

# Vertical activator—Does the growth vector change?? A Case Report

Dr Eshan Awasthi<sup>1</sup>, Dr Pallav Ghoshal<sup>1</sup>, Dr Abhilasha Goyal<sup>1</sup>, Dr Sharad Awasthi<sup>2</sup>

\* Department of Orthodontics, Sharad Pawar Dental College, Wardha, Maharashtra

\*\* Department of Orthopedics, Late Lakhiram Agrawal Memorial Medical College, Raigarh, C.G

**Abstract-** Class II malocclusions are one of the most frequently encountered conditions in orthodontic faculty. Growing Class II malocclusions are treated by functional appliances when the component involved is mandibular retrognathism. Variety of functional appliances are used depending in the age of the patient, type of malocclusion, severity of malocclusion & patient compliance. The current case is of a 12 year old male patient with a Class II malocclusion due to mandibular retrognathism & a clockwise rotating mandible excessive overjet & overbite, convex profile. The objective of the treatment was to correct sagittal discrepancy and also redirecting the growth vector from clockwise rotating to closing the mandible. The treatment was two phased with phase I in which a vertical activator was given which patient wore for 14 months followed by phase II fixed mechanotherapy for stabilizing the occlusion which lasted for 12 months. The sagittal improvement was seen with mandibular growth stimulation and also the closure of mandibular plane was observed. Maxillary incisors showed slight retrusion with labial flaring of lower incisors. Significant improvement in overjet, overbite & profile was seen and the results were stable six months post retention.

**Index Terms-** Class II malocclusion, functional appliances, activator

## I. INTRODUCTION

Class II malocclusions are one of the most commonly occurring problem encountered by orthodontists.[1] Extraoral appliances in headgears or functional appliances are used for treatment of growing Class II malocclusion depending on the malocclusion. Either by restraining the maxillary growth or stimulating the mandibular growth the aim is to reduce the overjet & sagittal skeletal discrepancy. For stimulating the mandibular growth variety of functional appliances have been proposed including Robin's monoblock, Activator, Bionator, Twin block & Frankel's regulator.[2] The effect of these functional appliances is that by holding the deficient mandible forward mandibular growth can be stimulated by inducing bone growth at condylar level.

The activator provides greater contact are with the mandibular teeth & lingual mucosa and thus effective in stimulating patient to position the mandible forward.[1] In addition to growth modulation the effects of activator include lower incisor proclination & upper incisor retroclination resulting in decrease in overjet. The activator loads on lingual surface of lower incisors & can procline them gradually because of

reciprocal intermaxillary traction while the patient occludes in construction bite. The acrylic framework of activator provides contact with all teeth & posterior erupting teeth can be guided mesially or distally with selective grinding of acrylic framework. Activator can be used to change dental relationship in all three planes of space. [1]

## II. MATERIAL & METHOD

### 2.1 CASE PRESENTATION:

The current case is of a 12 year old male patient who reported to our orthodontic clinic with the chief complaint of forwardly placed upper front teeth. The patient was in an early permanent dentition stage with an excessive overjet of 7mm & complete overbite. Class II molar relationship on left side & Class I on right side.( Figs 1a-e)

Cephalometric analysis showed a Class II skeletal base due to retrognathic mandible.(Fig 3) The mandibular plane angle was clockwise rotated & no excess gum show on smiling. Arches were well expanded. The profile of the patient was convex with incompetent lips & recessive chin.

Since the patient was growing with growth potential in hand, we decided to go for a two phase treatment with phase I being growth modulation therapy using an activator followed by phase II fixed mechanotherapy. Since the patient was a vertical grower, an activator with high construction bite was fabricated to not only correct the sagittal relationship but also changing the growth vector from vertical to more towards average. The aim of phase I treatment was to correct class II molar relationship, overjet & profile followed by phase II good interdigitation.

### 2.2 TREATMENT PROCEDURES:

After the loose fitting appliance delivery, the rough areas were smoothed & trimming was not done since patient being a vertical grower.(Fig 6) The patient wore the appliance for 14 months & at the end of Phase I the patient showed improved facial profile bilateral Class I molar & canine relationship. Superimposition of pre treatment & post treatment (Fig 5) revealed that mandible had grown forward & upward i.e. closure of mandible which was favourable for downward growing mandible. After active phase I treatment phase II treatment was initiated. An 0.018" x 0.025" pre-angulated edgewise appliance was placed for full mouth fixed orthodontic stage treatment. With the progression of wire 0.014" Niti, 0.016" Niti, 0.016" SS, 0.016" x 0.022 " Niti, 0.16" x 0.022 SS wire and proper wire bending, a good occlusion with ideal overjet, overbite was achieved.(Fig 2a-e)

### III. TREATMENT RESULTS

Six months after debanding & debonding, patient still retained good occlusion with a bilateral Class I molar & canine relationship, good facial proportions & straight profile. The maxillary findings remained stable, SNB changed from 69° to 73°, mandibular plane angle closed from 30° to 27°. (Fig 4). Upper & lower incisors remained stable post treatment when compared to pre treatment. (Table No. 1)

### IV. DISCUSSION

The discrepancies between jaws in the development of stomatognathic system plays an important role in development of Angle's Class II division malocclusions. [3] Studies have revealed that the majority have a component of mandibular deficiency. [4] Changing the function of the mandible by forcing the patient to function with the lower jaw forward could stimulate mandibular growth thereby correcting a Class II problem. [5] Functional appliances are of greatest clinical benefit in actively growing patients. [6]

In this case an activator with high construction bite was given to the patient not only for sagittal correction but also to change the downward growing growth vector of mandible to close. The ANB showed a significant decrease and the reason being stimulation of mandibular growth. When patient wore the appliance muscular forces generated by forward positioning of mandible was transferred to maxillary & mandibular teeth through the acrylic body & labial bow. These teeth which were transmitted through the bone & periosteum produced restraining effect on forward growth of maxilla.

Harvold & Vargervik indicated that at the end of activator treatment, the height of posterior mandibular alveolar processes increase and as a result posterior mandibular rotation occurs. [7] In our case the mandibular angle closed due to increase in condylar growth. Nelson et al when used Harvold appliance found increase in gonial angle attributing to posterior displacement of articulare. [6] Posterior fossa displacement through spheno-occipital synchondrosis has also been cited as an important factor. [8] De Vincenzo et al recorded significant increase in effective mandibular length in his treatment group. [9] On the contrary, some authors claim that mandible does not grow in length with usage of functional appliances. [10], [11]

A significant decrease in overjet was seen with mandibular forward growth & less of dental changes. Reey & Eastwood claim that the reason for decrease of overjet is the stimulation of forward growth of mandible, in addition to retraction of upper incisors. [12] Upper incisors in our patient showed some amount of retrusion which was similar to findings of Tumer & Gultan. [3] Lower incisors showed proclination of some degree as was seen by De Vincenzo, Vargervik, Harvold and Meach. [9], [10], [13]

In most of the studies, a response to the anterior displacement of mandible occurs within the dental arch. The force returning the mandible to its original position is transmitted by the appliance & its labial bow to maxillary dentition & particularly to maxillary incisors.

So the possible mechanism for the activator in correcting Class II malocclusion includes: retardation of maxillary growth, encouragement of mandibular growth, maxillary incisor lingual

tipping, mandibular incisor labial tipping & remodelling changes in temporomandibular joint.

### V. CONCLUSION

The study clearly showed that the changes which were brought about by the activator were:

1. Stimulation of mandibular growth & the correction of Angle's Class II malocclusion.
2. Closure of mandibular plane angle by change in the growth vector from clockwise to being closed
3. Reduction in facial convexity, overjet, overbite & a pleasant facial profile
4. Upper incisors retrusion and slight proclination of lower incisors.

### ACKNOWLEDGMENT

We would like to thank Dr Sunita Shrivastav, Prof. & Head, Dept of Orthodontics, SPDC Wardha, Dr R.H Kamble, Prof, Dept of Orthodontics, SPDC Wardha and Dr Narendra Sharma, Asso. Prof, Dept Of Orthodontics, SPDC Wardha for their support and guidance.

### REFERENCES

- [1] Tsai, Yao and Chang "Treatment of Class II malocclusion with an activator", Chin Dental Journal, vol 21, No. 3
- [2] Bishara, Ziaja "Functional appliance, A review", Am J Orthod Dentofacial Orthop, 95: 250-258, 1989
- [3] Tumar and Gultan "Comparison of the effects of monoblock and twinblock appliances on the skeletal and Dentoalveolar structures", Am J Orthod Dentofacial Orthop, vol 116: 460-468, 1999
- [4] McNamara Jr "Components of Class II malocclusion in children 8-10 years age", Angle Orthod, 51:177-202, 1981
- [5] Proffit, Fields "Contemporary orthodontics 2nd ed. St. Louis: Mosby; 1993. p 423-33
- [6] Nelson, Harkness, Herbison "Mandibular changes during functional appliances treatment", Am J Orthod Dentofacial Orthop, 104: 153-161, 1993
- [7] Harold, Vargervik "Morphogenetic response to activator treatment" Am J Orthod Dentofacial Orthop, 60: 478-90, 1971
- [8] Graber, Rakosi, Petrovic "Dentofacial orthopaedics with functional appliances", 2nd ed. St. Louis: Mosby; 1997
- [9] De Vincenzo, Huffer, Winn "A study in human subjects using a new device designed to mimic the protrusive functional appliances used previously in monkeys", Am J Orthod Dentofacial Orthop 91:213-24, 1987
- [10] Vargervik, Harvold "Response to activator in Class II malocclusions", Am J Orthod Dentofacial Orthop 88:242-51, 1985
- [11] Weislander, Lagerstrom "The effect of activator treatment on Class II malocclusion" Am J Orthod Dentofacial Orthop 75: 20-6, 1979
- [12] Reey, Eastwood "The passive activator: case selection, treatment response and corrective mechanics" Am J Orthod Dentofacial Orthop 73:378-409, 1978
- [13] Meach "A cephalometric comparison of bony profile changes in Class II, division 1 patients treated with extraoral force and functional jaw orthopaedics" Am J Orthod Dentofacial Orthop 52:353-70, 1966

**AUTHORS**

**First Author** – Dr Eshan Awasthi, Senior lecturer (Corresponding author), Department of Orthodontics, Sharad Pawar Dental College, Wardha, Maharashtra, eshaan.awasthi33@gmail.com

**Second Author** – Dr Pallav Ghoshal, Senior lecturer, Department of Orthodontics, Sharad Pawar Dental College, Wardha, Maharashtra, pallav.ghoshal@gmail.com

**Third Author** – Dr Abhilasha Goyal, Senior lecturer, Department of Orthodontics, Sharad Pawar Dental College, Wardha, Maharashtra, abby.rockz@gmail.com

**Fourth Author** – Dr Sharad Awasthi, Associate Professor Department of Orthopedics, Late Lakhiram Agrawal Memorial Medical College, Raigarh, C.G, drsharadawasthi@gmail.com

**Table No. 1**  
**Cephalometric comparison**

	Pre treatment	Post treatment
SNA	78°	78°
SNB	69°	73°
ANB	9°	5°
Effective mandibular length	104mm	108mm
Mandibular plane angle	30°	27°
Upper incisor to NA	23°	22°
Lower incisor to NB	28°	30°

**List of figures:**

Figure 1a-1e – Pre treatment photographs

Figure 2a-2e—Post treatment photographs

Figure 3—Pre treatment lateral cephalogram

Figure 4—Post treatment lateral cephalogram

Figure 5-- Superimposition

Figure 6-- Activator



Figure 1a

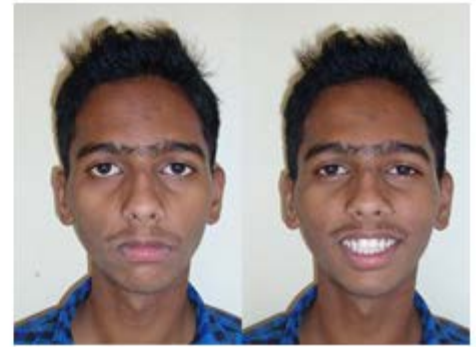


Figure 2a



Figure 1b



Figure 2b



Figure 1c



Figure 2c



Figure 1d



Figure 2d



Figure 1e



Figure 2e



Figure 3



Figure 4

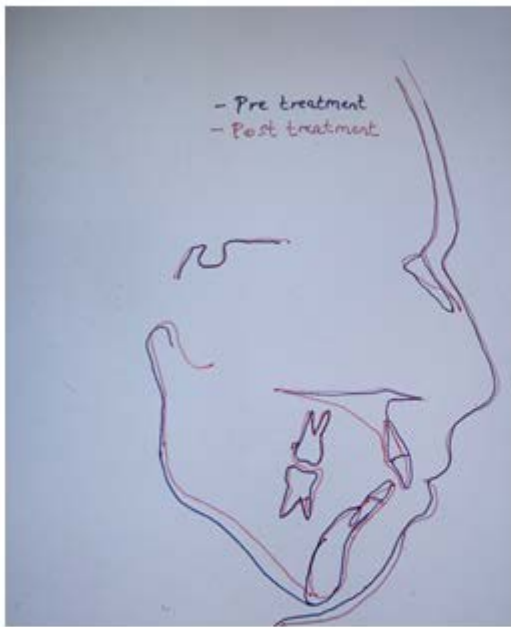


Figure 5



Figure 6