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COMPLICATIONS ASSOCIATED WITH FACIAL FILLING WITH HYALURONIC ACID IN OROFACIAL HARMONIZATION

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Case Report

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Abstract. The increase in the elderly population and the search for a youthful appearance are driving aesthetic dentistry, which, through facial harmonization, offers treatments such as filling with hyaluronic acid. This biomaterial, recognized for its biocompatibility and rapid results, presents risks and adverse effects that require professional knowledge and skill. In view of the above, the focus of this study is to understand the complications that can occur with the use of hyaluronic acid for facial fillers, in the field of orofacial harmonization, in order not only to devise therapeutic strategies to solve them, but also to act to prevent them. The study is a descriptive qualitative research, based on an integrative literature review, using databases such as Google Scholar and PubMed. Inclusion and exclusion criteria were established, focusing on articles from the last four years, in English and Portuguese.Facial filling with hyaluronic acid in orofacial harmonization presents associated risks that require specialized attention. Complications can be classified as allergic reactions, infections, inflammatory nodules and intravascular events such as skin necrosis and blindness. Although most complications are mild and temporary, some can cause permanent damage. Careful patient selection, aseptic techniques and a thorough knowledge of facial anatomy are essential to reduce these risks. Prompt treatment of complications, often with hyaluronidase, is crucial to avoid serious sequelae, highlighting the importance of continuous training for professionals involved in aesthetic practice.

Keywords — Intercurrence; Hyaluronic acid; Facial fillers.

1 Introduction

The growing demand for a youthful appearance has increasingly become a priority among individuals, largely due to its impact on self-image and the value attributed to one's social positioning. Within this context, the study of the face, through facial harmonization, seeks to address these aspirations by developing treatments capable of minimizing the visible signs of aging, such as wrinkles and expression lines. Such improvements often begin with the volumization of the face using soft tissue fillers, which restore diminished facial contours resulting from the physiological decline of collagen production—a natural process of aging that leads to thinner and less elastic skin [1].

In this framework, this subfield of dentistry offers a wide range of procedures employing diverse biomaterials designed to restore facial harmony, thereby contributing to the patient's self-esteem and confidence. A fundamental concern in these interventions lies in reconciling comfort with efficacy, while maintaining a minimally invasive character. Accordingly, the market provides several fillers and biostimulators that, according to recent scientific evidence, deliver significant aesthetic outcomes by stimulating neocollagenesis, which restructures the skin layers and enhances firmness. These biomaterials thus represent a safe and innovative alternative, capable of naturally delaying and attenuating the facial manifestations of aging [2, 3].

Among these agents, hyaluronic acid (HA) stands out as a natural polysaccharide widely accepted by professionals due to its biocompatibility, which ensures reversibility and excellent tissue integration. Its abundant presence in the human dermis and the rapid results it provides meet patient expectations, thereby establishing HA as the gold standard in orofacial harmonization and the filler considered closest to the ideal, capable of replicating youthful features with remarkable precision [2, 3].

Despite its recognized safety and the positive outcomes widely endorsed within the scientific community, hyaluronic acid, like any clinical procedure, carries inherent risks and potential adverse effects when applied in facial filling. These complications may stem from professional inexperience leading to iatrogenic injury, local inflammatory responses, or interactions between the biomaterial and the host tissue, particularly in patients with pre-existing conditions that predispose to cervicofacial infections. Such events may occur immediately, in the short term, or as delayed reactions. Consequently, practitioners must be prepared to make swift and effective clinical decisions, supported by an in-depth understanding of the mechanisms of action of these biomaterials, to ensure adequate management [4, 5].

In light of the above, the aim of the present study is to examine the complications that may arise from the use of hyaluronic acid in facial fillers within orofacial harmonization, not only to establish therapeutic strategies for their resolution but also to develop preventive measures. In doing so, the study seeks to refine clinical protocols, safeguard patient well-being, and enhance personal satisfaction outcomes.

2 Materials and Methods

The present study is characterized as a qualitative, descriptive investigation, conducted through a literature review. The integrative review method is defined by the critical analysis of relevant studies that support clinical practice, thereby enabling the extraction and synthesis of findings on a specific theme. In this regard, the investigation was carried out by consulting databases such as Google Scholar, Scientific Electronic Library Online (SciELO), Virtual Health Library (BVS), and the U.S. National Library of Medicine (PubMed). The search for references was guided by specific keywords, namely: "Complication," "Hyaluronic Acid," and "Filler." Within the research strategy, the Boolean operator "AND" was applied, and the keywords were carefully cross-checked with health sciences descriptors, ensuring an adequate breadth and accuracy of the retrieved results.

Additionally, inclusion criteria were established to define a temporal scope limited to the last four years, covering the period between 2020 and 2024. Only articles that demonstrated a satisfactory theoretical alignment with the proposed theme were considered, and publications in English and Portuguese were accepted. Conversely, the exclusion criteria comprised the elimination of duplicate articles within the consulted databases. In this way, the adopted methodology ensured both the relevance and the quality of the materials selected for analysis.

3 Results and Discussion

With regard to the human face, its harmony is determined by the balance among the facial thirds. Thus, through the linear analysis of soft tissues, it is possible to establish aesthetic parameters that reverberate in the proportionality of the patient's facial structures. The face can be classified according to its morphology and structural characteristics into three types: dolichocephalic, brachycephalic, and mesocephalic. Knowledge of these proportions and recognition of facial patterns constitute essential tools in the practice of facial filling procedures [6].

At present, dermal fillers have become an excellent non-surgical alternative aimed at improving proportional balance among facial zones, delivering both immediate and long-lasting results. The main indications are based on patient complaints related to volumetric loss resulting from the natural aging process, as well as the need to restore facial proportions through the use of strategic injection points, including cases of dissatisfaction stemming from genetic patterns. Contraindications, however, are primarily directed toward patients with a history of hypersensitivity, autoimmune or active diseases, pregnancy, and/or lactation. Therefore, this treatment is characterized as a minimally invasive injectable procedure used to address wrinkles, folds, scar corrections, and contour definition. As such, it represents an increasingly refined aesthetic option, as the injection of biomaterials improves skin glow, firmness, and elasticity, while simultaneously satisfying both professionals and patients [7, 8].

The trajectory of facial fillers dates back to the 19th century, beginning with the discovery

of paraffin by the chemist Karl Ludwig, which was later used for aesthetic purposes in 1899 by the Austrian physician Gersuny, when he created a testicular prosthesis for a patient who had undergone orchiectomy due to tuberculosis. However, it was only in 1982 that facial filling acquired its current form, when cannulas were introduced for vacuum aspiration followed by autologous grafting of the aspirated product. Since then, various management techniques have been developed and refined for facial augmentation, progressively replacing plastic surgery, which had traditionally been the main alternative for mitigating the effects of aging on the skin. In some situations, however, surgical interventions could accentuate the loss of facial contours. Consequently, volume restoration through facial fillers became recognized as a new standard to be further improved [7].

Given the complexity of such procedures and their clinical execution, meticulous care is required not only from an aesthetic standpoint—linked to facial visagism and the balance among the three facial thirds—but also from a physiological perspective, since the region is traversed by arteries vital to facial function and muscles responsible for facial expressions. Thus, comprehensive knowledge of these anatomical aspects forms the foundation both for optimizing aesthetic results and for preventing intraoperative complications arising from iatrogenic factors, as well as postoperative events [9].

From a regulatory standpoint, in Brazil the use of facial fillers by dentists is governed by Federal Council of Dentistry (CFO) Resolution No. 176 of September 6, 2016. Its first article states: "the use of botulinum toxin and facial fillers by dentists is permitted for therapeutic, functional, and/or aesthetic purposes, provided that such use does not exceed their anatomical scope of practice." Thus, it is imperative that dental professionals possess solid training, enabling a comprehensive understanding of facial anatomy and of the specific needs and expectations of each patient [10].

Hyaluronic acid occurs naturally in the extracellular matrix of connective tissues, synovial fluid, aqueous humor, and the vitreous body. In the skin, this compound is an integral component of the elastoviscous fluid matrix surrounding elastic collagen fibers. However, its concentration progressively decreases with aging, a decline directly associated with reduced hydration and cutaneous volume, ultimately resulting in the formation of rhytids. In aesthetics, the use of hyaluronic acid is predominantly associated with age-related skin changes and is indicated for the correction of nasolabial folds, tear troughs, nasal reshaping, and lip augmentation [11].

The main mechanism of action of hyaluronic acid lies in its ability to absorb and retain water. Conventional formulations provide volume correction in a 1:1 proportion, and once injected, the volume remains stable. In contrast, anhydrous formulations are specifically designed to absorb water from the body, thereby increasing volume after injection. Importantly, hyaluronic acid fillers are degraded by enzymatic and phagocytic activity, which contributes to their safety but simultaneously confers a more temporary effect [12, 13].

Investigations into hyaluronic acid began in 1934, led by Karl Meyer and his team at the Biochemical Research Department of Ophthalmology at Columbia University. At that time, they succeeded in isolating this previously unknown substance from bovine vitreous humor. In subsequent years, research expanded to include sources such as skin, joints, umbilical cord, and rooster comb. In 1937, Kendall, Heidelberger, and Dawson reported a striking similarity between a polysaccharide found in the capsule of Streptococcus (group A, hemolytic) and hyaluronic acid, thereby establishing its microbial origin [14].

It was not until 1950 that Meyer and his collaborators successfully defined the chemical structure of hyaluronic acid, enabling a deeper understanding and broader exploration of its properties. The findings demonstrated that hyaluronic acid is a high–molecular weight linear polysaccharide, composed of polyanionic elements and disaccharides, specifically D-glucuronic acid (GlcUA) and N-acetylglucosamine (GlcNAc), linked together in sequence [14].

Currently, hyaluronic acid available in the market is predominantly produced through bacterial fermentation biotechnology, a method chosen due to its minimal risk of provoking immune responses when compared to traditional extraction from animal tissues. For use as a dermal filler, the substance undergoes purification and a chemical process known as crosslinking. This technique involves the addition of compounds that form intermolecular bonds with hyaluronic acid, reducing toxicity while increasing resistance to degradation, enhancing in vivo retention, and optimizing viscoelastic properties. Soft-tissue filler procedures are classified as minimally invasive; however, the caliber of the injection needle significantly influences the degree of superficial trauma. Specifically, the viscosity and particle size of hyaluronic acid require the use of larger-diameter needles, which in turn increase epithelial rupture and dermal injury. These factors can result in capillary leakage, edema, and activation of inflammatory cascades, highlighting the necessity of strict precautions during administration [15].

To mitigate potential adverse events associated with this intervention, the practitioner must have a thorough knowledge of vascular anatomy in the injection area. Furthermore, precise technique is essential, as product administration at inappropriate depths may lead to undesirable complications. For instance, hyaluronic acid must be injected into the deep dermis; failure to respect this depth may result in nodule formation and unsatisfactory outcomes [15].

In general, the recommended average volume of hyaluronic acid per anatomical site is 1 ml, with a maximum of 2 ml to ensure safe and effective results. For greater patient comfort, a detailed anamnesis and pre-treatment with topical anesthetics should be performed, applied approximately 30 minutes prior to the procedure. Additionally, asepsis of the treatment site must be performed with 4% alcoholic chlorhexidine, ensuring a controlled environment [13].

It is also worth noting that some commercial formulations of hyaluronic acid already include anesthetics such as lidocaine, potentially eliminating the need for additional topical anesthetics. Once integrated into the epithelial layers, hyaluronic acid restores hydration balance, promoting fluid exchange and regulating protein distribution within the skin. This creates a favorable environment for cellular activity, significantly improving cutaneous structure and elasticity while softening facial expressions. Such interactions underscore the importance of a careful and informed approach to aesthetic procedures [16].

The main advantage of this procedure lies in the possibility of performing subtle and personalized adjustments, achieving natural and harmonious results while respecting each patient's individual characteristics. Orofacial harmonization with hyaluronic acid is therefore an integrative approach that considers fundamental aspects such as facial symmetry and proportion, with the goal of enhancing beauty in a balanced manner [17].

In addition to smoothing wrinkles and adding volume to specific areas, hyaluronic acid

fillers can also enhance facial contours, contributing to a rejuvenated and more harmonious appearance. Another noteworthy feature is the reversibility of the procedure; if patients are dissatisfied with the results, adjustments or removal of the filler can be performed. This reversibility provides greater safety and reassurance to patients, while maintaining flexibility to adapt results to their preferences. Nonetheless, it is imperative that facial filler procedures be conducted by experienced and qualified professionals, ensuring both safety and accuracy, as well as satisfactory aesthetic outcomes in orofacial harmonization [18].

The increased use of hyaluronic acid fillers has been accompanied by a higher incidence of complications associated with the procedure. Although hyaluronic acid is a resorbable substance and most adverse effects are limited to aesthetic concerns, some complications require rapid and effective interventions to minimize the risk of sequelae or morbidity. Adverse events may be categorized into early-onset events and persistent complications. While most complications are temporary and mild, reports exist of severe outcomes leading to irreversible functional and aesthetic deficits [19].

Complications associated with HA fillers can be grouped into four main categories: allergic reactions, infections, late-onset nodules/inflammations, and intravascular events. Notably, the incidence of complications such as late-onset nodules and intravascular events—including cutaneous necrosis and cases of blindness—is on the rise. Documented cases of blindness are explained by the theory of retrograde flow: if the needle tip penetrates the wall of a distal branch of the ophthalmic artery, the injection pressure may dilate the arterioles, causing retrograde flow. When the pressure exerted exceeds arterial systolic pressure, the filler material may migrate proximally within the arterial network and subsequently move distally once the pressure is released, leading to obstruction of the ophthalmic or retinal artery and their branches [20].

These complications, however, can be mitigated—or even prevented—through a careful and systematic approach. This requires meticulous patient selection, prudent choice of product, strict adherence to aseptic techniques, a profound knowledge of facial anatomy, and vigilant monitoring for the earliest signs of vascular compromise [9].

Immediate adverse effects frequently observed include erythema and edema, common responses to tissue injury. These may be exacerbated by the viscosity of the product or by inadequate injection technique. To minimize such reactions, the application of cold compresses at intervals of five to ten minutes and maintaining the head elevated are recommended. Ecchymosis or hematomas may result from vessel injury at the injection site or secondary rupture of blood vessels. In deeper vessel injuries, the risk of significant bleeding exists, potentially requiring cauterization. Edema is a frequent occurrence with all injectable fillers, although intensity and duration vary. Moreover, individual patient characteristics, such as dermographism, may influence swelling severity, being most pronounced in areas such as the lips and periorbital region [21].

It is also important to clarify that although the terms “nodule” and “granuloma” are often used interchangeably, they represent distinct entities. Non-inflammatory nodules are characterized by product accumulation and are clinically and histopathologically distinct from granulomas, which represent inflammatory lesions resulting from a foreign-body reaction to the injected material. Nodules manifest as discrete lesions, typically pea-sized or smaller, and may occur singly or in small numbers, most commonly in

periorbital, perioral, or mandibular regions. They appear as whitish papules or nodules, usually resulting from improper superficial injection of hyaluronic acid. Management may include local massage or, in more severe cases, surgical removal, although most resolve spontaneously [21].

Tissue necrosis is among the most concerning complications associated with improper hyaluronic acid injection, resulting from vascular occlusion caused by filler deposition. One of the pathophysiological processes involved resembles vascular occlusion, in which substances are transported intra-arterially through progressively narrower vessels until reaching capillary beds where the filler becomes lodged. This obstruction impairs oxygen exchange, as collateral circulation is insufficient to compensate, ultimately leading to ischemia [11].

Adverse reactions to dermal fillers therefore pose tangible risks to patient health and well-being, as no technique is entirely devoid of complications. It must be emphasized that even highly skilled professionals occasionally encounter complications. Research suggests that early arterial complications may be mitigated with the use of high-frequency ultrasonography, which allows precise visualization of the injected product and reduces vascular risks in facial areas. High-frequency devices, with or without Doppler, enable detailed imaging of superficial structures, offering enhanced safety [22].

Accordingly, treatment must be initiated promptly at the earliest signs of complications to prevent cascading adverse events and severe tissue damage. Current literature identifies hyaluronidase as the primary therapeutic resource. This enzyme acts by depolymerization; when injected into the affected area, it degrades hyaluronic acid around connective tissue cells, temporarily reducing tissue viscosity and increasing permeability to fluid diffusion. Hyaluronidase has proven effective for dissolving injected hyaluronic acid during complications, with an average recommended dose of 200 IU to flood the affected area, thereby expediting breakdown and resorption. This intervention may be combined with symptomatic drug therapy, antibiotics, laser therapy, or hyperbaric oxygen therapy, depending on severity and necrosis duration [23].

Thus, orofacial harmonization, particularly through the use of hyaluronic acid, represents a promising field within aesthetic dentistry, yet one that demands ongoing education and ethical commitment from professionals. The integration of knowledge regarding aesthetic procedures and their potential complications must remain a priority to ensure patient safety and satisfaction, reinforcing the importance of ethical and high-quality clinical practice [13, 19].

4 Conclusion

The analysis of complications associated with facial filling using hyaluronic acid, within the scope of orofacial harmonization, underscores both the complexity and the significance of this procedure in contemporary aesthetics. The pursuit of outcomes that enhance patients' self-esteem reflects broader shifts in beauty standards and the growing emphasis on self-image. Nevertheless, it is essential that such procedures be performed by qualified professionals, equipped with thorough knowledge of facial anatomy and specific technical skills, to minimize and effectively manage potential complications.

Although hyaluronic acid offers advantages such as biocompatibility and reversibility, complications, albeit infrequente, must not be overlooked. The classification of adverse effects, ranging from early-onset events to severe, acute complications, highlights the importance of continuous monitoring and timely interventions. Hyaluronidase, widely employed as a primary therapeutic strategy for reversible complications, further emphasizes the need for accessible therapeutic alternatives available to practitioners.

The advancement of techniques and materials, coupled with the refinement of application methodologies, has progressively increased the safety of filler procedures while reducing the incidence of adverse events. Accordingly, the continuous training of dental surgeons is indispensable to ensure both treatment effectiveness and patient health.

In conclusion, orofacial harmonization constitutes a valuable tool within aesthetic dentistry, offering not only physical enhancements but also meaningful improvements in self-esteem and quality of life. A commitment to ongoing education and the regular updating of clinical practices remains essential for professionals to deliver excellence in care, balancing safety with patient satisfaction in the context of orofacial harmonization

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Competing Interests

Declare potential competing interests or state “The authors declare no competing interests.”

Data Availability

State where data are deposited (repository, DOI, license).

Code Availability

State where code is hosted (e.g., GitHub + DOI on Zenodo) and its license.

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Supplementary Information

List supplementary files (extended methods, extra figures/tables, videos).

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