

# HYPERBARIC OXYGEN THERAPY FOR MANAGEMENT OF SEVERE MAXILLARY PSEUDARTHROSIS IN ORTHOGNATHIC SURGERY

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## ABSTRACT

Maxillary pseudarthrosis is a rare complication in orthognathic surgery. For its treatment to be successful, it requires attention, special care and effective techniques. Such factors as inadequate osteosynthesis, occlusal instability, absence of bone grafts and unstable bone movements, could contribute to pseudarthrosis formation. Does not have on this literature field established protocols or guidelines for resolution of this complication. The purpose of this report is to highlight the case of a 26-year-old woman, who had severe jaw mobility with significant impairment of masticatory function after twelve months of orthognathic surgery. The authors will describe the treatment performed that consist in osteosynthesis exchange, autologous bone graft blocks from the chin to le fort I osteotomy, local care and hyperbaric oxygen therapy. After two years of follow up we have as result a great evolution presenting a resolute and predictable therapeutic alternative for cases of maxillary pseudarthrosis improving recovery and postoperative stability of patients undergoing orthognathic surgeries.

**KEYWORDS:** Pseudarthrosis, Orthognathic, Hyperbaric Oxygenation.

## 1. INTRODUCTION

Le Fort I osteotomy is a common surgical procedure used in orthognathic surgery when patients present maxillary deformities. Described and adhered to by many authors for its versatility, it was named after its discoverer René Le Fort. Pseudarthrosis is a rare complication, characterized by bone non-union. Factors such as failure in osteosynthesis, excessive surgical movements of lower jaw repositioning, failure to perform bone grafts, non-collaboration of the patient, occlusal instability, among others can favour the formation of fibrous scar tissue<sup>1</sup>.

Even if these complications are uncommon in orthognathic surgery, the possibilities should not be underestimated. Surgically these complications are related to trans and postoperative, however, we must not forget that the patient inadequate preoperative preparation can often be responsible for future complications or unsatisfactory results. Surgical

planning and orthodontic preparation were described as crucial factors for a successful result<sup>2</sup>.

The association of hyperbaric oxygen therapy in patients undergoing bone reconstructions, especially in areas with compromised vascularization, has been shown to be effective in the maxillofacial region. Such efficacy is mainly due to the angiogenic, bactericidal and bacteriostatic potential of hyperbaric oxygen therapy, enhancing results<sup>3,4</sup>.

Thus, the present work reports a clinical case of maxillary pseudarthrosis, after orthognathic surgery, presenting an alternative form of treatment for this surgical complication.

## 2. CASE REPORT

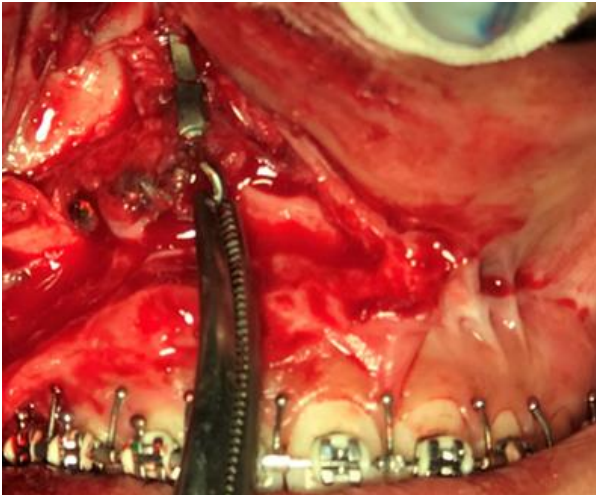
Patient 26 years old, female, came up to the Service of Maxillofacial Surgery of the Hospital Unique (Brazil) reporting discomfort when chewing. She reported having undergone bimaxillary orthognathic surgery previously in another service, 12 months before. At physical examination, great maxillary mobility was observed, confirmed by tomographic examination, which showed images that suggested the absence of bone tissue in the region of the maxillary osteotomy. Additionally, possible errors in osteosynthesis were noted, with poorly adapted plates and screws and loose screws. (Figure 1).



Figure 1. Preoperative computed tomography scan.

The surgery was performed under general anesthesia, with nasotracheal intubation. Initially, the internal fixation material from the first surgery was

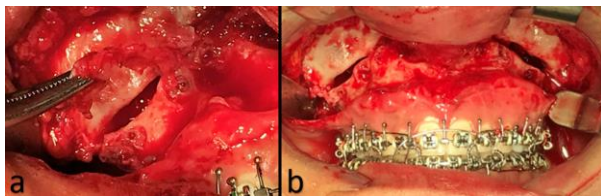
removed (Figure 2), when fractures of some loose plates and screws were confirmed (Figure 3); afterwards, the fibrous tissue was curetted and removed from the region of the previous osteotomy (Figure 4.a), in which we observed an important space, typically seen in bone non-union (Figure 4.b). The maxillary-mandibular block was realized, and a new osteosynthesis was performed.



**Figure 2.** Removing internal fixation material from the first surgery.



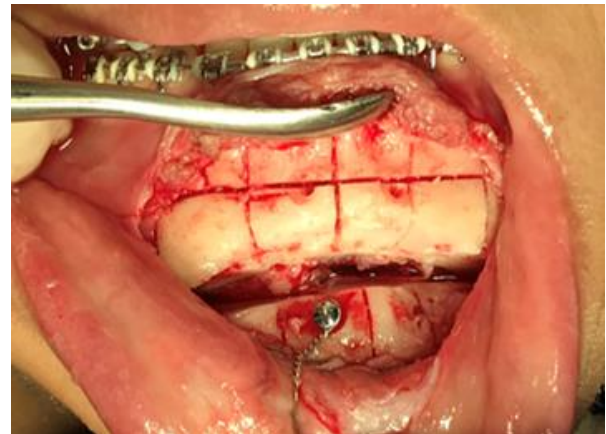
**Figure 3.** Fractured plate removed.



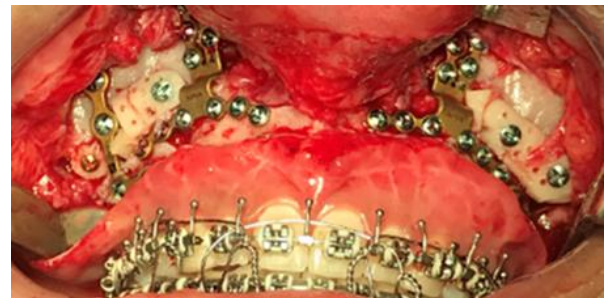
**Figure 4.** 4a - Curetted fibrous tissue; 4b - Bone gap showing non-union.

Then, bone graft blocks were removed from the mandibular mentum region, using ultrasonic tips (Piezo) (Figure 5), and onlay grafts were performed on the maxilla in order to assist bone healing. (Figure 6) All surgical wounds were sutured with 4.0 ETHICON® monocryl suture. In the postoperative period, the patient maintained food restriction for 60 days, and underwent 30 sessions of hyperbaric oxygen therapy. After 2 years of follow-up, the patient does not present clinical signs of maxillary mobility, maintaining occlusal stability. Tomographically, there are images

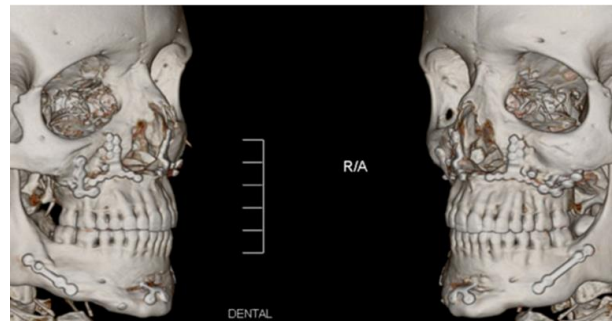
that suggest maintenance and stability of the fixation performed associated with bone consolidation (Figure 7).



**Figure 5.** Autologous bone grafts removed from chin.



**Figure 6.** Final aspect of new osteosynthesis.



**Figure 7.** 2-year postoperative computed tomography scan.

### 3. DISCUSSION

Le Fort I osteotomy is widely used for the correction of dento-skeletal deformities, and adequate osteosynthesis is essential for satisfactory bone healing<sup>1,3-5</sup>.

Bone non-union / pseudarthrosis in Le Fort I type maxillary osteotomies are rare. However, they have a high severity. Imholz *et al.* (2010)<sup>1</sup> reported 4 cases, in a total of 150 patients, of maxillary bone non-union. Kramer *et al.* (2004)<sup>6</sup>. reported the occurrence of 1% bone non-union in a sample of 1000 patients undergoing orthognathic maxillary surgery. In all of these papers, the authors suggest that factors such as inadequate osteosynthesis, occlusal instability, absence of bone grafts and unstable bone movements, contributed to the failure<sup>1,6,7</sup>.



In the present article tomographic examination, showed images that suggested poorly adapted plates and screws and loose screws.

Van Sckieles *et al.* (1990)<sup>8</sup> recommend the use of autogenous bone graft in cases of bone non-union. Among the advantages of this use are the osteogenic, osteoconductive and osteoinductive properties of the autogenous bone graft, in addition to allowing stabilization with screws when used in blocks<sup>8</sup>. In the related case a new osteosynthesis was performed associated with autogenous bone graft blocks.

Hyperbaric Oxygen Therapy (HBOT) can be used as an important complementary therapy in the process of angiogenesis and bone neoformation. Eid *et al.* (2011)<sup>10</sup> suggest the association of HBOT in order to improve recovery and postoperative stability of patients undergoing orthognathic surgeries to correct dentofacial deformities. In the reported case, hyperbaric oxygen therapy was used because it was an area with severe vascular impairment, due to the previous non-bone consolidation<sup>3,9-11</sup>.

Maxillary bone non-union is a complication that presents serious clinical implications for patients undergoing orthognathic surgery and it is directly related to failure in surgical planning. The exchange of osteosynthesis materials and the use of autogenous bone graft blocks, associated with hyperbaric oxygen therapy, proved to be an effective treatment, with low morbidity, to patients with maxillary pseudarthrosis after orthognathic surgery<sup>1,8,10</sup>.

#### 4. CONCLUSION

We can observe some important factors for the successful treatment of maxillary pseudoarthrosis after orthognathic surgery. The correct planning of grafts, paying attention to movements of greater instability and associating adjunctive therapies in the postoperative period such as hyperbaric oxygen therapy.

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