

Application of Skeletal Anchorage with Zygomatic Mini-Plates in the Treatment of Anterior Open Bite in Adults

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Abstract

Clinical situations involving moderate skeletal discrepancies, and which would have ortho-surgical treatment as therapeutic option by means of orthognathic surgery, the patient can benefit from the use of skeletal anchorage for achieving satisfactory results and decreasing morbidity. The patient was told that her anterior open bite would be treated by correcting the absence of lip sealing by means of mini-plates surgically installed in the zygomatic buttresses, including extractions of the upper first pre-molars. In the present case report, it was observed that skeletal anchorage using T-shaped mini-plates installed in the zygomatic buttresses is effective for intrusion of upper molars and closure of open bite, resulting in aesthetic benefits to the soft profile. Results on several aspects were obtained, such as: intrusion of upper molars, improvement in the lower molar inclination, desired counter-clockwise rotation of the mandible, significant change in lip sealing and anchorage for maxillary retraction.

Key words: Orthodontic Anchorage; Mini-Plates; Anterior Open Bite

Introduction

Anterior open bite has been considered a challenging malocclusion to treat, especially in adults. This deformity has several etiological factors, such as genetic, dental, functional, soft tissue and habits ([1,2]. In the majority of the times, open bite is treated with conventional orthodontics, that is, by using elastics attached to anterior teeth for their extrusion. However, in this case, one cannot reduce the facial height and thus the smile aesthetics may be significantly changed as teeth become elongated with more gingival exposure [1]. Another option would be a surgical treatment by means of orthognathic surgery, allowing more gains in the more complex cases. As alternative to the ortho-surgical treatment of some moderate discrepancies, temporary devices for skeletal anchorage with mini-screws, mini-plates and even osseointegrated implants are described in the literature [3,4,5].

Studies evaluated intrusion of lower molars caused by the use of mini-plates in the cortical bone, more precisely in the apical region of the first and second molars, reporting intrusions from 3 to 5 mm without significant changes in the occlusal plane [6]. The use of fixed anchorage with mini-plates enabled a better

control of the force, thus reducing root resorption [7].

Another work showed that molar intrusion affects occlusal plane, mandibular plane and anterior facial portion as well as reduces the posterior dentoalveolar excess. The intrusion of upper molars is effective for closure of open bites measuring up to 3 mm. As for more severe malocclusions, they should be corrected by using appliances in the two arches as simultaneous intrusion of upper and lower molars enables greater rotation of the mandible in the counter-clockwise sense, thus promoting greater skeletal changes [8].

Objective

To report a clinical case of a patient submitted to orthodontic treatment for correction of open bite by using skeletal anchorage with temporary orthodontic mini-plates installed bilaterally in the zygomatic buttresses for intrusion of posterior teeth.

Case Report

A 38-year-old female patient presented with Class II skeletal malocclusion with anterior open bite with no apical periodontitis or other pathologies. (*Figure 1-3*)



Figure 1: Initial photos of the patient's face.



Figure 2: Initial intra-oral photos.



Figure 3: Panoramic radiograph before treatment.

Shaped-T mini-plates of 2.0 mm (Signo Ortho, Campo Largo, Brazil) were installed in the zygomatic buttresses on each side for skeletal anchorage, being fixed with three screws of 1.8 mm x 7 mm. This anchorage system was necessary for intrusion of posterior teeth, thus improving inclination of lower molars, allowing counter-clockwise rotation of the mandible and providing adequate lip sealing. (Figure 4) Prior to surgery for installation of the mini-plates, the teeth were aligned and levelled by using a self-ligating device (Roth Slot 22, Morelli Ortodontia, Sorocaba, Brazil). Due to the Class II malocclusion, teeth 14 and 24 were extracted in order to compensate the severe overjet, that is, reduce dentoalveolar protrusion and compensate bone discrepancy. In this phase, a stainless steel rectangular arch of 0.19 mm x 0.25 mm (Morelli Ortodontia, Sorocaba, Brazil) was used for torque control.

The mini-plates were installed under local anesthesia by making a straight incision at the mucogingival junction, between teeth 16 and 26, and displacing the entire patch. The mini-implants were shaped onto the zygomatic bone in order to make

them anatomically adapted, that is, leaving the most occlusal link exposed to the oral cavity for fixation to the intrusion appliance by means of Ni-Ti springs. The fixation of each mini-plate was performed by using three mono-cortical screws of



Figure 4: Surgery and installation of the 2.0-mm mini-plate for skeletal anchorage.

1.8 mm x 7 mm. The patient evolved without intercurrent and corroborated with good hygienisation during the treatment. Orthodontic mini-screws (Neodent, Curitiba, Brazil) were used in the regions between teeth 44 and 45 for assisting in the skeletal anchorage and making tooth 47 mechanically vertical. For a better control of the buccal molar movement and anchorage, a transpalatal bar was placed away from the mucosa and welded onto the bands. In this way, by activating the spring, it was possible to achieve intrusion and consequently correction of the anterior open bite. Thirteen months after installation of the mini-plates, the desired intrusion of the upper posterior teeth was observed. At the end of the orthodontic treatment, 3/16 inter-maxillary elastics (Morelli Ortodontia, Sorocaba, Brazil) were used in the rectangular arch for improvement of intercuspitation. The total treatment time was 36 months. The initial and final USP-standard cephalometric analyses can be observed in Table 1.

Table 1. Comparison of the initial and final cephalometric analyses.

MEDIDAS	NORMA	INICIAL	FINAL
SNA	82°	83,97°	81,31°
SNB	80°	80,24°	79,64°
ANB	2°	3,73°	1,66°
1/NA	22°	15,69°	21,94°
1'-NA	4mm	3,42mm	5,55mm
1/NB	25°	23,82°	23,36°
1'-NB	4mm	3,35mm	4,22°
1/1'	131°	136,76°	133,04°

Clearly reduction of the angle SNA in the cephalometric analysis can be observed, indicating an adequate retraction of the maxilla and correction of Class II skeletal malocclusion and also balancing the angle ANB, which is closer to the ideal pattern after the treatment. After achieving adequate horizontal

and vertical trespasses following the treatment, one can observe an improvement in the patient's soft profile, which was proven through lip sealing, improved convex profile and counter-clockwise rotation of the mandible (Figure 5). Panoramic radiograph showed discrete signs of rounded apices of upper anterior teeth following posterior intrusion and anterior retrac-



Figure 5: Final photo of the patient's face.



Figure 6: Final intra-buccal photo.



Figure 7: Final panoramic radiograph.

tion. (Figure 7)

As part of the rehabilitation treatment, reanatomization of anterior teeth and replacement of occlusal restorations of posterior teeth with composite resin were performed (Figure 6). A fixed lower 3x3 retainer and a modified removable upper retainer (Hawley) were installed.

Discussion

Several treatment options for anterior open bite in adults are described in the literature, all depending on the type of open bite. Orthodontic treatment is enough for dentoalveolar open bite, whereas the skeletal open bite is treated with other approaches such as orthognathic surgery with Le Fort I osteotomy, ortho-surgical procedure or repositioning of the condyle [9]. As alternative to the conventional ortho-surgical treatment, the use of skeletal anchorage by means of mini-plates has been described in terms of orthodontic mechanics and dental movements. The intrusion of upper molars by using mini-plates allows counter-clockwise rotation of the mandible without extruding the upper incisors and affecting the temporomandibular joint [10]. Moreover, another advantage compared to the orthognathic surgery is the possibility of performing outpatient procedures under local anesthesia, which reduces morbidity, costs and chair time, as in the case reported here [5, 11].

One of the concerns regarding the treatment of open bite in adults is the stability of result, since relapses are commonly reported in the literature [1]. For some authors, extraction of upper premolars in Class II patients improves the therapeutic stability as retention helps in the lip positioning and, when associated with loss of anchorage, facilitates the treatment. The orthodontic results associated with extractions and use of mini-plates in the zygomatic buttress can improve the profile of the soft tissues, provide good control of facial height, and correct the anterior open bite efficiently due to intrusion of molars and verticalization of incisors [12, 13]. In a similar case report, the advantages cited elsewhere and described in our work were also found [14].

Considering the high rate of malocclusion relapse, the use of retention is important after removal of the appliance and mini-plates [1,15]. In order to minimize the relapse, installation of 3x3 lingual lower retainer and upper Hawley arch is indicated in the final of the treatment [15]. Anterior maxillary retention causes reduction in the angle ANB, which indicates a maxillo-mandibular relationship in the antero-posterior sense, thus improving the patient's facial profile [16]. Loss of anchorage is a worrying factor in orthodontics, and for small spaces in

the mandible where absolute anchorage is desired, mini-screws are the solution. In this case, mini-screws were also used to achieve verticalization of the right lower second molar, which was mesially inclined, thus counteracting any side effect on the anterior teeth in case of verticalization by using conventional technique [17]. Anterior mandibular rotation tends to cause a passive lip sealing due to reduction in the anterior lower facial height (ALFH). The smile aesthetics is also changed positively as the intrusion of molars reduces the posterior dentoalveolar height, which prevents excessive anterior gingival exposure [17].

Another advantage of skeletal anchorage compared to conventional orthodontic mechanics for intrusion of molars is the necessity for removable devices to correct the open bite, such as extra-oral appliances and/or inter-maxillary elastics, which does not depend on the patient's cooperation [18]. The main dento-eskeletal and aesthetic effects associated with open bite correction with skeletal anchorage can be described as follows: levelling of occlusal plane by intrusion of molars, increase of vertical inter-incisal trespass, decrease of ALPH, reduction in the mandibular plane angle, counter-clockwise mandibular rotation, reduction in the Class II skeletal discrepancy, correction of gingival smile, and improvement of lip sealing and facial convexity [19].

Conclusion

In view of the references used and of the results found, we have concluded that the surgical installation of orthodontic mini-plates for treatment of anterior open bite was effective, safe and little invasive. In this way, it was possible not only to correct the malocclusion, but also to achieve functional and

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