

Stepwise Advancement in a Removable Twin Block for the Treatment of Class II Div 1 Malocclusion with Laterotrusion- A Case Report

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ABSTRACT

Class II malocclusions can manifest in various skeletal and dental configurations in which deficiency in anteroposterior position of the mandible is most common. Purpose of orthopaedics is to modify the pattern of facial growth and the underlying bone structure of the face during growth periods by changing functional muscle environment. Functional appliance therapy eliminates unfavorable developmental factors and reprograms the muscle engram according to McNamara and Clark. The clinical cases shown here are examples of these. The mandibular advancement is either done in single advancement or stepwise. Single advancement more than 5mm causes unnecessary strain as stated by Rabie et al. in 2002. Laterotrusion and laterognathia need to be differentiated in the patient (if present) at the time of recording of postural rest position. Laterotrusion is manageable through functional appliances while laterognathia is not.

Keywords: Twin-block, Class II, myofunctional, mandibular advancement, retrognathia.

INTRODUCTION

According to Angle, if the mandibular 1st molar occludes in distal relationship to the maxillary 1st molar such that the distobuccal cusp of upper 1st molar

lies in the buccal groove of mandibular 1st molar, then it is said to be in dental class II relationship. Such a relationship of maxillary occlusal force on the mandibular teeth in normal function has a distal component of force that is unfavourable to nocturnal forward mandibular development¹. In such cases mandible needs to be brought forward by jumping the bite if the growth still persists^{2,3,4}. Twin block is one such myofunctional appliance. Its indications and contraindications are given in Table 1. The philosophy of twin block lies in occlusal inclined plane. The function of its different component is given in Table 2^{1,2,5,6}. Twin block works primarily by changing the form because of which functional adaptation takes place secondarily. All this leads to neuromuscular adaptation which along with the patient compliance leads to success of the functional appliance^{7,8,9,10}. In this article, we describe 2 cases. Case 1 is of a 12-year-old girl with class II div 1 malocclusion and latero-occlusion (laterotrusion) treated by Twin block. Case 2 is of a 14 yr old male patient with the same malocclusion (without any laterotrusion or laterognathia) treated with similar appliance to achieve class I occlusion.

Table 1 : Indication and Contraindication of TWIN BLOCK

INDICATIONS	CONTRAINDICATIONS
<ul style="list-style-type: none"> • Growing patient (near growth spurt) • Well aligned arches with minimal crowding • Skeletal class II with normal maxilla and retrognathic mandible. • Full cusp class II • Properly torqued maxillary and mandibular incisors • 10-12 mm of overjet with deepbite • Positive VTO 	<ul style="list-style-type: none"> • Crowding that require extraction • Negative VTO

Table 2: Component of Twin block with its function

COMPONENT	FUNCTION
1. Delta clasp (maxillary 1 st molars, mandibular 1 st premolars)	Improved retention, Minimal adjustment, Reduces metal fatigue.
2. Labial bow (maxillary anteriors)	Overcorrection of incisor angulation acts as a barrier and limits functional correction by mandibular advancement.
3. Occlusal bite block	Guide the mandible forward.
4. Ball end clasp	Retention

DIAGNOSIS AND ETIOLOGY

The patient was a 12-year-old girl having class II div 1(end-on molar right side, class II left side) dental relationship of permanent dentition with a 9.5mm overjet, 2mm mandibular midline shift towards left side, overbite of 5mm, 3mm of curve of spee, constricted maxillary arch and mild crowding in lower arch. All the teeth were erupted except the 3rd molars as shown in pre-treatment photographs (Fig-1) Clinical evaluation showed bilaterally symmetrical face ,mesoprosopic facial pattern, Convex profile with posterior divergence, retrognathic mandible and competent lips. The path of closure of mandible was normal

without any deviation.VTO was found to be positive (Fig-2).

Lateral cephalometric (Fig-3) evaluation showed patient in CVMI stage 3 with class II skeletal malocclusion(ANB-4°), increased angle of convexity(14°), proclined mandibular incisor(Md1-OP, 23°; Md1-Mp, 9°; Md1-APog, 4mm; Md1-NB, 7mm), proclined maxillary incisors(Mx1-APog, 10mm; Mx1-SN, 114; Mx1-NA, 6mm), hypodivergent patient (FMA -19°, Jarabak ratio-66.8%) with decreased lower anterior facial height(51%). Bjork analysis showed large saddle angle (132°) which indicated posterior condylar position with mandible placed posteriorly with respect to cranial base and maxilla.



Fig 1: PRE-TREATMENT PHOTOGRAPHS



Fig 2: PROFILE PHOTOGRAPHS SHOWING POSITIVE VTO



Fig 3: PRETREATMENT LATERAL CEPHALOGRAM

TREATMENT OBJECTIVES

- Correction of molar relationship
- Correction of maxillary constriction and midline deviation.
- Establishment of normal overjet and overbite.
- Achieve an optimum functional occlusion with acceptable esthetics

TREATMENT PLANNING

Myofunctional appliance followed by fixed mechanotherapy to correct latero-occlusion. Patient did not want any fixed appliance and agreed to accept the changes obtained through the removable functional appliance only.

TREATMENT PROGRESS

Bite registration was done with sagittal advancement of 5mm. The cast was

articulated along with the after which wire bending and wax-up was done as shown in Fig-4. Expansion screw was placed in the maxillary cast for the expansion of maxillary arch in order to achieve proper articulation of the posterior maxillary section with broader posterior mandibular segment after bite jumping. Twin block was then fabricated and delivered to the patient as shown in Fig-5. The treatment phases are shown in Table 3. After active phase (Fig - 6) of treatment, the patient was kept on supportive phase for 6 months for eruption of molars and premolars. The aim of support phase is to maintain the incisor relationship until buccal occlusion is established.²For this the blocks are completely trimmed off and anterior inclined plane is made as shown in Fig-7.

Table 3: TREATMENT PHASES OF TWIN BLOCK WEAR

Treatment phases	Work Done
<u>ACTIVE PHASE(9 months)</u>	
1. After 7 days of appliance delivery	Expansion of maxillary arch started with 1 turn/week.
2. After 14 days of appliance delivery	Trimming of maxillary block done occluso-distally (1mm).
3. After 2 months of active trimming, sequential advancement of 3mm done.	Active phase of treatment continued with 1mm trimming/month.
4. Active phase continued	Trimming continued
<u>SUPPORT PHASE(6 months)</u>	
Maxillary anterior inclined plane	Eruption of molars and premolars
<u>RETENTION PHASE(6 months)</u>	
Maxillary anterior inclined plane	Reduction of appliance wear with time



Fig 4: ARTICULATION AFTER WIRE BENDING AND WAX-UP



Fig 5: APPLIANCE DELIVERY(Active Phase)



Fig 6: AFTER ACTIVE PHASE



Fig 7: SUPPORT PHASE

TREATMENT RESULTS

An excellent esthetic and functional outcome was achieved through removable Twin-block. The overall profile and other intraoral changes are shown in Fig-8,9,10. The changes involving the dentition are summed up in Table-4 and 5.

Table 4: TREATMENT RESULTS OBTAINED

Model evaluation	PRE	POST
Intercanine width		
maxilla	34 mm	35 mm
mandible	27mm	28 mm
Interpremolar width		
maxilla	41mm	43.5mm
mandible	36 mm	37mm
Intermolar width		
maxilla	46 mm	50 mm
mandible	41mm	43 mm
Midline discrepancy	2mm(mandibular) towards left	0 mm (Coincedent)
Overjet	9.5 mm	3 mm
Overbite	5mm	4 mm
Curve of spee	3mm	2 mm

Table 5: CEPHALOMETRIC READINGS

CEPHALOMETRIC ANALYSIS

TWEED'S	Pre	Stage	NORMAL
FMA	19°	21°	25°
IMPA	99°	98°	90°
FMIA	62°	61°	65°

DOWN'S	Pre	Stage	NORMAL	SOFT-TISSUE ANALYSIS	Pre	Stage	NORMAL
Facial Angle	80°	84°	87.8° (82-95)	Steiner's Upper lip	1 mm	0 mm	0 mm
Angle of convexity	14°	9°	0° (-8.5-10)	Steiner's Lower lip	-4 mm	-1 mm	-2 mm
AB Plane angle	-5°	+2°	-4.6° (0 to -9)	Rickett's "E"line(upper)	-2 mm	-4 mm	-4 mm
"Y" Axis	69	66	59.4° (53-66)	"H" Angle	19°	11°	10°(7-15)
ANB	4°	2°	2°	L. lip to "H" line	3 mm	1 mm	1-2mm
SND	70°	74°	76°	Inf. Sul to "H" line	10 mm	6 mm	5mm

FUNCTIONAL ANALYSIS

Maxillary base	48 mm	48 mm
Mandibular base	70 mm	72 mm
Width Ascending Ramus	57 mm	60 mm

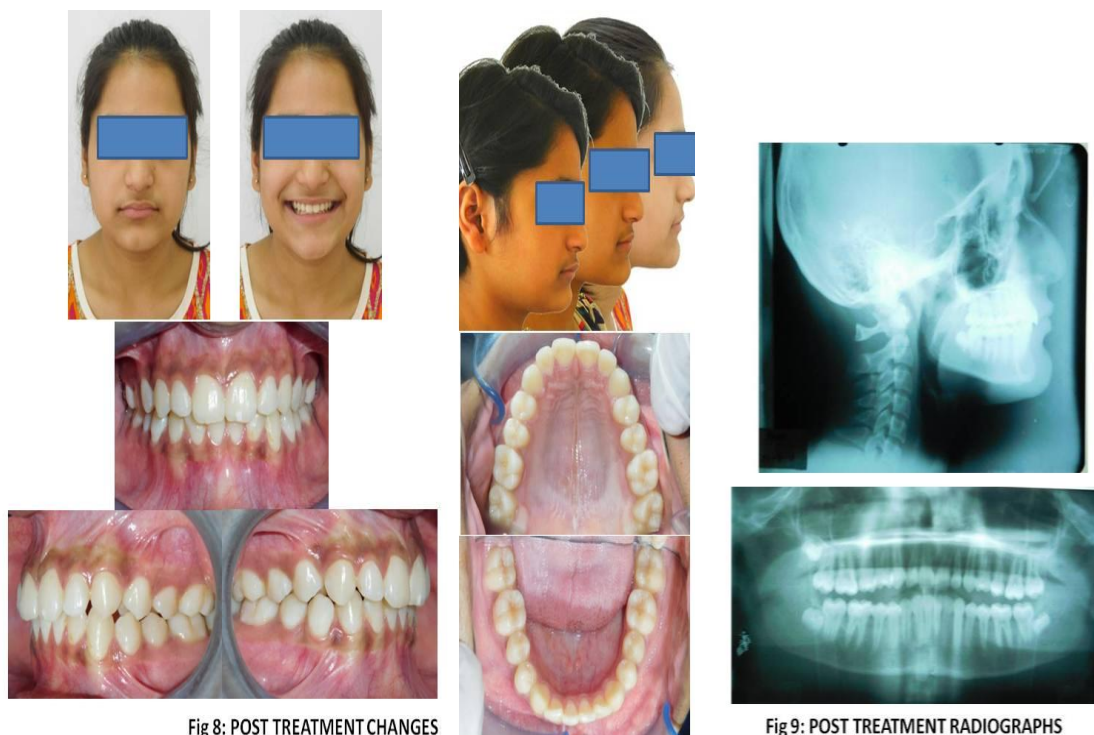


Fig 8: POST TREATMENT CHANGES

Fig 9: POST TREATMENT RADIOGRAPHS



Fig 10: SUPERIMPOSITION SHOWING POSITIVE CHANGES

DISCUSSION

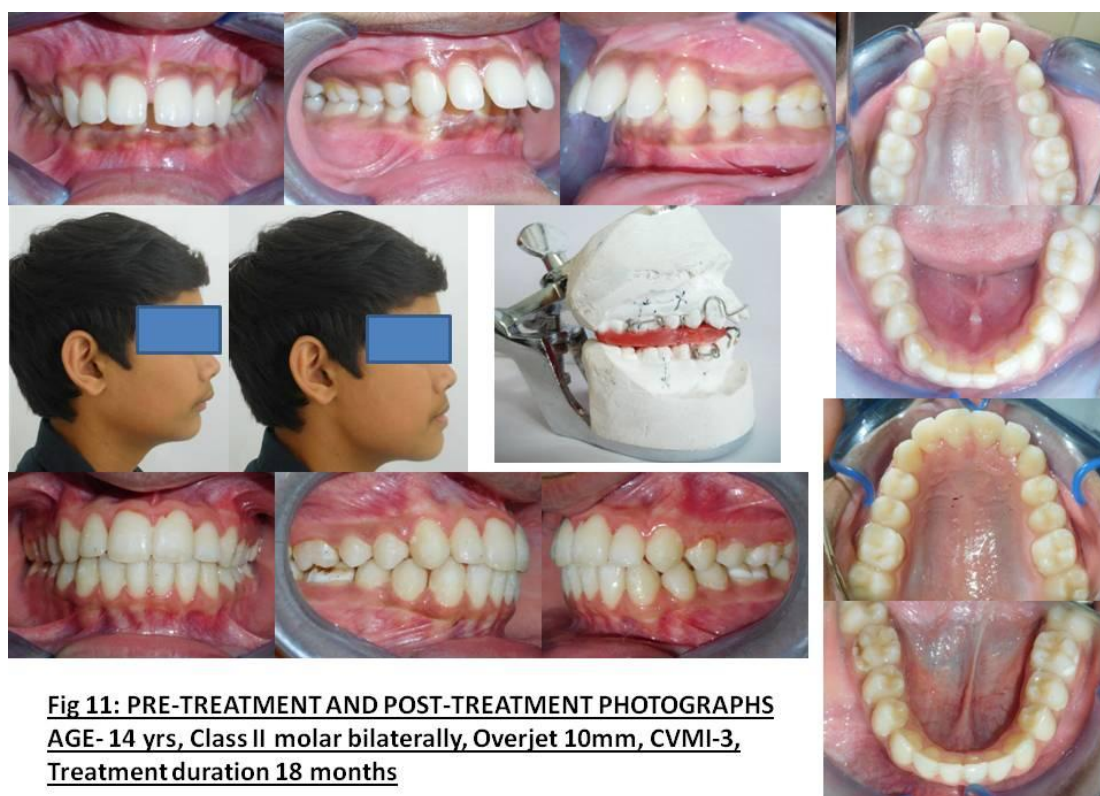
The following case with stepwise mandibular advancement was supported by Rabie et al. in 2002^{11,12,13,14}. He explained the role of Type II collagen and Sox9 gene in mandibular advancement. VEGF plays a vital role in osteogenesis by recruitment of new blood vessel supply which provide necessary osteoprogenitor cells. The connective tissue and blood vessels apparently proliferate in the retrodiscal

attachment within min/hrs^{1,15,16}. The overall changes are due to combined effect of condylar growth and glenoid fossa remodeling as stated by Voudouris^{7,8,9,13,14,17}. As mandibular arch follows maxillary arch, expansion of maxillary arch led to increase in inter-canine width (by 1mm) in the mandibular arch since maxillary canines act as safety valve for mandibular canine (safety valve mechanism)¹. The midline shift thus

improved. The eruption of mandibular molars flattened the Curve of Spee because of which there was improvement in overbite. In the following case overall increase in mandibular length and ascending ramus was also found as supported by studies of Mills & McCulloch, Bacetti, Franchi, Mc Namara and Trenouth^{3,4}.

The success of Twin block appliance depends on the development of Pterygoid response. The average time for it to develop is around 2-3 weeks. This development of this response depends upon the appliance

wear¹. If there's a successful wearing of appliance, scars will be found on the palate under the maxillary acrylic plate. Also, dual bite will be seen. The treatment result of a similar case, Case 2 of a 14yr old male patient with CVMI stage 3, Class II molar bilaterally, 10 mm overjet, 100% deep bite is shown in Fig-11 with pre and post-treatment photographs. The total duration of treatment was 18 months involving active phase (8 months), supportive phase (4 months) followed by retention phase (6 months).



CONCLUSION

1. A well aligned arch or an arch with minimal discrepancies can be very well handled through functional appliance alone if patient is co-operative.
2. Latero-occlusion to be carefully diagnosed against latero-gnathia. Careful recording of postural rest position is the key.
3. The maxillary occlusal plate should be extended to 2nd molar in order to prevent development of open bite at the end of treatment.

4. Trimming should be done 1mm per appointment, in order to prevent lateral tongue thrust.

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