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Case Report

Lip Enhancement with Polymethylmethacrylate (PMMA) Filler

Tagliani MM* and Bonetti E

Private Clinician and Orofacial Harmonization Postgraduate Professor, V&G-FUNORTE, Brazil

***Corresponding Author**: Tagliani MM, Private Clinician and Orofacial Harmonization Postgraduate Professor, V&G-FUNORTE, Brazil.

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Abstract

The lip contour adds beauty and a youthful look to the face. Aside from being a significant aesthetic feature of the face, lips play an important role in phonation and in the formation of an anterior oral seal in swallowing. Among the methods to improve or recover lip contours and lip function, the authors advocate the use of injectable polymethylmethacrylate microspheres (PMMA), as a minimally invasive procedure into the lips. The biomaterial was injected into the lips of a female patient using cannulas. Within two years following the procedure, there were no related complications. In conclusion, good results and a high degree of satisfaction were achieved among patient and staff.

Keywords: *Fillers, Polymethylmethacrylate (PMMA); Lips; Volumizing; Contouring*

Introduction

Dental surgeons and their patients consider facial beauty preeminently important [1]; it is a motivational factor many times greater than the improvement of dental function and dental health. A good morphological relationship between the proportions of chin, nose and lips results in the characterization of a pleasant and aesthetic face [2].

The lips are one of the facial areas most affected by the aging process. With advancing age, the lip filter tends to increase in size, the cupid's bow becomes flatter, the red color of the lips fades, and the volume decreases. As a consequence of these effects, the inter-labial distance decreases, as well as the exposure of incisors both in the smile and at rest position [3,4].

In addition to the intrinsic aging process, genetics, exposure to the sun, and repetitive contraction of the orbicularis musculature of the mouth produce wrinkles and perioral angular, radial, and vertical lines around the mouth [5].

The ideal ratio between the upper and lower lips is approximately 1: 2.26. However, the properties of the lips change over time, resulting in an increase in the cutaneous portion of the upper lip. Also, the vermilion of the upper lip gradually loses volume and becomes thinner [5].

Considering all of the above, lip fillers have been used in order to provide proper lip sealing, more youthful appearance and improvement in the patient's facial proportion.

For more than a decade, Dentistry has used lip filling techniques in order to provide the patient with a more satisfactory functional and aesthetic result. The ideal lip filling has long-lasting efficacy and excellent aesthetic results, as well as a low rate of complications [5,7]. In addition, it must be safe, biocompatible and stable at its site of implantation [7].

Among the various types of fillers on the market today, used in both cosmetic and functional indications in clinical practice, we can highlight collagen (bovine, porcine or human), hyaluronic acid of animal or synthetic origin, calcium hydroxyapatite, L-polylactic acid and

polymethylmethacrylate (PMMA). Such biomaterials diverge in the time interval in which the material remains in the tissue before being reabsorbed as well as in its mechanisms of action [8].

Polymethylmethacrylate (PMMA) is a transparent and rigid thermoplastic synthetic material. It is one of the most resistant, light and modern polymers on the market. Developed in 1928, it came on the market in 1933 through the German company Röhm and Haas, patented as Plexiglas®.

In medicine the use of PMMA began in 1940, applied in craniofacial surgery, dental prostheses and orthopedics [10]. As a filler material in human faces, its use since 1994 has been estimated in 200,000 patients in several countries [11].

PMMA is the only permanent implant in the USA and Brazil which is approved by FDA and ANVISA. In 2009, the BIOSSIMETRIC® brand was launched under license registration no. 80434370001, in concentrations of 5%, 10%, 15% and 30%, and with syringes of 1 mL and 3 mL.

Currently, PMMA is a material that has been gaining space in Brazilian dental offices, due to its low cost compared to other fillers, as well as its greater durability. It is a permanent material that causes both immediate and long term results [12]. Its microspheres are biocompatible and have shown stability for decades. The commercial products contain bovine collagen or carboxymethyl-cellulose, which serve as carriers for the PMMA microspheres. The injected microspheres stimulate fibroblasts to produce collagen, which encapsulates each microsphere and stimulates tissue growth where it is deposited [14]. In addition, it can be modeled during and within one week after application.

It is indispensable that the professional performing PMMA fillers is well trained and experienced in filling procedures. In the majority of articles on PMMA filling, the injection technique is cited as the main cause of complications, occurring after both superficial and deep injections [11,15].

In this article, we present and discuss a case in which a technique of lip filling with PMMA was performed in a patient with a dual purpose, aesthetics and function.

Case Report

In February 2017, a Brazilian female patient, 37 years old, presented at the Orofacial Harmonization Clinic complaining of an absence of lip seal at rest position. She also reported discomfort with her inverted labial commissures, which caused her a sad appearance.

In the initial frontal facial analysis it was possible to observe a mesofacial skeletal pattern. Differential diagnoses included an absence of lip sealing at rest, flattening of lip filters, labial commissures downward, lack of definition of lip contour, volume and projection (Figure 1).

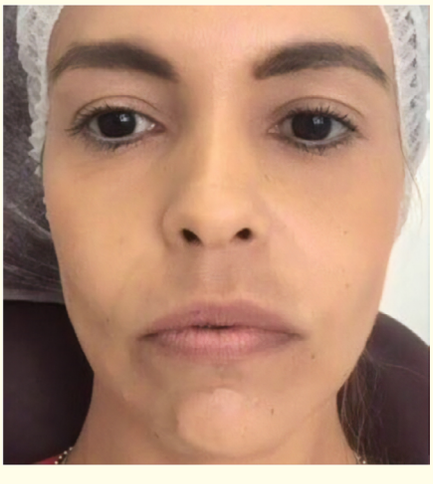

Figure 1: *Initial analysis.*

Once diagnosed, the aim was to correct the contours and to volumize the lips, in order to obtain a correct lip seal, and, in addition, to achieve a more pleasant aesthetic look.

The material of choice was the PMMA of BIOSSIMETRIC®, in the concentration of 10% for contour and 5% for volume. According to the manufacturer, the material is an inert, injectable implant that uses polymethylmethacrylate with 40 µm homogenous microspheres in a gel that is consistent enough for soft tissue expansion. The carrier (carboxymethylcellulose and others) is absorbed within 72 hours, with only PMMA particles remaining. Microspheres larger than 40 µm prevent phagocytosis by macrophages and, consequently, migration of the material.

A filling technique [16] (Figure 2) was proposed and executed, consisting of a retro-injection into the white roll of the cutaneous-vermillion junction, a small amount of material into the cupid´s bow, and a minimal injection into the columellas. Corrections in the vermilion of the lip, including the tuber, were made at the vermillion-mucosa junction in the submucosal plane with a small and secondary injection towards the vermilion depth. The contour and volumizing corresponded to the patient's facial proportion.

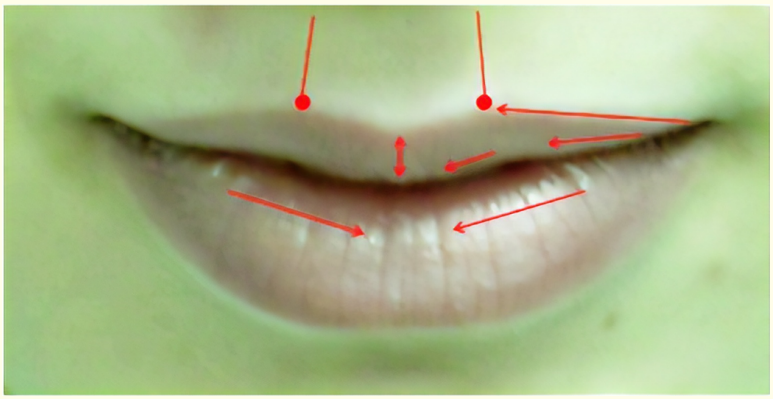

Figure 2: *Filling technique.*

After 20 days, the desired results were verified (Figure 3). In the post-treatment facial analysis, passive lip sealing at rest, lipid and cupid arch delineation, well-positioned labial commissures, definition of lip contours, aesthetic and proportional lip volume and projection were observed.

Figure 3: *Facial analysis after 20 days.*

On follow-up after 24 months, the initial results remained unchanged. In addition, no side effects, intercurrences or abnormalities were reported.

Figure 4: *Results remained unchanged after 24 months.*

Discussion

The absence of lip sealing may be the result of an anteroposterior and vertical disharmony of the dentofacial complex. In a patient with a large overjet or AFAI (height of the lower third of the face) it is possible to observe that the lips are usually separated when in the resting position, so that the activity of the lower lip is significantly increased when the lips are forced to sealing. In order for lip seal to occur, excessive and conscious muscle contraction is necessary, which can be evidenced by the alteration of the skin in the chin region [17].

In the present case, the patient expected an immediate solution to her complaint, therefore, orthodontic or surgical treatments were discarded in the treatment plan. In addition, the anatomy of the lips allowed volumizing and contour, which were lost in the intrinsic process of aging. The decision was taken together with the patient and according to her expectations.

The decision to choose PMMA as the filler material involved two factors, the cost and the permanence of the material in place. A previous case had been described [15] in which a 70-year-old patient had an upper right deformity was adequately corrected using PMMA in two steps. Three years after the procedure, the patient was still highly satisfied with the results. Four years post-procedure, no allergic reactions, granuloma formation, particle extrusion or any other adverse reactions were observed.

The two steps mentioned above are due to the PMMA filling technique *per se*. Because it is a permanent material, it must first be applied with hypocorrection, that is, in a conservative way [15]. More product can be added if necessary, but its removal is not always possible or successful, demanding extremely complex techniques. Therefore, professionals take the precaution of using lesser or equal volume of the required PMMA and may perform a secondary procedure if necessary, after an interval of at least 90 days [15].

There is still no consensus on the volume to be injected and the form of PMMA application. Intramuscular injection is condemned by the majority of authors, advocated by others [18] and contraindicated by the precursor of PMMA use in facial aesthetics [11,19], with the justification that the muscle displaces the implant in an uncontrolled way and with a tendency to form agglutinations.

The use of PMMA should be judicious. A Brazilian study [20] performed histological evaluation after the use of PMMA in rats. The results indicated the presence of inflammatory infiltrate and fibrosis at the injection sites, in addition to a decrease of PMMA in all samples.

Granulomas occurred independently of the technique. On the other hand, no presence of PMMA was observed in the distant organs.

Finally, it is known that the use of PMMA fillers has a great significance in the treatment of lipoatrophy in patients with acquired immunodeficiency syndrome (AIDS) [21], who due to deficient cellular immune response, are less likely to present granulomas in areas injected with the product.

Conclusion

There was improvement in both the function and lip aesthetics of the patient described. PMMA did not show any side effects two years after the procedure. The execution of PMMA filling techniques requires professional skills, due to the material's permanent character. It is imperative to use only certified and approved materials. Correct and thorough planning of the case will lead to the success of the procedure and patient satisfaction.

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