Efficacy of high pull headgear in restricting maxillary growth: A clinical study

Authors' Name:

Namitha Ramesh P.V., B.D.S (M.D.S)
Post graduate student
Department of Orthodontics & Dentofacial Orthopedics
Coorg Institute of Dental Sciences
Maggula, Virajpet, Coorg district
e-mail: namta80@yahoo.co.in
phone no.: 09880545032

P.P.Biswas, B.D.S, M.D.S
Professor & H.O.D
Department of Orthodontics & Dentofacial Orthopedics
Coorg Institute of Dental Sciences
Maggula, Virajpet, Coorg district
e-mail: ppbiswas@yahoo.co.in
phone no.: 09447062318

Abstract
The usage of headgear therapy dates very long back but its popularity has been marred due to the advent of micro implants and the necessity of patient cooperation with extraoral appliances. Although these new advances can successfully substitute headgear therapy for purpose of anchorage, there is no other replacement for growth modulation procedure.

The vertical maxillary excess, typically characterized by a gummy smile, is almost always due to a hereditary etiology. The choice of treatment is usually a high pull headgear therapy or a surgical approach later, the complication and fear involved with orthognathic surgery, has made headgear therapy as treatment of choice. This magical appliance could remove the gumminess from smile in just about 6 month's time.

In this paper we present 5 cases treated with maxillary splint high pull headgear and their results has been assessed cephalometrically.

Key words
Gummy smile, High pull headgear, Centre of resistance

Introduction
Gummy smile, defined as 2mm or more of maxillary gingival exposure in full smiling has provoked more interest & concern among orthodontists. The various etiologies of gummy smile include vertical maxillary excess, short upper lip, palatal plane tipped downwards anteriorly, most of which have a hereditary basis.

The different treatment modalities for a gummy smile include a high pull headgear in growing patients, orthognathic surgery in non growing patients & periodontal crown lengthening procedures. Of recently, mini implants have also shown to produce similar treatment effects.

The use of headgear dates very long back & has found a variety of clinical applications in contemporary
orthodontics like for anchorage control, distalization, restricting maxillary growth. It has been demonstrated in numerous animal studies that it is physically possible to produce absolute distal displacement of the maxilla & the maxillary dentition by using heavy headgear forces for a prolonged period of time2-4.

In this paper, we present 5 cases showing the efficacy of high pull headgear in reducing the gummy smile by restricting maxillary growth.

**Materials & methods:**

5 growing patients, 2 females & 3 males of age ranging from 11 to 13 yrs, with class II div 1 malocclusions are included in this study. All patients presented with a gummy smile clinically of more than 2 mm. Cephalometrically also, these patients showed a vertical maxillary excess. Hand wrist radiographs were examined to make sure that sufficient growth was present.

Appliance design consisted of a high pull headgear with a maxillary splint. The splint was of removable type, with full coverage of palate & all maxillary teeth with the inner bow fixed onto the splint (fig 1A). The length of the outer bow was kept short so that forces passed anterior to the centre of resistance of the maxilla & maxillary dentition5.

The centre of resistance of the maxilla was considered to be near the posteroinferior of the zygomaticomaxillary suture & that of the dentition to be between the roots of the bicuspids 6 (fig 2).

Extraorally the high pull headgear consisted of a headgear strap with plastic modules. The force values were maintained at 600-1000 gms per side (fig 1B). Out of the 5, as 2 patients exhibited a severely retrognathic mandible, the intraoral splint was modified to incorporate a twin block appliance (fig 1C).

Patients were instructed to wear the appliance 24 hours per day except while eating, brushing & bathing. They were asked to clean the appliance twice a day. Patients were also advised to close their lips onto the bows as most of these patients required lip exercise since they exhibited incompetent lips. Patients were also told to maintain the same hole on the force module, as instructed, to be inserted on the outer bow.

Recall visits were scheduled at 4 weeks interval and force levels were checked and maintained. The splint was trimmed to facilitate the eruption of permanent teeth if required.

A check list was maintained to keep track of regular appliance wear. The check lists points were, ease of insertion of the appliance, observation of speech difficulty, wear marks on the hair especially for boys were noticed. All records were taken every 6 months.

Once the gummy smile was corrected which usually ranged from 6 months to 1 year the patient was asked to wear the appliance only at night as retention till puberty or secondary sexual characteristics appeared.

**Results:**

Clinically in all cases the gummy smile was reduced, bite was opened, there was reduction in incisor visibility and overjet, molar relation changed from Class II to Class I (fig 3 & 4).

Pre and Post treatment cephalometric tracing showed that the growth of the maxilla was restrained (Table 1.1).

SNA was decreased by 0.30.

Na perpendicular to Pt A showed a decrease of -2.5 mm.

The convexity at Pt A was reduced to 2.1 mm.

The palatal plane as measured by the inclination angle showed an increase of 10 indicating that palatal plane has tipped upwards anteriorly.

Length of C - Axis remained constant during the treatment period which indicates that the growth of maxilla was restrained in the downward and forward direction.
Fig 1A: Intraoral maxillary splint design.

Fig 1B: Extraoral appliance design

Fig 1C: Maxillary splint with twin block incorporated

Fig 2: Centre of resistance of maxilla & maxillary dentition
Fig 3 & 4: Pre & post treatment photographs
Table 1.1: Cephalometric readings

<table>
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<tr>
<th>MEASUREMENTS</th>
<th>PRE Rx</th>
<th>POST Rx</th>
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<tbody>
<tr>
<td>SNA</td>
<td>84.50</td>
<td>83.80</td>
</tr>
<tr>
<td>Nasion perpendicular to point A</td>
<td>-1.1mm</td>
<td>-3.6mm</td>
</tr>
<tr>
<td>Convexity at point A</td>
<td>6.5mm</td>
<td>4.4mm</td>
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<tr>
<td>Inclination angle</td>
<td>86.60</td>
<td>87.60</td>
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<td>C axis (linear)</td>
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<td>80mm</td>
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<tr>
<td>C axis (angular)</td>
<td>43.20</td>
<td>43.80</td>
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Discussion

In normal growth, in class II individuals, rickets has shown SNA to increase by 0.30 in 30 months interval, but in our treated cases, SNA was reduced to 0.30 during the treatment period 7.

According to Stanley Braun et al the growth vector for the maxilla as represented by the C-axis, defined as the Sella - M point showed a mean velocity of length increase by 1.14mm per year in boys and 1.31mm per year in girl, up to the age of 14. In our treated cases we found that there was no increase in the length of C- Axis during the treatment period which indicates that the growth of maxilla was restrained in the downward and forward direction 8-9.

The advantages we saw with this appliance were reduction in gumminess as early as 6 months. Chairside time was minimal even at the time of delivery as it required only bending of the outer bow. As changes in anteroposterior and vertical dimension were achieved, the second phase of fixed appliance therapy was made easier and in some cases extractions could also be avoided. Disadvantages of this appliance were, 24 hours wear demanded absolute patient cooperation. In some of the cases, we saw a hindrance in transverse growth which was conspicuous in the buccolingual occlusion of the posteriors.

Conclusion

Clinically significant changes were brought about in the smile of the patient. Cephalometrically the growth of the maxilla was restrained. High pull headgear with proper biomechanics and patient cooperation can change the smile into one that you can be proud of.

References

2. Weislander L, Effects of orthodontic treatment on the craniofacial complex, AJO 49; 150: 1963
3. Weislander L, Early or late cervical traction therapy of class II malocclusion in mixed dentition, AJO 67;432 -439, 1975