Caspian J of Dent Res

Case Report

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. Assisstant Professor, Department of Orthodontics, Dental Faculty, Mazandaran University of Medical Sciences, Sari-Iran.
3. Specialist of Orthodontics, Tehran-Iran.

✉**Corresponding Author:** Farhad Sobouti, Dental Faculty, Mazandaran University of Medical Sciences, Sari-Iran.

Email: farhad_sobouti@yahoo.com **Tel:** +989123226518

Received: 20 Dec 2013 Accepted: 3 Jun 2014

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

Citation for article: *Sodagar A, Sobouti F, Shahsavari N. Occlusal plane flattening by miniscrew in skeletal open bite: a case report. Caspian J Dent Res 2014; 3:54-9.*

[Downloaded from cjdr.ir on 2026-10-31]

[DOR: 20.1001.1.22519890.2014.3.2.3.5]

[DOI: 10.22088/cjdr.3.2.54]

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

احمد سوداگر، فرهاد ثبوتی*، نگین شهسواری

چکیده

مقدمه: تسطیح پلن اکلوزال با استفاده از مینی اسکرو در اپن بایت اسکلتال: گزارش مورد فاکتور هـای مختلفـی همچـون مشکلات تنفسی، ژنتیک، ا لگوی رشد صورتی و موقعیت و عملکرد نادرست زبان مرتبط با اپن بایت قدامی می باشد. اپـن بایت اسکلتی غالباً با ارتفاع افزایش یافته دنتوآلوئولار در خلف ماگزیلا و چرخش به سمت عقب مندیبل همراه است. جهت درمان ارتفاع افزایش یافته صورت رویکردهای درمانی مختلفی معرفی شده است. استفاده از انکوریج مطلق بـا اسـتفاده از مینی اسکروها یک روش درمانی کارآمد جهت اینتروژن سگمنت های دندانی خلفی می باشد. در این مطالعه، درمان بیمـار دچار اپن بایت اسکلتی شدید و ایمبالانس های عضلانی صورتی ارائه می گردد. مینی اسکروها جهت تسطیح دندان هـای قوس فک بالا با اینتروژن پرمولرها استفاده گردید. سپس جراحی ارتوگانیک انجام گرفت.

واژگان کلیدی: اپن بایت، پلن اکلوزال، اینتروژن دندان

Introduction

Constriction 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.

[Downloaded from cjdr.ir on 2026-10-31]

[DOR: 20.1001.1.22519890.2014.3.2.3.5]

[DOI: 10.22088/cjdr.3.2.54]

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 3.1mm 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, table1)



Figure1. 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
7-Instruction to patient for correct tongue positioning during swallowing after orthodontic treartment.

Treatment progress

Initially both arches were bonded and aligned until 0.016 inch stainless steel wire was placed in both arches. Because of significant premolars extrusion we planned to intrusion of upper premolar initially for elimination of step between anterior and posterior segment.

Four mini screws (Jeil, made in korea, 1.4 mm diameter with 10 mm length) were inserted bilaterally in buccal and palatal area between first and second premolars.

A piece of 16×22 stainless steel wire was bonded to occlusal surfaces of premolars with composite resin and intrusive force was applied by chain elastic from miniscrews to teeth (figure 2). Elastic chain replacement was done every two weeks. Intrusive force that applied on premolars on each side was measured by force gauge (Ormco, California).

The measured intrusive force was 40 g. During period of intrusion panoramic radiography was taken to control intrusive force on premolar roots and check the position of miniscrews.

When the sufficient intrusion was gained in 5 month (2.2 mm left side, 2.4mm in right side) and upper occlusal plane was leveled, the stage record for model surgery prediction was prepared. The reference point for measuring intrusive movement was distance between rectangular wire on occlusal surface and buccal miniscrew in each side.

we used digital caliper for measuring the amount of intrusion according to references. Clinical changes in teeth position before surgery have been shown in figure 3.



Figure2. Bilateral insertion of miniscrews in buccal and palatal of premolars

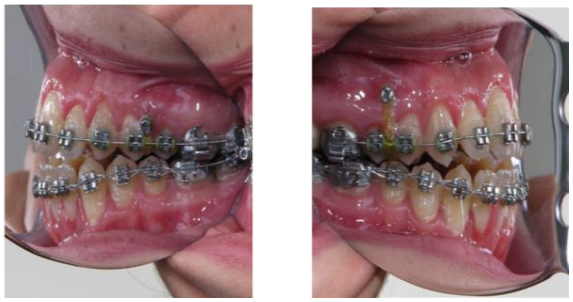


Figure3. Presurgical records

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

[Downloaded from cjdr.ir on 2026-10-31]
[DOR: 20.1001.1.22519890.2014.3.2.3.5]
[DOI: 10.22088/cjdr.3.2.54]

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)

Table1. Pretreatment and posttreatment cephalometric measurement

Measurement	Pre-treatment	Post-treatment
Occlusal plan-FH	28	17
SNB	64	69
ANB	8	5
FMA	51	39
Pog-Nprep	-23	-7



Figure 4. Posttreatment records

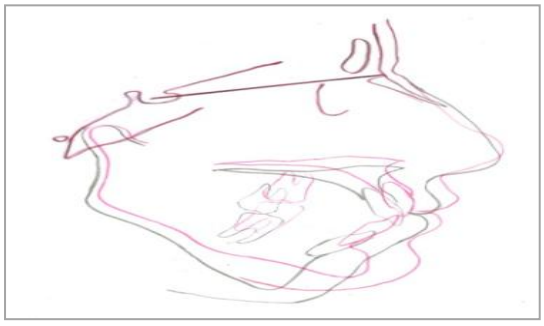


Figure 5. Cephalometric superimposition. Red line: post treatment tracing. Black line: pretreatment tracing

Discussion

Previous reports have demonstrated that anterior open bite occured by maxillary overgrowth and mandibular clockwise rotation. In other word extruded 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

[Downloaded from cjdr.ir on 2026-10-31]
[DOR: 20.1001.1.22519890.2014.3.2.3.5]
[DOI: 10.22088/cjdr.3.2.54]

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

1. Schudy FF. The rotation of the mandible resulting from growth: Its implication in orthodontic treatment. Angle Orthod 1965; 35:36-50.
2. Buschang PH, Sankey W. Early treatment of hyperdivergent open-bite malocclusions. Semin Orthod 2008; 8:130-40.
3. Kim YH. Anterior open bite and it's treatment with multiloop edgewise archwire. Angle Orthod 1987; 57:290-321.
4. Sugawara J, Daimaruya T, Umemori M, Negasaka H, Takahashi I, Kawamura H, et al. Distal movement of mandibular molars in adults patients with skeletal anchorage system. Am J Orthod Dentofacial Orthop 2004; 125:130-8.
5. Umemori M, Sugawara J, Mitani H, Naqasaka H, kawamura H.Skeletal anchorage system for open-bite correction. Am J Orthod Dentofacial Orthop1999; 115:166-74.
6. Erverdi N, Keles A, Nanda R. The use of skeletal anchorage in open-bite treatment: a cephalometric evaluation. Angle Orthod 2004; 74:381-90.
7. Xun C, Zeng X, Wang X. Miniscrew anchorage in skeletal anterior open-bite treatment. Angle Orthod 2007; 77:47-56.
8. Ma J, Wang L, Zhang W, Chen W, Zhao C, Smales RJ. Comparative evaluation of micro-implant and headgear anchorage used with a pre-adjusted appliance system. Eur J Orthod 2008; 30:283-7.
9. Hoppenrejis TJ, Frihofer HP, Stoelinga PJ, Tuinzing DB, Vanthof MA, Vanderlinden FP, et al. Skeletal and dento-alveolar stability of Le Fort I intrusion osteotomies and bimaxillary osteotomies in anterior open bite deformities. A retrospective three-centre study. Int J Oral Maxillofac Surg 1997; 26:161-75.
10. Swinnen K, Politis C, Willems G, De Bruyne I, Fieuws S, Heidbuchel K, et al. Skeletal and dento-alveolar stability after surgical-orthodontic treatment of anterior open bite: a retrospective study. Eur J Orthod 2001; 23:547-57.
11. Sherwood KH, Burch JG, Thompson WJ. Closing anterior open bites by intruding molars with titanium miniplate anchorage. Am J Orthod Dentofacial Orthop 2002; 122: 593-600.
12. Costa A, Raffainl M, Melsen B. Miniscrews as orthodontic anchorage: a preliminary report. Int J Adult Orthodon Orthognath Surg 1998; 13:201-9.
13. Kanomi R. Mini-implant for orthodontic anchorage. J Clin Orthod 1997; 31:763-7.
14. Paik CH, Woo YJ, Boyd RL. Treatment of an adult patient with vertical maxillary excess using miniscrew fixation. J Clin Orthod 2003; 37:423-8.
15. Reitan K,Rygh P. Biomechanical principles and reactions. In: Graber TM, Vanarsdall RL, editors. Orthodontics-current principles and techniques. 2nd ed. St Louis, Mo:Mosby; 1994.p.168-9.

[Downloaded from cjdr.ir on 2026-10-31]

[DOR: 20.1001.1.22519890.2014.3.2.3.5]
[DOI: 10.22088/cjdr.3.2.54]

16. Endo T, Kojima K, Kobayashi Y, Shimooka S. Cephalometric evaluation of anterior open-bite nonexxtraction treatment, using multiloop edgewise archwire therapy. Odontology 2006; 94:51-8.
17. Marcotte MR. Biomechanics in orthodontics. St.Louis,CV: Mosby; 1990.p.77-91.
18. Proffit WR, White RP, Sarver DM. Contemporary treatment of dentofacial deformity.3rd ed. St Louis,Mo: Mosby; 2003.p.463-506.
19. Kravitz ND, Kustono B. Posterior impaction with orthodontic miniscrew for open bite closure and improvement of facial profile. World J Orthod 2007; 8:157-66.
20. Hoffman GR, Moloney F. The stability of facial osteotomies in chin advancement. Aust Dent J 1995; 40:289-95.

[Downloaded from cjdr.ir on 2026-10-31]

[DOR: 20.1001.1.22519890.2014.3.2.3.5]
[DOI: 10.22088/cjdr.3.2.54]