Surgical-Orthodontic Treatment of Gummy Smile with Vertical Maxillary Excess

ABSTRACT
Vertical maxillary excess is a well-defined clinical entity with several treatment options available. Treatment of the condition requires extremely well-coordinated orthodontic and surgical treatment planning and execution. This case report describes a multidisciplinary approach in the successful management of a patient with severe vertical maxillary excess. Careful selection and good execution of a surgical-orthodontic treatment plan in the management of vertical maxillary excess provided the superior esthetic and functional results in this case. Maxillary Le Forte 1 procedure was performed for vertical maxillary impaction along with anterior segmental setback. The presented technique was unique as it shortened the treatment time and esthetic results in smile and vertical proportions were achieved.

Keywords: Orthognathic surgery, Gummy smile, Vertical maxillary excess, Class II malocclusion.

INTRODUCTION
Adult patients with skeletal Class II malocclusion usually require a combination of orthodontic and orthognathic surgical treatment. Surgery can sometimes be avoided with dental compensation or orthodontic camouflage by means of extractions, but the results are generally not as satisfactory. Orthodontists have long recognized that the position of the mandible can be altered by changing the vertical relationship of the posterior teeth. Only recently, however, has it been widely acknowledged that mandibular position can be altered by changing the position of the maxilla, especially in patients with vertical skeletal deformities. Even if surgery does not directly involve the mandible, the sagittal and vertical positions of the chin and mandibular teeth will change as the following case demonstrates.

DIAGNOSIS
An 18-year-old male presented with the chief complaints of protruding maxillary anterior teeth and a gummy smile (Figs 1A and B). Patient had history of past orthodontic treatment with active removable plates, which he discontinued after 9 months due to pain. Initial examination revealed a bilateral Class II molar relationship, a severe overbite, and a 10.5 mm overjet. The incisors of both arches were protrusive relative to the basal bones and moderate crowding in lower arch. On facial analysis, patient was having a leptoprosopic facial form, with no gross asymmetry of face. He was having a convex profile, lip incompetence, a pronounced gummy smile with muscular hypotonia. An incisor show of 8.5 mm was present at postural rest position.

Cephalometric analysis confirmed the skeletal problems (Table 1). The panoramic radiograph showed that all permanent teeth were present with moderate to severe resorption in maxillary incisors.

TREATMENT PLANNING
The primary treatment objectives were to improve the positioning of the maxillary arch, with a reduction in dental and gingival exposure; to achieve Class I canine relationships; and to correct the overjet and overbite. As the patient presented with moderate to severe resorption in maxillary anteriors, it was decided to extract the maxillary first premolars, followed by leveling and alignment of the maxillary arch. The extraction space was decided to be closed surgically with anterior segmental setback at the time of Le Fort 1 impaction to improve the basal-bone positioning of the incisors and reduce the overjet. In the mandibular arch, the incisor protrusion would remain the same, and the tooth-size discrepancy would be addressed through anterior interproximal reduction. This would be followed by maxillary impaction with Le Fort 1 surgery and anterior segmental setback into 1st premolar space. The result would be a camouflaged Class II molar relationship but with improved vertical dimensions.
Cephalometric Surgical Planning (Fig. 2)

- Step 1: Pretreatment ceph tracing was done.
- Step 2 and 3: Incisor inclination and other presurgical objectives were simulated on an overlay tracing (blue). Now, on another tracing sheet, the maxillae and mandible are traced separately (green) from this tracing.

Once the amount of incisor exposed beneath the upper lip is determined, the ‘ideal’ amount of superior repositioning of the upper incisor can be determined by the formula:

\[ X = \frac{(Y-2)}{0.80} = 8.1 \text{ mm} \]

where \( X \) is the amount of superior repositioning necessary and \( Y \) is the amount of upper incisor showing.\(^{12}\)

Surgical osteotomies are now simulated in maxilla along with mandibular autorotation with center of rotation at condyle.
### Table 1: Cephalometric data

<table>
<thead>
<tr>
<th></th>
<th>Pretreatment</th>
<th>Presurgical</th>
<th>Post-treatment</th>
</tr>
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<tbody>
<tr>
<td>SNA (°)</td>
<td>87</td>
<td>87</td>
<td>85</td>
</tr>
<tr>
<td>SNB (°)</td>
<td>80</td>
<td>80</td>
<td>82</td>
</tr>
<tr>
<td>ANB (°)</td>
<td>7</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>FMA (°)</td>
<td>28</td>
<td>29</td>
<td>25</td>
</tr>
<tr>
<td>Y-axis (°)</td>
<td>65</td>
<td>65</td>
<td>63</td>
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<tr>
<td>Upper anterior facial height N-ANS (mm)</td>
<td>54</td>
<td>54</td>
<td>46</td>
</tr>
<tr>
<td>Lower anterior facial height ANS-Gn (mm)</td>
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<td>77</td>
<td>75</td>
</tr>
<tr>
<td>Witt's appraisal (mm)</td>
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<td>5</td>
<td>3</td>
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<tr>
<td>Beta angle (°)</td>
<td>25</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>U1-NA (°/mm)</td>
<td>38/14</td>
<td>21/5</td>
<td>24/6</td>
</tr>
<tr>
<td>L1-NB (°/mm)</td>
<td>37/10</td>
<td>31/11</td>
<td>35/11</td>
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<td>Interincisal angle (°)</td>
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<td>121</td>
<td>120</td>
</tr>
<tr>
<td>Nasolabial angle (°)</td>
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<td>110</td>
<td>102</td>
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<tr>
<td>Upper lip to S-line (mm)</td>
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<td>+1</td>
<td>0</td>
</tr>
<tr>
<td>Lower lip to S-line (mm)</td>
<td>+5</td>
<td>+5</td>
<td>+1</td>
</tr>
</tbody>
</table>

• **Step 4**: Final profile tracing (red) is done along with soft tissue changes.

• **Step 5**: The final expected post-treatment profile (red) is compared with pretreatment tracing.

**Treatment Progress**

*Presurgical Orthodontics*

Maxillary first premolars were extracted and preadjusted edgewise 0.022" appliance (Roth prescription) was placed...
in both arches. A maxillary transpalatal bar was used for molar derotation. Air rotor stripping was done in lower anteriors. After initial leveling and alignment, 0.018” A J Wilcock SP+ wire was placed in upper arch and light Class II elastics were given for correction of inclination of incisors. Space between upper canine and 1st premolar was maintained for surgical closure. After closure of anterior spacing, 0.019" × 0.025" SS wire was placed in both arches for 3 weeks. Presurgical records were obtained and soldered surgical spurs were placed in both upper and lower arches (Figs 3A and B). Face bow transfer and Mock surgery was done on Hanau’s semiadjustable articulator (Fig. 4). Acrylic surgical splint was made. Orthognathic surgery was then performed with two piece maxillary osteotomy resulting in 8 mm of anterior segment impaction and 5 mm of posterior segment impaction. Anterior segment was consecutively retracted into 1st premolar space after bone removal (Fig. 5).
Postsurgical Orthodontics

After removal of intermaxillary fixation, surgical splint was trimmed to reduce deep interdigitations and was secured to upper arch only. Patient was advised to wear Class II settling elastics to guide mandible into position after autorotation for 4 weeks. Spaces in upper arch were consolidated and vertical settling elastics were given for final settling.

Presurgical treatment took 8 months and postsurgical treatment lasted 4 months. Keeping the significant amount of root resorption in mind (Fig. 6), the postsurgical time for finishing was kept to minimum.

Treatment Results

Post-treatment records demonstrated facial symmetry with proportional facial thirds, correction of gummy smile, a balanced maxillomandibular sagittal relationship, an esthetic smile line, and good lip positioning (Figs 7A and B). Treatment produced Class I canine and Class II molar relationships, coincident midlines, a 1 mm overjet, an overbite of one-third of the incisors, and well-aligned archforms. Superimposition of pre- and post-treatment cephalometric tracings indicated the amount of maxillary impaction and mandibular autorotation (Fig. 8). Skeletally, the maxillary anterior and posterior regions were impacted by the surgery, and the mandible evidenced counterclockwise autorotation. The retention regimen consisted of a bonded 3-3 lingual bar in the lower arch and a Begg-type retainer in the upper arch with sectional bonded lingual retainer 3-5 on both sides.

DISCUSSION

Treatment of vertical maxillary excess requires meticulous planning and appropriate treatment plan selection just like any other condition. Surgical superior impaction of the maxilla is a modality chosen in cases where the vertical excess of the maxilla has caused a downward and backward rotation of the mandible and an excessive tooth exposure at rest while the lip length is within the normal range.

The above patient was clearly a case for superior impaction of the maxilla. Though the length of the upper lip was normal, the patient still had excessive incisor exposure at rest and excessive gingival exposure in smiling. Exposure of all the upper incisors and a small amount of gingiva on smile is considered youthful appearance and esthetic. But, the excessive gingival exposure in this patient affected the esthetics negatively.
The stability of superior impaction of the maxilla is excellent. In the hierarchy of stability by Proffit, White and Sarver, superior repositioning of the maxilla with rigid internal fixation is ranked highest. When the maxilla is repositioned superiorly, the postural position of the mandible alters in concert with the new maxillary position, and occlusal forces tend to increase and not decrease contrary to earlier assumptions. This factor prevents the maxilla from
relapsing downward, and provides excellent stability of this surgical movement.

CONCLUSION

This case report highlights the importance of careful diagnosis and appropriate treatment planning so that the problem is identified and treated accordingly. The esthetic improvement achieved with this approach is high and requires good coordination between the orthodontist and the maxillofacial surgeon.

REFERENCES