

Management of Severe Class II Division 1 Malocclusion with Hybrid Functional Appliance by Double Advancement – A Case Report

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Abstract: Class II malocclusion is a challenging anomaly in orthodontic practice. The primary treatment goal in Class II mandibular retrognathism cases is to induce supplementary lengthening of the mandible via functional appliances. In case of any remaining dental discrepancy, a fixed appliance is obligatory. This patient was 10 year old growing female with convex profile, retruded chin, lower lip trap with class II skeletal and dental relationship with high overjet & overbite. Treatment started with Hybrid Functional Appliance (Twin Block with Lip Bumper and Expansion Screw) and then, secondary advancement done within same Appliance. This was followed by fixed mechanotherapy to align and level the dentition, close the spaces and retract the maxillary anteriors.

Keywords: Class II Division I, Hybrid Functional Appliance.

I. Introduction

Class II malocclusion is a challenging anomaly in orthodontic practice. The development of this malocclusion is due to mandibular retrognathia, maxillary protrusion, or both. It has been reported that retrusion of the mandible is the factor that most commonly contributes to a Class II malocclusion. Various types of functional appliances (eg, activator, bionator, Frankel, and Herbst) are used for the correction of Class II skeletal and occlusal disharmonies in growing patients. Over recent decades, Twin-block appliances, which were originally developed by Clark² in the late 1970s, have increased in popularity. The primary treatment goal in Class II mandibular retrognathism cases is to induce supplementary lengthening of the mandible via functional appliances. However, rather than skeletal, their effect is mainly dentoalveolar. Hence, in an effort to increase the orthopedic impact, attention has been drawn to the timing of treatment,³ type of functional appliance,^{4,5} rigidity of the fixed functional appliance^{6,9}, and mode of mandibular advancement during treatment¹⁰⁻¹² (single or gradual activation). The consensus is that condylar growth can be stimulated efficiently if the functional treatment is performed during the adolescent growth spurt using rigid functional appliances.

The experimental study of Rabel¹² demonstrated that bone formation at the condyle and glenoid fossa that reached the highest level during the first 30-day period with maximum “jumping” returned to the amount attained during natural growth from then on, while there was significantly more bone formation with stepwise advancement than with maximum jumping in the second 30-day period. Also, from the clinical standpoint, it has been stated that stepwise advancement could result in an increase of mandibular growth, less protrusion of the mandibular incisors, and better patient compliance. In this case report, we used a removable double advancement Hybrid functional appliance (Twin Block with Lip Bumper and expansion screw) followed by fixed mechanotherapy in severe skeletal class II Div 1 with lip trap in 10 year old growing patient.

Diagnosis

The patient was a 10 year old growing female with a skeletal class II jaw base relationship. She had orthognathic maxilla and retrognathic mandible with convex profile, posterior facial divergence, an acute nasolabial angle, incompetent lips, and deep mentolabial sulcus with lip trap and retruded chin. Intraorally, mixed dentition was present in all four quadrants. Molars were in class-II relation on both sides. Incisors were in class II relationship with Overjet was 12mm & overbite was 6mm. (Fig: 1). The lateral cephalometric analysis showed a class II skeletal pattern that resulted from ANB: 6⁰, Wit’s Appraisal: 3mm. Both the maxillary and mandibular incisors were labially proclined (U1-SN: 115⁰; L1-MP: 97⁰). Evaluation of patient’s cervical vertebrae maturity indicators (CVMI) suggested that the patient was in a pubertal growth spurt, which indicated optimal timing for orthopaedic therapy for a Class II disharmony.

No symptoms of temporomandibular joint disorder were detected.



Fig: 1 pre-treatment records (extraoral, intraoral and radiographs)

Treatment Plan:

The pubertal growth status of a patient is more critical for sagittal correction. So, we decided to institute the first phase of treatment by carrying out the sagittal correction with functional orthopaedic approach. A removable Hybrid Functional Appliance (Twin Block with Lip Bumper and Expansion Screw) was chosen to stimulate the forward mandibular growth. This was to be followed by secondary advancement in same appliance and to be followed by second phase of treatment with fixed-appliance mechanotherapy for space closure, retraction of the anterior teeth and finishing & detailing of the occlusion.

Treatment Progress:

The Twin Block appliance was fabricated with 1st advancement (Horizontal: 6mm & Vertical: 4mm) (Fig: 2a). The patient was instructed to wear the appliance full-time except contact sports. After 8 months of good compliance, the patient showed a class I molar relationship and end-on canine relationship with improved profile.



(a) 1st advancement: H = 6mm, V = 4mm



(b) 2nd advancement: H = 2mm (white colour)
Fig: 2 1st and 2nd advancement of the same Hybrid Functional Appliance

By taking 2nd VTO, patient showed considerably improved facial profile. Then, 2nd advancement (Horizontal: 2mm) was fabricated in same Twin Block appliance (Fig: 2b). At the end of this phase of treatment, the patient presented a super class I molar relationship and class I canine relationship with an overjet & overbite of 4mm. (Fig: 3) Phase II treatment with a preadjusted edgewise appliance (PEA) was initiated with McLaughlin Bennet Trevisi (MBT) prescription 0.022” brackets and then directly bonded. Leveling and aligning was done using nickel-titanium (NiTi) wires. The patient is currently at the stage of 0.019” x 0.025” SS with class II elastics of treatment. The molar and canine relationship is in class I. (Fig: 4) All that now remains for achieving proper finishing and detailing of the occlusion.



Fig: 3 Post-Functional Records (Extraoral, Intraoral And Raidographs)





Fig: 4 Current Status Records (Extraoral, Intraoral And Raidographs)

II. Discussion

Regarding the therapeutic choices for growing skeletal Class II patients, many studies have reported that functional appliances are highly effective in achieving better relationships between the maxilla and the mandible. Twin-block appliances, among other functional appliances, have proven to be comfortable, esthetic, and efficient.¹⁻³ Twin-block appliances have several advantages; they are well-tolerated by patients, easy to repair, and suitable for use in the permanent and mixed dentition.^{15,16}

However, there are also some potential disadvantages that include proclination of the mandibular incisors and the development of posterior open bites.¹⁷⁻¹⁹ Management of distal occlusion with functional appliances can lead to improvement in orofacial function through better muscle adaptation concurrent to the dental and skeletal changes achieved. Ideal timing for orthopaedic treatment for mandibular deficiency is after onset of pubertal growth spurt.²⁰ Orthopaedic phase and Orthodontic treatment phase should be combined in one single treatment. Success with this treatment result depends upon slight overcorrection of buccal segments (molars and canine) to a super class I, which builds anchorage into the system prior to placement of the fixed appliances and allows for a slight rebound.

In our patient, the cephalometric analysis indicated mandibular retrusive positioning, reduced lower facial height, deep curve of Spee, flaring maxillary incisors, and severe overjet and overbite. Using the Hybrid Functional Appliance, we achieved a favorable skeletal, dental, and soft tissue relationships were obtained. The severe deep overjet was corrected. Class I canine and molar relationships on both sides were also achieved. The profile was greatly improved. The cephalometric analysis indicated a significant skeletal anteroposterior reduction. The ANB angle decreased by 3°, and the Wits value decreased by 2.5mm. The positions of the maxillary incisors were significantly affected (U1-SN decreased from 115° to 106°), whereas the mandibular incisors were not significantly proclined by the treatment (L1-MP slightly increased by 3°). The active treatment phase produced an overjet correction of 9mm (from 12mm to 3mm) and the increase of nasolabial and labiomental angle with presence of competent lips.

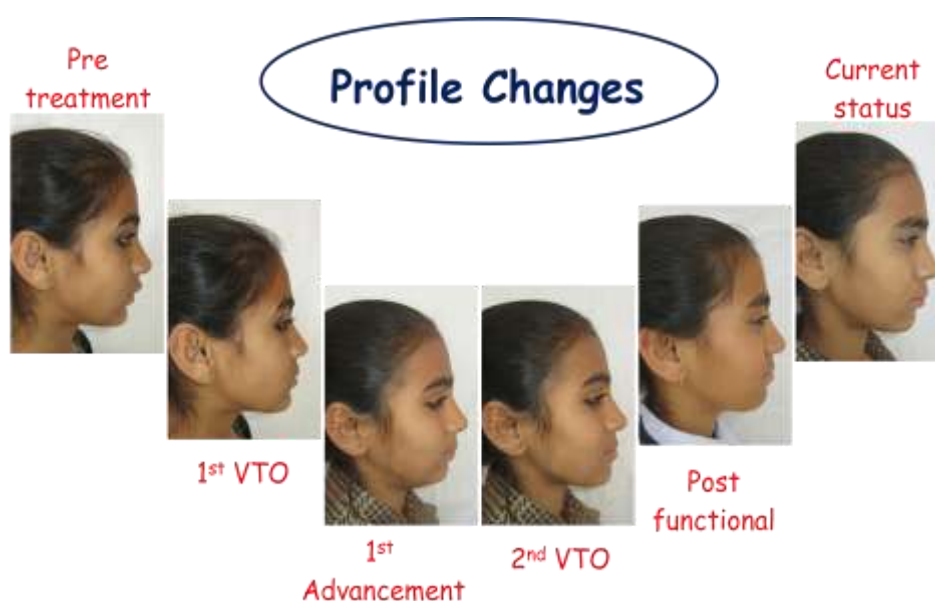
Table 1 Cephalometric Analysis:

Variable	Normal	Pre Treatment	Post Functional	Current Treatment
Sagittal Skeletal Relationship				
SNA	82°	74°	76°	76°
SNB	80°	68°	73°	73°
ANB	2°	6°	3°	3°
Wits Appraisal	F 0 Mm, M+1mm	3mm	0mm	0.5mm
Mcnamara Eff. Maxillary Lenth	95.2±3.2 Mm	79mm	87mm	87mm
Mcnamara Eff. Mandibular Lenth	120.6±3.2 Mm	99mm	112mm	112mm
Dental To Skeletal Relationship				
Upper Incisor to NA (mm/deg)	4 Mm/22°	12mm/34°	8mm/28°	6mm/26°
Lower Incisor to NB (mm/deg)	4 Mm/25°	5mm/26°	8mm/30°	6mm/29°
Upper Incisor to SN Plane	102°	115°	110°	106°

Lower Incisor to Mandibular Plane Angle (IMPA)	90°±3°	97°	102°	100°
Inter- Incisal Angle	135°	108°	116°	119°
Lower Incisor to AP Line	1-2 Mm	1mm	3.5mm	3.5mm
Soft Tissue Relationship				
Upper Lip to Ricketts E Plane	-2 To -3 Mm	1.5mm	-1mm	-1mm
Lower Lip to Ricketts E Plane	-1 To -2 Mm	1mm	0mm	-0.5mm
Nasolabial Angle	102°±8°	90°	94°	96°
Labiomental Angle	120°±9°	104°	124°	120°

III. Conclusion

Comparing the two groups of subjects at the peak of pubertal growth treated with the functional appliance by stepwise advancement produced greater skeletal effects than did single-step protrusion in terms of mandibular advancement and augmentation in mandibular length, with similar dental changes. The advantages of double advancement treatment approach have been made evident and in the opinion of the authors are useful tools in the armamentarium of the clinician.



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