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SMOOTHING THE MENTO LABIAL SULCUS IN ORTHOGNATHIC SURGERY WITH USE OF A POLYMETHYL METHACRYLATE (PMMA) PROSTHESIS: CASE REPORT

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ABSTRACT

PURPOSE: This article aimed to report a clinical case of a patient, a 26-year-old, caucasian man, who sought surgical treatment due to esthetic and functional complaints related to facial features. **METHODS:** The initial diagnosis was a standard dentofacial deformity, short face, mandibular hypoplasia, deep mento labial sulcus, and Class II occlusion. **RESULTS:** Bimaxillary orthognathic surgery was performed using genioplasty associated with filling the chin with a polymethyl methacrylate (PMMA) prosthesis to soften the deep mento labial sulcus. **CONCLUSION:** PMMA was shown to be a good material for use as a definitive prosthesis that enabled facial harmonization to be achieved. PMMA has advantages such as stability, biocompatibility, easy handling, and low cost.

Keywords: Orthognathic Surgery. Filling Polymethyl Methacrylate. Mento labial sulcus

INTRODUCTION

Concern about health and beauty has always been part of the population's daily lives. However, in the last decade, the search for ideal esthetics has increased considerably among patients who seek orthognathic surgery. Approximately 2/3 of those who undergo surgery do so because of their facial appearance. In some cases, however, traditional osteotomies may fail to restore the natural appearance of the face and lead to a reduction in the volume of soft tissues¹.

In this sense, the use of treatments adjacent to the orthognathic surgery performed has played an important role in obtaining a more symmetrical facial appearance and more esthetic contours, such as filling places where bone movement was not sufficient, with soft tissues, to achieve an adequate projection of these tissues².

For this esthetic purpose, various filling materials have been used, with high success rates and predictable long-term results. Among these, we have bone grafts (autogenous, allogeneic, or xenogeneic types); and alloplastic materials (titanium, porous polyethylene, hydroxyapatite, and polymethyl methacrylate - PMMA)¹.

Facial implants have been used since the beginning of cosmetic surgery. Autogenous tissues, such as bone and cartilage, have been used to repair traumatic, congenital, and surgical defects of the face. The increase in morbidity at the donor site, limited supply, resorption, migration, and implant distortion have contributed to a dramatic decrease in the use of autogenous and irradiated cadaver tissue resources³.

Allogeneic implants are an effective alternative to autogenous grafts in the reconstruction of facial defects. They are used to reconstruct a variety of bone and soft tissue defects, including those in the frontal and temporal regions, internal orbit, infraorbital rim, malar, paranasal and nasal regions, mandible, and chin. When compared with their autologous counterparts, alloplastic materials are readily available, do not lead to morbidity in the donor area, reduce surgical time and costs, and have shown postoperative tissue tolerance (biocompatibility)⁴.

When selecting a reconstruction material, properties such as biocompatibility, radiopacity, cost, osteoconductive, risk of infection, and easy handling (preparation and application) must be considered⁵.

Among the alloplastic materials, PMMA has the advantages of low cost, minimal inflammatory reaction, easy availability, and excellent adaptation to the bone contour. As a

disadvantage, it has a high level of bacterial adhesion, has poor tolerance to infection, and has relatively poor properties of osteoconductive and allergenicity⁶. It can be used in conjunction with orthognathic surgery; that is, simultaneously at the time of surgery or after surgery⁷.

Commercially, PMMA is presented as a type of powder/liquid, and it must be manipulated when it is installed in the region where it will be fixed with titanium screws. It can also be customized, before surgery, based on the prototype of the defect to be treated⁸. Technologies that have recently been incorporated into oral and maxillary surgery, such as rapid prototyping, allow the simulation of steps in the surgical procedure before creating personalized orthoses and prostheses, thus reducing morbidity and providing superior results⁹.

Therefore, this report aims to present the use of PMMA in a clinical case of smoothing the labial sulcus during intraoperative orthognathic surgery.

RESULTS (CASE REPORT)

The patient, a 26-year-old, caucasian man, sought surgical treatment due to esthetic and functional complaints related to facial features. After the preoperative orthodontic preparation, the patient was referred for orthognathic surgery.

In the facial analysis, the patient presented dentofacial deformity of the short face type, Class II occlusion, mandibular hypoplasia, deep mento labial sulcus, a low occlusal plane (brachycephalic), vertical and anteroposterior deficiency of the maxilla, with little exposure of the teeth in resting and smiling positions (Figures: 1A-C; 2 A-B; 3 and; 4 A-C).



Figure 1A- Preoperative front view of the patient. **B-** Preoperative front view of the patient smiling. **C-** Preoperative view of the patient's profile.

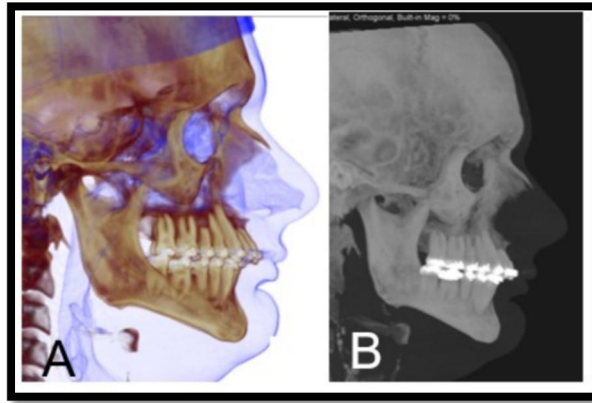


Figure 2A - Preoperative computed tomography image of the face; B - Preoperative lateral teleradiograph image.



Figure 3 Preoperative right side view, showing deep mento labial sulcus.



Figure 4 A- Preoperative occlusion, right side view. B - Preoperative occlusion, front view C- Preoperative occlusion, left side view.

Virtual surgical planning for orthognathic surgery was carried out using Dolphin Imaging 11.95 Premium® software and the concomitant installation of a PMMA prosthesis in the region of point B was planned to soften the deep mentolabial sulcus¹⁰.

- Virtual Planning

A bimaxillary advancement was planned, by performing genioplasty, with clockwise rotation of the occlusal plane. To improve the region of the mentolabial sulcus, a PMMA prosthesis¹¹

in the mandibular region of point B was used, which generated a more harmonious appearance of the lower lip, mentolabial sulcus, and chin region¹².

A 2 mm advancement of the maxilla was performed, and it was repositioned inferiorly by 7 mm. An 8 mm advancement of the mandible was performed, and the chin was repositioned inferiorly by 3 mm (Figure 5).

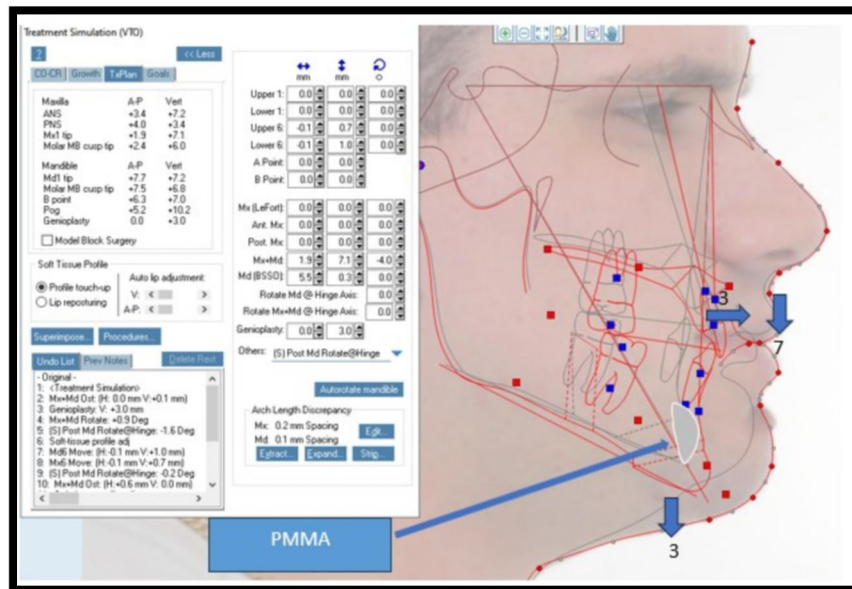


Figure 5 2D surgical planning in Dolphin Imaging software, showing the surgical changes to the patient's face and the location where the PMMA prosthesis will be placed.

- Fabrication and installation of the polymethyl methacrylate (PMMA) prosthesis

After completion of the genioplasty, the assistant surgeon himself fabricated the PMMA prosthesis at the surgical center. The commercial presentation of PMMA was in the form of sterile liquid/powder packed in a wrapper. The powder and liquid were mixed in a sterile tub. After manipulation, the PMMA was adapted to and shaped in the desired region. In the polymerization phase, the material had to be abundantly irrigated with saline, to avoid damage to the bone tissue due to the exothermic reaction of the product. During the polymerization phase, it was also important to remove the prosthesis from the operated area, to prevent the part from getting stuck, and then to reinsert it in its place after polymerization and adjustments. After polymerization, adjustments were made to the piece itself, by removing burrs close to the tissues and defining its ideal thickness. On concluding the refinement, the PMMA piece was fixed to the bone with two titanium screws.

The suture in the region was performed in layers, to prevent the piece from being exposed to the oral environment (Figures 6 A-H).

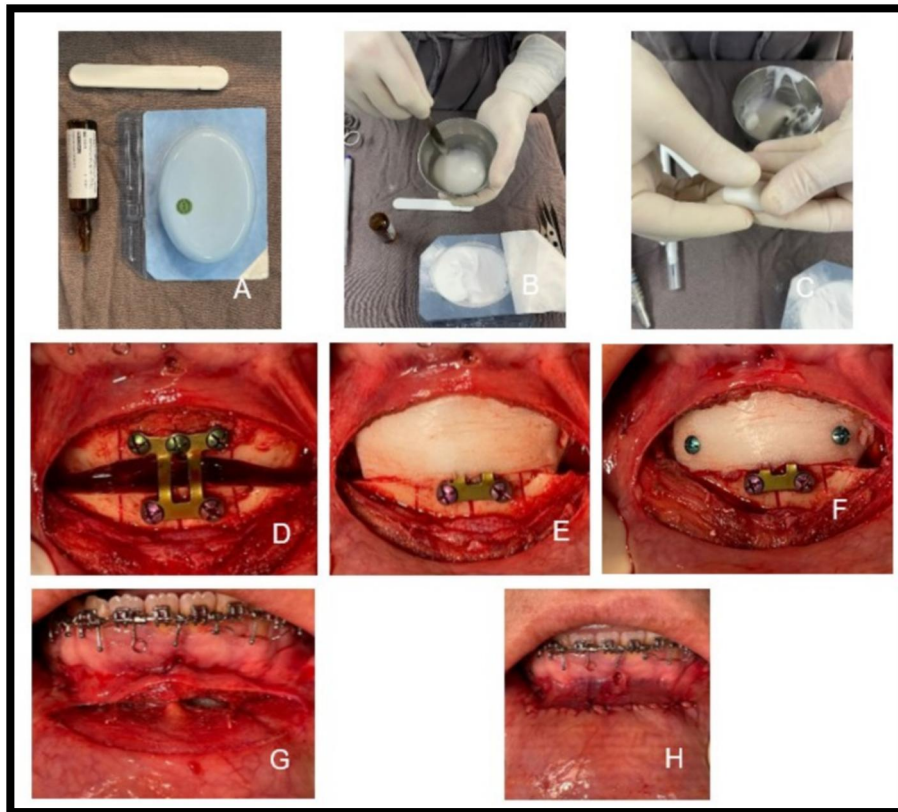


Figure 6 - Polymethyl methacrylate powder and liquid. B- Manipulation of the powder and liquid in a sterile tub. C- Product ready to be placed in position. D- PMMA receptor area. E- PMMA shaped and in position in the chin. F- Fixation of PMMA with two titanium screws. G- Suture in layers. H- Final aspect after suturing.

During the first month, the patient underwent weekly exams, and in the second month, the patient had scheduled monthly follow-up visits. No exposure or infection of the PMMA occurred. After the procedure, the patient did not feel any specific discomfort, such as pain or paresthesia/ paralysis in the jaw/chin/lower lip.

At 10 months after surgery, smoothing of the lip sulcus was observed and, consequently, an improvement in facial harmony. In addition, the PMMA graft was stable (Figures 7A-E and 8A-B).

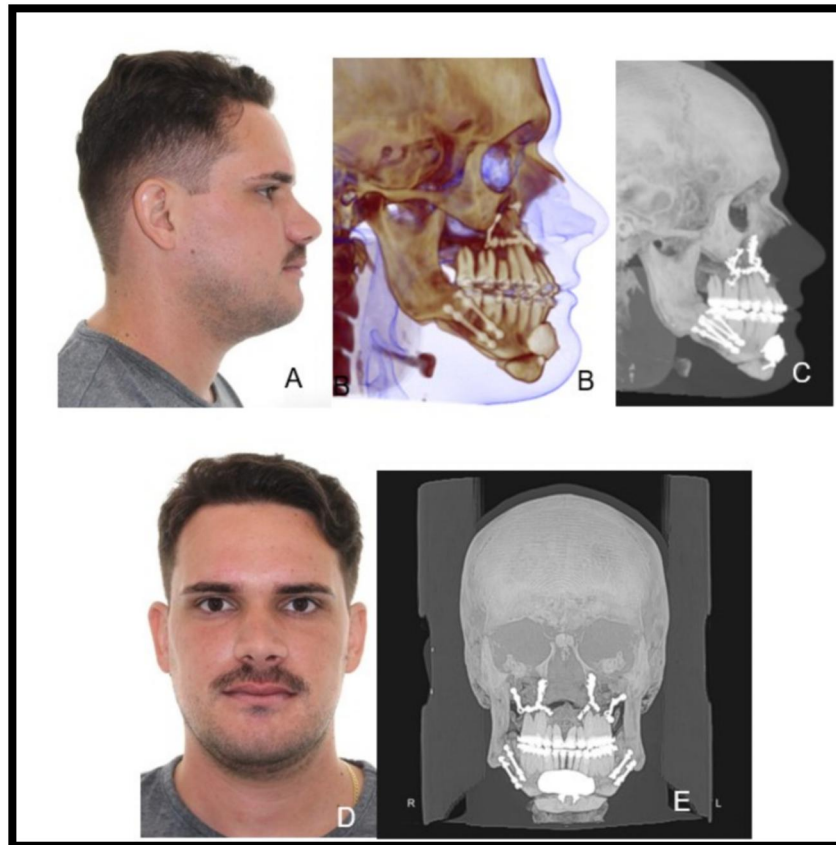


Figure 7 A- Postoperative right side view. B- Side view of the postoperative 3D tomographic reconstruction, detail for adaptation of the PMMA. C - Postoperative lateral teloradiograph D - Postoperative front view. E - Front view of 3D tomographic reconstruction.



Figure 8A - preoperative right side view, showing deep mentolabial sulcus. B - Postoperative right side view, showing smoothing of the mento labial sulcus.

DISCUSSION

Frequently, orthognathic surgery alone is not capable of correcting all the facial esthetic problems of patients, so other treatment alternatives are required to resolve them, such as facial harmonization and permanent facial prostheses. In the case in question, the patient not

only had a short facial dentofacial deformity, which was treated with bimaxillary orthognathic surgery but also had esthetic complaints about the exacerbated depth of the mentolabial. This complaint was treated by placing a filling in the region of Point B of the mandible with a customized prosthesis made of PMMA⁴⁻¹².

At present, various filling materials are being used for this purpose, such as, for example, autogenous bone, fat, cartilage, hyaluronic acid, porous polyethylene, hydroxyapatite, silicone implant, Mersilene® mesh, and PMMA^{1,5-7,9-10}. In the present case, PMMA was chosen because it has advantages such as stability, a high level of biocompatibility, strong resistance to functional stress, ease of handling, and low cost. Moreover, it is easy to remove, when compared with an autogenous bone graft^{4-5,8,11-12}.

The autogenous bone graft has some disadvantages, such as resorption and consequent loss of contour in the long term, which reduces the predictability of its result. In addition, there are difficulties with its customization and adaptation to the receptor bed^{2,9}.

The use of PMMA for maxillofacial reconstruction has shown predictable results, eliminates the usual complications seen in non-customized implants, and provides an excellent degree of patient satisfaction. Its main disadvantage is its high cost when fabricated virtually using software. Whereas when it is fabricated using the implant analog method, it is modeled to the patient during surgery, which minimizes costs. Although it also has the disadvantage of a greater risk of infection, the temperature of the material must be controlled during the PMMA setting, as the polymerization reaction releases heat and can damage healthy tissues. Attention should also be paid to covering the operated area with soft tissue, to avoid suture dehiscence and exposure of the material^{1,4-6,10,12}.

These complications can be avoided by performing abundant irrigation with saline solution at the time of polymerizing the material and to avoid dehiscence, suturing in planes is recommended^{1,5-6,10-12}.

Mechanical fixation with screws is the method most used to maintain the stability of the PMMA prosthesis after surgery. The implant size may affect the total number of screws used. However, further clinical studies involving larger cohorts of patients are needed, as well as finite element analyses for determining the ideal number of screws. In the case presented, two fixation screws were used^{4,8,12}.

CONCLUSION

Based on the contemporary literature and the clinical case presented, it could be concluded that filling with a PMMA prosthesis for smoothing the mentolabial sulcus was shown to be effective, with a gain of harmony in the region of the lower lip, mentolabial sulcus, and chin. PMMA was shown a good material for use as a definitive prosthesis. It showed innumerable advantages when compared with other types of implants.

ETHICS

The Authors declare that all human subjects were conducted following the Declaration Of Helsinki and all procedures were carried out with the adequate understanding and written consent of the subjects.

CONFLICT OF INTEREST

No author has any actual or potential conflict of interest including any financial, personal, or other relationships with other people or organizations.

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