anticoagulants and antiplatelet agents

Although it occurs in a small portion of the procedures (0.89-3% of cases)[16,17] and usually without long-term sequelae,[16,41] bleeding is the most common complication in dermatologic surgery.

Bordeaux et al.[16] observed that partial closures, flaps, warfarin, and clopidogrel are significantly associated with bleeding complications. A meta-analysis of articles from 1966 to 2005, published in 2008,[17] found increased moderate to severe post-operative bleeding as compared to the control, associated with warfarin (OR = 6.69, CI = 95%, 3.03 - 14.7, $p < 0.001$) and acetylsalicylic acid – however without statistical significance regarding the latter.[17] Nonetheless, despite the increased risk as compared to the control, the incidence of bleeding complications associated with warfarin in dermatologic surgery remained limited. Severe post-operative bleeding occurred in 5.7% of cases.[17] This is due to the low rate of complications in cutaneous surgery in general.

Vitamin K antagonists (warfarin)

Despite the increased likelihood of peri-operative bleeding associated with this medicament,[16,17] it is usually controlled with adequate hemostasis during surgery and does not require major post-operative care.[16] The risk of thrombotic events with discontinuation of the drug varies from 1:278 to 1:11,500.[20] Thus, the risk of cardiovascular events after discontinuation of the drug in the peri-operative outweighs the benefits of its suspension.[16] It is considered safe to perform surgery if the INR is less than 3[15] - 3.5.[16]

Unfractionated heparin

Its interruption is not recommended in dermatological surgery.[15]

Acetylsalicylic acid (ASA)

Some factors increase the risk of peri-operative bleeding with ASA, among them are: age over 67 years, surgeries close to the ear region, and closure with flaps or grafts.[15] The probability of bleeding is greater when combined with clopidogrel than with isolated ASA.[42]

It is recommended that the drug be suspended from 10 to 14 days before surgery and restarted 7 days after the procedure, in cases where the patient uses it for analgesic/anti-inflammatory purposes or primary prophylaxis of cardiovascular events.[15,43] When ASA is indicated for secondary prevention, it should not be interrupted. This includes patients who have already had acute myocardial infarction or ischemic stroke.[15,43]

Thienopyridines

Thienopyridines are antiplatelet agent inhibitors of the adenosine diphosphate's receptor (ADP). This group is composed of: clopidogrel, ticlopidine, and prasugrel. The risk of bleeding with these drugs is greater when they are combined with other antithrombotics.[16,41] The risk is higher with prasugrel.[43]

Some authors do not recommend suspending the drug pre-operatively.[15] Others instruct patients to maintain it when under monotherapy. However, it is prudent not to undergo surgery before consulting with the prescriber physician in case there is an intention to combine it with other antithrombotics.[43]

Direct inhibitors of thrombin

The direct inhibitors of thrombin are: lepirudin, argatroban, and dabigatran. There are no data about lepirudin and argatroban in dermatologic surgery. And there are few reports of bleeding in dermatologic procedures in patients under the use of dabigatran.[44,45] Although these are new drugs, it is recommended that their use be maintained before dermatological surgery.[15,43,45] There should be heightened attention to bleeding complications in patients over 75 years of age, due to the increased risk of upper gastrointestinal hemorrhage in patients on dabigratan than with those on ASA.[43]

Indirect factor XA inhibitors (Fondaparinux)

Surgery should be postponed until the drug is discontinued or replaced by warfarin.[43]

Direct factor XA inhibitor (Rivaroxaban)

This drug requires further study. Surgery should be postponed until treatment is completed.[43]

Dipiradamol (phosphodiesterase inhibitor)

There is a lack of studies in minor surgeries. There is an absence of recommendation for discontinuation.[15]

Non-steroidal anti-inflammatory drugs (NSAIDs)

Should be suspended 3 to 5 days prior to surgery and reintroduced between 3 and 7 days after the procedure.[15,16]

Herbal medicines and other drugs with platelet anti-aggregant action

Ginger, fish oil (eicosapentaenoic acid), garlic, fever few,

ginseng, ginkgo biloba, vitamin E, glucosamine sulfate and chondroitin have platelet anti-aggregant action and should be suspended before surgery.[16,46] (Chart 4)

Capsaicin can decrease the concentration of factor VIII. Research on bleeding is inconsistent. The use of the drug should be suspended two weeks prior to surgery, and can be resumed two weeks after the procedure.[46]

SUPPLEMENTARY EXAMINATIONS

Supplementary examinations should be requested pre-operatively according to the patient's clinical history and physical examination.[40] There are numerous guidelines in the literature and many different protocols among dermatology services. A coagulogram is recommended in patients with a history of bleeding or with medical conditions that predispose to bleeding, as well as in patients taking anticoagulants.[47] CBC is recommended for patients with diseases that increase the risk of anemia or who are at risk of peri-operative bleeding. Fasting glucose should be requested for patients at risk of undiagnosed diabetes mellitus. Renal function should be assessed in patients with chronic diseases or in use of medications that may alter or cause electrolyte disturbances. Chest radiography should be requested in patients who may have pulmonary complications during or after surgery. Patients with cardiovascular signs and symptoms should be evaluated with appropriate examinations.

Chart 4: Recommendations regarding the suspension of herbal medicines and other drugs that inhibit platelet aggregation [16,46]

	Suspension	Resume after surgery
Ginger	2 to 3 weeks before	2 weeks
Fish oil		
Glucosamine sulfate		
Chondroitin		
Fever few		
Ginseng	7 days before	2 weeks
Ginkgo biloba	More than 36 hours before	7 days
Garlic	7 days before	7 days
Vitamin E	2 to 3 weeks before	Up until complete healing

CONCLUSION

The clinical history serves as a guide for a more appropriate pre-operative management, which does not need to be based on strict protocols, but rather on the overall assessment of the patient and the proposed surgery. ●

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Dermoscopy in periorbital hyperpigmentation: an aid in the clinical type diagnosis

Dermatoscopia na hiperpigmentação periorbital: uma ajuda no diagnóstico do tipo clínico

Authors:
Natacha Quezada Gaón[1]
Williams Romero[2]

[1] Postgraduate in Dermatocosmiatry the Faculty of Medicine of ABC (FMABC) - Santo André (SP), Brazil and Dermatologist responsible for outpatient Dermatocosmiatry the Pontificia Universidad Católica de Chile - Santiago, Chile

[2] Dermatologist responsible for outpatient and Dermoscopy in Psoriasis Pontificia Universidad Católica de Chile - Santiago, Chile

ABSTRACT

Periorbital hyperpigmentation is a common cause of dermatological consultations and can have a major impact on a patient's quality of life. Diagnosis with the naked eye can sometimes leave doubt as to whether the pigmentation is vascular, due to deposition of pigment, or mixed. In the present article the authors describe the dermoscopic features of these three variants, which can help in choosing the most appropriate therapeutic approach for each case.

Keywords: dermoscopy; eye; hyperpigmentation; quality of life

RESUMO

A hiperpigmentação periorbital é motivo frequente de consulta dermatológica e pode apresentar grande impacto na qualidade de vida do paciente. Por vezes, o diagnóstico a olho nu pode deixar dúvidas se a pigmentação é vascular, por deposição de pigmento ou mista. Neste artigo descrevemos as características dermatoscópicas dessas três variantes, o que pode auxiliar na escolha da abordagem terapêutica mais adequada a cada caso.

Palavras-chave: *dermatoscopia; olho; hiperpigmentação; qualidade de vida*

Correspondence:
Dr. Natacha Quezada Gaon
Avenida Ricardo Lyon 1263/207 - Providencia
7510575 - Santiago de Chile - Chile
E-mail: natachaq@yahoo.es

INTRODUCTION

Periorbital hyperpigmentation is a matter of very common consultation in cosmetic dermatology, one that can have a significant impact on a patient'squality of life.[1] The pigmentation of the periorbital region depends on multiple factors: the amount of melanin deposited in the epidermis and dermis, the presence of periorbital blood vessels, reduced thickness of the epidermis (creating a translucent appearance that leaves deep structures visible – the thinnest epidermis of the human body is located in this region), and genetic factors.[2-4]

The skin of the palpebral region is physiologically thin, and is therefore more sensitive to exposure to irritative, recurrent, and chronic factors (contact dermatitis, blepharitis, etc) that

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may contribute to the worsening of the picture through post-inflammatory hyperpigmentation. Based on the main causes of pigmentation, periorbital hyperpigmentation has been clinically classified into three types: vascular, pigmented, and mixed.[5]

The vascular type is genetically determined, with darkening being caused by an extremely thin and translucent skin, favoring the visualization of blood vessels and underlying muscles.[4] The pigmented type is caused by melanin deposits associated with ethnic factors and exposure to the sun.[1] The third type is the mixed type, which results from a combination of factors from the first and second types. It is important to note that all types can be aggravated by post-inflammatory hyperpigmentation, when hemosiderin and melanin deposits can be observed.[2-4]

The classification described is instrumental for a better therapeutic approach, however recognizing each specific type with the naked eye can be difficult. The dermatoscope is a valuable tool in the dermatological examination; nevertheless it is still seldom used in cosmiatric practice. The authors of the present study propose a very simple exploration of the palpebral skin with the dermatoscope, which facilitates easy identification of the periorbital hyperpigmentation type.

COMMENTS

The authors examined 48 patients (40 women and 8 men) between 25- and 53-years-old whose reason for consultation was periorbital hyperpigmentation. They performed clinical examinations with the naked eye under slight local traction, in addition to dermoscopic examination (Handyscope, FotoFinder Systems GmbH, Bad Birnbach, Germany), finding 12 (25%) vascular type patients, 15 (31%) pigmented type patients and 21 (44%) mixed-type patients in the studied series.

In the dermoscopic examination of patients with the vascular type the authors found: diffuse erythema pattern or multiple thin blood vessels or diffuse vascular network.

In the pigmented type, it was possible to observe: a pattern of multiple dots with different sizes and colors, or a diffuse network of pigment. The mixed type was characterized by the combination of the patterns described above. (Figure 1)

CONCLUSIONS

In the authors' experience, it was more straightforward to determine and classify the periorbital pigmentation with the assistance of the dermatoscope, especially in cases where the pigment hue was darker, making it difficult to determine the correct pattern with the naked eye. The authors stress that the accurate clinical classification has direct influence on the therapeutic approach. In vascular periorbital hyperpigmentation it is sought to improve the skin's quality and stabilize the walls of the blood vessels, with the literature indicating the use of vitamin C, Phytonadione (vitamin K1), tretinoin etc. for that end.[2,4] On the other hand, the pigmented type responds favorably to hydroquinone and other depigmenting elements, in addition to intense pulsed light and lasers.[2] In the mixed type, the combination of therapies seems to be the most effective approach.[4,5]

Dermoscopy is a simple, minimally invasive and useful tool in the evaluation of periorbital hyperpigmentation.

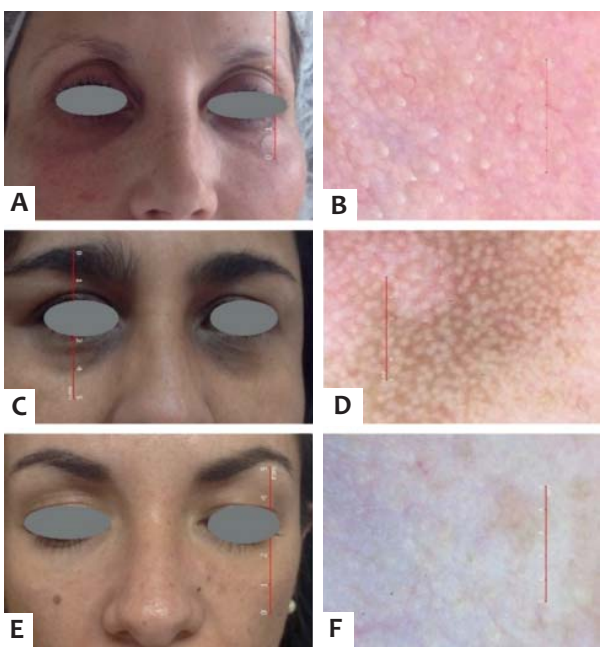

Figure 1: Clinical **(A, C, E)** and Dermatoscopical **(B, D, F).** Vascular periorbital hyperpigmentation (A and B), pigmented type **(C and D)** and mixed type **(E and F)**

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Surgical treatment of axillary hyperhidrosis: internal "shaving" of the sweat glands

Tratamento cirúrgico da hiperidrose axilar: "Shaving" interno das glândulas sudoríparas

Authors:
Osório de Castro Alves Corrêa Lara[1]
Ed Wilson Tsuneo Rossoe[2]

[1] Dermatology Resident Physician at Complexo Hospitalar Padre Bento de Guarulhos - Guarulhos (SP), Brazil

[2] Plastic Surgeon; Master in Health Sciences at the Hospital Civil Servants (HSPE) - Recife (PE), Brazil

ABSTRACT

Primary axillary hyperhidrosis is a common disease that affects the social and professional lives of individuals. There are various treatments described in the literature, such as topical, systemic, and surgical. The present study describes the technique applied in a female patient, bearer of axillary hyperhidrosis, who underwent surgical treatment of axillae, progressing with significant regression of local sweating. The objective of the present study is to demonstrate the effectiveness of this surgical technique, with low complication rates, as a therapeutic option for axillary hyperhidrosis.

Keywords: *hyperhidrosis; axilla; dermatologic surgical procedures; sweat glands.*

RESUMO

A hiperhidrose axilar primária é doença comum, que afeta a vida social e profissional do indivíduo. Existem vários tratamentos descritos na literatura, como tópicos, sistêmicos e cirúrgicos. Relatamos a técnica empregada em uma paciente do sexo feminino, portadora de hiperidrose axilar, que realizou tratamento cirúrgico das axilas, evoluindo com regressão significativa da sudorese local. O objetivo deste trabalho é demonstrar a eficácia dessa técnica cirúrgica com baixos índices de complicações como opção terapêutica à hiperidrose axilar.

Palavras-chave: hiperidrose; axila; procedimentos cirúrgicos dermatológicos; glândulas sudoríparas.

Correspondence:
Dr. Osório Alves Corrêa de Castro Lara
Rua Terceiro Sargento Alcides de Oliveira, 101 apto. 31B
Cep: 07050-030 – Guarulhos – SP, Brazil
E-mail: osoriolara@hotmail.com

INTRODUCTION

Primary axillary hyperhidrosis is characterized by excessive sweating in physiologically larger quantities than that needed for thermoregulation, being considered most often of idiopathic etiology. It has a major impact on quality of life, with limitations on professional life, social interaction, physical activity, and leisure. Its prevalence varies from 1-3% in the population, with a slight predominance in people of Jewish and Asian origin.[1-4]

The treatment of axillary hyperhidrosis may be carried out conservatively with topical products, medicaments, iontophoresis, and botulinum toxin. When the clinical options do not present satisfactory results, surgical procedures are indicated, with a preference for localized resection. Comparatively, transthoracic sympathectomy has a higher risk of complications, such as chest wall paresthesia (50%), pneumothorax (7%),

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Horner's syndrome (<1%), and hemothorax (<1%), in addition to compensatory sweating in other body sites.[3-6]

Local resection of the skin and subcutaneous tissue was used for many years, since the complete exeresis of the sweat glands guaranteed the definitive solution to hyperhidrosis, however it frequently entailed scars with fibrosis and restriction of movement. On the other hand, the removal of the glandular tissue without resection of the skin can be performed through curettage or ablation in a "blind" way (without visual control) – as it is done in liposuction with curettage – or under visual control, usually with the eversion of the borders of the surgical wound in order to visualize the glandular tissue. These two techniques provide additional options for axillary hyperhidrosis resistant to clinical treatment, besides having less morbidity when compared with the already mentioned surgical techniques.[3, 6-9]

CASE REPORT

A 26-year-old mulatto female patient with a history of excessive axillary sweating for five years sought care at the dermatology service. She described noticing the onset of the condition after taking a daytime job as a keeper of an uncovered parking lot, where she had to wear a black-colored uniform. Due to the need for frequent changes of the uniform during the work shift because of excessive sweating, she decided to seek care. Once diagnosed with axillary hyperhidrosis, a treatment with aluminum hydrochloride associated with botulinum toxin was administered with excellent results during the first six months. Nevertheless, after one year of treatment the patient's condition worsened. She was then referred for local surgery, with procedures performed in each of the axillae during different months.

METHODS

The patient, who had suspended the use of topical products in the axillae for five days, was placed in the operating room in the supine position, at a room temperature of 21°C. The demarcation of the hyperhidrotic area was carried out through the Minor iodine-starch test (Figure 1a), with subsequent local antisepsis with pyrrolidone iodine solution and local anesthesia of the affected area. An incision was performed in the axillary crease aligned with the tissue's tension lines (Figure 1b). The detachment of the skin was carried out in the subcutaneous plane, being followed by rigorous hemostasis with electrocoagulation. The borders of the wound were everted, and under direct visual observation, the shaving of the dermis was conducted with surgical scissors, (Figure 1c) with the material removed being sent for histological study (Figure 1d). After the procedure, the skin was sutured with 4-0 nylon, with the placement of a penrose drain. A dressing was applied until the following day.

On the first post-operative day, the penrose drain was removed, with no local complications – such as bleeding, hematoma, necrosis, infection, seroma, or dehiscence – being observed. The patient was instructed as to local care of the surgical wound, antibiotic therapy with cephalexin for 7 days, and restriction of vigorous exercise with the upper limbs for the same period.

The reassessment of the sweating was performed using the iodine-starch test after the procedure, at 14 months in the right axilla and at 16 months in the left axilla, with no sweating being observed in the right axilla (Figure 2a) and a discrete area of residual sweating in the left axilla (Figure 2b).

DISCUSSION

In axillary hyperhidrosis, 50% of the sweat is produced by apocrine glands and 50% by eccrine glands. Using the shaving technique with surgical scissors, the target is the deep dermis and the subdermis, which is the most superficial part of the subcutaneous. In this way, two types of glands are removed: the apocrine (that are located closely adjacent to the hair follicles) and the eccrine (that are partially removed, except for the complete removal of the dermis).[7]

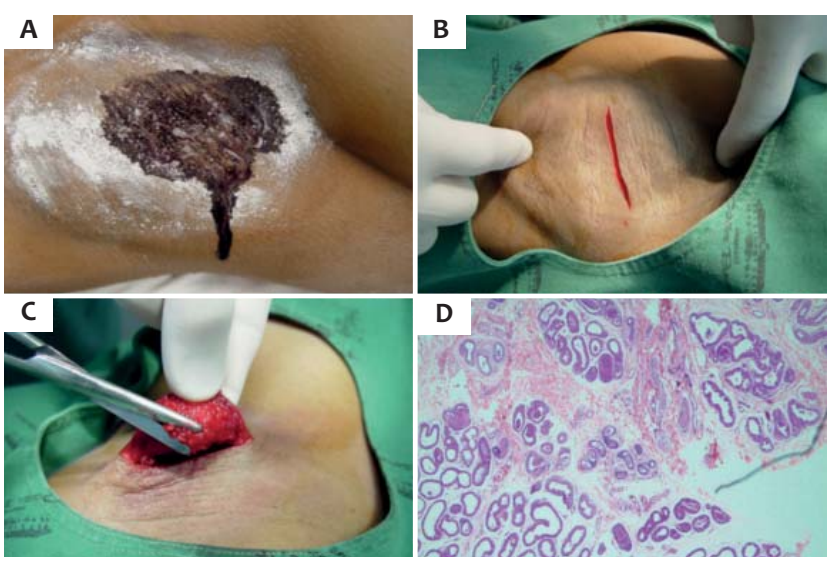

Figure 1: A - Intense sweating after 11 minutes into the test with iodine-starch. **B –** Incision of the skin in an axillary fold **C –** Internal shaving of the hair follicles and glandular tissue with surgical scissors under direct visualization. **D –** HE 40x, with the presence of eccrine and apocrine sweat glands

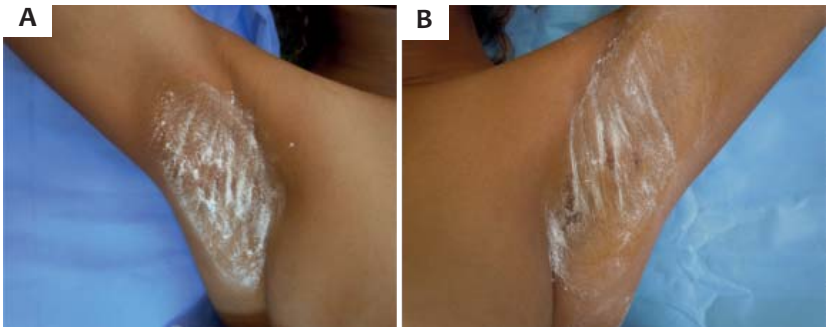

Figure 2: A - Absence of sweating at rest in the right axilla, after 15 minutes at a temperature of 21°C, with iodine-starch test.
B – Presence of mild residual sweating in the left axilla.

Ideally, the permanent removal of axillary sweat glands results in permanent improvement of hyperhidrosis. However, the limited data regarding the results of curettages and the variations in surgical techniques do not allow definitive conclusions on the effectiveness of the procedure in the long run. Continued sweating may occur as a result of incomplete removal of eccrine glands in certain areas or due to local compensatory sweating. The skills of the surgeon performing the procedure can also influence the treatment's efficacy.

The final cosmetic result was considered good, showing no cicatricial retraction. The local sensitivity was preserved, and there was a decrease of the axillary hairs, which was not cause for dissatisfaction by the patient.

CONCLUSION

The authors consider the described surgical technique for axillary hyperhidrosis as a safe method, with low complication rates and an excellent additional option for cases where there is resistance to conservative treatments. Due to the fact that the study was carried out with only one case, the authors note that recurrences cannot be excluded for the method.

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Case Reports

Reconstruction of the lower eyelid with a cutaneous flap and oral mucosa graft

Reconstrução de pálpebra inferior com retalho cutâneo e enxerto de mucosa oral

Authors:
Marcela Duarte Villela Benez[1]
Deborah Sforza[2]
Danielle Mann[3]
Solange Cardoso Maciel Silva[4]

[1] Substitute Instructor at the Dermatology Service, Hospital Universitário Pedro Ernesto da Universidade Estadual do Rio de Janeiro (UERJ) – Rio de Janeiro (RJ), Brazil

[2] Graduate Student in Stomatology, Universidade Estadual do Rio de Janeiro (UERJ) – Rio de Janeiro (RJ), Brazil

[3] Research Assistant at the Department of Dermatology, Hospital Universitário Pedro Ernesto da Universidade Estadual do Rio de Janeiro (UERJ)

[4] Head and Assistant Professor at the Dermatology Service, Hospital Universitário Pedro Ernesto da Universidade Estadual do Rio de Janeiro (UERJ)

ABSTRACT

Over the last centuries, several surgeries for eyelid reconstruction have been developed, perhaps due to the complexity of this anatomical area. Tumors larger than two-thirds of the lower eyelid preclude their direct closure and require surgical reconstruction that preserves the anatomy of the eyelid. The purpose of the present study is to present a technique for reconstruction of the lower eyelid with jugal mucosa and Mustardé flap or advancement flap, without reconstruction of the tarsus. This technique was performed in a series of six cases, all presenting satisfactory post-operative results. These patients did not present distortion of the anatomy nor ectropion.

Keywords: carcinoma, basal cell; carcinoma, squamous cell; mouth mucosa; eyelid neoplasms; surgical flaps.

RESUMO

Ao longo dos últimos séculos, várias cirurgias para reconstrução de pálpebra foram desenvolvidas, talvez devido à complexidade dessa área anatômica. Tumores maiores do que dois terços da pálpebra inferior impossibilitam seu fechamento direto e requerem reconstrução cirúrgica que preserve a anatomia da pálpebra. O objetivo deste artigo é mostrar uma técnica de reconstrução da pálpebra inferior com mucosa jugal, retalho de Mustardé ou de avançamento e sem reconstrução do tarso. Essa técnica foi realizada em uma série de seis casos, todos apresentando resultado pós-operatório satisfatório. Esses pacientes não tiveram distorção da anatomia e não apresentaram ectrópio.

Palavras-chave: *carcinoma basocelular; carcinoma de células escamosas; mucosa bucal; neoplasias palpebrais; retalhos cirúrgicos*

Correspondence:
Dr. Marcella Duarte Villela Benez
Good Shepherd Street, 551
Cep: 20510-060 - Rio de Janeiro – RJ, Brazil
E-mail: mabenez@hotmail.com

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INTRODUCTION

The moveable nature of the eyelids and their functional and aesthetic importance create substantial challenges for the reconstruction of this structure after surgery for tumor resection. A detailed understanding of the anatomy of the eyelid and ocular areas (Figure 1) helps the surgeon in selecting the best surgical technique for restoring ocular function and improving the aesthetic result.

The eyelid is divided into anterior and posterior lamella. The anterior lamella consists of skin and the orbicularis muscle. The posterior lamella consists of the conjunctiva, tarsus, and the eyelid retractor muscles. The orbital septum can be considered a middle lamella and cannot usually be rebuilt.[1-3] The ocular conjunctiva on the surface of the eyeball is continuous with the conjunctiva that overlays the inner surface of the eyelids. This relationship needs to be maintained or restored during recon-

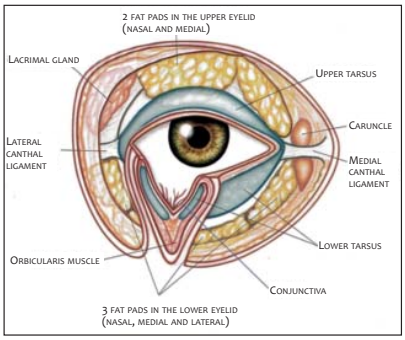

Figure 1: Anatomy of the eyelid. Schematic drawing of the anatomy of the eyelid

struction in order to preserve the palpebral function and prevent complications, such as dryness of the cornea, keratitis, and finally, loss of vision.

The selection of the best technique will depend on the size of the surgical wound, its location, and depth.[2]

Superficial surgical defects require only reconstruction of the anterior lamella. Full-thickness defects require that both lamellae – anterior and posterior – be reconstructed.[2]

Direct primary closure of the eyelid is sometimes possible in the presence of deformities of up to 33% of its horizontal length.

A wedge excision of the total thickness is carried out, and subsequently comes close to the vertical edges of the vertical matress suture. However in major defects, it gives preference to flaps instead of grafts. In this case[1-5], different types of skin flaps can be used: advancing; transposition; Mustardé and Mcgregor; Fricke,[6] Landolt-Hughes, Dupuys-Dutemps Hughes (uses skin and mucosa of the upper eyelid); and Abbe.[1,3,7]

The present article is aimed at introducing a technique for the reconstruction of the posterior lamella, only with a jugal mucosa graft and a Mustardé or a cutaneous advancement flap.

METHODS

A group of 6 patients – between 52 and 73 years of age, bearing surgical wounds on the lower eyelid, resulting from the removal of malignant tumors that were larger than two thirds (50%) of the eyelid's horizontal extension. The tumors were previously confirmed by histopathology: 5 basal cell carcinomas (BCC) and 1 squamous cell carcinoma (SCC). (Table 1) The patients were photographed by the same professional photographer at the pre- and post-operative stages, with the same technique and camera.

The patients underwent local anesthesia with a tumescent solution. After the complete excision of the tumor located in the lower eyelid, surgical reconstruction was performed with a cutaneous advancement or Mustardé flap. For the reconstruction of the posterior lamella, the authors used only the jugal mucosa. In all 6 cases the reconstruction of the tarsus with cartilage graft – which is usual in the lower eyelid surgeries with extensive involvement of that anatomical structure – was not carried out. (Figure 2)

The reconstruction using the advancement flap consists of carrying out a composite flap with 2 vertical and parallel incisions, with a number 15 scalpel blade, just below the surgical defect. The subcutaneous tissue is detached at the orbicularis muscle level. The jugal mucosa graft is removed and then positioned in the residual conjunctiva, being sutured with absorbable thread (6.0 catgut). Next, the cutaneous flap is com-

Table 1: Materials and methods - Description of patients and surgeries

Patient	Gender	Age	Tumor	Location	Surgical technique
Patient 1 (Fig. 3)	Female	73 years	BCC	>50% of the external corner of the lower left eyelid	Mustardé flap with jugal mucosa graft
Patient 2 (Fig. 4)	Male	52 years	BCC	>50% of the medial portion of the lower right eyelid	Advancement flap with jugal mucosa graft
Patient 3 (Fig. 5)	Male	73 years	BCC	>50% of the medial portion of the lower left eyelid	Advancement flap with jugal mucosa graft
Patient 4 (Fig. 6)	Male	64 years	BCC	Total thickness, external corner of the left upper and lower eyelids	Mustardé flap with jugal mucosa graft
Patient 5 (Fig. 7)	Female	69 years	BCC	>50% of the external corner of the lower left eyelid	Mustardé flap with jugal mucosa graft
Patient 6 (Fig. 8)	Male	70 years	SCC	>50% of the external corner of the lower left eyelid	Mustardéflap with jugal mucosa graft

CBC: basal cell carcinoma; SCC: squamous cell carcinoma

pletely detached, superiorly advanced, and positioned within the deformity of the lower eyelid in such a way that the upper border of the residual tarsus is aligned with the border of the flap. The skin is then approximated with a simple suture of 6.0 mononylon thread.

For reconstruction using the Mustardé technique, a lateral incision is carried out from the external canthus – at the level of the zygomatic arch –and running upwards in the direction of the temporal region. The skin is completely detached up to the orbicularis muscle. The jugal mucosa graft is subsequently attached to the residual conjunctiva with absorbable suture (6.0 catgut). Then the musculocutaneous flap is positioned on the lower eyelid, the edges of the wound are brought closer to each other, and the external canthal ligament is sutured to the periosteum for the fixation of the lower eyelid. The skin is then sutured with simple continuous stitches using 6.0 mononylon thread.

DESCRIPTION OF CASES

A 73-year-old female patient with BCC located in the external corner of the left lower eyelid, covering 50% of its length. The authors have chosen the Mustardé technique, with the use of a jugal mucosa graft. (Figures 2 and 3)

A 52-year-old male patient with ulcerated nodular BCC on the right lower eyelid, involving more than 50% of its medial portion. The grafting with jugal mucosa and advancement flap was chosen for the replacement of the anterior lamella, as the location of the tumor was medial. (Figure 4)

A 73-year-old male patient with ulcerated nodular BCC on the left lower eyelid, in its medial portion. The lesion affected approximately two-thirds of the eyelid. The authors have again chosen the advancement flap and grafting with jugal mucosa of the conjunctiva. (Figure 5)

A 64-year-old male patient with nodular BCC affecting the external canthus of the left eye in the total thickness of the upper and lower eyelids. A Mustardé flap and a jugal mucosa graft were performed with excellent functional and aesthetic outcomes. (Figure 6)

A 69-year-old female patient with nodular BCC in the external portion of the left lower eyelid, covering two-thirds of its length. In this case, a Mustardé flap and a jugal mucosa graft were also performed with good outcomes. (Figure 7)

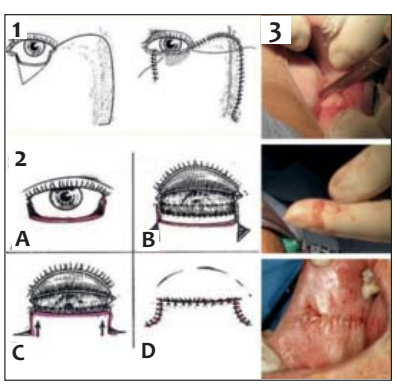

Figure 2: Cutaneous flaps and jugal graft **1:** Illustrative drawing of a Mustardé flap; **2:** Illustrative drawing of an advancement flap; and **3:** Image showing the removal of the graft from the jugal mucosa

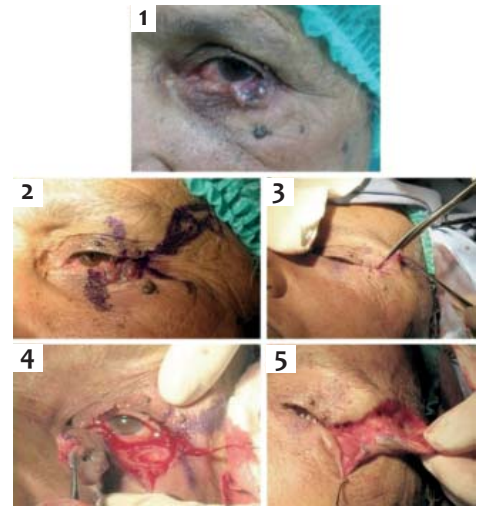

Figure 3: Case 1: BCC in the left lower eyelid; **2:** Marking of the Mustardé flap; **3:** Lateral incision of the skin from the externalcanthus, at the zygomatic arch level, running upwards towards the temporal region; **4:** After resection of the tumor, fixation of the jugal mucosa graft in the remaining tarsus; and **5:** Approximation of the edges of the flap.

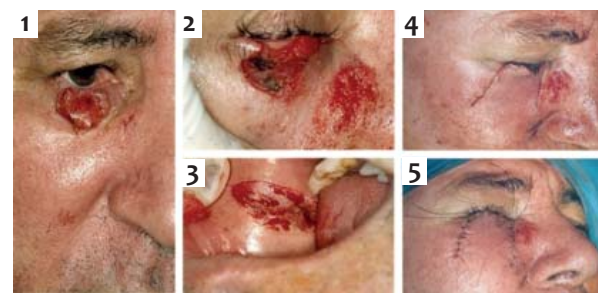

Figure 4: Case - 2 - 1: BCC in the lower right eyelid; **2:** Surgical defect involving more than 50% of the lower eyelid; **3:** Removal of the graft from the donor area; **4:** Incision of the advancement flap; and **5:** Positioning and suturing of the advancement flap.

A 70-year-old male patient with an SCC affecting two-thirds of the external region of the left lower eyelid. The authors have chosen reconstruction with a Mustardé flap and a jugal mucosa graft. (Figure 8)

RESULTS

Six patients (aged 52-73 years, 2 females and 4 males, 5 diagnosed with BCC and 1 with SCC) were operated on. Among the operated cases, 4 were located at the external corner of the left lower eyelid (with 1 of these affecting both the external corners of the upper and the lower left eyelids. The 2 remaining cases affected the medial portion of the lower eyelid.

The patients who had the external corner of the lower eyelid compromised by the tumor underwent the Mustardé flap tech-

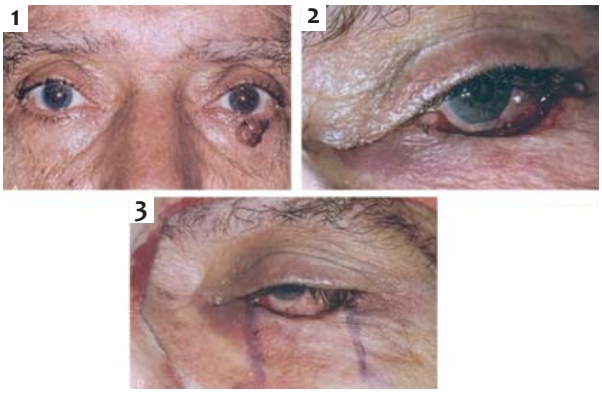

Figure 5: Case 3 - 1: BCC in the left lower eyelid; **2:** Surgical defect affecting two-thirds of the lower eyelid; and **3:** Marking of the advancement flap.

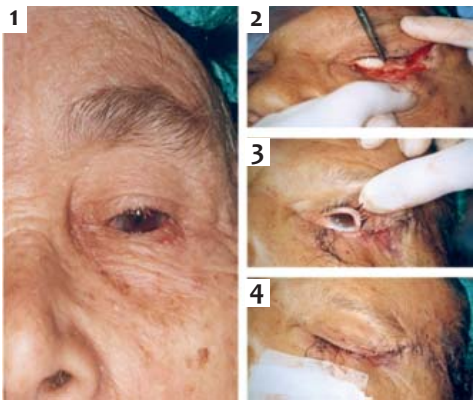

Figure 6: Case 5 - 1: BCC in the left lower eyelid; **2:** Fixation of the jugal mucosa graft; **3:** Positioning of the Mustardé flap; and **4:** Final result

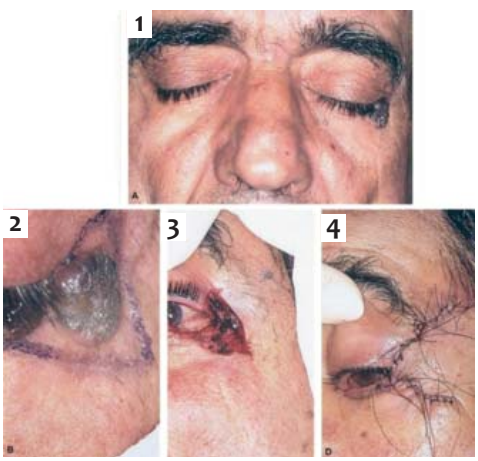

Figure 5: Case 4 - 1 e 2: Pigmented BCC affecting the external corner of the left eye, compromising the upper and lower eyelids; **3:** Surgical wound and placement of the jugal graft; and **4:** Positioning and suturing the Mustardé flap

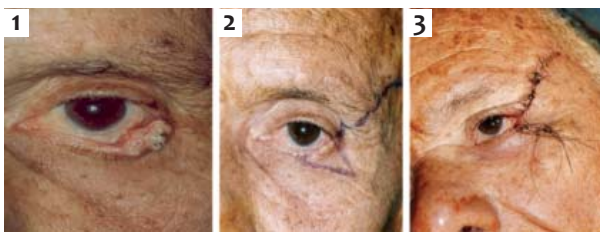

Figure 7: Case 6 - 1: SCC in the left lower eyelid; **2:** Marking of the Mustardé flap; and **3:** Positioning and suturing of the flap

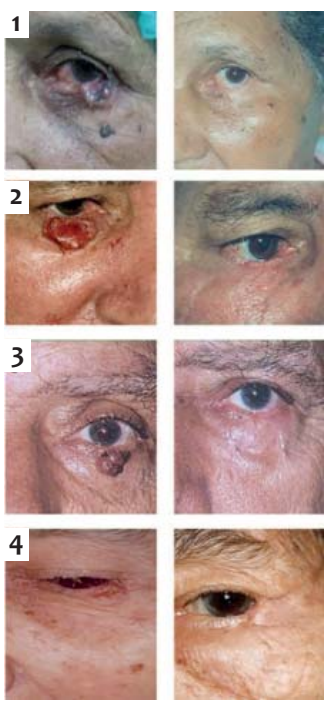

Figure 8: Final results (before and after) **1:** Case 1; **2:** Case 2; **3:** Case 3; and **4:** Case 4

niquewith graftsof oral mucosa. On the other hand, the patients with involvement of the medial portion of the lower eyelid underwent an advancement flap with oral mucosa graft. (Table 2)

The 6 patients had no major complications during the post-operative period. Palpebral oedema with difficulty opening the eye and slight hematoma are expected in the first days after surgery, usually resolving in a few days. All patients received prophylactic antibiotics and were instructed to carry out compress with ice and rest with the head elevated, in order to decrease the palpebral oedema. The stitches were removed on the 7th post-operative day.

It has been more than 7 years since these patients were operated on and all continue to be monitored at the

Table 2: Results of surgeries

Results	Gender	Age	Tumor	Location	Surgical technique
	2 females	52 and 73 years old	5 BCCs	4 cases in the external corner of the left lower eyelid	4 Mustardé flaps with jugal mucosa grafts
	4 males		1SCC	2 cases in the medial portion of the lower eyelid	2 Advancement flaps with jugal mucosa grafts

BCC: Basal cell carcinoma; SCC: Squamous cell carcinoma.

Dermatologic Surgery Service. To date all have presented good aesthetic and functional outcomes in the lower eyelids, with the preservation of the anatomy of that region and without complications, such as keratitis and ectropion (Figure 8), in addition to having demonstrated satisfaction with the aesthetic and functional results of the performed surgery.

DISCUSSION

Several techniques have been described for the surgical reconstruction of the lower eyelid. In extensive surgical defects it is considered that the substitution of the conjunctiva for other mucosal tissue is necessary in order to avoid trauma to the cornea. The literature recommends replacing the tarsus with cartilage – aiming at restoring the palpebral skeleton function– and rebuilding the orbicular skin-muscle complex with a flap or graft.[2, 4]

The Mustardé technique was described during the Second World War and even today is considered one of the best options for extensive lesions in the lower eyelid. Despite the advancement flap not usually being performed in these surgical reconstructions, due to the risk of ectropion, they can provide satisfactory results as shown in our set of cases.[1]

The graft for reconstructing the tarsus is usually extracted from the nasal or auricular cartilage, or from the periosteum, with more recent descriptions of the use of the posterior temporal fascia. In the cases described, a choice was made for using only jugal mucosa for the repair of the conjunctiva, without the replacement of the tarsus, since in the presence of the remaining tarsus – both medial and lateral – the lower eyelid would remain properly positioned, avoiding the formation of both ectropion and entropion. The jugal mucosa was preferred at the expense of the mucosa of the palate due to the greater ease and lower incidence of complications at the donor site, such as oronasal fistula.[1, 4, 8]

By following these patients, the authors conclude that the procedure is safe and without anatomical and functional complications, and can be reproducible.●

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Reconstruction of the nasal tip with medial frontal flap

Reconstrução da ponta nasal com retalho médio frontal

Authors:
Petra Pereira Sousa[1]
Carlos Alberto Chirano Rodrigues[2]
Renato Candido da Silva Junior[2]
Carolina Chrusciak Talhari Cortez[2]
Danielle Cristine Westphal[1]

[1] Dermatologist Physician and Surgeon - São Paulo (SP), Brazil

[2] Dermatology Resident Physician at Fundação Alfredo da Matta - Manaus (AM), Brazil

ABSTRACT

The reconstruction of surgical defects generated by the excision of nasal tumors is a challenge for dermatologic surgeons due to the rigid structure and low mobility in the region. Among the alternatives to repair these defects is the pedicled frontal interpolation flap, especially where there is involvement of two or more aesthetic units of the nose. The present study reports the case of a patient with basal cell carcinoma involving the alae, tip, and columella of the nose, in which surgical repair after resection was carried out with pedicled frontal interpolation flap or medial frontal flap with excellent cosmetic results.
Keywords: carcinoma, basal cell; surgical flaps; reconstructive surgical procedures

RESUMO

A reconstrução dos defeitos cirúrgicos gerados pela excisão de tumores nasais é um desafio para os cirurgiões dermatológicos devido à estrutura rígida e de pouca mobilidade da região. Dentre as alternativas para a cobertura destes defeitos destaca-se o retalho frontal interpolar pediculado, principalmente nos casos em que há o envolvimento de duas ou mais unidades estéticas do nariz. Neste trabalho relata-se o caso de paciente com carcinoma basocelular envolvendo as asas, ponta e columela do nariz, em cujo reparo cirúrgico após a ressecção, utilizou-se o retalho frontal interpolar pediculado ou retalho médio frontal, com excelente resultado cosmético.
Palavras-chave: *carcinoma basocelular; retalhos cirúrgicos; procedimentos cirúrgicos reconstrutivos*

Correspondence:
Dr. Renato Cândido da Silva Junior
Rua Codajás, 24 - Cachoeirinha
Cep: 69065-130 - Manaus – AM, Brazil
E-mail: rcandidojr@hotmail.com

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INTRODUCTION

The nasal pyramid is the most common site for the emergence of malignant tumors in the head and neck, particularly in areas with great exposure to the sun, such as the nasal alae (45%), the nasal dorsum (17%) and the nasal tip (5.5%). 1 Basal cell carcinoma (BCC) is the most common malignant neoplasia, accounting for approximately 75% of those lesions, followed by squamous cell carcinoma (SCC), which accounts for 15% of cases and, more rarely, by melanoma, which in dermatology corresponds to 4% of all cutaneous malignancies.[2]

The reconstruction of surgical defects caused by the excision of nasal tumors is a challenge for dermatologic surgeons, due to the complex anatomy and limited availability of remaining skin in the site to perform the correction.[2,3]

Burget & Menick revolutionized nasal reconstruction surgery with the introduction of the concept of *aesthetic subunits*

of the nose, based on differences in the skin's elasticity, color, contour and texture, contributing to the refinement of nasal surgery.[4]

Total thickness skin grafts can yield good results, however there is risk of depressed scars, dyschromias, and alterations in the shape of the nose. The results obtained with pedicled flaps are always superior than those obtained with grafts, precisely due to the reduction of those risks. 5 In the present study the authors present a method for the reconstruction of the alae, tip, and columella of the nose using a pedicled interpolated frontal flap after the excision of a BCC involving those subunits.

CASE REPORT

A 70-year-old Caucasian patient, originally from a rural area of the Northern Brazilian State of Amazonas, sought medical care complaining of a slow growing sore in the nasal tip, which had emerged one year before. The clinical examination evidenced an exulcerated and crusted plaque with pearly borders, of terebrant aspect, located in the nasal tip and alae, with invasion of the upper third of the columella. (Figure 1)

Histopathological examination confirmed the clinical hypothesis of BCC. Surgical excision with a 5 mm margin resulted in the bilateral removal of the nasal alae and columella. (Figure 2) The preparation of the flap used the paramedian frontal region as donor area. The flap was dissected in the subcutaneous plane up to the medial-lateral glabellar region. Doppler examination was not used to identify the supratrochlear artery. The closure process of the donor area was then performed by approximation. The portions in this area that could not be completely approximated were left to heal by second intention. No cartilage structure was used for remodeling the nose. (Figure 3) The second surgical event – which comprised the transection of the pedicle – was carried out four weeks after. Calcium alginate was used in the dressing. The surgical margins were free of the tumor and the patient recovered uneventfully and with excellent cosmetic result. (Figure 4)

DISCUSSION

The cutaneous flaps used for nasal reconstruction have great versatility in their application.[1] Numerous techniques can be used for the closure of surgical defects caused by the excision of tumors in the nose, such as the primary synthesis, advancement flap, transposition flap, bilobed flap, grafts, or combinations of techniques. [3]

The frontal region skin is recognized as the best donor area for nasal coverage, due to the appropriateness of its color and texture, with the interpolated frontal skin flaps used to treat great losses of substance affecting more than one aesthetic unit, and defects that affect cartilage and/or the mucosa.[1,6] Furthermore,

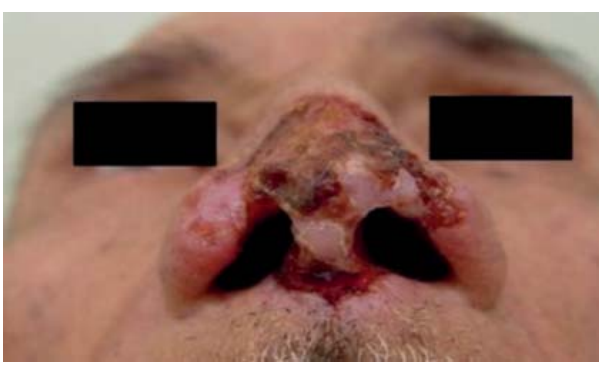

Figure 1: Basal cell carcinoma compromising nasal alae, tip, and columella

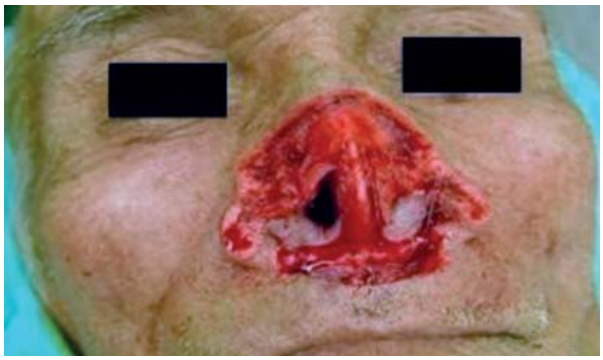

Figure 2: Large surgical defect after excision of lesion

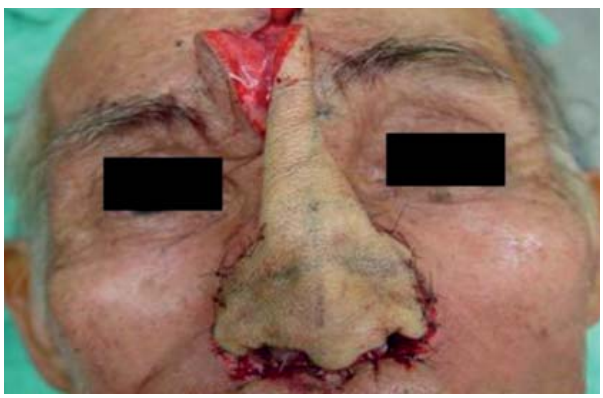

Figure 3: Pedicled frontal interpolated flap used for closing the surgical wound in the nose

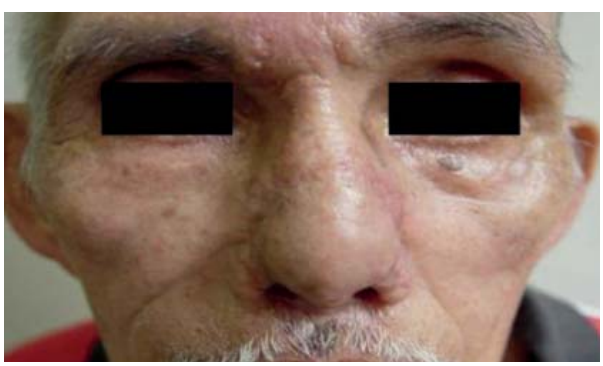

Figure 4: Final aesthetic result

the arterial blood flow concept and venous drainage are of utmost importance for the design of the flap. The forehead is nourished by a rich vascular network supplied by the supratrochlear, supraorbital, and superficial temporal arteries.[7] In the case described, the patient had full thickness compromise with involvement of the nasal alae, columella, and tip due to BCC.

The post-operative difficulties are most present in the first 24 hours, when the patient needs to remain with the nostrils occluded due to the dressing, and in the need for a second surgical event for the resection of the pedicle – which must be carried out four weeks later. As disadvantages of the technique, the authors highlight the presence of frontal scarring and of deformity in the eyebrow line. [2,7]

The dermatologic surgeon must recognize the various types of cutaneous flaps since there is a growing incidence of nasal tumors. Thus, the authors present an interesting method for reconstruction of nasal defects using a pedicled frontal interpolated flap with excellent aesthetic results. ●

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Clinical case / CO2 Laser: Post-operative complication

Caso Clínico: Laser ablativo fracionado de CO2: complicação pós-operatória

Author:
Patricia de Barros Guimarães[1]

[1] Dermatologist Physician - Recife (PE), Brazil

ABSTRACT

There are many treatments proposed for the aging skin. CO2 laser has a growing indication as such. The author reports a case involving a complication using treatment with this technology in the periorbital region.

Keywords: blepharoplasty; laser therapy; carbon dioxide; treatment outcome.

RESUMO

Os tratamentos propostos para o envelhecimento cutâneo são diversos. O laser fracionado de CO_2 tem tido crescente indicação. Relata-se um caso de complicação de tratamento com essa tecnologia na região periorbital.

Palavras-chave: *blefaroplastia; terapia a laser; dióxido de carbono; resultado de tratamento.*

Correspondence:
Dr. Patricia de Barros Guimarães
Real Hospital Português
RealDerma
Av. Agamemnon Magalhães, 4.760
Cep: 52010-900 - Recife – PE, Brazil
E-mail: patriciagui@ig.com.br

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INTRODUCTION

Cutaneous rejuvenation is one of the most sought after cosmetic treatments in dermatology practices.[1,2]

Fractional carbon dioxide (CO_2) laser assisted cutaneous renewal (resurfacing) is an effective treatment foraging skin.[3]

Complaints of wrinkles and sagging is very common, particularly in the periorbital region. Treatments in this anatomic region must be precise and delicate. In addition, the ocular function must be untouched, as well as an ability to maintain the appearance of a natural gaze.[4] Blepharoplasty is considered the gold standard of periocular treatment. However several therapeutic proposals have been indicated, fractional CO_2 laser among them.

CO_2 laser has a great affinity for water,[3,4] its principle being the selective photothermolysis.[5] It is characterized as being an accurate and effective method for removing part of the damaged epidermis,[6] stimulating neocollagenesis and its contraction[4] and organizing elastic fibers in the dermis.[7] Furthermore, type I collagen – which is the most abundant collagen in the dermis – is primarily synthesized by fibroblasts in the dermis, which in turn are the targets of photorejuvenation.[8]

Fractional photothermolysis is a laser modality that creates numerous zones of microscopic injuries, which can be controlled for in its depth and its density.[4]

Microscopic columns of epidermal necrosis are produced with denaturation of collagen. The tissue around those columns remains intact, resulting in a fast reepithelization process (approximately 24 hours), with the treatment coursing with minimal side effects.[3,9,10]

CO_2 laser fractioning has undoubtedly brought huge benefits. However, a false perception that it comes with an absence of side effects has also disseminated. 8 Although considered a safe procedure, complications may arise even with experienced hands.[1,2]

Immediate complications include local pain, contact dermatitis, and secondary infections.[1,2] Delayedside effects include infections, milia, acne, persistent erythema,[3] post-inflammatory hyperchromia, hypopigmentation, scarring, synechiae, and ectropion.[1,3]

CASE REPORT

A 66-year-old female patient (formerly a physician), sought care for complaints of "facial wrinkles".

The patient had hypertension and cardiac arrhythmia. Surgical lifting was contraindicated due to a pre-existing heart condition. She made continuous use of valsartan, amilodipine, enalapril, and sotalol chlorhydrate as antiarrhythmic. The resurfacing was carried out in the lower eyelids with CO_2 laser (AcuPulse / Lumenis / USA) at an energy of 10 mJ and density of 10%. (Figure 1)

Approximately 48 hours after the procedure the patient returned with significant periorbital edema. In addition, the patient had an area of ulceration at the site of contact between the edematous skin and the spectacles for refractive correction. (Figure 2) Oral prednisolone (60mg/day) was prescribed, being reduced to 20 mg/day after 3 days. Cephalexin (500mg 4 times a day for 8 days) was also prescribed. In addition, an antibiotic-steroid cream (betamethasone and gentamicin) was dispensed and applied 2 times a day for 8 days.

The patient showed complete regression of edema after roughly 5 days, and healing of the post-traumatic ulcer after 8 days.

In contrast to traditional CO_2 laser – which has potential for more marked and frequent adverse effects, 5 ablative fractional CO_2 is better tolerated and yields quite satisfactory final results with a single session.[7,9,10]

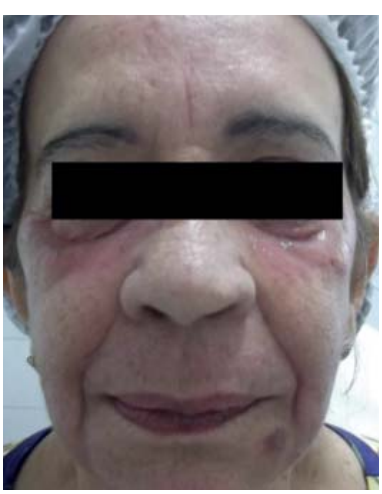

Figure 1: Immediately post-operative. Resurfacing of the lower eyelids. AculPulse, 10MJ energy density and 10% density

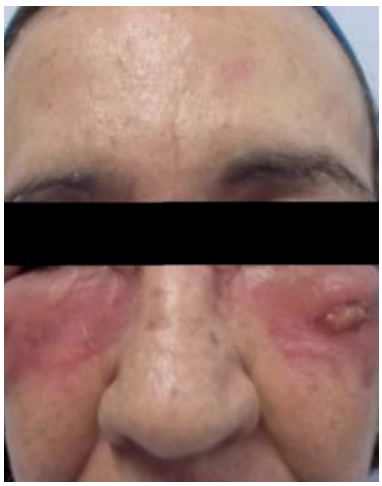

Figure 2: Two days after the procedure: important lower bipalpebral oedema. Ulceration in the left infraorbital region

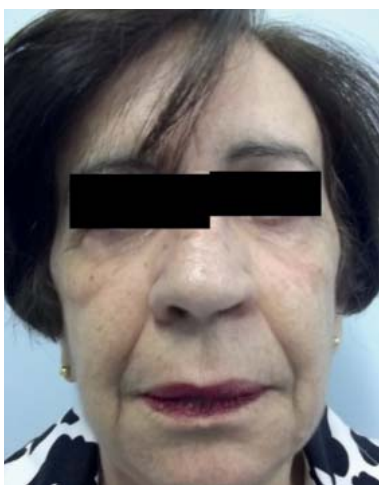

Figure 3: Absence of unsightly scars and quite satisfactory aesthetic result

Most complications of resurfacing do not concern, however, to its type but to the depth, amount of overlapping pulses, density used, pulse duration, and fluence.[3]

According to Kalil, 1 undesirable risks can be minimized through the understanding of the laser's function, proper training, and correct indication.

The edema of the periorbital region peaks on the morning following the procedure, 8 as happened with the patient in question. In the most intense cases of edema 40-60mg/day prednisone can be used for 2 to 4 days. If the edema lingers for more than 5 days, the possibility of secondary infection must be taken into consideration. In the present case, the authors chose to administer antibiotic therapy due to the risk of unsightly scarring.

CONCLUSION

The use of lasers in dermatology has been greatly diffused. Despite being a relatively simple technique, its side effects should be an ever-present concern.

The author highlights that a simple guideline – not using prescription spectacles or even sunglasses during the post-operative period – can avoid inconveniences for both the physician and the patient. Fortunately no scars have arisen in the present case and the final cosmetic result was quite satisfactory for both parties. (Figure 3)

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The treatment of discoid lupus erythematosus achromic cicatricial lesions with the punch grafting technique: a case report

Tratamento de Lesões Cicatriciais Acrômicas de Lúpus Discoide com Técnica de Enxertia por punch: Relato de Caso

Authors:
Luiza Eastwood Romagnolli[1]
Larissa Montanheiro dos Reis[2]
Fernanda Bebber Douat[3]
Manuela Ferrasso Zuchi Delfes[2]
Eveline Roesler Battaglin[2]
Deborah Skusa de Torre[4]

ABSTRACT

The present paper describes the case of a 47-year-old female patient, with discoid lupus erythematosus—the most common clinical variant of chronic cutaneous lupus—presenting achromic cicatricial lesions on the face. The punch grafting technique was performed in the following regions: right supraorbital, right malar, and nasal. The donor sites were the left and right retroauricular regions. A repigmentation halo of about 1cm was observed around each graft. This technique has been used in the treatment of refractory vitiligo, however it can also be used in inactive achromic cicatricial lesions of discoid lupus with good results.

Keywords: lupus erythematosus, discoid; skin transplantation; ambulatory surgical procedures; skin.

RESUMO

Relata-se o caso de paciente do sexo feminino, de 47 anos, com lúpus discoide, variante clínica mais comum do lúpus cutâneo crônico, apresentando lesões cicatriciais acrômicas na face. Foi realizada técnica de enxertia com punch nas regiões: supraorbitária direita, malar direita e nasal. As áreas doadoras foram as regiões retroauriculares direita e esquerda. Observou-se halo de repigmentação de aproximadamente 1cm ao redor de cada enxerto. Essa técnica vem sendo utilizada no tratamento de vitiligo refratário, porém pode também ser empregada com bons resultados nas lesões cicatriciais acrômicas de lúpus discoide sem atividade.

Palavras-chave: *lúpus eritematoso discoide; transplante de pele; procedimentos cirúrgicos ambulatorios; pele.*

INTRODUCTION

Lupus erythematosus (LE) is an autoimmune disease of the connective tissue characterized by the presence of localized or disseminated cutaneous-vascular lesions.[1] Cutaneous LE presents in a variety of clinical forms, which can be classified into 3 subtypes: acute, subacute, and chronic. Acute cutaneous LE (Acle) arises during systemic disease activity and its most common manifestation is the malar rash. Subacute cutaneous LE (Scle) is characterized by non-infiltrative erythematous plaques, predominantly in areas exposed to the sun. Discoid LE (DLE) is the most common clinical variant of chronic cutaneous LE (Ccle), being characterized by plaques covered with fine scales. Those plaques may be initially hyperpigmented and can develop into cicatricial lesion scars with depigmentation, which are permanent in most cases.[2]

In the treatment of active DEL, high potency topical corticosteroids, intralesional infiltration with triamcinolone and systemic therapy with the antimalarial chloroquine or hydroxy-

[1] Dermatology 3rd year Resident Physician at Hospital Universitário Evangélico de Curitiba – Curitiba (PR), Brazil

[2] Dermatology 2nd year Resident Physician at Hospital Universitário Evangélico de Curitiba

[3] Dermatologist Physician - Curitiba (PR), Brazil

[4] Dermatology Residence Preceptor, Hospital Universitário Evangélico de Curitiba

Correspondence:
Hospital Universitário Evangélico de Curitiba
Ambulatório de Dermatologia
Av. Sete de Setembro, 4.713 - Batel
Cep: 80240-000 - Curitiba – PR, Brazil
E-mail: manuzuchi@hotmail.com

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chloroquine can be used. Other options for resistant cases are systemic corticosteroids, thalidomide, clofazimine, dapsone, acitretin, and immunosuppressants such as methotrexate, azathioprine and cyclophosphamide.[1]

After adequate control of the disease, DEL can result in unsightly cicatricial lesions, which can be stigmatizing, causing a negative impact on the patient's quality of life. The treatment of achromic DEL cicatricial lesions can be performed through the punch grafting technique, which is traditionally used in cases of localized or segmental refractory vitiligo.

CASE REPORT

A 47-year-old female patient, bearing DEL for 18 years, sought care presenting achromic and atrophic cicatricial lesions located in the right supraorbital, nasal, and right malar regions, with an absence of signs of disease activity. She had already made prior use of topical corticosteroids, methotrexate, and thalidomide. Initially, punch grafting was performed in the right supraorbital region (test area). The right retroauricular region was chosen as the donor area. Local anesthesia was carried out with 2% lidocaine and 1:100,000 epinephrine, and the collection (four specimens) was performed with a 2.5mm punch. After the incision, the specimens were cut with the assistance of Adson forceps and iris scissors at the dermo-hypodermal junction level, and were subsequently placed on sterile gauze moistened with saline solution. The donor area was sutured with 5.0 nylon monofilament. The receptor area was incised with a 2mm punch, with a distance of about 1cm between each other, with the depigmented fragments being discarded. The implants were placed in the receiving area with the assistance of an Adson forceps, and attached with sterile micropore, which was removed after 7 days. (Figure 1) The patient returned 3 months after the procedure, showing a halo of repigmentation of about 1cm around the implanted grafts.

Subsequently, a similar new procedure was performed on the right malar region (2 specimens), according to the technique described above (the right retroauricular region was the donor area again). The patient returned after 6 months with satisfactory repigmentation in the receptor area. The grafting on the nasal dorsum region was then carried out (two specimens) (Figure 2), having as a donor area the left retroauricular region. At the 3-month return the grafting procedure was repeated on the superior nasal dorsum region, according to the techniques described above. It is possible to notice a slight elevation of the grafts in comparison to the surrounding skin, however the patient reported being satisfied with the aesthetic outcome of the treatment nonetheless. (Figure 3)

DISCUSSION

Residual scar lesions after control of the DEL are disfiguring and cause a worsening in the quality of a patient's life.[2]

The classical technique for total skin punch grafts harvested from the occipital and temporal regions for the treatment of vitiligo was published in 1959.[3] In 1971, Orentreich performed grafts using donor skin from the retroauricular region, with the formation of a halo of pigment diffusion of 1mm.[4] Other diseases, such as discoid lupus with achromic cicatricial sequel in the scalp, were treated by Lobuono in 1976 with punch grafts obtained from the occipital region, with the formation of halos of pigment in the receptor area.[5] Implants of follicular units have been performed with a spacing of 3-5mm between the insertion points of the follicles. It is possible to notice repigmentation between the 4th and 7th week, with cases of full repigmentation after 6 months.[6] In a study published by Fongers *et al.* in 2009 in which 61 patients with vitiligo vulgaris and 9 patients with segmental vitiligo underwent punch grafting, it was possible to observe that regarding the patients with vitiligo vulgaris, 17 (28%) lesions had excellent repigmentation, 14 (23%) had good, 14 (23%) reasonable, and 16 (26%) poor. Of the patients with segmental vitiligo 7 from the 9 lesions had excellent repigmentation. A cobblestone pattern was observed in 27% of lesions.[7]

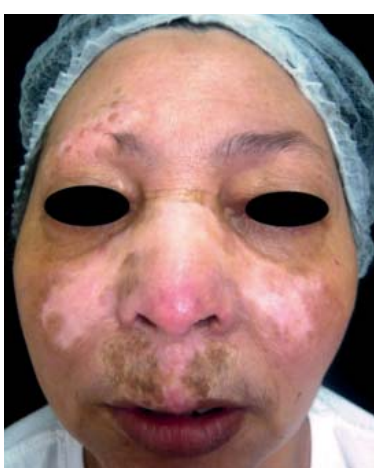

Figure 1: Seven days after punch grafting in the righthand area of the forehead

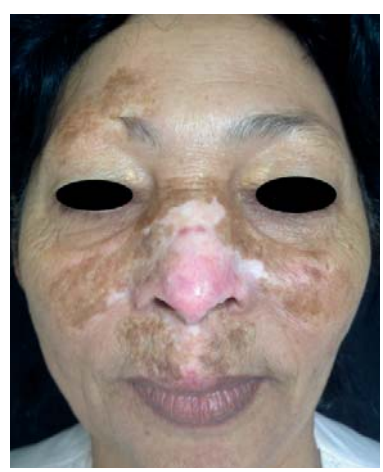

Figure 2: Six months after right malar punch grafting

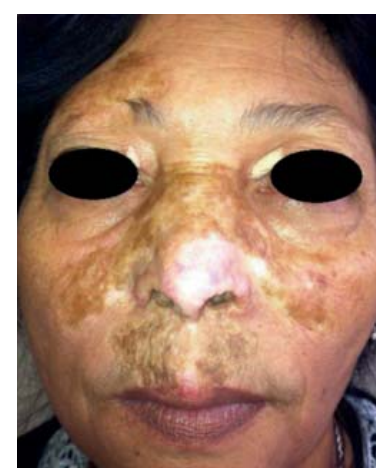

Figure 3: Punch grafting in the right frontal, right malar,and right nasal dorsum regions. Final outcome

The density of melanocytes varies in an individual, with an average density of 1,560/mm^2, and a ratio of 1:13 between melanocytes and malpighian cells. Those figures vary largely depending on the body site. Areas exposed to ultraviolet radiation suffer a 10% reduction in the population of melanocytes every ten years. Therefore, the best donor areas are those that are hidden from sunlight, such as the scalp, the retroauricular region, the sacral region, buttocks, and the dorsa of the feet.[3]

It is essential that the receiving area be completely inactive in order for the implanted melanocytes not to become targets of immunological aggression. The implant testing area is performed in order to determine the absence – or not – of immune activity that might interfere with repigmentation. In the receiving area to be treated, a 2.5mm implant of normal skin is performed in an orifice of 2mm. The development is observed for two months, during which the implanted skin should not lose its pigmentation.[3]

Potentially, a 2mm implant might cause a pigmentary halo of 1cm in diameter over the course of 1 year –therefore the implants must be performed with a spacing of approximately 1cm. In the donor area, specimens should be harvested with 0.5mm in excess of the receiving area (Ex: 2.5mm/2mm).[3]

In line with the positive outcomes described in reports published in the literature,[3-7] the present study used an innovative technique aimed at establishing a new treatment option for achromic scars arising from DEL.

Just as Orentreich obtained a halo of pigmentary diffusion, the present study also obtained repigmentation.[4] A halo of roughly 1cm emerged around each graft. Thatrepigmentation became more evident between 3 and 6 months after the procedure, falling within the interval of repigmentation mentioned in the literature regarding patients with this disease.[6]

CONCLUSION

The treatment of achromic cicatricial lesions arising from DEL is a therapeutic challenge. These unsightly lesions usually have a significant negative impact on the quality of life of affected patients. The punch grafting technique has been described for a long time for the treatment of refractory vitiligo lesions, with good repigmentationrates. Although there are few reports in the literature, this technique can be used in achromic lesions arising from DEL, also with good repigmentation outcomes. ●

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Letter

Periorbital hyperchromia

Hipercromia periorbital

Authors:
Paula Yoshiko Masuda[1]
Ana Luiza Grizzo Peres Martins[1]
Patrick Alexander Wachholz[2]

[1] Volunteer Preceptor at Instituto Lauro de Souza Lima (ILSL) - Bauru (SP), Brazil

[2] Physician; MSc in Public Health Candidate from the Faculdade de Medicina de Botucatu – Botucatu (SP), Brazil

Correspondence:
Instituto Lauro de Souza Lima
Rodovia Comandante João Ribeiro de Barros, Km 225/226
17034-971 – Bauru – SP - Brazil
E-mail: sandmanb@terra.com.br

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The present study was carried out at Instituto Lauro de Souza Lima (ILSL) - Bauru (SP), Brazil.

ABSTRACT

With the intention of contributing to the manuscript sent by Lüdtke et al. (2013) to this journal, the authors send this letter to the editors with comments relevant to the article, which examines the profile of the sample of patients with periorbital hyperpigmentation assisted at an ambulatory unit in southern Brazil. The authors of this letter present their considerations and suggestions to the authors of the referred article, and add relevant comments to the published study.

Keywords: *hyperpigmentation; eye; dermatology.*

RESUMO

Com a intenção de contribuir com o artigo de Lüdtke et al.(2013) publicado neste periódico, enviamos esta carta aos editores com considerações e comentários ao texto, que versa sobre o perfil de amostra de pacientes com hipercromia periorbital assistidos em unidade ambulatorial no Sul do país. Apresentamos nossas considerações e sugestões aos autores, bem como adicionamos comentários pertinentes ao trabalho publicado.

Palavras-chave: *hiperpigmentação; olho; dermatologia.*

Dear Editor,

It was with great interest that we have analyzed the article written by Lüdtke *et al.*,[1] which describes the profile of a sample of patients with periorbital hyperpigmentation (POH) who were treated at an outpatient unit in southern Brazil. The authors of the paper introduced the subject elegantly, presenting a didactic classification for the condition besides supplementing it with appropriate diagnosis and preventive management information. Contributing to the introductory section, we highlight the interesting classification of POH proposed by Ranu *et al*,[2] who consider other possible etiologic factors in the condition's description, namely: vascular; due to post-inflammatory hyperpigmentation; due to shadow effect; constitutional (secondary to excessive constitutional presence of pigmentation); among others.

Despite the originality and relevant contribution offered by the results presented by Lüdtke *et al.*[1], it is worth highlighting some considerations.

Firstly, when stating their goals the authors proposed to evaluate the prevalence of POH in the studied sample. In fact population studies with cross-sectional design can be used to calculate measurements of the frequency of occurrences, such as

the prevalence of a condition. Nevertheless, the lack of data on the total number of patients – the population – treated in the relevant dermatology service during the study period, combined with the sampling method employed, does not allow for the calculation of frequency measurements. Therefore, the authors' assertion (in the article's *Abstract* and *Objectives* sections) that one of the goals of the study was to assess this prevalence, but then not presenting this data in the *Results* or *Conclusions* sections, has caused confusion.

Furthermore, in the *Methods* section, the exclusion criteria presented by the authors are contradictory. In theory, these criteria should not adhere to the opposite of the inclusion criteria. Much to the contrary, it is recommended that the exclusion criteria be used to exclude patients who, after having been included, voluntarily express a desire to withdraw from the research, or to eliminate patients who must be excluded because their permanence would cause some sort of bias to the analysis of data or risk to the patient (for instance, the use of potentially teratogenic drugs in pregnant women).

Also, when employing the Kolmogorov-Smirnov test to assess the symmetry of the continuous variables, the authors should have described which variables showed normal distribution according to the test, using in the tables only measures of central tendency compatible with the result of that test (parametric or non-parametric), rather than presenting means and medians for all variables.

Likewise, due to the fact that it was a descriptive study, we felt there was a lack of references to studies that would enable the authors to compare their findings with those of similar investigations. In a quick literature search, we were able to find at least two studies, [2,3] published in the last three years that would greatly enrich the discussion of the article, especially those elements which pertain to the evaluation of the sociodemographic and clinical profile of the sample.

Moreover, when Lüdtke *et al.*[1] claim that the preponderance of women that they have found in their sample is consistent with the literature, no information on such literature is offered. Ranu *et al.*[2], for example, found a predominance of men (62.5%) in a cross-sectional study with the prevalence of 20% of POH (N = 1,000). Regarding the description of POH family history, the researched literature was also quite contradictory: Verschoore *et al.*[3] described a frequency of 21.2%, while Ranu *et al.*[2] found 42.2% and Lüdtke *et al.*[1] 63.7% of affirmative answers to that question.

An interesting analysis performed by Ranu *et al.*[2] with the application of the Tukey's multiple comparison test between the proportions of different types of POH, has not evidenced any statistically significant correlation with sleep deprivation, nonetheless the presence of a positive family history evidenced association with POH due to post-inflammatory hyperpigmentation.

In summation, we would like to congratulate the authors for the originality of the research, hoping that our contributions may enhance future examinations of their study. ●

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