MICROBOTOX: AN INNOVATIVE APPROACH TO FACIAL REJUVENATION AND DERMATOLOGICAL DYSFUNCTIONS

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ABSTRACT

This integrative review presents a comprehensive analysis of the use of Microbotox in facial rejuvenation and in the treatment of dermatological dysfunctions. Skin aging is inevitable and is associated with intrinsic and extrinsic changes in the skin, resulting in sagging and wrinkles. The application of botulinum toxin, specifically Microbotox, has stood out as an effective and safe procedure to smooth facial lines and rejuvenate the skin. Microbotox is injected into multiple small blisters on the skin, aiming to weaken facial muscles and reduce fine wrinkles in areas such as the forehead, perioculars, and cheeks. In addition, it is effective in rejuvenating the neck and recontouring the jaw. The study seeks to fill a gap in the scientific literature by offering an up-to-date analysis of the clinical outcomes and mechanisms of action of Microbotox. Through an integrative review, it aims to guide clinical practice and direct future research in this promising field, contributing significantly to the advancement of knowledge in dermatological aesthetics.

Keywords: Botulinum toxin. Mesobotox. *Skin aging*. Skin aging.

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INTRODUCTION

The skin is the largest organ in the human body, it is responsible for about 16% of body weight and its main function is to isolate internal structures from the external environment, and consists of three layers: epidermis, dermis and subcutaneous mesh (Bernardo; Saints; Silva, 2019). According to Ferreira *et al*. (2021), the appearance of the skin depends on a number of factors, namely: age, sex, climate, hydration, diet and health status of the individual.

Any change in the function or aesthetics of the skin results in problems for the physical and mental health of the individual and for this reason, the concern with aesthetics has increased a lot in the last decade. (Milani; Ribas, 2021). With aging, the skin gradually loses its elasticity and ability to regenerate, resulting in visible signs of sagging and wrinkles, which directly affect the aesthetics and self-esteem of individuals (Breda, 2022).

Aging, also called senescence, is inevitable. It can be stated that the first signs of skin aging are characterized by the changes suffered due to intrinsic and extrinsic factors (Novais; Souza, 2020). The process is associated with reduced functional capacity that causes susceptibility to increase skin problems and with this comes the appearance of sagging and wrinkles (Silva *et al*., 2023).

Skin aging processes are associated with the degradation of collagen and elastin fibers, which support the firmness and elasticity of the skin, aggravated by chronic exposure to external agents (Rodrigues *et al*., 2023). The structure of the skin includes cells such as keratinocytes and melanocytes in the epidermis, and fibroblasts in the dermis, responsible for collagen production and skin elasticity (Oliveira, Torquetti, Nascimento, 2020).

Over the years, the skin progressively loses its ability to maintain homeostatic and regenerative, which results in sagging and deeper wrinkles, typical characteristics of skin aging (Johner, 2021). As the greatest aesthetic dysfunctions occur in the skin during the integumentary cycle, it is the main object of action of professionals in the aesthetic area, and in-depth knowledge of this organ is imperative (Barreto, 2023).

The application of botulinum toxin type A has revolutionized facial aesthetics by providing a safe and effective method to smooth expression lines and restore the youthful appearance of the skin (Barbosa and Brito, 2020). Recent studies show that the application of botulinum toxin type A is effective for facial harmonization, offering natural results that preserve facial expressiveness (De Souza Costa, 2024).

The application of botulinum toxin is one of the most cited and studied procedures, contributing to the smoothing of facial lines and for being a safe, reliable, and minimally invasive procedure (Woitchunas *et al*., 2022).

Microbotox refers to the systematic injection of multiple small blisters of diluted botulinum toxin at repeated intervals into the skin. If injected for cosmetic purposes, it targets the superficial fibers of the facial muscles, with the aim of weakening their insertion on the lower surface of the skin, which is responsible for the fine lines and wrinkles of the face and neck (Calvisi; Diaspro; Sito, 2022).

According to Iranmanesh *et al*. (2022), Microbotox is an efficient and attractive method for facial rejuvenation, mid-lower facelift, and reduction of fine wrinkles in the forehead, periocular, and cheek regions, especially in younger age individuals. In addition, it is a suitable treatment for neck rejuvenation and recontouring of the lower edge of the jaw, particularly in older individuals with sagging skin.

It is essential that health professionals, such as biomedical doctors, pharmacists, physiotherapists and others, understand Microbotox due to its growing relevance in the aesthetic area. This knowledge empowers these professionals to offer broader, more personalized treatment options in line with current trends.

Therefore, the objective of this literature review is to deepen the understanding of the techniques, analyze the published results on microbotox in the treatment of facial wrinkles, dermatological dysfunctions, considering its benefits and potential side effects.

METHODOLOGY

STUDY DESIGN

This study is an integrative review whose objective is to synthesize existing research on the use of Microbotox in facial rejuvenation and in the treatment of dermatological dysfunctions. The research question guiding this review is: How does Microbotox contribute to facial rejuvenation and the treatment of dermatological dysfunctions?

Database Selection: Searches were conducted in the following electronic databases: *Web of Science, SciELO, PubMed (National Library of Medicine)* and *Journal of Cosmetic Dermatology.* The use of the *Web of Science* is justified by the scope of indexed articles in various areas of science, with a focus on studies of high relevance and impact.

Search Strategy: For the selection of articles, a search strategy with descriptors in Portuguese and English was used. The keywords used were: "microbotox", "mesobotox", "skin aging", "botulinum toxin" and "skin aging". The combinations between these terms were performed using Boolean operators AND and OR, in order to expand the scope and precision of the results. The search was limited to the last five years to ensure the contemporaneity of the information, covering the period from 2020 to 2024.

Selection and Evaluation of Studies: After the search, inclusion and exclusion criteria were applied to determine the relevant studies. The selection process followed two stages: initially, the screening was based on the titles and abstracts of the studies; Subsequently, the full articles were reviewed to ensure that they met the objectives of this review.

Public-alvo

The target audience of this integrative review includes professionals and students in the areas of biomedicine, pharmacy, physiotherapy, as well as other health professionals interested in advanced facial rejuvenation techniques and dermatological treatments.

Inclusion Criteria

Articles published in Portuguese or English between 2018 and 2024;

Studies that deal with the use of Microbotox in aesthetic and dermatofunctional treatments;

Review articles, clinical studies, observational studies, and case reports that provide data on the efficacy and safety of Microbotox.

Studies that bring relevant information about the skin and human aging.

Exclusion Criteria

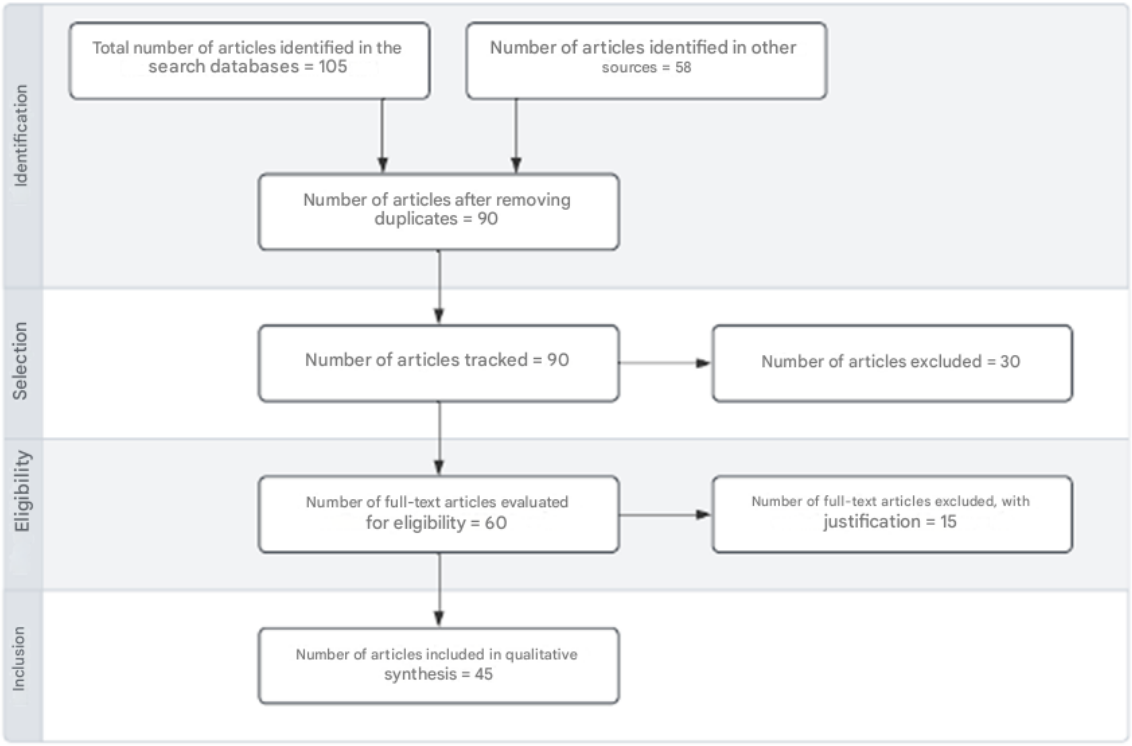
Articles published more than seven years ago at the time of data collection;

Studies that do not involve the participation of human beings;

Publications that do not specifically focus on the use of Microbotox, or that deal with other forms of botulinum toxin without direct relevance to the objectives proposed by this study.

The selection process was systematized using the PRISMA flowchart, which organized the stages of search, screening, eligibility and inclusion of the studies. The PRISMA flowchart (Figure 1) illustrates the number of articles identified in each step, detailing the excluded articles and the reasons for exclusion.

Figure 1 - Flowchart for selecting articles for integrative review.



Source: The authors (2024).

THEORETICAL CONTEXTUALIZATION

THE SKIN

An organ with a unique composition and complex architecture, the skin performs multiple functions, covers and ensures a large part of the relationships between the internal and external environment, being the first line of defense against aggressions from environmental damage (Almeida, 2020). In addition, it acts as a mechanical support, participates in the senses, has immune function, synthesizes hormones, and participates in calcium homeostasis through active participation in vitamin D production (Ciol *et al*., 2019).

According to Silva *et al*. (2024), the skin consists of two layers, the epidermis and the dermis. The main types of cells present in the epidermis are keratinocytes and melanocytes. In addition, the epidermis also contains Langerhans cells, which are responsible for immune responses, and Merkel cells, which are responsible for playing an important role in sensory reception (Oliveira; Torquetti; Birth, 2020)

In the dermis, there are fibroblasts. Fibroblasts produce and maintain the extracellular matrix (ECM). The ECM is responsible for the filling, elasticity and support of the skin. Among the constituents of ECM are collagen fibers, which provide support to the tissue (Silva *et al*., 2024).

The dermis, or connective component, the middle layer, a support tissue in which vessels and nerves cross, where the cutaneous attachments such as sweat glands, hair, sebaceous glands, and nails are implanted (Almeida, 2020).

The hypodermis, according to some researchers, is not part of the skin, but it is extremely important because it attaches the epidermis and dermis to the underlying structures, and is also known as the subcutaneous mesh, subcutaneous tissue, or superficial fascia (Johner, 2021).

The skin is the body's first line of defense, protecting against external agents and helping with homeostasis (BERNARDO *et al.*, 2019). The skin reflects the general health status of the individual and may indicate malnutrition or systemic diseases (Costa; Oliveira, 2022).

The skin is also an important thermal regulator of the body, contributing to the maintenance of internal temperature. This occurs through the dilation and constriction of blood vessels in the dermis, in addition to the evaporation of sweat by the sweat glands. When body temperature increases, these glands activate, allowing heat loss through sweating, an essential process to prevent overheating (Almeida, 2020).

Advances in dermatology have allowed the development of more effective treatments for various skin conditions, such as acne, eczema, and psoriasis. Topical and systemic therapies and new approaches such as biological therapy have shown promising results, offering relief and improved quality of life for patients. However, it is essential that these treatments are personalized, considering the individual characteristics of each patient's skin and their response to medications (Silva *et al.,* 2024).

Daily skin care, such as cleansing and sun protection, are essential for the prevention of skin damage (Pereira; Lima, 2022). The evaluation of the skin should include physical, psychological and social aspects, recognizing its importance in self-esteem (Ferreira *et al.*, 2023).

AGING

Skin aging occurs naturally and is caused by age, but extrinsic and intrinsic factors end up contributing to accelerate this process (Santana; Senna; Silva, 2022).

According to Johner (2021), the skin loses some functions with aging, such as: homeostatic maintenance, coating and protection against external agents, it has the ability to regulate water exchange and cell replication. In addition, there is a decrease in elasticity, causing fragility, atrophy, loss of blood vessels, collagen and fat.

Among the aesthetic changes, skin changes, wrinkles, loss of elasticity, and skin tone can be mentioned, being more evident on the face and upper limbs. Due to these changes, the aesthetic resources that act to improve the skin as well as to prevent problems caused by aging (Brito; Barbosa, 2020).

The prevention of skin aging should be a priority from youth, incorporating healthy habits (Martins; Oliveira, 2021). Proper hydration and nutrition are essential to slow down the aging process of the skin (Silva *et al.*, 2023). Aesthetic interventions can help improve the appearance of aging skin, but the approach must be personalized (Ferreira *et al.,* 2023).

According to Law No. 10,741, of October 1, 2003, an elderly person is considered a citizen aged 60 years or older (Brasil, 2022). Currently the reality is different, as life expectancy reaches 80 to 90 years in a simpler way. Due to this, youth has been more valued, because with the growth in life expectancy, youth itself has been more desired (Silva *et al.*, 2023).

Scotti and Velasco (2023) express that skin plays an important role in people's self-esteem, social relationships, and quality of life. When we have a young, healthy and beautiful appearance, we feel more confident and secure to face everyday life and also be better accepted by society.

BOTULINUM TOXIN

The application of botulinum toxin is one of the most cited and studied procedures, due to its contribution to the smoothing of hyperfunctional facial lines and for being a safe, reliable and minimally invasive procedure (Woitchunas *et al.*, 2022).

Botulinum toxin (TB) is a toxin produced through the sporulation of a gram-positive and anaerobic bacterium known as *Clostridium botulinum*, discovered in 1895, the year in which an outbreak of botulism occurred (Gouveia; Ferreira, 2020).

Among the existing toxins, eight are serological types found, and the most used for aesthetic procedures is type A, as it is considered to have greater potency, efficacy, better specificity and longer duration in aesthetic use (Brito; Barbosa, 2020).

According to Gouveia and Ferreira (2020), the eight serotypes are named A, B, Cb, C2, D, E, F, and G. Commercially, type A and type B toxins are available. In facial aesthetics, TBA has been the most used since it was approved by the Food and Drug Administration (FDA) in 2002.

The mechanisms of action in aesthetic treatment involve the inhibition of the production of acetylcholine, a neurotransmitter responsible for muscle contraction. This

results in the temporary paralysis of the muscles, reducing tension and minimizing the formation of expression wrinkles (Borges, 2023).

The safety of botulinum toxin in aesthetic procedures is widely recognized when administered by qualified professionals (Almeida *et al.,* 2020). Customization of the dosage and application technique is essential to obtain natural and satisfactory results (Costa; Oliveira, 2022).

MICROBOTOX

Microbotox, also called mesobotox, is the injection of multiple microdroplets of botulinum toxin A diluted into the upper dermis. It is used clinically to improve skin tone, texture, as well as reduce flushing, enlarged pores, and seborrhea (Attar; Nofal, 2020). According to Kandhari *et al*. (2022), botulinum toxin in microdroplets has the potential to induce reversible atrophy of sweat and sebaceous glands, thereby improving skin texture and radiance.

The higher dilution and low concentration prevent the "pulling" effects of the superficial fibers and safeguard the function of the deep muscle fibers, giving the face a rested appearance (Kandhari *et al*., 2022). The results of microbotox include improved skin texture and reduced enlarged pores, without losing facial expression (Silva *et al.*, 2023).

Figure 2 - Before (A) and after (B) the microbotox procedure. There is a significant improvement in skin texture, a face-lifting effect and a reduction in wrinkles.

Source: Fabi *et al.,* (2023).

According to Tamura (2019), the indications for this method are similar to the common aesthetic indications for Botulinum Toxin, but in some cases it may be a better

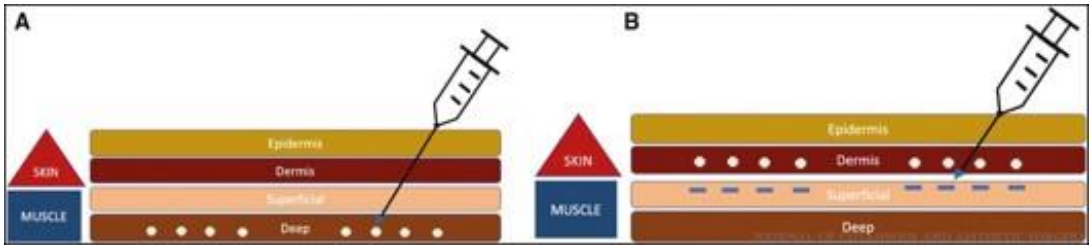
choice for a result without excessive muscle relaxation. Topical anesthetics can be applied before treatment as it involves multiple punctures and some patients may complain of pain.

The goal is to provide relaxation of fine lines and wrinkles, without the unwanted "frozen" or "plasticky" appearance. In addition to facial rejuvenation, the technique has been used for hyperhidrosis, seborrhea, and keloids (Kandhari *et al*., 2022). The use of botulinum toxin has shown significant efficacy in the treatment of facial scars (Almeida; Gonçalves, 2023).

Microbotox has fewer risks of adverse effects compared to more traditional applications of botulinum toxin (Ferreira *et al.,* 2023). The effectiveness of microbotox is related to the application technique and the choice of sites to be treated (Martins, 2023). The preventive effect of botulinum toxin on expression lines has been widely discussed in the literature (Andrade; Carvalho, 2023).

According to Kaur (2022), the technique is performed with a 30–32 G needle, gradually advanced, with a bevel pointed downwards and almost parallel to the skin. Gentle pressure is applied to the plunger, enough to raise a small bubble. 0.05 mL of solution is injected at 1 cm intervals, intradermally, uniformly and in grid fashion.

Figure 3 - Difference between a normal application of botulinum toxin (A) and the application of microbotox (B).



Source: Kandhari *et al.* (2022).

Microbotox has a lower risk of adverse effects compared to traditional botulinum toxin applications, due to the lower dosage and more superficial injection technique (Ferreira *et al.,* 2023). Most patients report high satisfaction with the results of microbotox, especially in relation to the naturalness of the appearance after treatment (Martins; Oliveira, 2021).

Although Microbotox is considered safe, some adverse effects have been reported. The side effects of microbotox treatments tend to be mild and transient (Carneiro; Silva, 2021). The following table lists the main risks, with guidelines for management.

Table 1: Possible adverse effects of microbotox and care guidelines.

Adverse Effect	Percentage of occurrence	Duration of symptoms	Management recommendations
Redness	15%	04 to 48 hours	Cold compress, avoid sun exposure
Swelling	20%	1 – 3 days	Use of mild anti-inflammatories
Pain at the site	8%	1 – 3 days	Cold compress, use of oral analgesics

Source: Survey data (2024).

Therefore, according to Kandhari *et al.* (2022), the microbotox technique can be considered a simple, relatively safe and effective treatment used for facial rejuvenation and dermatological dysfunctions. Its ability to preserve muscle movement and provide "natural-looking" results makes it a desirable and current option.

The use of microbotox is recommended for patients with specific dermal dysfunctions (Costa; Oliveira, 2020). Here, a detailed table of the different techniques used in microbotox is shown.

Table 2 - Different Microbotox application techniques, as described in the studies, highlighting the results and associated adverse reactions.

Specific Technique	Depth of Application	Indications for Use	Observed Clinical Outcomes	Associated Adverse Reactions
Microdroplets every 1 cm	Derme superficial	Fine wrinkles, skin texture	Smoother skin, less visible pores	Temporary redness
Injections in bubbles	Middle Dermis	Fine lines and scars	Reduction of lines and scars	Moderate swelling
Application at specific points	Derme profundo	Deep rugae, sagging	Lifting effect, improvement of sagging skin	Pain at the site, small bruising

Source: Survey data (2024).

Next, the image illustrates the effects of Microbotox treatment on the neck region, highlighting the visible changes before and after the procedure. There is a significant improvement in deep wrinkles and sagging skin, highlighting the potential of this treatment in smoothing the signs of aging and achieving a firmer, more rejuvenated appearance.

Figure 4 - Before treatment with microbotox (A), after treatment with microbotox (B).

Source: Kandhari *et al.* (2022).

Botulinum toxin treatments are associated with improvements in the appearance of the skin, particularly in the reduction of expression marks (Freitas; Castro, 2023). Comparative studies show that microbotox can have more effective results than conventional botox for superficial lines (Dias; Santos, 2023).

FINAL CONSIDERATIONS

This study reinforces the relevance of Microbotox as an effective and innovative approach in the field of facial rejuvenation and in the treatment of dermatological dysfunctions. Throughout the review, it was found that the application of diluted botulinum toxin, in small amounts and distributed intradermally, provides natural aesthetic results, preserving facial expressiveness and minimizing the effects of muscle freezing.

This method has proven to be advantageous, especially in patients looking to smooth fine lines and improve skin texture without excessive muscle relaxation. However, the research has limitations that need to be considered. The lack of long-term studies, with large samples and controlled methods, limits the complete understanding of the effects and possible complications of Microbotox.

In addition, the heterogeneity in the application techniques and in the concentration of botulinum toxin in the different studies makes it difficult to standardize the results and compare the studies. For future studies, it is suggested that randomized clinical trials be conducted to explore variations in application techniques and compare results with other aesthetic procedures.

Expanding the scope of research to include variables such as skin type, patients' age, and the presence of comorbidities can also contribute to the consolidation of

Microbotox as a safe and personalized clinical practice, allowing professionals to offer treatment options with greater efficacy and predictability of results.

Ultimately, addressing these limitations and gaps will not only enrich existing knowledge about Microbotox but also promote a significant advancement in clinical practices. By encouraging collaborative and targeted research, the scientific community can develop a more concrete and grounded understanding that benefits both healthcare professionals and patients seeking effective and safe solutions to their aesthetic and dermatological concerns.

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