

Review Article

“Growth Modification in Class II Malocclusion: A Review”

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Class II malocclusion is the condition in which the mandibular first molars occlude distal to the normal relationship with the maxillary first molar. The etiology of class II malocclusion varied between skeletal, soft tissues, dental factors and habits. Skeletal class II could be because of protrusion of maxilla, retrusion of mandible and combination of both. The treatment modalities of any skeletal problem include Growth modification, Dental camouflage and Orthognathic surgery. The optimal time for treatment of patients with Class II malocclusions therapy should be initiated at the beginning of cervical vertebrae maturation stage CS3 to maximize the treatment effects. Age of treatment is approximately 8-14 years. The growth modification of moderate to severe skeletal class II malocclusion can be done by head gear, bionator, activator, twin block, herbest appliance, Frankel II regulator. The ultimate goal of growth modification depends on treatment timing, length of treatment, working mechanism of appliance, patient's skeletal and dental condition we want to treat and the compliance of the patient.

Introduction

Edward Angle in 1899 defined class II malocclusion as the condition in which the mandibular first molars occlude distal to the normal relationship with the maxillary first molar. He further divided it into two divisions:

division 1 in which maxillary incisors protruding, division 2 in which the maxillary incisors retruding. On the other hand the British Dental Institute in 1983 defined class II as the condition in which the lower incisor edges lie posterior to the cingulum plateau of the upper incisors which are proclined or of average inclination and there is an increase in overjet^{1,2}.The etiology of class II malocclusion varied between skeletal, soft tissues, dental factors and habits and the prevalence of class II

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is high, according to angles he estimated about 27% of malocclusion could be classified as class II, while according to the NHANES 33% class II discrepancies. Class II malocclusion mostly accompanied by skeletal discrepancies². Skeletal class II could be because of protrusion of maxilla, retrusion of mandible and combination of both. Another interesting statistics we have to mention it that is according to McNamara 75% of class II skeletal discrepancies are the result of mandibular retrognathia. The treatment modalities of any skeletal problem include Growth modification, Dental camouflage and Orthognathic surgery¹.

Methods of growth modification

The optimal time for treatment of patients with Class II malocclusions therapy should be initiated at the beginning of cervical vertebrae maturation stage CS3 to maximize the treatment effects. There are many methods to predict growth potential like hand wrist and cervical vertebrae radiographs, sequential Cephalogram as well as talking with the children parents about the growth potential. Age of treatment is approximately 8-14 years.

Class II malocclusion can be treated according different treatment protocols, characteristics of the problem, such as antero posterior discrepancy, age and patient compliance. Both 1-phase and 2-phase treatment protocols are considered effective approaches for correcting a Class II malocclusion^{3,4}. The 1-phase treatment begins after the emergence of the second molars with fixed appliances associated with Class II inter maxillary elastics and extra oral appliances, and the 2-phase treatment start in the mixed dentition with functional appliances, and is followed by a second phase with fixed appliances for completion of the treatment.

The growth modification of moderate to severe skeletal class II malocclusion can be done by head gear, bionator, activator, twin block, herbest appliance, Frankel II regulator. Head gear is used for delivering a posteriorly directed extra oral force to the maxilla². The result is to

suppress or restrict normal downward and forward maxillary growth while the mandible continues to grow. The intention is for the mandible to "catch up" with the maxilla, correcting the anteroposterior skeletal discrepancy¹

Dento alveolar changes of headgears tend to distalize and intrude or reduce the eruption of the maxillary Molars⁵ and extrusion of the mandibular incisors. . The soft tissue profile changes were a correction of facial convexity, and an increase in lower anteroposterior, and lower vertical soft tissue dimensions. The mentolabial fold depth also significantly decreased.

Functional appliance is designed to position the mandible downward and forward to stimulate or accelerate mandibular growth. Functional appliances remove abnormal and restrictive muscular activity that prevents the normal development of the maxilla and mandible. Functional appliances alter muscle tension or reduced condylar tissue pressure on the condyle leading the mandibular condyle out of the fossa which cause additional growth (remodeling of the glenoid fossa more anteriorly). The effect on the maxilla is small however it is observed that it restrains maxillary growth^{1,2}.

Dento alveolar effects of functional appliances are retroclination of upper incisors and greater effect in proclination of lower incisors^{1,2}. In fixed appliances like fixed twin block or Herbst the dental effect is much more because of the continuous force applied moreover Herbst cause posterior dental intrusion. Functional appliances can be helpful in leveling Curve of Spee by extrusion of lower posterior teeth and inhibit lower incisors from erupting.

Twin block was developed by Clark in 1977 which can be removable or fixed. It consists of two components, an upper and lower unattached plates that fit tightly against the teeth, alveolus. Now a days twin block is widely used for class II malocclusion within a forward growth repositioning of the mandible, inhibition in maxillary growth, increase anterior and posterior facial height distalization of maxillary molars, extrusion of mandibular molars and tipping of anterior incisors and supporting structure⁶.

Patients can wear twin block 24 hours a day and can eat comfortably with the appliance. There is less interference with normal function because the mandible can move freely in anterior and lateral excursion without being restricted by bulky one-piece appliance. Patient's speech is normal as tongue movement is not restricted, as well as patient appearance and profile is noticeably improved immediately which is an excellent patient motivator. Twin block can correct class II malocclusion within 6 to 9 month period^{1,2,6,7}

Retention after functional appliance or head gear

We have to consider three important things when we want to stop the treatment with headgear or functional appliance. First the age of the patient how long still he has from his active growth period. Second before we stop the treatment to achieve over correction to maintain the results we got and to prevent relapse. Third point is to consider whether we will start the phase two treatment or not. It is a rule after any orthodontic treatment we have to stop it gradually to maintain what we gain, here also in head gear and functional appliance we have to stop it gradually by decreasing the time we ask the patient to wear before^{1,2,8}. The Hawley is worn full-time and the extra oral force is added at night with a force of about 500 gm per side. Orthopedic retention may be instituted at night for as long as 2 to 5 years. Retention is even more important in those patients who have not achieved a solid Class I molar relationship during phase 1. Full-time wear of a retention appliance with nighttime wear of a headgear attached to the appliance may yield better retention results.

Discussion

As we know the prevalence of class II Malocclusion is high and it is most often associated with skeletal jaw discrepancies either mandibular deficiency or maxillary excess or

both. Functional appliances have become part of contemporary orthodontic practice; however, their mode of action is still controversial. The ability of functional appliances to reduce over jets by means of modifying dental relationships (incisor angulations and position) is not in dispute. The controversy surrounds the ability of the appliances to increase mandibular growth, and thus result in a long-term change in the skeletal pattern^{9,10}. There is also a lot of controversy about which appliance to use and the real effect. We have to emphasize that it is because lack of proper research and statistics, also one of the problems that cephalometric measurement we cannot fully depend on it because as an example point B will not move just anterior posterior but also vertically. Recently the invention of the new 3 dimensional x-ray could help us in the future researches to measure properly the effect of all the appliances and to avoid errors. A number of studies have looked into the possibility of modifying growth with orthopedic appliances. Some retrospective studies demonstrated some average modest increase in mandibular growth 2-4 mm per year during treatment with functional appliances. Other investigators, however, did not consider the effect of functional appliances on quantitative lengthening of the mandible to be clinically significant¹¹. Koehn stated that the cervical headgear therapy with an elevated external bow and an expanded inner bow is a very useful appliance in correcting skeletal Class II in the late mixed –early permanent dentition because of the potential to displace the entire maxilla posteriorly down and back, on the cranial base and to give a vastly improved antero posterior jaw and dental relationship in the skeletal Class II patient¹⁰.

Profit stated that skeletal change without dental movement is usually desired but not possible for a tooth borne appliance to selectively alter skeletal relationships without dental change^{2,12}. A study to evaluate the treatment changes associated with the bionator and the removable headgear borne appliance to selectively alter skeletal relationships without dental change^{2,12}. Ghafari et al found that both the headgear and function regulator are effective in correcting the Class II, Division I malocclusion of pre pubertal children. The common mode of action of these

appliance is the possibility to generate differential growth between the jaws. Activator and high-pull headgear combination treatment in growing patients resulted in a correction of the skeletal Class II relationship, a restriction of maxillary growth, an advancement of the mandibular structures, an increase in lower face height, a correction of the overjet, an improvement in overbite, up righting of the maxillary incisors, protrusion of the mandibular incisors, and a correction of the dental Class II malocclusion. An intrusive and distal force can be applied to all the erupted maxillary teeth if a standard face bow is attached directly to a maxillary acrylic splint or a functional appliance^{2,13}

Proffit stated that functional appliance could just accelerate the growth.. In general as we can see headgear will restrict maxilla while functional appliances will enhance the mandible. Growth modification could not just ease phase 2 treatments but also will help in the open bite and deep bite cases. Proffit suggest methods of treatment by combining the interaction of vertical and horizontal plane in treatment plan according to that¹:

A) In short face skeletal deep bite class II: Here our objective will be to inhibit eruption of incisors teeth, control and facilitate eruption of the lower posterior teeth. So the goal is to increase face height and correct deep bite while allowing more eruption of lower than upper so occlusal plane rotates up posteriorly. This can be treated by functional appliance, like activator-bionator or herbest as a fixed appliance.

B) In class II children with normal face height: Here both head gear and functional appliances can be used.

C) In long face skeletal open bite class II: Most effective treatment is the combination of head gear and functional appliances.

Conclusion

The awareness of general dental and orthodontic treatment among the patients and their parents has increased. Now we are trying not just to treat teeth only, we are trying to improve the facial

profile taking the advantage of the growth potentials of the children. The ultimate goal of growth modification depends on treatment timing, length of treatment, working mechanism of appliance, patient's skeletal and dental condition we want to treat and the compliance of the patient.

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