Profile Convexity Changes after Maxillary Protraction Therapy in Patients with Class III Malocclusion

SUMMARY

The purpose of this study was to determine profile convexity changes in Class III growing patients after maxillary protraction therapy.

This study comprised a sample of 11 patients with Class III malocclusion (4 females and 7 males), ranging from 6 years 4 months to 12 years of age. Changes in sagittal jaw relationship and facial profile were detected by using lateral cephalograms before and after therapy. Mean treatment time was 11 months, and the effect of maxillary protraction treatment was improvement of skeletal sagittal jaw relationship and increase of profile convexity angles, mostly as a result of forward displacement of the maxilla (SNA p<0.05), mandibular retro-position (SNB p<0.05) and clockwise rotation of the mandible, which significantly increased vertical cephalometric angles and measurements SN/GoGn, SN/Gn, SNA to Me).

These findings indicate that concave facial profile in Class III patients can be improved after maxillary protraction treatment, which is very important in this period of life for building self confidence and normal socializing in the community.

Keywords: Profile Convexity; Maxillary Protraction; Growth; Lateral Cephalograms

Introduction

Skeletal Class III malocclusions are usually growth-related discrepancies, and these patients usually have components of maxillary size deficiency, maxillary retro-positioning, true mandibular excess, mandibular forward positioning, or any combination of these1-2. In many patients with Class III malocclusion, the mandible appears large because of a deficient maxillary growth3-4. With the limited ability to influence mandibular growth, treatment modalities for influencing mild to moderate Class III alveolar base discrepancies have shifted to a maxillary protraction treatment. Ellis and McNamara5 showed that combination of mandibular protrusion and maxillary retraction existed in their sample of Class III patients, while Jacobson et al1 found that 25% of class III malocclusion had components of maxillary deficiency.

In all of these cases the treatment of choice would be facial mask treatment or more precisely protraction of the maxilla downward and forward, inhibition of the mandibular forward growth, and clockwise rotation of the mandible.

The effects of maxillary protraction have been perhaps best studied on Japanese subjects6-10 because of their higher incidence of Class III malocclusion11,12. It is good to know that longitudinal cephalometric data on untreated Class III subjects to which the treatment effects produced by the facial mask can be contrasted are deficit. Much of information about the skeletal effects of protraction forces still derives from animal studies, which show that orthopaedic forces are able to provide significant sagittal changes in growing craniofacial complex, by stimulating the anterior displacement of the entire maxilla13-15, with significant increase of cellular activity at the circum-maxillary sutures, and at the
tuberosity, at the bone surfaces through the periosteal influence and even at the deeper cranial structures\textsuperscript{16,17}.

As clinical, experimental, and biomechanical studies certify, the orthopaedic approach to the maxilla for Class III correction, when well indicated, enables a morphologic and functional conditions that favours the ensuing normal facial growth, in addition to creating more acceptable aesthetics through improvement of facial profile in the early stages\textsuperscript{18}.

Most cases with Class III malocclusion are characterized by an average of a 60\% maxillary deficiency\textsuperscript{3}. In this sense, it becomes logical to alter aberrant growth patterns promoting maxillary advancement in the same physiologic maxillary displacement direction by using protraction face mask treatment. This movement can be facilitated by rapid maxillary transverse expansion, which disrupts the sutural articulation of the maxilla to 9 bones of craniofacial complex, allowing for a more positive reaction to protraction forces\textsuperscript{19,20}.

As we said before, Class III individuals are well-recognized and perceived to be abnormal by the lay public, as well as by health care practitioners. Concave facial profile is one of the most unattractive facial look, which has a negative impact to normal socializing of those individuals in the community. The facial mask that has been popularized by Delaire is very common at our clinic and, because of all these reasons and big frequency of class III patients, the purpose in our study was to determine sagittal and vertical behaviour of the jaws, and profile convexity changes in Class III growing patients after maxillary protraction treatment.

Figure 1. A. Patient before treatment; B. Delaire facial mask; C. Patient after treatment
Material and Method

The sample consisted of 11 patients (4 females and 7 males), ranging from 6 years 4 months to 12 years of age, who had Class III malocclusion with an anterior cross-bite and a component of maxillary deficiency. The evaluation of the facial profile was 1 of the most important items in our differential diagnosis. Flat or concave profiles, retractive maxillas, and prominent mandibles were included. Cephalometric values were also used, but bearing in mind that those measurements are more realistic in older children with a limited value in younger ones. Generally, children up to 10 years of age present positive angular and linear measurements, which could mislead the practitioner into postponing treatment.

2 radiographs were evaluated, the first was taken before the beginning of the treatment and the second was taken immediately after face mask treatment. The treatment time varied as a result of patients’ compliance, severity of the problem and individual response of the patient to treatment. Mean treatment time was 11 months. The maxillary protraction was performed through a Delaire facial mask (Fig. 1), using elastics with a force delivering of about 350 gm per side. Bands were fitted on first permanent molars and first primary molars in early mixed dentition, or on first premolars in late mixed dentition or early permanent dentition. These bands were joined by a heavy wire to the palatal plane or hyrax rapid maxillary expansion appliance. Another wire was soldered bilaterally to the buccal aspects of the molar bands and first primary molars or first premolars; a hook for elastic traction was extended into the canine region.

Facial mask was adjusted to rest on the forehead and the chin of the patient (Fig. 1). The patients were instructed to wear the protraction mask at bed time for children under the age of 9 and for 14 hours for children over the age of 9. Treatment was discontinued when positive overjet was achieved and no more changes were noted after 3 months. In some patients with posterior cross-bite, before protracting maxilla, rapid maxillary expansion appliance was used, and it was activated every day until achieving correction of the bite posteriorly.

The results obtained with this therapy have been evaluated through pre-treatment and post-treatment lateral radiographs (Figs. 2 and 3). Cephalometric measurements that were used included evaluation of maxillary sagittal relationships (SNA, Co-A point mm), mandibular sagittal relationships (SNB,Co-Gn mm), facial convexity angles and measurements (ANB, N-Pg to A - Fig. 2), and vertical behaviour of the jaws (SN/GoGn,SN/Gn,Sna to Me - Fig. 3).
Results and Discussion

All cephalometric measurements used in this study showed significant changes in sagittal relationships of jaws (Tab. 1), facial convexity angles (Tab. 2) and vertical behaviour of the jaws (Tab. 3).

Changes in the angle between the anterior part of the maxilla and the base of the skull (SNA), when compared pre- and post-treatment cephalograms, showed significant increase (p<0.001) as a result of forward displacement of the maxilla after protraction treatment. Statistically significant difference was noticed in Co-A measurements as well. It is good to know that these cephalometric measurements do not usually change in normal conditions21. The forward displacement of the maxilla with the use of facial mask has proved to be efficient clinically and experimentally15,22,23 in many studies, which confirm our findings.

Results and Discussion

All cephalometric measurements used in this study showed significant changes in sagittal relationships of jaws (Tab. 1), facial convexity angles (Tab. 2) and vertical behaviour of the jaws (Tab. 3).

Changes in the angle between the anterior part of the mandible and the base of the skull (SNB) showed significant decrease after face mask treatment (p<0.005), which is reflection of downward and backward mandible rotation diagnosed by statistically significant increases with Steiner’s analysis24 of angles (SN/GoGn and SN/ Gn) and McNamara’s measurements25 (Sna-Me). From this, we can conclude that it is desirable if patients have deficit in anterior high when protracting maxilla because with downward and forward mandible rotation, as a result of protraction therapy, there is an increase of facial high, which in other case can worsen malocclusion.

After maxillary protraction, significant positive changes were seen in the ANB angle (p<0.001) and profile convexity measurements N-Pg to A (p<0.001), suggesting the fact that forward displacement of the maxilla and mandible retro-position increase facial convexity, thereby improving the facial profile.

Facial attractiveness is very important component in human communication and can also have positive influence in all areas of civilized society. Physical attractiveness or more precisely, facial balance and symmetry, are considered as parameters of how people are perceived by the public, as well as how their own perception is. Negative psychological consequences as a result of facial non-attractiveness from skeletal malocclusions have been documented long time ago26. A study designed to survey facial profile preferences in a sample of 1189 Asian teenagers found that mandibular prognathism was the least favoured of all profiles.
Most Class III malocclusions can be detected early, but still there are many clinicians who are delaying treatment because there is a hope that with growth the problem will cease, there is a fear of treating young children, and also a possibility of relapse exists. The recommended treatment for these patients is usually to wait until the end of the growth period for the combined orthodontic treatment with orthognathic surgery. But aside of this, in Class III patients there is a big motivation for orthodontic treatment because their dentofacial appearance deviates from socio-cultural norms. Therefore, an important objective of accepting maxillary protraction treatment in Class III malocclusion is providing nonsurgical alternative in the treatment and improving the physical-social wellbeing and appearance of the patients, especially during their teenage years.

Conclusion

In summary, results from this study showed sagittal and vertical skeletal changes and improvements in facial profile after maxillary protraction therapy in Class III patients. Mean treatment time was 11 months, and the effect of maxillary protraction treatment was improvement of skeletal sagittal jaw relationship and increase of profile convexity angles, mostly as a result of forward displacement of the maxilla (SNA p<0.001), mandibular retroposition (SNB p<0.005) and clockwise rotation of the mandible, which significantly increases vertical cephalometric angles and measurements (SN/GoGn, SN/Gn, SNA to Me). These findings indicate that concave facial profile in class III patients can be improved after maxillary protraction treatment, which is very important in the teenage period of life for building self confidence and normal socializing in the community.

Even though, the management of Class III malocclusion remains one of the most challenging problems in the clinical practice today; the results from this study support maxillary protraction for correction of Class III malocclusion with deficient maxillary growth.

References


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