

## Directing the force vector directly: Use of micro-implants for correction of gummy smiles

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### ABSTRACT

The treatment of a patient involving a skeletal Class II facial profile having a gummy smile due to vertical maxillary excess along with short upper lip is reported. In such cases, the outcome may not always be predictable by orthodontic therapy alone. Hence, surgical therapy is often selected for the dentoalveolar correction to achieve the desired esthetic goal. However sometimes the patient refuses to undergo surgical treatment and an alternative method needs to be considered. Mini-implants have revolutionized orthodontic treatment by providing absolute anchorage. Skeletal anchorage systems such as miniscrews are now frequently used for the correction of severe malocclusion that previously would be treated by surgical therapy. In this case a patient with gummy smile was treated by using miniscrews, assisted intrusion arm as part of the orthodontic mechanotherapy.

KEY WORDS: Gummy smile, Miniscrew, Vertical maxillary excess.

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### INTRODUCTION:

According to Hulseley, “A smile is one of the most effective means by which people convey their emotions.” People with dental deformities often make every effort to cover the displeasing portion with their lips. They abstain to smile or laugh, and thus might be viewed by others as unfriendly. Recent studies have indicated that the amount of gingival display on smiling, plays an important role in achieving well balanced beautiful smile. In fact, Van der Geld et al. found that the amount of gingival display was an important characteristic in a person's own perception of their smile. The term “gummy smile” is well known to the dental community and especially to orthodontists. Most of the time, some exposure of the gums during a smile is more than acceptable. However, when excessive amount of gingival tissue is exposed during smiling or when the lips are at rest, the esthetic problem is apparent.

Excessive gingival display during smiling, or a “gummy smile”, may result from a variety of etiological factors. These could be: excessive maxillary vertical growth, short upper lip,

incomplete anatomic crown exposure, and combinations of above factors. Thus, proper diagnosis and treatment planning play an important role in this treatment. If a gummy smile is characterized by anterior vertical maxillary excess, the outcome may not always be successful with conventional orthodontic therapy alone. In such cases, surgical therapy, such as a Le Fort I impaction or maxillary gingivectomies are often chosen for the dentoalveolar correction. However, if the patients are unwilling to undergo surgical treatment, an alternative method must be considered to treat the gummy smiles. Miniscrews which are extensively used for establishing absolute anchorage can be considered for achieving dentoalveolar correction.

### CASE REPORT

#### PRE TREATMENT EVALUATION

A 20 year old female, Bindiya Trambadiya presented with the chief complaint of excessive gingival exposure during smile. Extra oral examination showed Class II convex profile, short upper lip & and lip incompetency, with excessive

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gingival display on smiling and, an average nasolabial angle, mandibular retrognathism, increased lower facial height, (fig.1)

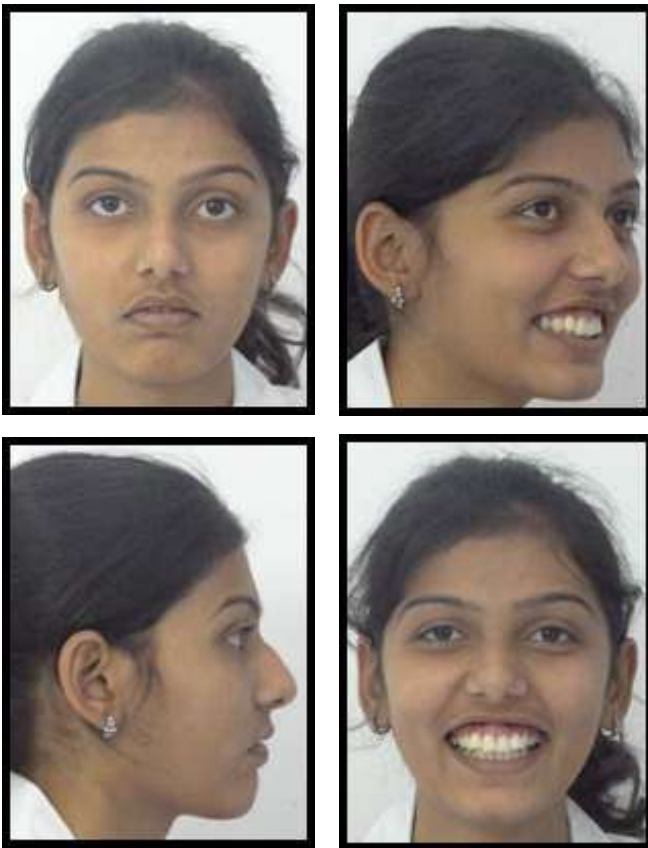


Figure 1. Pretreatment extra-oral photograph of 20year old patient bindiya

Intraoral examination showed an Angle's dental Class II malocclusion with crowded and proclined lower anterior teeth with 4 mm overjet, 6 mm overbite and rotation of individual teeth. The upper dental midline coincided with the facial midline, but the lower dental midline was shifted to the right by 2 mm. The arch length discrepancy showing maxillary excess was about 2.5 mm. (fig.2)



Figure 2. Pretreatment intra-oral photographs

Panoramic radiograph showed all third molars are erupting with average alveolar bony support (fig.3).

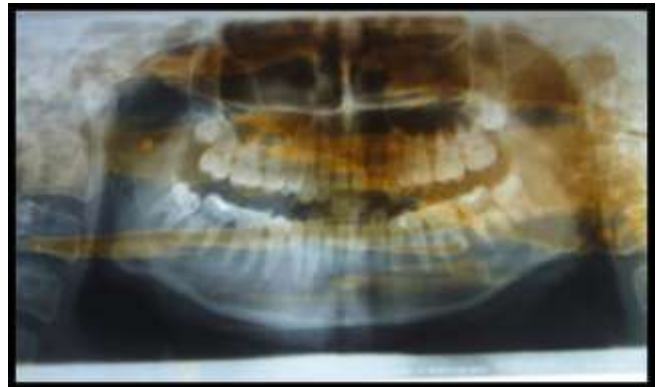


Figure 3. Pretreatment OPG

Lateral cephalometric analysis showed skeletal class II, mandibular retrusion with increased mandibular plane angle, upper 1 to NF 35, upper 6 to NF 25 (fig.4 & table 1)



Figure 4. Pretreatment cephalogram

Table 1- Summary of cephalometric measurement.

Measurement	Pretreatment	Posttreatment
SNA	80°	80°
SNB	76°	77°
ANB	4°	3°
FMA	27°	25°
IMPA	100°	99°
OVERJET[mm]	4	2
OVERBITE[mm]	6	2
Upper 1 to NF (mm)	35	32
Upper 6 to NF (mm)	25	23
OP-HP angle	11°	9°

**Treatment Objectives**

The treatment objectives were:

1. To intrude the upper dentition with the use of mini-screw implants as the orthodontic anchorage
2. Obtain adequate overbite and overjet for a satisfactory maxillary gingival exposure during smile.
3. To achieve Class I molar and canine relationships.

**TREATMENT PLAN:**

In this case gummy smile is due to vertical maxillary excess and a short upper lip. The first option was traditional orthodontic treatment with Le Fort I surgery to reduce the gingival exposure and to correct maxillary protrusion. The second option involved orthodontic intrusion of the maxillary anterior region using miniscrew anchorage. The surgical treatment plan was declined by the patient, and so the second option of using miniscrew implants was opted for.

The treatment plan involved the following steps:

1. Initial leveling and alignment
2. Insertion of miniscrews into the buccal alveolar bone to intrude the maxillary dentition
3. To achieve stable class I molar and canine relation
4. Finishing and detailing

**Treatment Procedure**

The patient was treated with MBT prescription (0.022” slot). Initial leveling and aligning was done

by flexible NiTi and resilient round stainless steel wire for 8 months followed by insertion of 0.019 × 0.025" S.S. wire to express torque in 0.022” slot for 2 months.

Under local anesthesia, two self-drilling titanium alloy mini-screws (1.5 mm in diameter and 8 mm in length) were inserted into the buccal alveolar bone between the upper lateral incisors and canine and 2nd premolar and 1st molar on both sides between root apices. After miniscrew insertion, 50 g of intrusive force was applied from each mini-screw to the upper dentition by elastic chain (fig.5&6). After 3 months of anterior teeth intrusion, the patient's gummy smile was fully corrected. The teeth were well aligned with good inter-cuspal relation. The total treatment period with the fixed appliance was 16 months.



Figure 5. intra oral photographs showing placement of micro-implants in ant-post region



Figure 6. OPG of patient showing position of micro implant.

### TREATMENT RESULTS

Upper incisors were intruded successfully and an improvement of the gummy smile could be observed in a posed smile (Fig. 7). Class I molar and canine relationships were obtained with adequate amounts of overbite and overjet. No root resorption occurred in the intruded upper incisor region, and root parallelling was achieved.



Figure 7. Post intrusion extraoral photographs

The post-treatment lateral cephalometric analysis showed no skeletal changes but changes in incisor inclinations and lip positions. The maxillary incisor inclination was decreased and the mandibular incisor inclination was increased to the normal value. 6 mm of deep overbite and a 4 mm of overjet was corrected to 2 mm. Upper and lower lips were slightly retracted due to the changes in incisor positions. The significant intrusion of upper incisors was evident on superimpositions

posttreatment cephalometric films (Fig.8&9)



Figure 8. Post intrusion lateral cephalogram

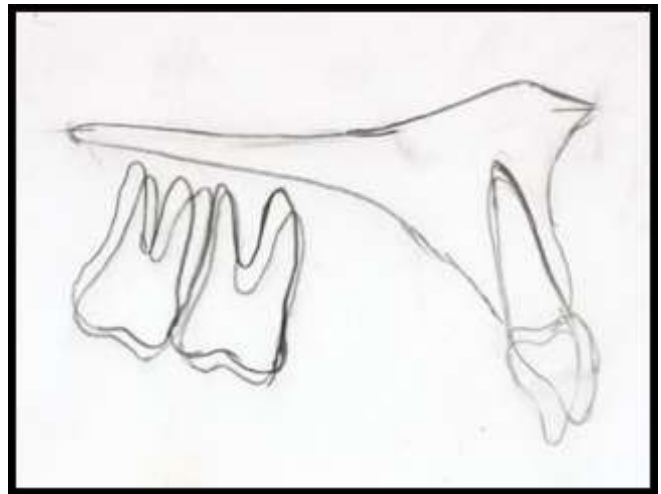


Figure 9. Superimposition

### DISCUSSION

Excessive gingival display can be divided into several categories according to the etiologic factors.

In this case the gummy smile was due to vertical maxillary excess and short upper lip which can be

corrected efficiently by intrusion of maxillary dentition. It was planned to intrude the upper dentition with miniscrews which could provide desirable force vectors for the correction. Generally, miniscrews for intrusion of dentition are placed between the roots of upper lateral incisor and canine and 2nd premolar and 1st molar on both sides. In this case, we inserted the miniscrews in the maxillary bone between the root apices. Miniscrew placement superior to the incisor apices has a major advantage as it does not hurt the roots of the teeth. The placement of mini-screws and associated intrusion resulted in significant improvement in facial esthetics which would not have been possible using other contemporary mechanotherapy options.

## CONCLUSION

Treatment of excessive gingival display using miniscrew anchorage, has the following advantages over orthodontic treatment combined with orthognathic surgery:

- Fewer risks
- Simpler orthodontic biomechanics
- Less patient discomfort
- Less treatment cost

Use of Miniscrew anchorage represents a paradigm shift in orthodontic biomechanics, enabling more direct, predictable, effective, and efficient tooth movement. It has proved to be a successful alternative to orthognathic surgery and for years to come, it will remain as an important tool in the able hands of aspiring orthodontists.

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