Occlusal plane flattening by miniscrew in skeletal open bite: a case report

Ahmad Sodagar(DDS)¹, Farhad Sobouti (DDS)²*, Negin Shahsavari (DDS)³

1. Associate Professor, Dental Research Center, Department of Orthodontics, Tehran University of Medical Sciences, Tehran-Iran.
2. Assistant Professor, Department of Orthodontics, Dental Faculty, Mazandaran University of Medical Sciences, Sari-Iran.

*Corresponding Author: Farhad Sobouti, Dental Faculty, Mazandaran University of Medical Sciences, Sari-Iran.
Email: farhad_sobouti@yahoo.com Tel: +989123226518

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Abstract

Introduction: Different factors such as respiratory disorders, genetics, facial growth pattern, tongue malfunction and malposition are associated with anterior open bite. Skeletal open bite is often appeared by increased posterior dentoalveolar height of maxilla and backward rotation of mandible. Many treatment approaches have been developed for treatment of increased facial height problems. Achieving absolute anchorage has been a very efficient device for intrusion of posterior segments. In this article, the treatment of patient with severe skeletal open bite and facial imbalances was explained. Researchers of the present study used mini screws for leveling of upper arch by intrusion of premolars. Then, appropriate orthognathic surgery was done.

Keywords: Openbite, Occlusal plane, Tooth intrusion

Introduction

Constraint in upper air way, forward tongue position and other factors can result in anterior open bite. If these abnormal conditions continue, the vertical dimension of the facial structure will increase. Finally dolicho-facial growth pattern, hypotonicity of facial musculature and open bite malocclusion will occur. Thus, elimination of these conditions is very important in growing period for prevention of open bite malocclusion. [1]

An open bite is often appeared by increased posterior dentoalveolar height of maxilla. Many treatment approaches have been developed for treatment of increased facial height problems. High-pull headgear with trans palatal bar and vertical elastic in combination with multi-loop edgewise appliance are common modalities used to correct over erupted posterior segment. [2,3]

These devices may be not efficient because their treatment results are depended on patient cooperation. Surgical impaction of maxillary posterior segment is recommended too. [4,5] Based on action and reaction rule, intrusion of extruded teeth causes undesired displacement of adjacent teeth. Thus, achieving absolute anchorage has been a very important topic of interest in fields of orthodontics. [5-10]

In recent years miniplates and mini screws as an alternative safe approach are now frequently used for establishing absolute anchorage during orthodontic tooth movement. [8-12]

Traumatic damage is minimal during mini screw insertion compared to miniplate. [9] In this report of class II open bite malocclusion treatment, we used the mini screws for flattening the maxillary occlusal plane (premolars intrusion) were used and then orthognathic surgery was done for correction of excessive gingival show and sagittal discrepancy.

Case Report

The patient was a female aged 21 years and 9 months. Her complaints were: difficulty in mastication and swallowing, breathing disorder, unattractive smile, chin deficiency and open mouth.

Patient had no history of systemic diseases and trauma. Pretreatment clinical and photographic evaluation showed a convex profile, incompetent lips, chin deviation to left, hypermentalis activity, excessive gingival show.

چکیده

تسطیح پلن اکلوزال با استفاده از مینی اسکرو در بیمار دچار اپن بایت اسکلتی: گزارش مورد

امحمد سوداگر، فرهاد ثبوتی*، نگین شهسواری

مقدمه: تسطیح پلن اکلوزال با استفاده از مینی اسکرو فاکتور های متالفی همانند مشکلات تنفسی، زنینک، اگوی رشد صورتی و موقعیت و عملکرد نادرست زبان مربوط با این بایت فیزیکی می باشد. این بایت اسکلتی غالباً با ارتفاع افزایش یافته دندوآلوئولار در خلف ماگزیلا و چرخش به سمت عقب مندیبل همراه است. جهت درمان ارتفاع افزایش یافته دندوآلوئولار در خلف ماگزیلا، درمان‌های مختلفی معرفی شده است. استفاده از انکوریج مطلق با استفاده از مینی اسکروها یک روش درمانی کارآمد جهت تسطیح دندان‌های درمانی انتروژ شده پرمولر است. در این مطالعه، درمان بیمار دچار اپن بایت اسکلتی شدید و ایمبالانس‌های عضلانی صورتی را نشان دادند. مینی اسکروها جهت تسطیح دندان‌های قوس فک بالا با ایبرتوژن درمان شدند. سپس جراحی ارتودنسی انجام گرفت.

واژگان کلیدی: اپن بایت، پلن اکلوزال، اینتروژ دندان

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Dental casts and intra-oral examination revealed a 3.4 mm anterior open bite, 3 mm overjet, V shape upper arch, extrusion of upper premolars (curved occlusal plane), 3 mm space deficiency in maxilla and 3.1 mm in mandible. Dental midline was correct according to skeletal midline. First molars occlusion was class I on the left side and right side.

In panoramic view all third molars were presented and no abnormality was found in teeth and other structures. According to table 1, Cephalometric measurement showed skeletal class II with severe vertical excess facial pattern. (figure, table 1)

**Figure 1. Pretreatment records**

**Treatment plan**

Objective of treatment plan was elimination of step in maxillary occlusal plane in presurgical phase for doing proper orthognathic surgery.

The treatment plan sequence was as follows:

1. Aligning of upper and lower teeth
2. Leveling by intrusion of upper premolars
3. Upper and lower arch coordination
4. Surgical phase; maxillary impaction and autorotation of mandible, genioplasty, rhinoplasty
5. Post surgical finishing
6. Fixed lingual retainer in upper arch

**Figure 2. Bilateral insertion of miniscrews in buccal and palatal of premolars**

**Figure 3. Presurgical records**

Then orthognathic surgery was done according to determined treatment plan. After surgery, finishing phase of orthodontic treatment was done and for retention phase a lingual bonded retainer in mandible and Hawley retainer in maxilla were prescribed. Furthermore, the training of tongue posture was given
to the patient. Total treatment time was taken 23 months, and posttreatment photographs have been were taken one year after orthodontic debonding during follow up recalls. Normal overjet and over bite and occlusion were achieved.

Upper and lower dentitions were aligned and midlines were coincided. Better lip shape and function and soft tissue adaptation were achieved met. Lips were competent at rest without strain. (figure 4) Cephalometric analysis and radiographic tracings superimposition revealed significant decrease in FMA, occlusal plane angle-FH, Pog-Nperp and ANB. (figure 5, table1)

Table 1. Pretreatment and posttreatment cephalometric measurement

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Pre-treatment</th>
<th>Post-treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occlusal plan-FH</td>
<td>28</td>
<td>17</td>
</tr>
<tr>
<td>SNB</td>
<td>64</td>
<td>69</td>
</tr>
<tr>
<td>ANB</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>FMA</td>
<td>51</td>
<td>39</td>
</tr>
<tr>
<td>Pog-Nperp</td>
<td>-23</td>
<td>-7</td>
</tr>
</tbody>
</table>

**Discussion**

Previous reports have demonstrated that anterior open bite occurred by maxillary overgrowth and mandibular clockwise rotation. In other word extracted posterior dentoalveolar segment is most common cause of this malocclusion.

There are different treatment approaches for correcting vertical disharmony in such as extrusion of anterior teeth, intrusion of posterior teeth, segmental surgery or total maxillary surgery.[6-11]

Intrusion of posterior teeth is more predictable and stable than anterior extrusion with elastics.[12-15] Flattening of occlusal plane with continuous arch wire results in anterior teeth extrusion without molar intrusion. In this case occlusal plane flattening by premolars absolute intrusion was needed to achieve good post treatment overbite and decreased lower anterior facial height.

In patient with skeletal open bite, leveling of upper arch by continuous arch wire is a mistake, This can lead to extrusion of upper incisors. Removal of appliances postsurgically results relapse of corrected bite by apically movement of upper incisors. Furthermore, the extrusion of upper incisors presurgically which increases gummy smile and tooth show that more surgical maxillary impaction is needed.[9,10] We needed high amount of intrusion in premolars for flattening of occlusal plane.

In recent years, orthodontic skeletal anchorage has been developed. Use of miniscrew can provide absolute anchorage for intrusion and it is also time-saving. [14-19] Xun and et al. used miniscrews for posterior intrusion effectively. [7]

Reported amount of intrusion in maxillary first molars was 1.9 mm with SD=0.4. Another study applied mini screws showed that the maxillary and mandibular first molars were intruded by an average of 1.8 and 1.2 mm, respectively. [6,7] Ma and et al. compared the intrusive effect of high pull headgear and miniscrew on maxillary first molar and they concluded that miniscrew had better effect.[8]

The researchers used palatal and buccal intrusive force on premolars. From biomechanical point of view, this pattern of force application is better for tooth control during movement.

The premolar intrusion was obtained by miniscrew, 2.2 mm on the left side and 2.4 mm on the right side in five months. It seems that, we had some extent of anterior extrusion because of using...
continuous arch wire. Surgical impaction of maxilla is often applied in such cases to obtain counter clockwise rotation of the mandible with severe skeletal open bite. Open bite treatment with Le Fort I appears to be a very successful technique with stable results after 15 years.[9]

Open bite correction with LeFort I osteotomy with or without bilateral sagittal osteotomy have very stable results. Swinnen demonstrated relatively good skeletal and dental results in patient with open bite who treated with LeFort I impaction of maxilla.[10]

Segmental surgery for downward movement of anterior portion of maxilla is a common surgery, but it is more traumatic and time consuming for surgeon.[9,10] This technique also needs root divergence or space in arch for osteotomy site that can increase orthodontic treatment time.

In this case, after leveling, Le Fort I osteotomy for maxillary impaction was performed. Mandibular autorotation improved facial profile and anterior facial height. Following these, advancement genioplasty have been done for improvement of chin contour. [20]

Conclusions

Most common reason for anterior skeletal open bite is over eruption of posterior maxillary dentition. More efficient and stable method for correction of this malocclusion is intrusion of posterior buccal segment of maxilla. Miniscrew can provide absolute anchorage for proper intrusive movement. Following this mandible can rotate forward and upward that result in open bite correction. In cases who have severe curved occlusal plane, surgeons can combine the use of miniscrew and orthognathic surgery for achieving the better results.

References


