

CASE REPORT



Anterior Open Bite Treated by Maxillary Posterior Teeth Intrusion Using Zygomatic Miniplates: A Case Report

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ABSTRACT

Aim: This case report aims to demonstrate the successful utilization of zygomatic miniplates in the treatment of an adult patient with anterior open bite (AOB).

Background: During treatment of anterior open bite, incisor extrusion may compromise facial esthetics in cases with long facial height and/or sufficient incisor exposure at rest and smile. The intrusion of posterior teeth has the advantage of correcting vertical dimension and maintaining proper incisors show.

Case description: The patient, a 22-year-old boy, had an anterior open bite of 4.5 mm with increased lower facial height, bilateral posterior crossbite, and two different occlusal planes in the upper arch. Titanium miniplates were used to intrude maxillary posterior teeth with a trans-palatal arch appliance to limit buccal tipping. The intrusive force was then applied through elastomeric chains placed bilaterally in the maxillary arch between the miniplate and posterior teeth. The anterior open bite was corrected within 7 months of intrusion with decreased lower facial height and significant improvement in anteroposterior jaw relationship.

Conclusion: This report emphasizes the significant role of facial appearance and smile.

Clinical significance: Most of the non-surgical approaches are not suitable for open bite correction in cases with long facial height and/or sufficient incisor exposure at rest and smile because of their extrusive mechanics which compromise the facial and smile esthetics. The intrusion of posterior teeth using miniplates allowing a counterclockwise rotation of the mandible to correct anterior open bite without compromising facial esthetic and smile.

Keywords: Miniplate, Open bite, Temporary anchorage device.

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INTRODUCTION

An anterior open bite is defined as the lack of overlap and incisal contact between anterior teeth in centric relation.¹ The etiology of an anterior open bite is complex and multifactorial. Several etiological factors have been associated with the anterior open bite, including digits sucking habit, lip habits, anterior posture of the tongue at rest, large tongue, nasal obstruction, mouth breathing, hypertrophic tonsils and adenoids, neurological disturbances, muscular dystrophy, temporomandibular joint internal disorder, and skeletal growth abnormalities.^{2,3}

The anterior open bite is one of the most challenging cases to treat in adult patients.⁴ Several surgical and non-surgical treatment approaches have been used to manage these cases. Surgical treatment approach involves maxillary impaction allowing forward and upward rotation of the mandible which decrease the lower anterior facial height and correct anterior open bite. Although maxillary impaction is one of the most stable orthognathic surgery, the cost and risks of this treatment approach is the major disadvantage.² Nonsurgical treatment approaches of anterior open bite usually aimed to intrude posterior teeth or/and extrude incisors.² Incisor show at rest and smile are important features to consider during treatment of anterior open bite. Incisor extrusion may compromise facial esthetics in cases with long facial height and/or sufficient incisor exposure at rest and smile. On the other hand, intrusion of posterior teeth allowing a counterclockwise rotation of the mandible to correct anterior open bite without compromising facial esthetic

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and smile.⁵ However, the best treatment approach is mainly determined by proper diagnosis and is related to the morphological pattern and characteristics of anterior open bite.

The current article presents a case report of an adult patient with anterior open bite treated by the intrusion of posterior maxillary teeth using zygomatic miniplates.

CASE REPORT

Diagnosis and Etiology

A 22-year-old Saudi male presented with a chief complaint of: "open bite." He had a convex profile with a symmetrical face, increased lower facial height, retruded upper lip, competent lip, no incisors display at rest, the full crown of an incisal display a smile, 1 mm gingival display at smiling, and non-consonant smile arc (Fig. 1). The intra-oral examination revealed permanent dentition stage with left class II molar relationship, right and left class II canine relationship, an open bite of 4.5 mm at the central incisors extending laterally to the canines on both sides, bilateral posterior crossbite, two different occlusal planes in upper arch, proclined and protruded upper incisors, protruded lower incisors, -0.5 mm of crowding in the upper dentition, +5.5 mm of spacing in the lower dentition, and deviated lower midline to the left in relation to upper midline (Fig. 1). The cause of the anterior open bite was suggested to have been an extrusion of maxillary posterior teeth.



Fig. 1: Pretreatment clinical photographs and panoramic radiograph

Treatment Objectives

The primary objectives of the treatment were to:

- Correct anterior open bite with adequate overjet and overbite,
- Achieve class I molar and canine relationship,
- Correct posterior crossbite,
- Close spaces, and
- Correct lower midline deviation.

Treatment Plan

Two treatment options were presented to the patient including orthognathic surgery with maxillary posterior impaction or nonsurgical orthodontic treatment combined with the intrusion of maxillary posterior teeth using zygomatic miniplates. After reviewing the risk and benefits of each treatment approach, the treatment of choice was nonsurgical orthodontic treatment utilizing zygomatic miniplates to intrude maxillary posterior teeth and correct anterior open bite.

Treatment Progress

The upper and lower third molars were extracted before starting orthodontic treatment. Preadjusted edgewise fixed orthodontic appliances (0.022" slot-roth prescription) were bonded in both arches. To control undesired extrusion of maxillary anterior teeth, the maxillary archwire was divided into three segments during leveling and alignment phase and intrusion of maxillary posterior teeth. These three segments were one anterior (incisors and canines) and two posteriors (premolars and molars). Initial alignment and leveling were achieved with maxillary and mandibular 0.016 "nickel titanium archwires. This was followed by 0.016" × 0.022" stainless steel and 0.019" × 0.025" stainless steel. The space in the mandibular arch was closed with a short elastomeric chain.

Titanium miniplates (Dentsply-Sankin, Japan) were inserted in the right and left zygomatic process of the maxilla under local anesthesia combined with intravenous sedation. They were adjusted to fit the contour of each zygomatic process and stabilized by two screws. The miniplate arm extended in the oral cavity with a hole at the tip to ligate elastomeric chains for the intrusion. After 4 weeks of miniplate placement, the intrusion treatment was initiated. Elastomeric chains were placed bilaterally in the maxillary arch between the miniplate and maxillary posterior teeth. During the intrusion phase, the main archwire in the maxillary arch was a 0.019" × 0.025" stainless-steel divided into three segments. A transpalatal arch appliance, located 5 mm from the palatal tissues, was cemented to limit buccal tipping that resulted from the intrusion force. The intrusion of the maxillary posterior teeth

was accomplished, and the anterior open bite was corrected within 7 months. After removal of the fixed orthodontic appliance, essix retainer and fixed lingual canine-to-canine retainer were placed in upper and lower arches, respectively.

Treatment results

The anterior open bite was corrected successfully with normal overjet and overbite. Angle class I molar relationship was achieved. Canine relationship was class I on right and 1/4-unit class II on left side (Fig. 2). The treatment resulted in pleasing smile, straight facial profile, improved chin position, improved facial proportions, and minimized lip strain. The cephalometric analysis indicated clockwise rotation of the mandible with decreased lower facial height, decreased the angles of mandibular plane to SN plane and palatal plane,

and significant improvement in anteroposterior jaw relationship (ANB).

Two years posttreatment evaluation of the patient (Figs 3 and 4) revealed good stability with retention of pleasing facial profile and proportions. Super imposition of the pre- and post-treatment cephalometric tracings was not performed because the two cephalograms were not taken on the same machine.

DISCUSSION

It has been documented in the literature that miniscrews and miniplates were successful in treating anterior open bite by intruding the mandibular or maxillary molars.⁶⁻¹³ The advantages of miniscrews compared to miniplates include lower cost, relatively simple and easy insertion, less invasive surgical procedure, and more oral implanting



Fig. 2: Posttreatment clinical photographs and panoramic radiograph

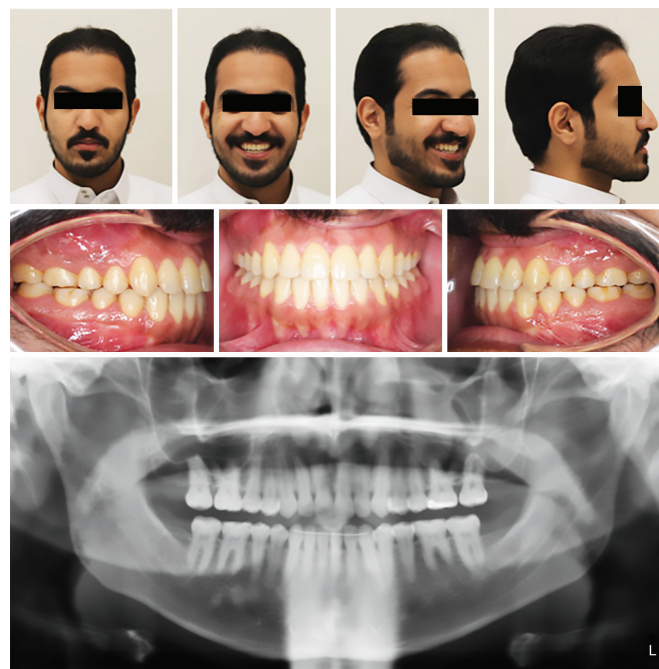
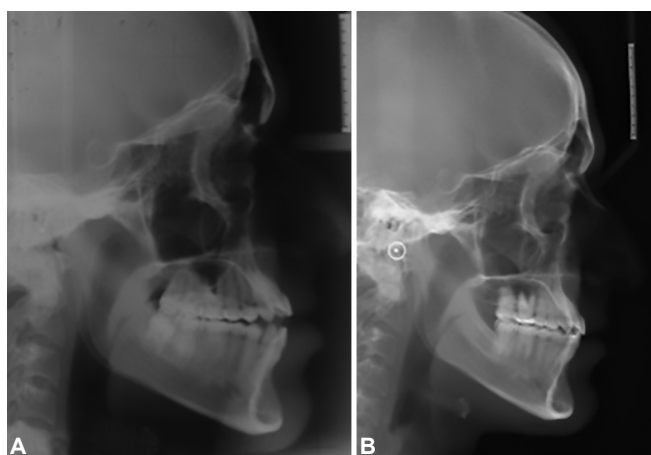


Fig. 3: Two years posttreatment clinical photographs and panoramic radiograph



Figs 4A and B: (A) Pretreatment cephalograph; (B) 2 years Posttreatment cephalograph

sites.⁷ However, miniplates showed greater stability and significantly lower failure rate when compared to miniscrews.¹⁴⁻¹⁶ In this case, the miniplate showed great stability and retention during treatment, which had the advantage of shortening treatment duration.

Extrusion of maxillary posterior teeth is a frequent cause of anterior open bite cases seen in orthodontic clinics. These cases usually associated with increased lower facial height, steep mandibular plane, obtuse gonial angle, lip incompetency and strain, and two different occlusal planes in the arch.⁵ In the adult, a severe anterior open bite can be treated successfully by orthognathic surgery. However, increased risk and cost of this treatment approach encourage the patients and orthodontist to attempt alternative approaches. Several non-surgical treatment modalities have been used to manage these cases such as extraction therapy, multiloop edgewise archwires, high-pull headgear, and intermaxillary elastics.⁶ However, these non-surgical approaches not suitable for open bite correction in cases with long facial height and/or sufficient incisor exposure at rest and smile because of their extrusive mechanics which compromise the facial and smile esthetics.⁷ On the other hand, intrusion of posterior teeth using miniscrews or miniplates has the advantage of correcting vertical dimension and maintaining proper incisors show.⁵ In the current case, the patient had a full crown of incisal display and 1 mm gingival display at smiling. Therefore, the main archwire in the maxillary arch was a divided into three segments during leveling and intrusion phases to avoid unwanted incisors extrusion that would result in a continuous archwire. For a pure intrusion of maxillary posterior teeth, a transpalatal arch appliance was cemented to limit buccal tipping that resulted from the intrusion force. The intrusion of posterior teeth and avoidance of incisors extrusion resulted in a pleasing smile, straight facial profile, improved chin position, improved facial proportions, and minimized lip strain. The cephalometric analysis indicated clockwise rotation of the mandible with decreased lower facial height, decreased the angles of the mandibular plane to SN plane and palatal plane, and significant improvement in anteroposterior jaw relationship (ANB).

In the current case, 2-years post-treatment evaluation revealed good stability with retention of pleasing facial profile and proportions. Limited long-term data were found in the literature regarding the stability of anterior open bite correction in adults treated with maxillary posterior segment intrusion using zygomatic miniplates. Recently, Marzouk and Kassem^{5,17} evaluated 26 anterior open-bite patients, who had maxillary posterior segment intrusion with zygomatic miniplates. They found that the intruded maxillary molars relapsed by 10.2% in the first

year and by 13.37% after 4 years of treatment. Overbite relapse amounts were 8.19% and 11.18% at 1 year and 4 years posttreatment, respectively. In addition, soft tissue changes appeared to be stable 4 years after treatment. Baek et al.¹⁸ reported that most relapse occurred during the first year of retention. Thus, it is reasonable to conclude that the application of an appropriate retention method during this period clearly enhances the long-term stability of the treatment.

CONCLUSION

Utilizing zygomatic miniplates to intrude posterior teeth was effective in treating the anterior open bite. In addition, they provide correction of vertical dimension and maintaining proper incisors show in cases with long facial height and/or sufficient incisor exposure at rest and smile. This case report emphasizes on the benefit of zygomatic miniplates as a safe, quick, and less expensive treatment tool for correcting anterior open bite.

REFERENCES

1. Alderico Artese, Stephanie Drummond, Juliana Mendes do Nascimento and Flavia Artese. Criteria for diagnosing and treating anterior open bite with stability. *Dental Press J Orthod.* 2011;16(3):136-161.
2. Peter Ngan and Henry W. Fields. Open bite: a review of etiology and management. *American Academy of Pediatric Dentistry.* 1997;19(2):91-98.
3. García Argumedo A, Castro Prado PS, and Grageda Núñez E. Open bite correction through molar intrusion with mini-implants. *Revista Mexicana de Ortodoncia.* 2014;2(4):e251-e260.
4. Vela-Hernández A., Lopez-Garcia R, Garcia-Sanz V, Paredes-Gallardo V, Lasagabaster-Latorre F. Nonsurgical treatment of skeletal anterior open bite in adult patients: Posterior build-ups. *The Angle Orthodontist.* 2017; 87(1): 33-40.
5. Marzouk, E. S. and H. E. Kassem. Evaluation of long-term stability of skeletal anterior open bite correction in adults treated with maxillary posterior segment intrusion using zygomatic miniplates. *American Journal of Orthodontics and Dentofacial Orthopedics.* 2016;150(1):78-88.
6. Gurton AU, Akin E and Karacay S. Initial intrusion of the molars in the treatment of anterior open bite malocclusions in growing patients. *Angle Orthod.* 2004;74:454-464.
7. Kuroda S, Katayama A and Takano-Yamamoto T. Severe anterior open-bite case treated using titanium screw anchorage. *Angle Orthod.* 2004; 74: 558-567.
8. Sepideh Dadgar, Farhad Sobouti, Mehran Armin and Nasim Esnaashari. Correction of Skeletal Openbite Using Zygomatic Miniplates. *British Journal of Medicine and Medical Research.* 2017;19:1-10.
9. Erverdi N and Acar A. Zygomatic anchorage for en masse retraction in the treatment of severe Class II division 1. *Angle Orthod.* 2005;75:483-490.
10. Kadir Beycan and Nejat Erverdi. Anterior Open Bite Treatment by Means of Zygomatic Miniplates. *J Istanbul Univ Fac Dent* 2017; 51: 52-56.

11. Park YC, Lee HA, Choi NC and Kim DH. Open bite correction by intrusion of posterior teeth with miniscrews. *Angle Orthod.* 2008; 78: 699-710.
12. Xun C, Zeng X and Wang X. Microscrew anchorage in skeletal anterior open-bite treatment. *Angle Orthod.* 2007;77: 47-56.
13. Chen YJ, Chang HH, Huang CY, Hung HC, Lai EH and Yao CC. A retrospective analysis of the failure rate of three different orthodontic skeletal anchorage systems. *Clinical oral implants research.* 2007; 18: 768-775.
14. Miyawaki S, Tomonari H, Yagi T, Kuninori T, Oga Y and Kikuchi M. Development of a novel spike-like auxiliary skeletal anchorage device to enhance miniscrew stability. *Am J Orthod Dentofacial Orthop.* 2015; 148: 338-344.
15. Yao CC, Chang HH, Chang JZ, Lai HH, Lu SC and Chen YJ. Revisiting the stability of mini-implants used for orthodontic anchorage. *J Formos Med Assoc.* 2015;114:1122-1128.
16. De Clerck EE and Swennen GR. Success rate of miniplate anchorage for bone anchored maxillary protraction. *Angle Orthod.* 2011;81:1010-1013.
17. Marzouk, ES. and Kassem HE. Long-term stability of soft tissue changes in anterior open bite adults treated with zygomatic miniplate-anchored maxillary posterior intrusion. *The Angle Orthodontist.* 2018;88(2):163-170.
18. Baek MS, Choi YJ, Yu HS, Lee KJ, Kwak J, Park YC. Long-term stability of anterior open-bite treatment by intrusion of maxillary posterior teeth. *American Journal of Orthodontics and Dentofacial Orthopedics.* 2010;138(4):396-399.