IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 24, Issue 2 Ser. 6 (February. 2025), PP 32-37
www.iosrjournals.org

Buccal Segment Intrusion: A Conservative Approach For Anterior Open Bite Correction – A Case Report

Dr. Aruna Dokku, Dr. Revathi Peddu, Dr. Ashok Kumar Talapaneni, Dr. Devikanth Lanka

Reader, Dept. Of Orthodontics & Dentofacial Orthopedics Sibar Institute Of Dental Sciences, Takkellapadu, Guntur
Professor, Dept. Of Orthodontics & Dentofacial Orthopedics Sibar Institute Of Dental Sciences, Takkellapadu, Guntur

Abstract:
Background: *Open bite correction is one of the most challenging orthodontic procedures due to its multifactorial etiology and the limitations of conventional treatment methods. The introduction of temporary anchorage devices (TADs) has significantly improved the management of these cases by offering more precise and minimally invasive approaches. This case report highlights the innovative use of bucco-palatal implant anchorage for the successful correction of an open bite through anterior intrusion.*
Methodology: *A 23-year-old female presented with a chief complaint of an anterior open bite and difficulty in chewing. Clinical examination revealed a significant anterior open bite of approximately 4 mm, with supra-erupted maxillary posterior buccal segments. The patient also exhibited a hyperdivergent skeletal pattern and increased lower facial height. The treatment approach aimed at correcting the anterior open bite by intruding the posterior buccal segments and normalizing the vertical dimension. Posterior buccal segments were intruded by placement of zygomatic plates bucally and implants palatally and the force of 150 gms on both sides was applied through coil springs bucally and elastic chains palatally.*
Results: *The open bite was successfully corrected with significant posterior intrusion, improving anterior occlusion and facial aesthetics. Post-treatment cephalometric superimpositions confirmed there is a reduction in overbite by 5 mm, and SN-Go-Gn from 34 to 29 degrees and a decrease in ANS- Me from 66mm to 60 mm. the intrusion treatment.*
Conclusion: *Buccal zygomatic plate anchorage, in conjunction with palatal implants, offers a predictable and effective solution for open bite correction. This case demonstrates its potential for achieving stable, functional, and aesthetically pleasing results.*
Keywords: *Open bite correction, zygomatic plate, bucco-palatal implant, skeletal anchorage, orthodontic biomechanics.*

Date of Submission: 21-02-2025 Date of Acceptance: 01-03-2025

I. Introduction

Anterior skeletal open bite (AOB) is a challenging malocclusion, characterized by excessive vertical growth in the posterior dentoalveolar regions of both the maxilla and mandible. This leads to an increased anterior facial height and a steep mandibular plane angle. Various treatment approaches aim to achieve intrusion of the posterior teeth, but they often come with limitations such as minimal intrusion, relapse, and side effects caused by insufficient anchorage support.

One effective solution has been surgical maxillary impaction, which allows for mandibular autorotation, significantly reducing the lower anterior facial height and resolving the AOB. However, orthognathic surgery poses certain drawbacks, including its complexity, potential risks, and high costs.

The introduction of mini-implants has expanded the scope of orthodontic treatment by enabling control in three dimensions (3D). Research indicates that implant-assisted intrusion of posterior teeth can effectively reduce the lower facial height and correct AOB without the drawbacks associated with surgical procedures [1-3].

II. Case Report

Diagnosis

The 25-year-old female patient's chief complaint was lack of teeth overlap in the front region. She had a symmetric face with convex profile, incompetent lips, 3mm incisors display at rest, the full crown of an incisal display along with 2mm of gingiva at smile and nonconsonant smile arch. The intraoral examination

showed that she had good oral hygiene, and the periodontal tissues were healthy with full complement of permanent dentition from incisors to third molars. Buccal segments were in Class I relationship and canines were in end on relation. She had anterior open bite (overbite -4 mm), overjet of 0mm. The upper and lower dental midlines were coincident with the facial midline (Figure 1). According to the pretreatment lateral cephalometric analysis she had Class II skeletal relationship, increased lower facial height, and proclined upper and lower incisors (Figure 2; Table 1).

Figure 1: Pretreatment Extraoral and Intraoral photographs

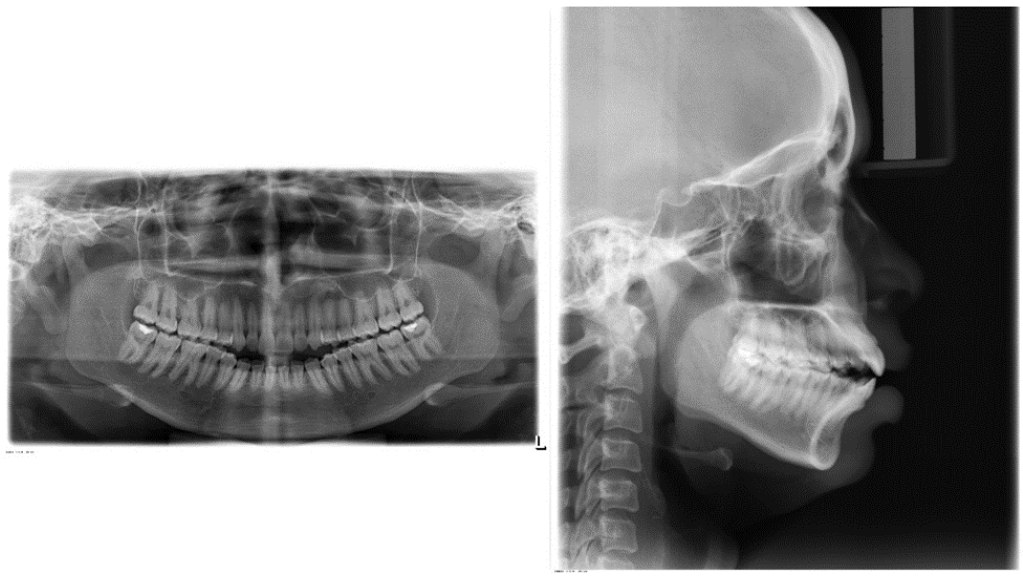

Figure 2: Pretreatment Radiographs

Treatment objectives

The primary objectives of the treatment were to:

• Correct anterior open bite with adequate overjet and overbite,
• Maintain class I molar and canine relationship,
• Improve facial esthetics

Treatment Plan

Different treatment options were presented to the patient including Bijaw orthognathic surgery, all first premolars extraction and implant aided intrusion and retraction and nonsurgical orthodontic treatment combined with the intrusion of maxillary posterior teeth using zygomatic miniplates. After reviewing the risk and benefits of each treatment approach, patient and her parents chose 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-MBT prescription) were bonded in both the arches. To control undesired extrusion of maxillary anterior teeth, segmental arch approach is followed. The maxillary archwire was divided into three segments, one anterior (incisors and canines) and two posteriors (premolars and molars) during leveling and alignment phase and intrusion of maxillary posterior teeth. These three segments were. Initial alignment and leveling were achieved with maxillary and mandibular 0.016, 0.016" × 0.022 and 0.019" x 0.025 "nickel titanium archwires. This was followed 0.019" × 0.025" stainless steel. Before intrusion the posterior teeth were connected by full-dimension segmental archwires from the buccal side and soldered in palatal side. A transpalatal arch is connected between molars at 4 mm from palatal to create sufficient space for intrusion (Figure 3).

Figure 3: Soldered TPA

A pure titanium Y-shaped multipurpose mini-plate was bent to fit the contour of the lower surface of each zygomatic buttress and it was fixed with bone screws 7mm in length.The last hole of the mini-plate was exposed to the oral cavity. The exposed hole was split distally to serve as a hook to receive the intrusive force. A mini implant of 2.0x10mm was placed palatally between premolar and molar to receive intrusion force from palatal side.

Two NiTi coil springs were placed at the exposed hook of the mini-plate; one is attached archwire mesial to second molar and the other one between premolars. A power chain is used from soldered palatal hooks to mini implant (Figure 4). An intrusive force of 300g on four maxillary posterior teeth per quadrant; 150g from buccal and 150g from palatal implants was used based on the recommendations of Cifter et al (2011)[4].

Figure 4: Intrusion force from Buccal and Palatal sides

The patient was recalled for every four weeks interval. The intrusion force was stopped when anterior over bite reached 2mm. after the step I the anterior ad posterior segments corrected, continuous wires were used for alignment and leveling and finishing. The molar intrusion was retained all through these stages with vertical wire ligation between the tube of the first molar bands and the miniplates.

III. Results:

The active treatment time for intrusion is 7 months and overall treatment time was 18 months. At the end of treatment, the profile, vertical and sagittal relationship were improved and the anterior open bite was corrected. Class I molar and canine relationship with normal overbite and overjet were achieved (Figure 5). The posttreatment lateral cephalometric analysis and superimpositions showed skeletal changes which include change in mandibular plane angle in counter clockwise rotation, decrease in the lower facial height and molar intrusion of 3mm. (Figure 6; Table 1)

Figure 5: Posttreatment Extraoral and Intraoral photographs

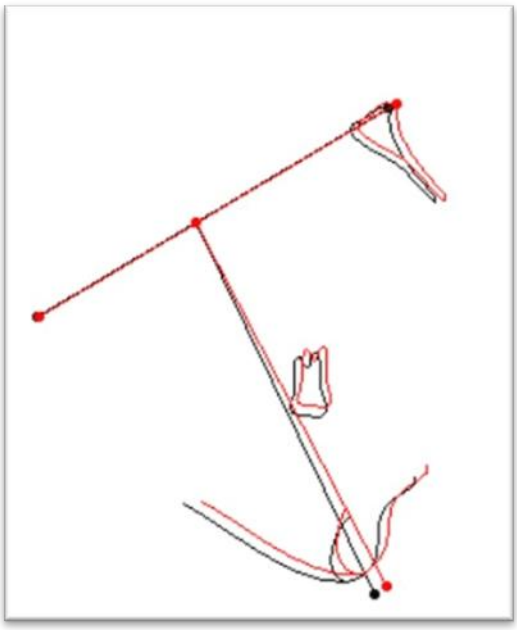

Figure 6: Superimposition of skeletal structures

IV. Discussion

Among the common malocclusions, open bite cases—particularly in adults—pose a major challenge for orthodontists to treat. Skeletal anchorage is an ever-evolving clinical approach that significantly enhances the management of complex malocclusions. In the present case, treatment of the upper arch followed a segmented approach, in order to avoid the extrusion of incisors which will worsen the gummy smile in this patient.

Skeletal anchorage has introduced new possibilities for treating dentofacial anomalies. Some researchers have suggested the use of miniplates as effective units for providing absolute anchorage in the intrusion of overerupted teeth[5,6]. Compared to conventional intrusion mechanics, skeletal anchorage techniques for posterior tooth intrusion offer significant advantages. These include a minimally invasive technique for achieving the desired outcome with minimal side effects and eliminating the need for patient compliance.

When unilateral intrusive forces are applied to a tooth or tooth segment, it is essential to maintain balance; otherwise, the tooth or segment may tilt toward the direction of the applied force. To counteract this effect, balancing momentum with a transpalatal arch (TPA) is commonly used to prevent buccal tipping of the posterior segment. Studies have shown that despite constructing TPA with rigid wire and positioning it 2 to 3mm away from palatal mucosa, the TPA alone was found to be insufficient in preventing buccal tipping of the molars during intrusion. So, we have placed a palatal implant for balancing the intrusion forces and to prevent buccal flaring of molars[7].

Literature presents varying recommendations regarding the optimal intrusive force for molars. Kalra et al. (1989) suggested 90g per tooth for molar intrusion in growing individuals, while Melson et al. (1996) recommended 50g of force applied buccopalatally for maxillary molar intrusion in adult patients[8,9]. Çifter et al. (2011) analyzed three different FEM model combinations for maxillary posterior intrusion and concluded that using four implants per quadrant with 300g of intrusive force would achieve true intrusion[4]. However, the clinical application of this model poses challenges within the oral environment.

In the present case, the skeletal anchorage system included a zygomatic plate positioned in the buccal and an implant in palatal sides, along with a transpalatal arch (TPA) soldered to the maxillary first molars. An intrusive force of 300g was applied to the four maxillary posterior teeth per quadrant, with 150g exerted from the buccal implants and 150g from the palatal implants, following the recommendations of Cifter et al. (2011) [4].

Yao et al. observed 3-4 mm intrusion in first molars and 1-2 mm in second molars using miniscrews over 7.5 months[10]. Akan et al. reported a 3.4 mm vertical reduction in maxillary first molars in 7 months[11]. Erverdi et al. achieved 2.6 mm molar intrusion, 1.1 mm incisor extrusion, and occlusal plane rotation using zygomatic anchorage in anterior open bite cases[6]. In our case, an intrusion of 3mm resulted in closure of 4mm anterior open bite along with 2mm overbite achieved in a span of 7 months.

As the posterior teeth were intruded, simultaneous skeletal, dental and soft tissue changes occurred. Cephalometric values showed change in ANB angle from 6º to 4º from pretreatment to post treatment which is due to counterclockwise rotation of the mandible which in turn induced forward and upward displacement of B-point and pogonion, decrease in the mandibular plane angle and anterior facial height; and a significant improvement in the facial soft tissue convexity along with improved facial proportions and reduction in lip strain was observed.

The use of Zygomatic anchorage along with mini screws proved to be effective in achieving controlled intrusion of posterior segment with minimal patient compliance. However additional stabilizing methods like rigid Transpalatal arch is necessary to prevent side effects.

V. Conclusion

Accurate diagnosis and appropriate case selection are crucial for the success of skeletal anchorage in posterior segment intrusion. Over all skeletal anchorage offers a reliable approach to addressing the vertical discrepancies and enhancing the treatment outcomes.

S.NO	PARAMETER	PRE- TREATMENT	POST TREATMENT
1.	SNA	86º	86 º
2.	SNB	80º	82 º
3.	ANB	6º	4 º
4.	ANS- Me	66 mm	60 mm
5.	N- ANS	56 mm	56 mm
6.	SN-GoMe	34˚	29˚
7.	U1-PP	26 mm	26 mm
8.	U6-PP	24 mm	21 mm
9.	L1-MP	44	44
10.	L6-MP	30 mm	30 mm
11.	Overjet	0.5 mm	2mm

12.	Overbite	-3 mm	2 mm

Table 1: Pre and post treatment cephalometric values

References:

[1] Sherwood, K. H., Burch, J. G., & Thompson, W. J (2002). Closing Anterior Open Bites By Intruding Molars With Titanium Miniplate Anchorage. American Journal Of Orthodontics And Dentofacial Orthopedics, 122(6):593–600.

[2] Kuroda, Katayama, A. And Takano-Yamamoto, T (2004). Severe Anterior Open Bite Case Treated Using Titanium Screw Anchorage. The Angle Orthodontist 74(4): 558-567.

[3] Park Y-C, Lee H-A, Choi N-C, Et Al (2008) Open Bite Correction By Intrusion Of Posterior Teeth With Miniscrews. The Angle Orthodontist 78(4): 699–710

[4] Çifter M And Saraç M (2011) Maxillary Posterior Intrusion Mechanics With Mini-Implant Anchorage Evaluated With The Finite Element Method. American Journal Of Orthodontics And Dentofacial Orthopedics 140(5): E233–E241.

[5] Costa A, Raffainl M, Melsen B. Miniscrews As Orthodontic Anchorage: A Preliminary Report. Int J Adult Orthodon Orthognath Surg 1998;13:201-9.

[6] Erverdi N, Acar A. Zygomatic Anchorage For En Masse Retraction In The Treatment Of Severe Class II Division 1. Angle Orthod 2005;75(3):483-490.

[7] Erverdi N, Keles A, Nanda R. Orthodontic Anchorage And Skeletal Implants. In: Biomechanics And Esthetic Strategies In Clinical Orthodontics. Amsterdam, Netherlands: Elsevier; 2005. P. 278-94.

[8] Kalra V, Orth D, Burstone CJ, Et Al (1989) Effects Of A Fixed Magnetic Appliance On The Dentofacial Complex. American Journal Of Orthodontics And Dentofacial Orthopedics 95(6): 467–478.

[9] Melsen, B., & Fiorelli, G (1996) Upper Molar Intrusion. Journal Of Clinical Orthodontics 30(2): 91–96.

[10] Yao CC, Wu CB, Wu HY, Kok SH, Chang HF, Chen YJ. Intrusion Of The Overerupted Upper Left First And Second Molars By Mini-Implants With Partial-Fixed Orthodontic Appliances: A Case Report. Angle Orthod 2004;74(4):550-557.

[11] Akan S, Kocadereli I, Aktas A, Tasar F. Effects Of Maxillary Molar Intrusion With Zygomatic Anchorage On The Stomatognathic System In Anterior Open Bite Patients. Eur J Orthod 2013;35(1):93-102.