Content available at: https://www.ipinnovative.com/open-access-journals

Journal of Contemporary Orthodontics

Journal homepage: https://www.jco-ios.org/

Case Report

Correction of gummy smile using mini-implants in a growing patient: A case report

Deepti Gupta[1]*

[1]Private practice, United Arab Emirates.

Abstract

Gummy smile, characterized by excessive visibility of teeth and gingiva, often necessitates clinical intervention. In cases resulting from maxillary excess, orthognathic surgery is traditionally considered the optimal treatment. However, surgical procedures are inherently invasive and often associated with patient apprehension due to potential adverse effects. Recently, incisor intrusion facilitated by temporary anchorage devices (TADs) has gained traction, as it simplifies mechanics and mitigates the side effects of conventional methods. Despite their advantages, the application of TADs in adolescents remains relatively unexplored, primarily due to concerns about potential damage to developing tooth buds. Advances in modern imaging techniques now provide solutions to these challenges. This case report details the orthodontic management of a gummy smile accompanied by a deep bite in an adolescent female, utilizing TAD mini-implants to achieve favorable outcomes.

Keywords: Temporary anchorage device, Malocclusion, Deep bite

Received: 11-07-2024; **Accepted:** 23-08-2024; **Available Online**: 07-08-2025

1. Introduction

The aesthetics of an individual's smile significantly influence dentofacial attractiveness, and suboptimal facial aesthetics can adversely impact self-image and social well-being. This concern is particularly pronounced among adolescents and young adults, who often feel societal pressure to maintain a certain level of aesthetic appearance among their peers[1-2] Additionally, it is a widely recognized social observation that females tend to be more conscious about their aesthetic appearance compared to males.

Gummy smile (GS) has been defined as a no pathological condition causing esthetic disharmony in which more than 3 mm of gingival tissue is exposed when smiling. The possible causes are excessive vertical maxillary growth, short upper lip, or abnormal eruption of maxillary anterior teeth.[3] Addressing these etiological factors is crucial for improving smile aesthetics. The primary motivation for patients seeking orthodontic therapy is to enhance their dentofacial aesthetics, a concern that is particularly pressing for adolescent females who have high expectations for treatment outcomes. One specific cause of a gummy smile is maxillary vertical excess, which can be of skeletal or dentoalveolar origin, presenting as excessive visibility of the maxillary incisors and gingiva. Clinically, an excessive gingival display is generally considered to be more than 4 mm. Orthognathic surgery is often regarded as the optimal treatment for gummy smiles due to maxillary excess;[4] however, the invasive nature of surgical procedures and the associated fear of adverse effects can deter patients from opting for this solution.

The advent of skeletal anchorage systems has significantly expanded the scope of orthodontics, particularly through the use of temporary anchorage devices (TADs), which provide stable anchorage and leverage biomechanics to achieve desired outcomes. Mini-implants, a type of TAD, were first reported in 1983 for correcting deep overbite and they have since been utilized successfully in cases of deep overbite and gummy smile by intruding the incisors. Incisor intrusion assisted by TADs has gained popularity due to the

*Corresponding author: Deepti Gupta
Email: dr.deepti@gmail.com

https://doi.org/10.18231/j.jco.v.9.i.3.21

simplification of mechanics and the reduction of side effects associated with more conventional.[5] Nevertheless, the application of TADs in adolescents remains relatively unexplored due to concerns about potential damage to developing tooth buds—a challenge that can now be mitigated with modern imaging techniques.

This case report details the orthodontic management of a gummy smile with a deep bite in an adolescent female, achieved through the use of TAD mini-implants.

2. Case Report

2.1. Clinical observations

An 11-year-old girl reported with the chief complaint of an unaesthetic gummy smile. A retrusive mandible, gummy smile and a short upper lip were observed on extraoral examination.

On intraoral examination, the late mixed dentition stage was noted with all the canines unerupted. The maxillary central incisors were completely visible on smiling with an additional 6 mm of gingival exposure.(**Figure 1**) The pretreatment intraoral photographs and the study models demonstrated a Class I molar relationship, deep overbite, and a moderate-severe tooth size arch length discrepancy in the late mixed dentition(**Figure 2**) . The lack of space, which was more in the maxillary arch was discerned as the reason for the failure of canines to erupt as seen clinically & on the orthopantomogram (**Figure 3**).

Figure 1: Pre-treatment extra oral photos at rest, smiling & profile view.

Figure 2: Pre-treatment intraoral photos– Right, frontal, left & occlusal views

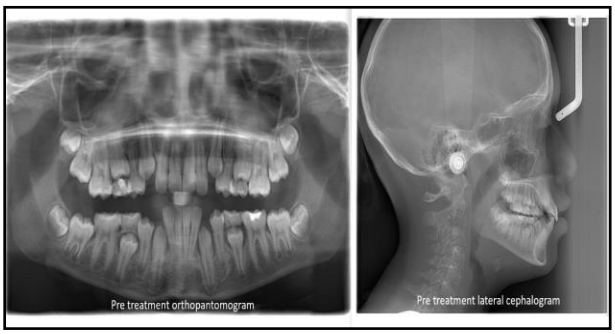

Figure 3: Pre-treatment Orthopantomogram & Lateral cephalogram

Figure 4: Pre intrusion assessment of gingival show & maxillary CANT.

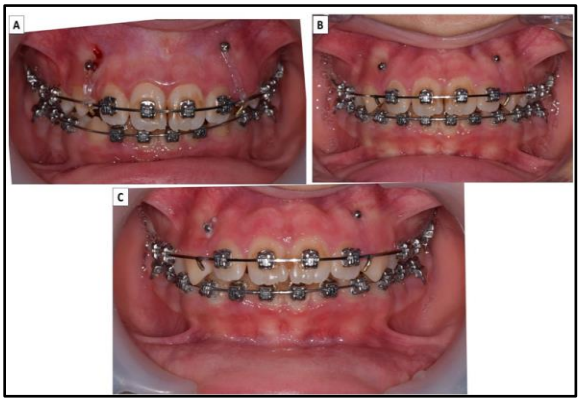

Figure 5: A) TAD placement **B)** 4 months post-intrusion, **C)** Post intrusion and cant correction

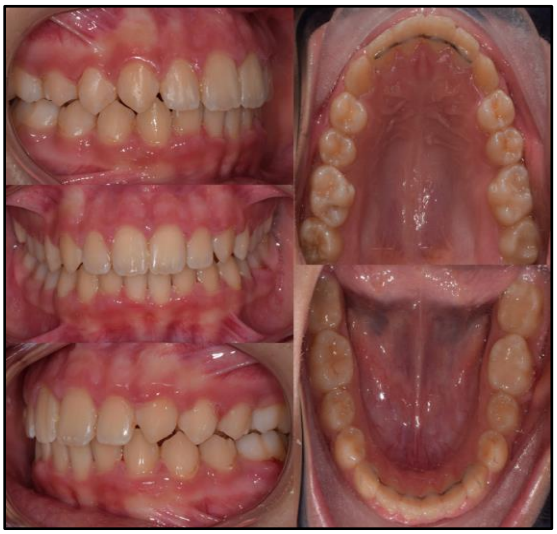

Figure 6: Post-treatment results – Intraoral photos at debond – Right, frontal, left & occlusal views

Figure 7: Post treatment extra oral photos at rest, smiling & profile view.

Figure 8: Comparative view of pre-treatment (left) and post-treatment smile (right)

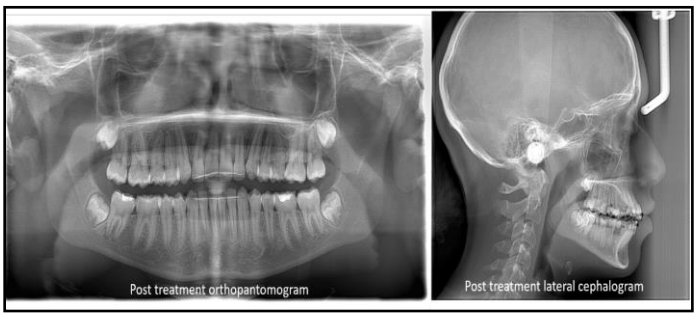

Figure 9: Post treatment Orthopantomogram & Lateral cephalogram

Figure 10: Post retention: Intraoral photos in retention – Right, frontal, left & occlusal views

Table 1: Comparative cephalometric analysis of skeletal, dental & soft tissue changes

Measurement	pre treatment	post treatment	Average
NA			
	80.62	80.32	82.0 + 4.0
SNB	79.32	80.42	80.0 + 4.0
ANB	1.42	-0.12	3.0+2.0
GoGn to S-N	29.12	26.92	32.02 + 4.0
bi _|_ toA point	-3.5	-0.4	0+1.0

UI			
to Palatal Plane	30.1	26.6	27.5+1.7
A6 to Palatal Plane	20.9	21.3	23+1.3
LI to Mandibular Plane	35.4	34.8	40.8 + 1.3
B6 to Mandibular Plane	25	27.4	32.1+1.9
UI - Palatal Plane Angle	108.02	111.22	112.52 + 5.3
Upper			
Lip Protrusion	2.4	0.8	0
Upper lip length (Sn - ULI)	17.2	17.6	21+0.9
Interlabial gap (ULI - LLS)	3.4	-0.2	0+1.0
Upper incisor exposure relaxed lip	6.6	3.1	4.7+1.6

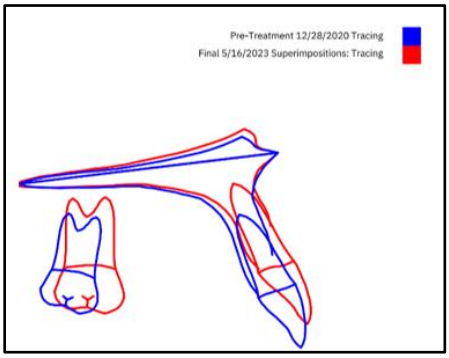

Figure 11: Superimposition on palatal plane: blue line – pretreatment; red line – post treatment The upper incisor was apparently intruded

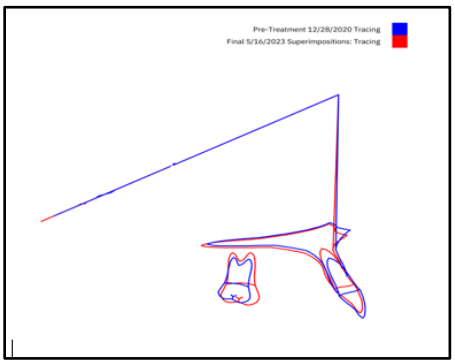

Figure 12: Superimposition on Sella Nasion plane: blue line – pre treatment; red line – post treatment showing upper incisor intrusion

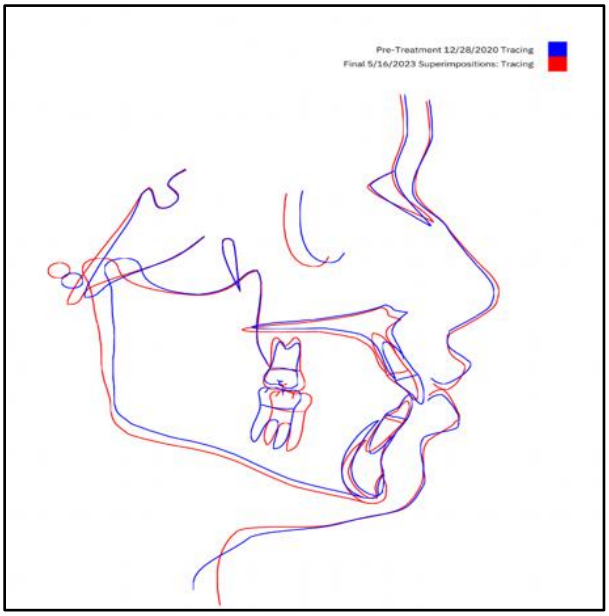

Figure 13: Overall Superimposition blue line – pre treatment; red line – post treatment showing upper incisor intrusion

2.2. Cephalometric analysis

A skeletal Class I relationship with bimaxillary retrusion (SNA=80.6° & SNB = 79.3°) was noted in the lateral cephalometric analysis. The Mandibular plane angle (GoGn-SN) of 29.1° was in the normal range. Maxillary incisor to SN was 111.7° & IMPA was 104.5° both of which are much larger than normal. Interincisal angle was 115.6° suggesting upper & lower incisor proclination.

On Burstone-Legan analysis, the Occlusal- Horizontal plane angle was found to be increased by 17.5° (avg-7.1 deg) indicating downward rotation of maxillary plane and increased anterior facial height leading to lip incompetence.

2.3. Treatment objectives

The patient was under observation for a year before prior to start of orthodontic treatment to watch mandibular growth and upper lip length growth along with lip lengthening exercises. Standard leveling and aligning mechanics were employed in the first six months of treatment to intrude maxillary incisors. No significant improvement was observed in the gummy smile and a maxillary cant was evident (Figure 4). Hence, two alternatives for intruding the maxillary central incisors were presented to the patient: (1) a maxillary 2x4 appliance and high-pull headgear with a transpalatal arch, or (2) intrusion mechanics with 2 mini-implants. The second plan was selected with the parents' consent.[6]

The treatment objectives were to create a more ideal overbite and overjet relationship, reduce the exposure of the maxillary gingiva and obtain Class I canine and molar relationship.

For the first stage, the goal of treatment was to align and establish torque on posterior teeth. Damon Q2 metal brackets

were bonded on upper and lower teeth to start alignment working upto upper 19x25 SS and lower 018 SS wires. Decreasing the overbite by maxillary incisor intrusion will allow the mandibular plane to be maintained. In contrast, opening of the mandibular plane angle by extrusion of the maxillary molars would make the mandible rotate backward and worsen the Class II skeletal pattern. During the second stage, the goal was to reduce the gingival display on smiling with TAD supported intrusion.

2.4. Mini implant placement procedure:

Topical anaesthesia was achieved by Benzocaine (20%) gel. Self-drilling mini implants (DENTOS SS 1312) of 6 mm length were placed bilaterally in the interradicular space between maxillary lateral incisors and canines. Due to lack of primary stability during initial implant placement between 1.2 and 1.3, the right TAD had to be replaced at a lower height. (**Figure 5**) Intrusive force of 90 grams was applied on each side using an elastomeric chain from a soldered hook on the upper 19x25 stainless steel wire anchored directly to the implant. Traction from the mini-screws was reactivated monthly. Intrusion forces from the mini-screws were applied for a total period of four months until the gummy smile was corrected. Patient did not report any discomfort during mini implant placement or during active intrusion phase.

The third stage was to maintain the intrusion achieved while working towards a functional occlusion. The occlusion was completed with a Class I canine and molar relationship along with ideal overjet and overbite with reduced gingival display on smiling. Post treatment intra oral, extra oral photographs & radiographs are depicted in figures.[6-9]

The appliances were removed after 23 months of active treatment. Fixed lingual retainers were bonded to the lingual surfaces of both arches and Hawleys retainers were used full time for 6 months followed by night time. She maintained excellent oral hygiene and no change in occlusion was observed in retention. (**Figure 10**)

3. Discussion

The present case report highlights the novel use of mini-implant supported intrusion technique for correcting gummy smile in a young patient without compliance issues of a headgear or the need for surgical intervention at later age. Such approaches in growing children are sparsely documented in the literature[7] and are predominantly applied in patients over 18 years of age. Implementing mini-implants for intrusion & gummy smile correction in this growing patient population allows for simplification of mechanics, the reduction of side effects associated with more conventional methods of early intervention without relying on patient compliance. The application of TADs in adolescents remains relatively unexplored due to concerns about potential damage to developing tooth buds, skeletal immaturity & ongoing dental development.

With modern imaging techniques, most of these risks can be mitigated. Treating adolescents with gummy smile can significantly enhance their self-perception and confidence during critical developmental stages. Early correction not only addresses functional concerns but also addresses aesthetic issues, potentially fostering positive psychosocial development.[1] Depending on the etiological factors, gummy smiles may be broadly classified as skeletal, muscular, or dental-related. The dental-related category includes dentoalveolar and dentogingival subcategories. The former occurs because of excessive eruption of maxillary anterior teeth in relation to the upper lip. The latter refers to those related to gingival hyperplasia or excess resulting in shorter clinical crowns.[8] Excessive vertical maxillary height is the most common skeletal cause of a gummy smile that warrants surgical intervention.[4] Hypotonicity of muscles of upper lips such as orbicularis oris leads to the shortening and incompetence of upper lips consequently contributing toward a gummy smile.[9] The present case was of dentoalveolar type wherein the incisors were over-erupted along with a deep bite. Since the patient was reluctant to opt for wearing headgear, TAD implant placement was considered for intruding the incisors.

3.1. Given the growth pattern of the patient, extrusion of molars was to be avoided.

The choice of location and number of TAD implants depends on factors such as upper incisor angulation and interradicular bone level.[10-11] There are two possible sites for mini-implant placement for upper incisor intrusion. When placed in the interradicular space between the two central incisors, it would have its location much anterior to the Centre of Resistance (CR) resulting in less intrusion but more labial tipping when the forces are applied. When the mini-screws are placed posteriorly between the roots of the lateral incisor and canines bilaterally, the distance to CR is relatively shorter. In this position, predominant effect achieved is intrusion with less of labial tipping.[12] The CR is set at 40% of the distance from the alveolar crest to the root apex. The CR is a more reliable point since it is not affected by incisor inclination unlike the incisal edge or root apex of the tooth.

Figure 9 depicts comparative cephalometric analysis of pre and post treatment lateral cephalograms.

Burstone & Legan cephalometric analysis reveals that the U1 to palatal plane linear(mm) reduced from 30.1mm to 26.6mm indicating intrusion of 3.5 mm while the U1 to palatal plane angle did not change significantly before (108 o) and after (111.2o) the treatment. This indicates that there was minimal flaring of the incisors while achieving the intrusion and thus, it can be inferred that true intrusion of the incisors was achieved. Furthermore, the analysis also revealed that there was only a slight extrusion of maxillary molars of 0.4 mm (A6 to palatal plane: pretreatment 20.9mm, post-treatment 21.3mm). Hence, the net effect was

an absolute intrusion of upper incisors with no extrusion of maxillary molars leading to improvement of gummy smile.

The TAD implants were placed at different heights as there was a lack of primary stability during initial implant placement. The implant between the right lateral incisor and canine had to be removed and replaced at a lower height. This also helped to correct the occlusal cant which developed after the leveling & aligning stage (**Figure 3**).

The exposure of upper incisal edge to relaxed upper lip reduced from 6.6 mm to 3.1 mm and upper lip length remained almost the same (pre-treatment:17.2 mm ; post treatment: 17.6 mm) as studied using the Soft tissue cephalometric analysis by Arnett.[13] Upper lip protrusion reduced from 2.4 mm to 0.8 mm. Cephalometric superimpositions in **Figure 10**, **Table 1** & **Figure 11** depict true intrusion of upper incisors

Using mini-implants was advantageous in the present case as they provided stable anchorage to intrude the incisors simultaneously correcting the deep bite as well as the gummy smile. Occluso-gingival positioning of the TAD implants determines the effect on the dentoalveolar system. The placements were tailored for the present case in such a manner that they achieved true intrusion of the maxillary incisors without tipping while also correcting the occlusal cant.[14]

4. Conclusion

Mini-implants present a relatively non-invasive and feasible option for the orthodontic correction of gummy smiles in growing children. These implants offer stable anchorage, enabling efficient achievement of desired outcomes. Furthermore, their flexibility in positioning allows for the modification of force direction, facilitating tailored orthodontic movements to meet specific treatment goals.

5. Source of Funding

None.

6. Conflict of Interest

None.

Références

1. Souza LD, Vaid NR, Roy ET, Urs GB. Shyness, self-Esteem, dental disharmony and orthodontic treatment. *Indian J Clin Psychol*. 2001;28(2):246-51.
2. Manevska I, Pavlic A, Katic V, Zrinski MT, Drevensek M, Spalj S. Satisfaction with facial profile aesthetics: are norms overrated?. *Int J Oral Maxillofac Surg*. 2018;47(1):72-8
3. Pavone AF, Ghassemian M, Verardi S. Gummy Smile and Short Tooth Syndrome--Part 1: Etiopathogenesis, Classification, and Diagnostic Guidelines. *Compend Contin Educ Dent*. 2016;37(2):102-7.
4. Khojasteh A, Mohaghegh S. Orthognathic surgery for management of gummy smile. *Dent Clin North Am*. 2022;66(3):385-98.
5. Qamruddin I, Shahid F, Alam MK, Zehra Jamal W. Camouflage of severe skeletal class II gummy smile patient treated nonsurgically with mini implants. *Case Rep Dent.* 2014; 2014:1-7.
6. Alansari R, Vaiid N. Why do patients transition between orthodontic appliances? A qualitative analysis of patient decision-making. *Orthod Craniofac Res.* 2023;27(3):439-46.
7. Kim T, Kim H & Lee S. Correction of deep overbite and gummy smile by using a mini-implant with a segmented wire in a growing Class II Division 2 patient. *Am J Orthod Dentofacial Orthop*. 2006;130(5):676-85.
8. Bajaj P, Bhombe KR, Oza RR. Periodontal management of gummy smile due to altered passive eruption: A case report. *Cureus*. 2022;14(9):e29174.
9. Fatani B. An approach for gummy smile treatment using botulinum toxin a: A narrative review of the literature. *Cureus*. 2023;15(1):e34032.
10. Alteneiji M, Liaw JJ, Vaid NR, Ferguson DJ, Makki L. Treatment of VME using extra-alveolar TADs: Quantification of treatment effects. *Semin Orthod*.2018;24:123–34.
11. Michiko A, Shirahama S, Shimizu A, Romanec C, Anka G. The Surgical Guides for TADs: The Rational and Laboratory Procedures. *Appl Sci*.2023;13(18):10332.
12. Goel P, Tandon R, Agrawal KK. A comparative study of different intrusion methods and their effect on maxillary incisors. *J Oral Biol Craniofac Res.* 2014;4(3):186-91.
13. Arnett GW, Jelic JS, Kim J, Cummings DR, Beress A, Worley Jr CM, Chung B, Bergman R. Soft tissue cephalometric analysis: diagnosis and treatment planning of dentofacial deformity. *Am J Orthodont Dentofac Orthoped*. 1999;116(3):239-53.
14. Gandedkar NH, Koo CS, Sharan J, Vaid N. The temporary anchorage devices research terrain: current perspectives and future forecasts!. *Semin Orthod*. 2018;24(1):191-20.

Cite this article: Gupta D. Correction of gummy smile using mini-implants in a growing patient: A case report. *J Contemp Orthod.* 2025;9(3):420-425.