Correction of Gummy Smile in a Patient of Vertical Maxillary Excess Using Absolute Anchorage System

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Abstract

This article presents the orthodontic treatment of a 24-year-old female patient with gummy smile and proclination along with a hyperdivergent profile. The patient showed excessive gingival display in both the anterior and posterior areas in the maxilla. Such situation in an adult patient often demands surgical therapy. However, due to patient reluctance toward surgery, the gummy smile was treated by the intrusion of the whole maxillary arch. After alignment and leveling, absolute anchorage system as well as a modified transpalatal arch was designed to achieve posterosuperior movement of the entire upper dentition. The active treatment period was 2.3 years.

Keywords: *Absolute anchorage, facial profile, gummy smile, hyperdivergent, intrusion*

Introduction

In recent times, mini-implants have been used for multiple purposes – for correction of gummy smile with increased anterior facial height by full maxillary arch intrusion; deep bite correction by intrusion of incisors; and open bite correction by molar intrusion.[1-4] In 2003, Paik *et al*.[1] treated vertical maxillary excess by single palatal implant and modified transpalatal arch (TPA). In 2006, Kim *et al*.[2] used mini-implant with segmented wires to achieve intrusion. Gummy smile poses an esthetic problem and requires proper diagnosis and treatment planning. Gummy smile along with a hyperdivergent profile is often characterized by excessive maxillary posterior dentoalveolar height along with excessive anterior dentoalveolar height. In such situations, often surgical therapy like a Le Fort impaction is needed to improve esthetics. However, alternative method using miniscrews is now frequently used in cases where going under the knife is an issue. This case report describes orthodontic treatment of a 24-year-old female patient with skeletal Class II malocclusion, gummy smile, proclination, and hyperdivergent profile in whom gummy smile correction was achieved by intrusion of the entire maxillary dentition using four miniscrews buccally in the maxillary arch and a modified TPA.

Case Report

A 24-year-old female patient presented with skeletal Class II malocclusion and gummy smile along with protrusion. Molars showed Class II relation. Her right first molar was in crossbite. Overjet was 11 mm and overbite was 2 mm. She also had "Gull Wing" lip deformity with short upper lip, lip trap, and mentalis strain on closing [Figure 1].

Cephalometric evaluation revealed a retrusive mandible, a large upper anterior dentoalveolar height (U1-NF) and a large upper posterior dentoalveolar height (U6-NF), and a large mandibular plane angle associated with increased anterior facial height. Both upper and lower incisors were flared [Figure 2 and Table 1].

Treatment objectives

Our treatment objectives included improving the patient's smile esthetics and facial profile along with a harmonious occlusion. This included the following:

- Correcting anterior proclination and creating a normal overbite and overjet relationship
- Reducing excessive gingival display
- Reducing the vertical dimension to improve facial balance
- Correcting right molar crossbite.

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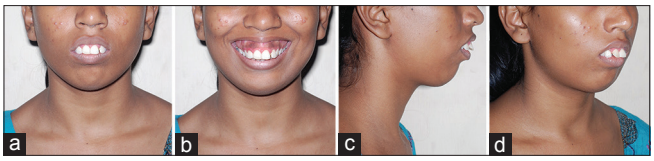

Figure 1: (a-d) Pretreatment facial photographs

Table 1: Cephalometric data

Measurement	Pretreatment	Posttreatment
Anteroposterior skeletal		
SNA (°)	82	81
SNB (°)	71	73
ANB (°)	11	8
Vertical skeletal		
GoMe-FHP (°)	38	36
FMA (°)	39	37
ANS-Me (mm)	73	70
Dental		
Overjet (mm)	11	2
Overbite (mm)	2	2
U1/SN (°)	116	97
IMPA (°)	102	93
U1-NF (mm)	34	30
U6-NF (mm)	27	24.5
L1-MP (mm)	51	49
L6-MP (mm)	38	38
Soft tissue		
U lip-E line (mm)	+2	−1.5
L lip-E line (mm)	+6	+1.5

U1-NF – Upper anterior dentoalveolar height; L1-MP – Lower anterior dentoalveolar height; U6-NF – Upper posterior dentoalveolar height; L6-MP – Lower posterior dentoalveolar height

Treatment alternatives

The following two treatment options were given to the patient:

1. Conventional orthodontic treatment with extraction of upper and lower first premolars and third molars combined with orthognathic surgery (Le Fort 1 maxillary impaction and augmentation genioplasty)
2. Extraction of all upper and lower first premolars along with all upper and lower third molars followed by orthodontic intrusion of complete maxillary dentition using absolute anchorage system.

Considering the severity of the case, orthognathic surgery was suggested as the first option, toward which the patient showed reluctance. Both the alternatives were explained to the patient, who chose the more conservative second option. Four maxillary buccal miniscrews and a modified TPA were then used for the intrusion of the entire maxillary arch. Two miniscrews buccally in the lower arch were used to hold the lower arch.

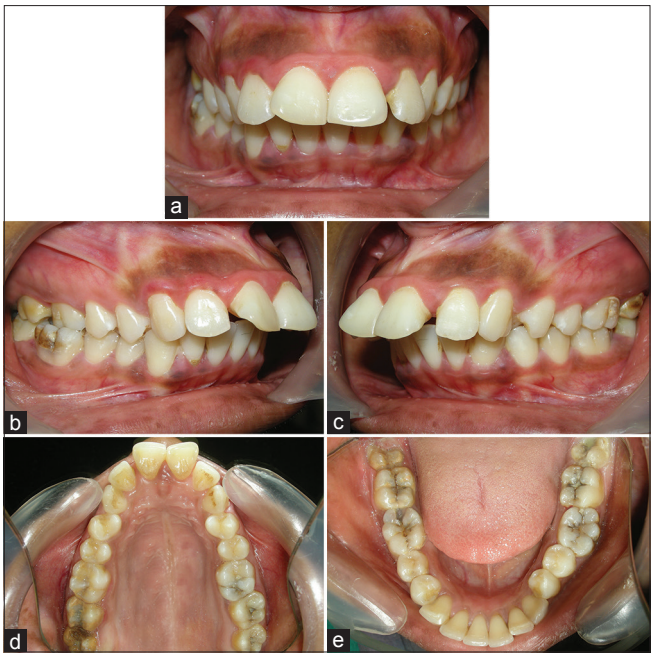

Figure 2: (a-e) Pretreatment intraoral photographs

Treatment progress

All upper and lower first premolars along with all upper and lower third molars were extracted. A preadjusted fixed appliance 0.022 × 0.028" slot (MBT prescription) was bonded to the maxillary and mandibular arches. Conventional alignment and leveling were performed in the upper and lower arches. After Six months, alignment up to the 0.019 X 0.025 inches stainless steel arch wires was achieved. Four miniscrews (diameter 1.5 mm and length 8 mm) were placed in the maxillary buccal region and two miniscrews in the lower posterior region buccally under local infiltration anesthesia. A modified TPA was fabricated with 1 mm stainless steel wire and a central acrylic pad such that it stayed approximately 5 mm from palatal mucosa [Figure 3].

After 4 months of placement, her two lower miniscrews got loose which were then removed. She was then asked to perform isometric clenching exercises for two 15 min sessions per day (3 s clenching with 5 s rest in between) for whole active treatment and after debonding for 8 weeks.

Closed coil spring (6 mm in anterior) was attached to hooks on either side of the archwire. E-chain was given in the posterior region. This produced intrusion of entire maxillary dentition. The intrusion took approximately 12 months [Figure 4], after which the modified TPA was almost touching the palatal mucosa. The space closure was done by active tiebacks. In this way, the mandible autorotated counterclockwise upward and forward resulting in reduction in anterior facial height and an advancement of chin. Following mandibular autorotation, anterior bite deepened and necessitated the incorporation of

the reverse curve in lower archwire to achieve proper overbite. The orthodontic treatment took about 28 months. Fixed lingual retainers were then bonded in both arches.

Treatment results

At the end of treatment, normal overjet and overbite has been achieved. Lower anterior facial height reduced by 3 mm. The lips and chin appeared more harmonious [Figures 4 and 5]. Mandibular plane angle decreased by by 2° [Table 1]. The posttreatment panoramic radiograph showed overall parallelism of roots. No significant root resorption was noted [Figure 6].

Overall superimposition of cephalometric tracings showed superior movement of the maxillary dentition and posterosuperior movement of upper incisors with little skeletal change and mandibular counterclockwise rotation. Lower molar showed minimal vertical and anteroposterior change [Figures 7-9].

Discussion

Gummy smile can occur due to many reasons such as vertical maxillary excess, excessive gingival overgrowth, altered passive eruption, anatomically short upper lip, hypermobile muscles of the upper lip, or a combination of any of these factors.[5,6] Many a times, orthognathic surgery is required for correction. In this patient, the gummy smile seemed to be a result of vertical maxillary excess.

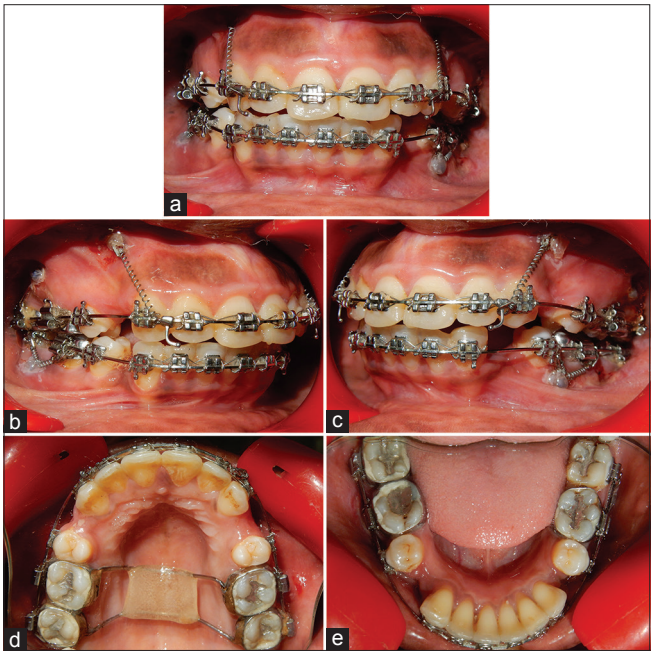

Figure 3: (a-e) Treatment progress intraoral photographs

Figure 5: (a-d) Posttreatment facial photographs

Figure 4: (a-e) Posttreatment intraoral photographs

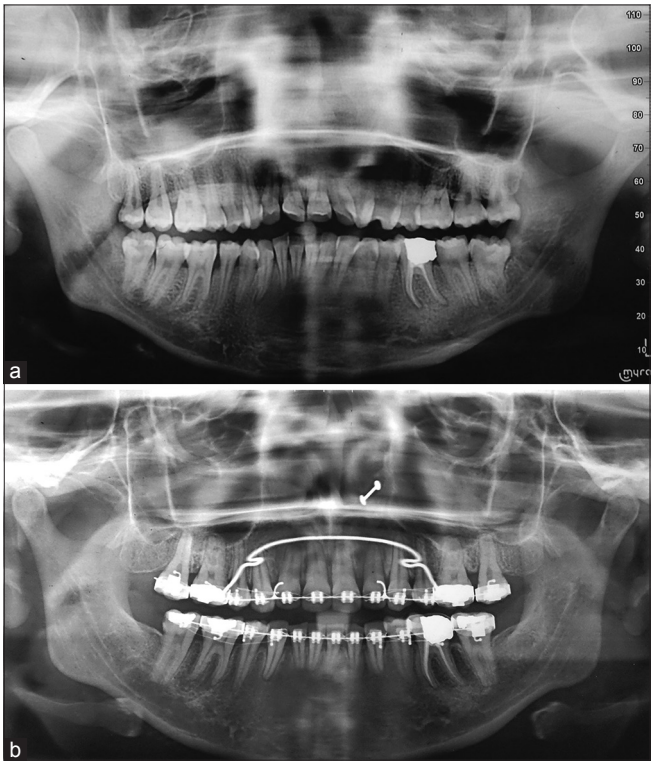

Figure 6: (a) Pretreatment panoramic radiograph. (b) Posttreatment panoramic radiograph

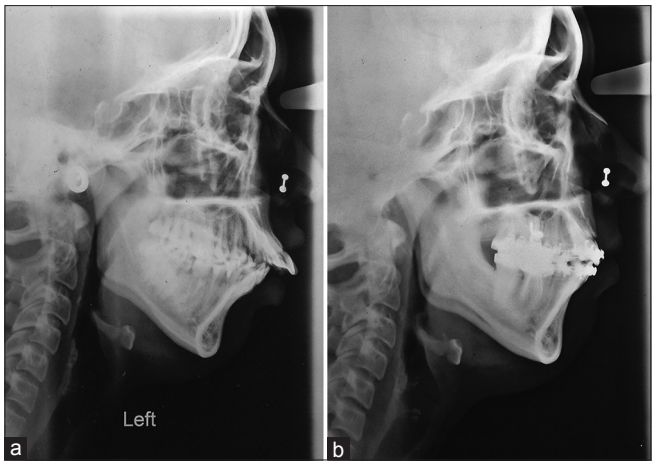

Figure 7: (a) Pretreatment lateral cephalogram. (b) Posttreatment lateral cephalogram

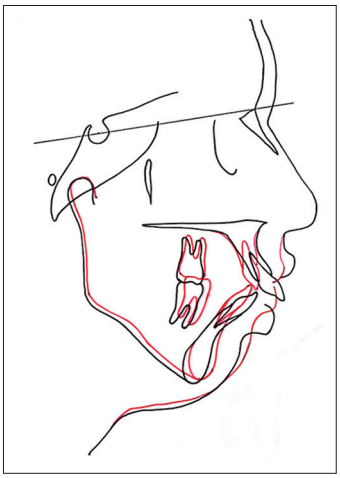

Figure 8: Superimposition of pre- and posttreatment cephalometric tracings, showing upper molar intrusion, autorotation of mandible, and decrease in lower anterior facial height

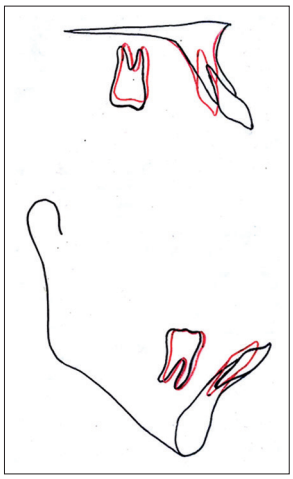

Figure 9: Regional superimposition tracings

The use of screw mechanics for achieving the effect of a Le Fort I impaction of the maxilla was proposed by Lin *et al*.[3] using multiple screws.

Posterior bite block therapy with or without repelling magnets[7,8] has been used in several studies, with results showing reduction in lower anterior facial height. However, patient compliance with such appliances is poor, and temporomandibular joint problems have been reported with the use of repelling magnets. In this case report, four miniscrews along with a modified TPA in the maxillary arch and two miniscrews in the mandibular arch have been used without any problem of patient compliance. This has satisfactorily resulted in the intrusion of entire maxillary dentition. This procedure has been termed by Paik *et al*.[1] as "slow impaction" of maxilla as it mimics the effects produced by Le Fort I maxillary surgery.

In the lower arch, two miniscrews were placed to prevent overeruption of mandibular molars as the mandible autorotated counterclockwise following maxillary impaction.

Stability has always been a concerning factor following posterior intrusion and reduction of vertical dimension in adult patients. It has been suggested that intrusion of posterior teeth can be maintained by isometric clenching exercises. Chewing gum exercise to increase the contraction forces of elevator muscles of the mandible can be helpful in maintaining the correction. Isometric clenching on soft bite plate for 30 min per day over an 8-week period or two 15 min sessions (3 s clenching with 5 s rest in between) can be done. Alternatively, chewing gum exercise of 30 min per day for 4 weeks can be advised. Following this, total occlusal force was found to be increased by 140% and contact area by 125%.[9,10] Clenching exercises were recommended to this patient.

Conclusion

Correction of gummy smile can be effectively done using miniscrews by the intrusion of maxillary dentition and has replaced the need for surgery in many cases.

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Declaration of patient consent

The authors certify that they have obtained all the appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that name and initial will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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