

Mini-Implant Assisted Gummy Smile and Deep Bite Correction

Abstract

This article demonstrates the noninvasive means of correction of gummy smile and deep bite by using mini-implants in a relapsed patient. Intrusion of the maxillary arch was achieved by using mini-implants in the anterior and posterior region. Significant reduction in the gingival and incisal display was seen with improved smile esthetics and ideal overbite and overjet by the end of the treatment. The aim of the article is to present a case where gummy smile was effectively treated by mini-implants without undergoing invasive surgical procedures.

Keywords: Deep bite, gummy smile, mini-implants

Introduction

Gummy smile is a major esthetic concern which can be related to various intraoral and five extraoral factors. It is necessary to diagnose the cause associated with gummy smile, in order to provide the appropriate treatment modalities.^[1] Gummy smile due to anterior vertical maxillary excess or dentoalveolar extrusion could be effectively corrected with orthognathic surgery by LeFort maxillary impaction.^[2,3] The advent of mini-implants in orthodontics has proven to be an alternative treatment solution to patients who are reluctant to undergo invasive orthognathic surgery.^[4,5] Gummy smile, associated with deep bite could be corrected by relative mechanics, that is, by the intrusion of anterior teeth or extrusion of posterior teeth or a combination of both. Stability of the treatment corrected by the extrusion of posterior teeth in nongrowing individuals is questionable.^[6-8] Mini-implants produce true intrusion of upper incisors, thereby increasing the chances of stability. Mini-screw implants are increasingly being used by orthodontists as the most favorable treatment option for the intrusion of teeth and correction of deep bite.^[9,10] Owing to their small dimensions, they provide the benefit of immediate loading, multiple placement sites, relatively simple placement and removal, placement in interdental areas where traditional implants cannot be placed.^[11]

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Diagnosis and Treatment Plan

A 25-year-old female patient, who is an endodontist, reported to our clinic with a chief complaint of gummy smile. She underwent orthodontic treatment with all first premolar extractions 15 years back. On extraoral examination, she presented with convex profile, incompetent lips and full incisor exposure at rest, and excessive gingival display in both anterior and posterior regions upon smiling, short upper lip relative to commissure height presenting a reverse-resting upper lip line. On intraoral examination, she has Angle's Class I molar and canine relation on right and left sides, anterior deep bite with increased curve of spee and minimal spacing in the maxillary anterior region and a well-aligned lower arch with the normal curve of spee [Figure 1]. On cephalometric examination, the patient has skeletal Class II jaw bases with retrognathic mandible (SNB = 78.3°, ANB = 6.3°), average growth pattern (SNMP = 33.1°), proclined upper anterior teeth (interincisal angle = 121.8°), anterior maxillary excess (upper incisor to nasal floor = 35 mm), posterior maxillary excess (upper molar to nasal floor = 30 mm), average upper lip length (19.3 mm), and upper lip strain of 2 mm with lip incompetency of 6 mm [Table 1]. Orthopantomogram shows missing all 1st premolars due to the history of extraction during previous orthodontic treatment and wisdom teeth [Figure 2].

Based on all the above findings, the patient is diagnosed to have Skeletal Class II with

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Figure 1: Pretreatment extra-oral photographs and intra-oral photographs

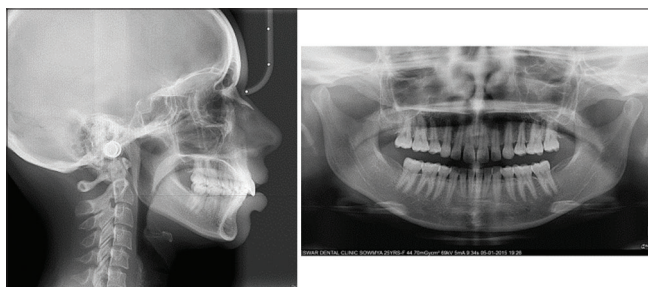


Figure 2: Pretreatment lateral cephalogram and orthopantomogram

Angle's Class I malocclusion, anterior deep bite with gummy smile. Considering the decently aligned lower arch, treatment was planned only on the upper arch. Although there was no cephalometric suggestion of vertical maxillary excess, considering normal upper lip length and excessive curve of spee, treatment was planned to disproportionately intrude the maxillary anterior and posterior teeth. Treatment objectives were to level the upper arch, to correct anterior deep bite and anterior gummy smile by intrusion of the anterior teeth using mini-implants, to correct posterior gummy smile using buccal and palatal mini-implants.

Treatment Progress

Monocrystalline 0.022×0.025 slot brackets were bonded on the anterior teeth and 0.022×0.025 slot metal brackets on the posterior teeth. A progression through continuous NiTi wires was initiated starting with 0.016 NiTi. For 7 months, alignment of maxillary teeth was progressed with gradual increases in arch wires and continued till 19×25 stainless steel arch wire was reached. Mini-implants of $1.4 \text{ mm} \times 7 \text{ mm}$ were placed between

maxillary central and lateral incisors for the intrusion of anterior teeth and mini-implants of $1.8 \text{ mm} \times 8 \text{ mm}$ were placed between maxillary first molar and second premolar on both buccal and palatal sides for intrusion of posterior teeth [Figures 3 and 4]. A force of 50–60 g in the anterior region and 80–100 g in the posterior region was applied onto the arch wires using the elastic chains. Unfortunately, the mini-implants placed on the palatal side failed a couple of times which forced us to carry on the intrusion of the posterior arch using only buccal mini-implants. The consequences of using mini-implants only on the buccal side were evident, as the posterior teeth started flaring buccally, few months after application of intrusive forces from buccal min-implants on to the arch wire [Figure 5]. Anterior deep bite was overcorrected to counteract relapse [Figure 6]. After the completion of orthodontic treatment, surgical crown lengthening was done on the lingual side to establish proper crown height and to allow for the placement of fixed lingual retainer [Figure 7].

Treatment Results

Favorable facial changes were observed with harmonious relationship of the facial soft tissue. The patient showed an esthetic smile with ideal amount of tooth structure displayed and the incisal line running along the border of the lower lip. Intra-orally, a well-interdigitated buccal occlusion with a Class I canine and molar relation was maintained. Ideal overjet and overbite were established [Figure 8]. Cephalometric radiographs and superimpositions showed a reduction in the proclination of upper anterior teeth, intrusion of upper anterior teeth by 3.9 mm and posterior teeth by 1.5 mm, reduction of

Table 1: Comparison of pre- and post-treatment cephalometric values

Parameter	Pretreatment measurement	Posttreatment measurement
SNA	84.6°	84.1°
SNB	78.3°	79.1°
ANB	6.3°	5.0°
SNOP	16.9°	16.6°
SNMP	33.1°	32.6°
IIA	121.8°	127.5°
Upper 1 to NF	35 mm	31.1 mm
Upper 6 to NF	30 mm	28.5 mm
Upper lip length	19.3 mm	19.6 mm
Lip incompetency	6 mm	3 mm



Figure 3: Photographs showing mini-implants in the anterior and posterior regions



Figure 4: Photographs showing adequate bite opening



Figure 5: Photographs showing buccal flaring of molars

the upper lip strain, and incompetency by 3 mm [Figures 9, 10 and Table 1]. Posttreatment panoramic radiograph

showed good root paralleling. Although the forces were within the physiologic limits, some amount of external root resorption was seen at the apices of upper central incisors [Figure 9]. The patient has been in retention for more than 15 months and the overcorrection that was achieved was lost, and ideal results have been maintained [Figures 11 and 12].

Discussion

The focus of the orthodontic literature has been on the evaluation of the smile and the effect of incisor

display during smiling.^[12] The treatment of choice for gummy smile depends on a variety of factors such as smile line, upper lip length, incisor display, and vertical dimension.^[13] Orthodontic tooth movement has always been associated with action and reaction mechanics. Anchorage control is vital, not just for achieving the desired tooth movement but also to produce stable results.^[9] Recently, mini-implants have been used to correct gummy smiles or deep overbites through the intrusion of the upper incisors. Kim *et al.* applied a segmental intrusive force between the maxillary central

incisors by using a mini-implant with segmented wires.^[4] Lin *et al.* introduced a combined approach using skeletal anchorage to simultaneously control the vertical dimension and to resolve gummy smiles of the skeletal origin in adult long-faced patients.^[14] Gummy smile with vertical maxillary excess and short upper lip often requires maxillary impaction and lip lengthening surgeries, respectively, to which patients are reluctant to undergo. The patient opted for minimal invasive procedures for her treatment, so gummy smile was addressed with intrusion of maxillary teeth only. Despite average upper lip length, it was short relative to commissure height, because of which the patient still had minimal lip incompetency at the end of the treatment. This could be corrected by surgical lip repositioning to improve facial profile.^[15] Reoccurrence of malocclusion years after the end of treatment may lead to patients seeking retreatment. Therefore, the long-term stability seems to be more important than the final result itself.^[16] The risk of overbite relapse is larger in extraction cases than that in nonextraction cases.^[17] Baek *et al.* examined the long-term stability of anterior open-bite correction with intrusion of the maxillary posterior teeth. They showed that the maxillary first molars were intruded by 2.39 mm during treatment and erupted by 0.45 mm at the 3-year follow-up.^[18] Lee and Park used miniscrews to intrude the maxillary molars and reported a 10.36% relapse rate for the intruded molars at 1-year posttreatment.^[19] If proper retention method is applied during the 1st year of retention, we could prevent the relapse and improve the long-term stability of the treatment. There is evidence that

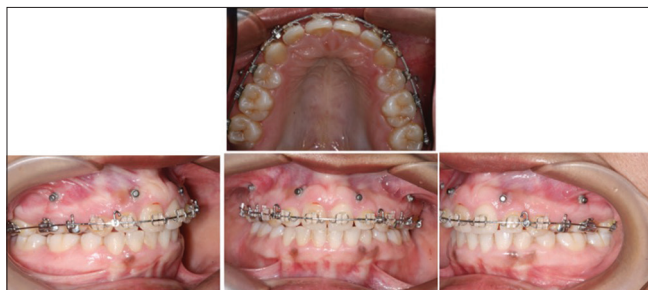


Figure 6: Overcorrection achieved



Figure 7: Gingivectomy done on palatal gingiva



Figure 8: Posttreatment extra-oral photographs and intra-oral photographs

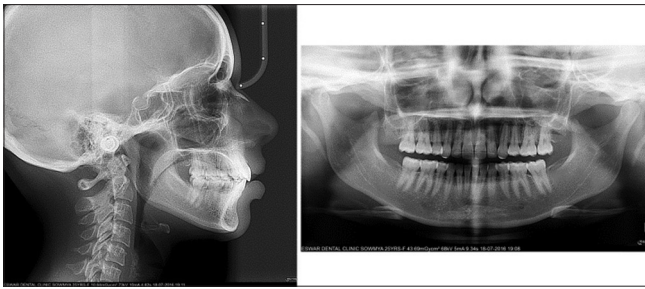


Figure 9: Posttreatment lateral cephalogram and posttreatment orthopantomogram

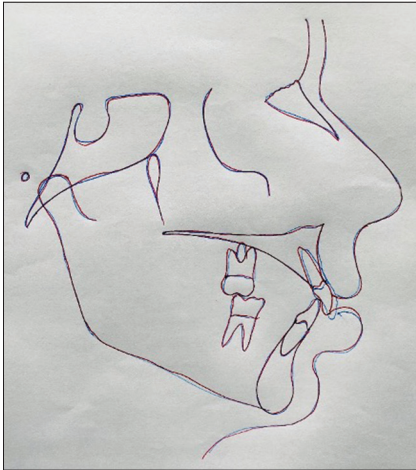


Figure 10: Superimposition of cephalometric tracing showing pretreatment with blue color and posttreatment with red color

indicates that a typical course of orthodontic treatment will lead to an average apical resorption of 1–2 mm for the upper incisors.^[20-22]

Conclusion

When nonsurgical correction of “gummy smile” is a prime treatment objective, then mini-implants present as an authentic treatment option. True intrusion of upper incisors can be achieved using miniscrew anchorage. This case report demonstrated that the mini-implant anchorage method was useful for achieving an excellent improvement of a dental deep bite and smile esthetics. An accurate diagnosis and treatment planning and anchorage preparation are required for the attainment of successful treatment outcome irrespective of the mechanics being executed.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Figure 11: Eighteen months posttreatment extra-oral photographs and intra-oral photographs

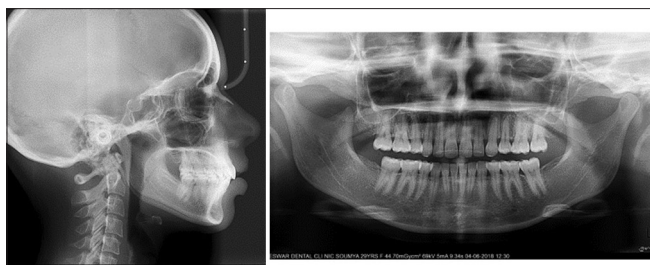


Figure 12: Eighteen months posttreatment lateral cephalogram and orthopantomogram

Conflicts of interest

There are no conflicts of interest.

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