

Versatility of Growth Modulation Appliances in Treatment of Skeletal Class II Malocclusions in Growing Individuals

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ABSTRACT

Functional jaw orthopedic appliances have a common effect, forward positioning of the lower jaw. This case report demonstrates treatment of skeletal class II malocclusions in growing individuals using growth modulation appliances. The goal was to match the skeletal bases and achieve pleasing profile with ideal over jet and overbite and correct the class II molar relation. The cases were successfully managed by modulating the growth. Orthopedic appliance, combination pull headgear with activator was used in the first case and in the second case myofunctional appliance, twin block was used. Skeletal corrections were attained at the end of the growth modulation therapy

Key words: Twin block, combi pull headgear, class II malocclusion.

INTRODUCTION

Class II malocclusion can result from a range of skeletal and dental disparities. This variation has led to a spectrum of treatment plans.¹ Growth modulation procedures designed to correct class II division 1 malocclusion includes extra oral traction devices ranging from high pull to cervical pull headgears and a wide variety of intra oral functional appliances like activator, Frankel, twin block or a combination of both extra oral traction and intra oral functional appliances.

Authors report two cases of skeletal class II malocclusion in teenaged girls managed by growth modulation appliances. The first case presented with maxillary prognathism and mandibular retrognathism and was treated with a combination pull headgear with activator. The second case presented with mandibular retrognathism and was treated with a twin block appliance.

CASE REPORTS

Case 1: A 12-year old girl presented to us with forwardly placed upper front teeth.

On extra-oral examination, the girl had a brachyfacial form, convex profile, posterior divergence, potentially incompetent lips with lower lip trap and a deep mentolabial sulcus. Intra oral examination revealed Class II molar relation bilaterally, Class II Division 1 incisor relation, an overjet of 10mm and a traumatic 100% deep bite (**Figure 1**). Skeletal assessment revealed pre pubertal status, skeletal maturity indicator revealed hand wrist maturation in Julian Singer Stage III and cervical vertebrae maturation in Hassel and Farman Stage II.

Cephalometric analysis showed prognathic maxilla and retrognathic mandible with Class II skeletal pattern (ANB of 9°), horizontal growth pattern, forwardly placed and proclined upper and lower incisors (**Figure 1**). Also, orthopantomogram showed unfavourable position of the unerupted maxillary canine that was mesial in angulation.

Treatment plan: Considering the bi-jaw skeletal discrepancy, growth modulation using activator with combination pull headgear was planned (**Figure 2**). The activator was used to correct the mandibular sagittal discrepancy and the combination-pull headgear was placed to restrict forward growth of the maxilla.



Figure 1 Pre treatment extra oral and intra oral photographs, lateral cephalogram and Orthopantomogram (Case 1)

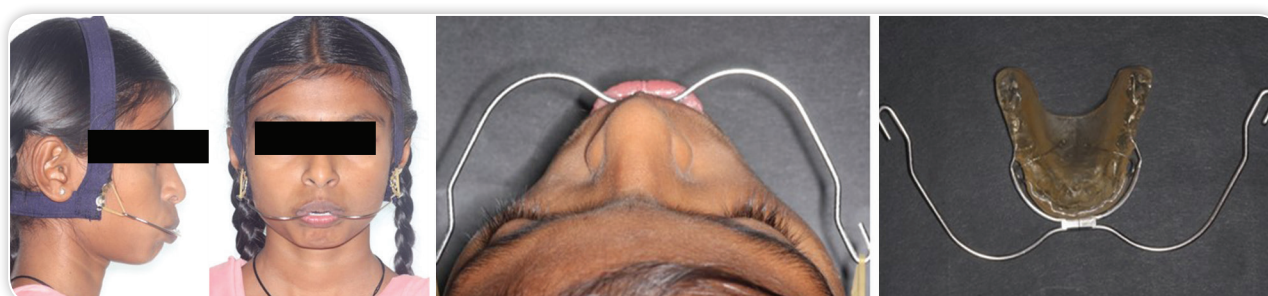


Figure 2 Activator with combination pull head gear with horizontal advancement of 7mm and vertical opening of 3 mm

Construction bite for the activator was taken with 7 mm of horizontal advancement and 3 mm of vertical opening. The inner bow of the face bow was adapted to be embedded in the acrylic block of the activator. Combination pull headgear was used with the force of 300-400 gm per side for 12-16 hours daily. The outer bow and extraoral force were adjusted such that force passed through the center of resistance of maxilla and the maxillary dentition approximately between the root tips of maxillary first and second premolars. The treatment duration was 19 months.

Outcome: Progress records obtained at the end of treatment showed improvement in the ANB angle, class I molar relation with an overjet of 3 mm (**Figure 3**). Cephalometric superimposition (**Figure 4**) revealed a mild decrease in the SNA angle by 2° and increase in the SNB angle by 2°. The ANB angle was reduced by 4°, which showed the restriction of the maxilla and growth of the mandible. The upper incisors were retroclined and lower incisors remained unchanged at the end of the growth modulation.



Figure 3 Post Orthopedic extra oral and intra oral photographs, lateral cephalogram and Orthopantomogram (Case 1)

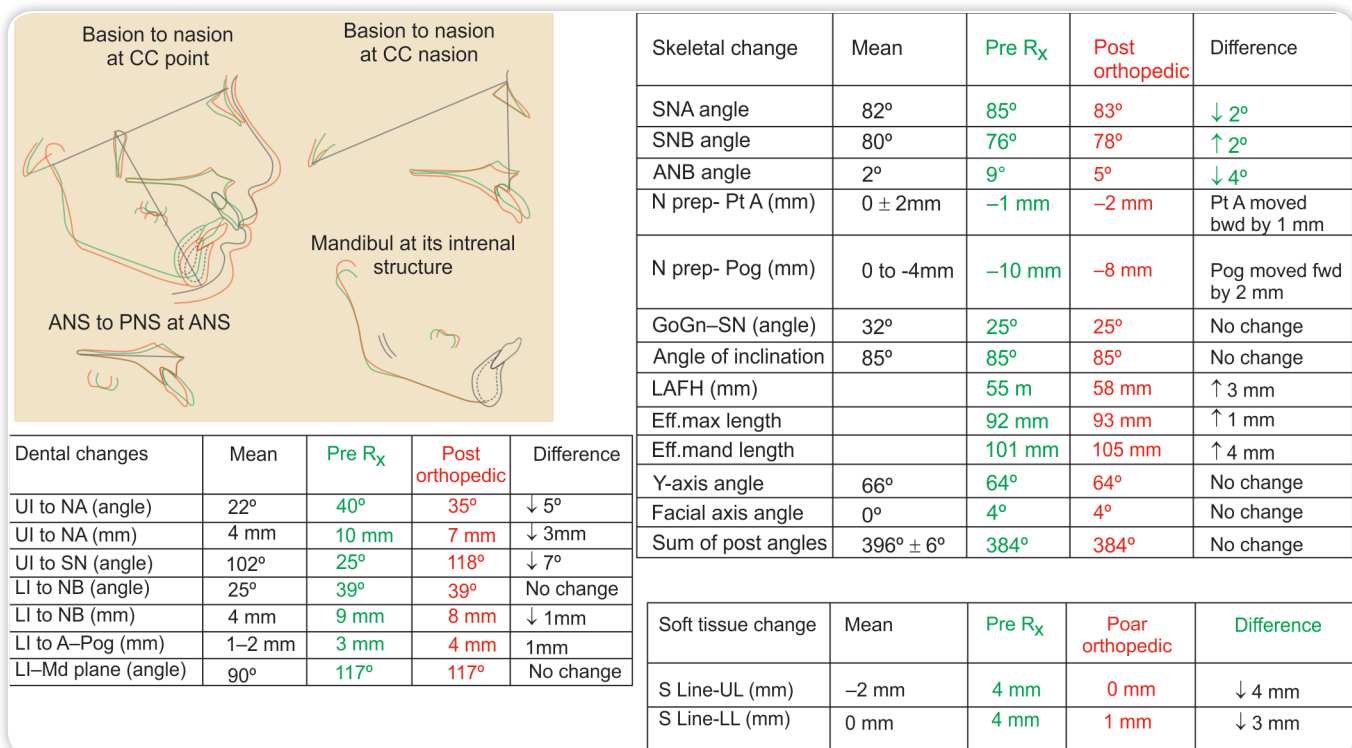


Figure 4 Cephalometric superimposition with composite analysis. (Case 1)

Case 2: A 13 year-old girl presented to us with complaints of forwardly placed upper front teeth. On extra oral examination, the girl had a brachyfacial form, convex profile, posterior divergence, reduced lower anterior facial height potentially incompetent lips with lower lip trap and a deep mentolabial sulcus.

Intra-oral examination revealed Class II molar relation bilaterally, end on canine relation bilaterally, Class II Division 1 incisor relation, an overjet of 12mm and a traumatic 100% deep bite (**Figure 5**). Skeletal assessment revealed pre pubertal status, skeletal maturity indicator revealed hand wrist maturation in Julian Singer Stage IV and cervical vertebrae maturation in Hassel and Farman Stage IV.

Orthognathic maxilla and retrognathic mandible with Class II skeletal pattern (ANB of 8°) with horizontal growth pattern, proclined upper and lower incisors were observed on cephalometric analysis (**Figure 5**).

Treatment plan: Considering the retrognathic mandible, growth modulation with removable twin block appliance was planned (**Figure 6**). The bite registration was taken so that mandible was advanced 5 mm and vertical opening of 5 mm. The treatment duration was 21 months.

Outcome: Progress records obtained at the end of treatment showed class I molar relation with an overjet of 4mm (**Figure 7**). Cephalometric superimposition (**Figure 8**) re-

vealed a mild decrease in the SNA angle by 2° and increase in the SNB angle by 2° . The ANB angle was reduced by 4° , which showed the minimal restriction of the maxilla and favourable growth of the mandible. The upper incisors were retroclined by 11° and lower incisors were flared by 15° at the end of the growth modulation.

DISCUSSION:

The paramount success of growth modulation depends on the timing of treatment, case selection criteria, patient compliance and finally the appliance selection. The optimal time to start the growth modulation is just before or at the peak of the pubertal growth spurt. Since, both the patients were pre pubertal to begin with, the growth modulation produced favorable skeletal and dental effects with good soft tissue response. Class II division 1 malocclusions are generally treated with all four or upper I premolar extractions. If a similar treatment strategy had been carried out, the result would have been more compromised ending in dish profile with imbalance of skeletal and dental tissues with varying soft tissue dynamics.

The first case had class II skeletal problem with prognathic maxilla and retrognathic mandible. Considering the bi jaw discrepancy, activator with combination pull headgear was chosen. The prime benefit of this headgear is its ability to produce an essentially pure posterior translatable force.² The



Figure 5 Pre treatment extra oral and intra oral photographs, lateral cephalogram and Orthopantomogram (Case 2)



Figure 6 Twin block appliance with horizontal advancement of 5mm and vertical opening of 5 mm

combination pull headgear restricts the maxilla in sagittal plane with its effect on other two dimensions also. In this patient, skeletal changes were confirmed by the orthopaedic retraction of the maxillary complex by 2° and Point A moved backward by -1.0 mm when measured vertical to N perpendicular. This

finding is in agreement with Cura et al.³ The mandible showed 2 mm of anterior displacement and increase in the SNB angle by 2° .

The second case had class II skeletal problem with retrusive mandible. Considering the positive visual treatment objective twin block was chosen. Visual treatment objective is an important chair side clinical maneuver that gives clue to the physician as to whether or not the functional appliance therapy that postures the mandible forward will improve the facial appearance and profile. The appliance constitutes of upper and lower bite blocks inclined at each other that helps in mandibular forward positioning of the mandible. The skeletal changes showed an increase in the SNB angle by 2° . Pogonion moved forward by 3 mm when measured vertical to N perpendicular. This can be related to changes in the condylar glenoid fossa complex: remodeling and anterior relocation of the glenoid fossa may have contributed to the correction of the skeletal Class II malocclusion which can also be appreciated by the superimposition of pre and post functional radiographs.⁴

Several studies have shown that twin-block produces retroclination of maxillary incisors and proclination of the mandibular incisors.⁵ Similar combined findings have been observed in our patient. The maxillary incisors retroclined by 11° (U1-NA) and the mandibular incisors proclined from 22° to 37° (L1-NB).

Short-term skeletal effects include a minimal restriction in forward maxillary growth with a mild headgear like effect and forward positioning of B point with functional appliances, leading to an ANB improvement in Class II patients with either appliance. Similar results were obtained in our study with the use of activator with combination pull headgear and twin block.⁶ These patients are advised to undergo second phase of fixed appliance therapy to finish and detail the occlusion following the first phase.

CONCLUSION

The diagnosis and treatment planning plays an utmost role in the success of treating a malocclusion. It is the ability of the clinician to decide which appliance to use and is best for the malocclusion and when to start the treatment for a specific malocclusion.

In Class II malocclusions in growing individuals with prognathic maxilla, head gear appears to be the appliance of choice while in class II malocclusions in growing individuals with retrognathic mandible and positive visual treatment objective, growth modulation using functional appliances can be performed.



Figure 7 Post functional extra oral and intra oral photographs, lateral cephalogram and Orthopantomogram (Case 2)

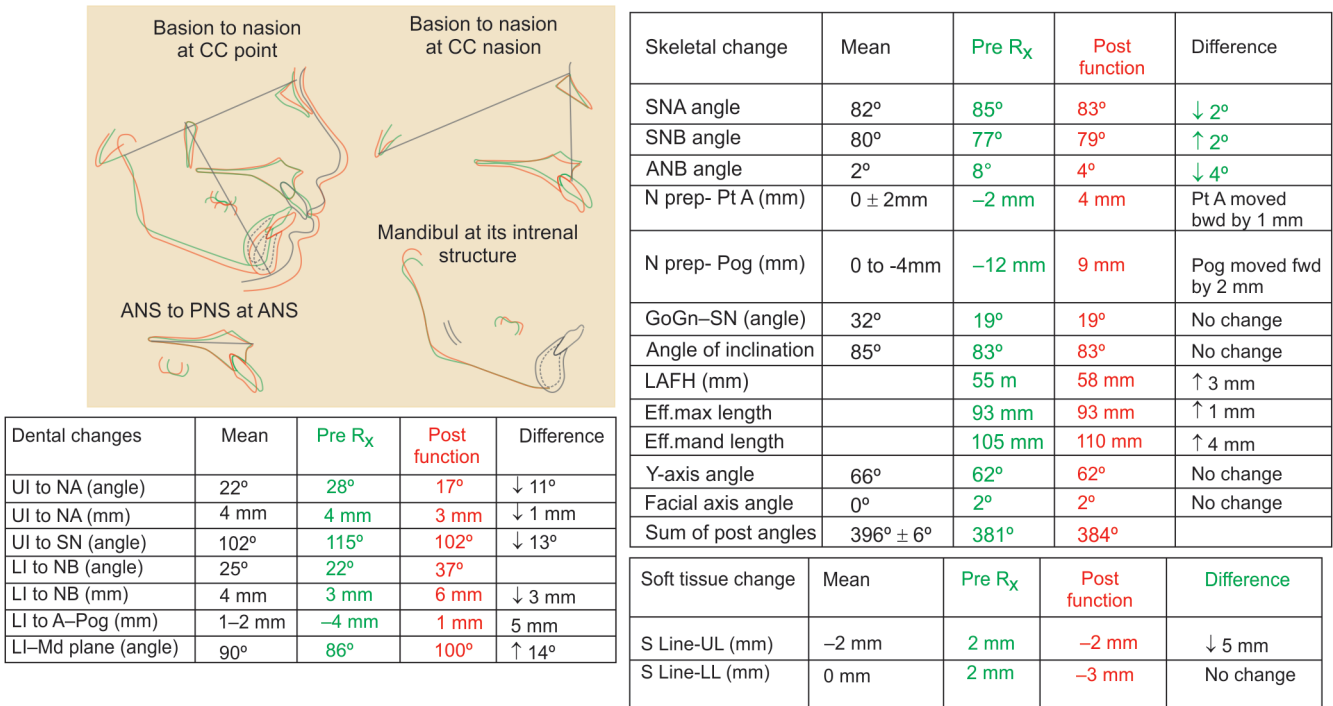


Figure 8 Cephalometric superimposition with composite analysis (Case 2)

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