A Synergistic Approach to Treat Class II Division 2 Malocclusion in a Post Pubertal Phase Using Bio-Progressive philosophy and Fixed Functional Appliance

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ABSTRACT

Class II Division 2 malocclusion presents unique clinical challenges due to its characteristic retroclined maxillary incisors, deep overbite, and often an underlying skeletal Class II base. This case report outlines the orthodontic management of a 15-year-old female patient exhibiting Angle's Class II Division 2 malocclusion with retroclination of anterior teeth, deep bite, and mandibular retrognathism. The treatment aimed to correct the sagittal discrepancy, achieve optimal alignment, and enhance facial esthetics. A sequential, non-extraction protocol was employed, beginning with incisor decompensation using a Ricketts utility arch, followed by sagittal correction via a Forsus™ Fatigue Resistant Device. Biomechanical control was maintained using torque-prescribed rectangular archwires and labial root torque to counteract incisor flaring. Over the 18-month treatment period, Class I canine and molar relationships were achieved alongside correction of overjet, overbite, and profile convexity. Post-treatment cephalometric analysis confirmed skeletal and dentoalveolar improvement with long-term stability ensured through dual retention strategies. This case reinforces the effectiveness of combining bio-progressive mechanics and fixed functional appliances in managing Class II Division 2 malocclusions in post-pubertal patients, especially when patient compliance is a concern.

INTRODUCTION

Class II malocclusion represents one of the most frequently encountered sagittal discrepancies in orthodontics. It typically results from maxillary prognathism, mandibular retrognathism, or a combination of both, often leading to compromised occlusal harmony, dentoalveolar imbalance, and unfavourable facial Esthetics. Among its subtypes, Class II Division 2 malocclusion is less prevalent but presents unique clinical challenges due to its distinct morphological characteristics. This form is commonly associated with a severe deep overbite, retroclined maxillary incisors and an obtuse interincisal angle, often coupled with a Class II molar relationship. Although the soft tissue profile in dental Class II Division 2 cases may appear balanced, skeletal variants frequently demonstrate reduced lower anterior facial height, short upper lip, prominent chin, and a small gonial angle. (1)

A strong genetic component underlies both the skeletal pattern and dental morphology in Class II Division 2 patients. Due to the complex skeletal and dental interrelationships, treatment of this malocclusion is considered challenging and prone to relapse. The choice of treatment is largely guided by the patient's chronological age, growth potential, and skeletal pattern. In growing individuals, functional orthopaedic appliances are often used to stimulate mandibular growth, while in non-growing or poorly compliant patients, fixed functional appliances (FFAs) offer a reliable option for sagittal correction. Among the FFAs, the Forsus™ Fatigue Resistant Device (FRD) is widely used as a compliance-free modality to achieve Class II correction through mandibular advancement and anterior teeth retraction. (2)

The present case report shows the importance of Rickets Bio progressive therapy in today's contemporary orthodontics practice.

CASE DESCRIPTION

The patient, a 15-year-old female, reported to the Department of Orthodontics with the chief complaint of irregularly placed anterior teeth. Facial analysis revealed a mesocephalic

head type and mesoprosopic facial form with an ovoid facial outline. The facial profile was convex with posterior facial divergence, and the lips were competent at rest. Incisor exposure at rest and on smiling both were within normal limits. Smile evaluation showed a non-consonant smile arc, symmetrical smile, and normal buccal corridors. The nasolabial angle measured 92°, and the mandibular plane appeared flat, suggestive of a horizontal growth pattern.

Intraoral examination revealed an Angle's Class II Division 2 malocclusion on a Class II skeletal base, with a deep overbite, decreased overjet, and retroclination of both upper and lower incisors. A scissor bite was noted seen with left first premolars with a deep curve of Spee. The left mandibular lateral incisor (tooth 32) was congenitally missing.

Figure 1: Pre Treatment extraoral and intraoral photographs and Lateral cephalograph

FINAL DIAGNOSIS

A 15 years old female patient with Angle's class II division 2 malocclusion on an underlying class II skeletal base associated with horizontal growth pattern, has retroclined upper and lower incisors, congenitally absent left mandibular lateral incisor, decreased overjet, deep bite, scissor bite with left 1st premolars, deep curve of spee, convex profile and decreased nasolabial angle. She was at end of post pubertal growth spurt phase.

TREATMENT OBJECTIVES

The primary goals of treatment were to establish:

- To correct underlying skeletal sagittal discrepancy
- To achieve pleasant soft tissue profile
- To achieve ideal axial inclination of upper and lower teeth.
- To achieve ideal canine and molar relation
- To achieve ideal overjet and overbite
- To achieve stable buccal occlusion

TREATMENT PLAN

Considering the cephalometric, soft tissue, and study model findings, a non-extraction approach was chosen using fixed appliance therapy. Initial 2*4 appliance was delivered to correct axial inclination of maxillary central incisors.

Figure 2: Utility arch delivery

Levelling and alignment was achieved as per arch wire sequence according to MBT fixed mechanotherapy. At this stage, the patient retained 8 mm of overjet and 50% overbite.

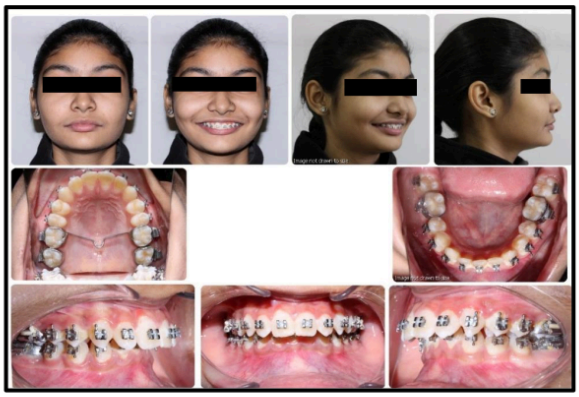

Figure 3: After alignment and leveling extraoral and intraoral photographs

During the clinical Visual Treatment Objective (VTO) assessment, the patient demonstrated a positive change in facial profile. Cephalometric evaluation also indicated a skeletal discrepancy characterized by mandibular retrognathism, which can be addressed using a fixed functional appliance.

To address the mandibular retrognathism, a 34 mm Forsus™ Fixed Functional Appliance was placed, anchored to the maxillary molar tubes and the mandibular arch distal to the canines. Labial root torque was incorporated in lower 0.019" × 0.025" stainless steel wire to prevent potential flaring of lower incisors. The mandibular advancement device Forsus was remained for 5 months after achieving class I canine and molars with correction of overjet, overbite, and improvement in the facial profile.

Figure 4: Forsus delivery

Finishing and detailing was achieved with partial debanding for better settling of posterior teeth. To maintain correction and avoid relapse, a removable maxillary anterior inclined plate was placed. The total treatment duration was 18 months to achieve Class I canine and Class I molar with well aligned dentition, functional occlusion, and facial Esthetics.

Figure 5: Post Treatment extraoral and intraoral photographs and Lateral cephalograph

RETENTION

For retention, a bonded lingual retainer was placed in the lower arch to maintain anterior alignment. In the upper arch, a removable Hawley's retainer with a reverse inclined plane was provided to preserve overbite correction and support long-term stability.

Cephalometric parameters	Pre treatment	Post treatment
SNA	82°	82°
SNB	77°	78°
ANB	5°	4°
FO-GN TO SN	21°	22°
UPPER INCISOR TO NA (angular)	-2°	26°
UPPER INCISOR TO NA (linear)	0 mm	3 mm
LOWER INCISOR TO NB (angular)	15°	17°
LOWER INCISOR TO NB (linear)	1 mm	1 mm
INTERINCISAL ANGLE	161°	132°

OCCLUSAL PLANE TO SN	14°	12°
UPPER INCISOR TO SN	81°	107°
FACIAL ANGLE (NPog-FH)	90°	91°
ANGLE OF CONVEXITY	7°	6°
A-B PLANE ANGLE	-13°	-10°
Y AXIS	52°	53°
MANDIBULAR PLANE ANGLE	13°	14°
CANT OF OCCLUSAL PLANE	3°	0°
LOWER INCISOR TO OCCLUSAL PLANE	13°	13°
LOWER INCISOR TO MANDIBULAR PLANE	3°	6°
INTERINCISAL ANGLE	161°	132°
UPPER INCISOR TO A-Pog	1 mm	3 mm
FMA	17°	18°
FMIA	73°	67°
IMPA	90°	95°
WITTS APPRAISAL	4 mm	4 mm
JARABAK'S RATIO	70%	71%
NASOLABIAL ANGLE	92°	91°

Table 1: Pre and post treatment cephalometric findings

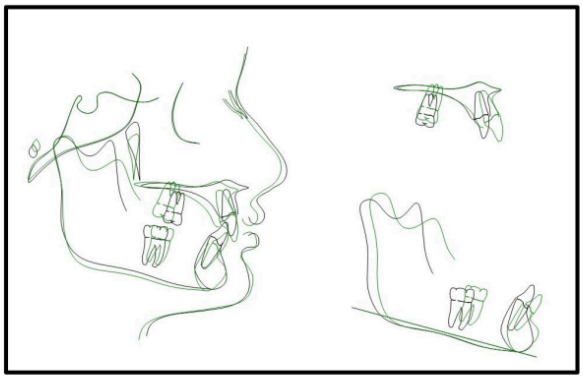

Figure 6: Pre and Post treatment Lateral cephalography superimposition 1. Black line shows pretreatment tracing 2. Green line shows post treatment tracing

Figure 7: Pre and Post Treatment Facial Profile Changes

DISCUSSION

The initial phase of treatment in this case utilized a Ricketts utility arch for the correction of retroclined maxillary incisors and deep bite. The utility arch offered precise control over anterior tooth movement while preserving molar anchorage. Its segmental design allowed independent manipulation of the anterior segment, facilitating both intrusion and proclination of the maxillary central incisors. This was critical in converting the incisor relationship from a Class II Division 2 to a more favourable Division 1 pattern, thereby creating sufficient overjet to permit the effective use of the Forsus FRD.

The primary biomechanical advantage of the utility arch is the generation of light, continuous forces ideal for incisor intrusion, minimizing the risk of root resorption. Additionally, its step-down bends and vertical loops allowed controlled sagittal and vertical positioning of the incisors without compromising posterior anchorage. In patients with a hypodivergent pattern, as in this case, vertical control is essential to avoid further deepening of the bite. The utility arch thus played a foundational role in preparing the arch for sagittal correction with Forsus. Similar initial mechanics have been described by Burstone CJ, who emphasized the role of utility arch mechanics in controlled incisor movement and bite opening. (3)

The correction of skeletal Class II Division 2 malocclusion in this patient was accomplished through a sequential approach that began with incisor decompensation using a protraction utility arch and followed by sagittal correction with Forsus FRD. The protraction utility arch created sufficient overjet by proclining the maxillary incisors, enabling effective mandibular advancement with the Forsus appliance. Similar initial mechanics have been described by Burstone and further reported by Bayram et al., emphasizing the importance of early incisor positioning before sagittal correction. (2), (3)

The Forsus FRD presents several advantages over traditional removable and fixed functional appliances. One of its most significant clinical advantages is that it is a compliance-free appliance, making it especially beneficial in patients where cooperation is uncertain or in cases requiring consistent force application. Unlike removable appliances such as the Twin Block, the Forsus delivers a continuous force without depending on patient wear-time (4).

When compared with other fixed appliances like the Jasper Jumper or MARA, the Forsus offers greater patient comfort due to its low profile and posterior positioning, which reduces bulk and mucosal irritation. It is also easier to install and activate chairside without requiring laboratory fabrication or complex patient fittings (4).

Biomechanically, Forsus enables simultaneous sagittal and vertical correction. It applies a force vector that induces mandibular advancement and headgear type effect on maxillary dentition while promoting extrusion of the lower molars and intrusion of the upper molars (5). This dual action helps correct Class II discrepancies while also aiding in vertical control, especially useful in hypodivergent patients like in this case.

Another advantage is that Forsus is easily integrated with pre-existing fixed appliance systems like MBT or Roth, without requiring appliance removal or rebanding. It also allows for earlier engagement during the treatment timeline, expediting Class II correction and reducing overall treatment time (5).

Studies have shown that Forsus achieves comparable or better results than elastics and other fixed appliances in terms of molar correction, incisor inclination, and overjet reduction—often within a shorter time frame and with less relapse when proper retention is followed (4).

The Forsus appliance led to both dentoalveolar and mild skeletal improvements. Cephalometric changes showed a mild positive change in ANB angle, consistent with reports by Atik et al, who noted limited skeletal but prominent dentoalveolar changes in similar patient populations. (6) The overjet correction was mainly due to proclination of lower incisors and retroclination of upper incisors, as also described in studies by Gunay et al. (7)

Vertical skeletal changes, such as mandibular clockwise rotation and an increase in anterior facial height, were observed. These are similar to findings from Antelo et al., who noted occlusal plane rotation and molar intrusion contributing to facial esthetic improvement in hypodivergent patients. (7)

Control of unwanted side effects like mandibular incisor flaring was achieved through the use of labial root torque and anchorage strategies such as cinch backs and figure-eight ligation. These mechanics align with protocols described by Antelo et al and Atik et al, who stress torque control as a key component of Forsus therapy. (6), (8)

Additional comparisons can be drawn from the studies of Paduano et al. and Cacciatore et al., who documented esthetic and occlusal improvements with Forsus use even in patients nearing the end of their growth phase. (8) The headgear-like effect of Forsus on the maxillary dentition and modest skeletal mandibular advancement were also observed, in agreement with Bayram et al. and Atik et al. (2), (6)

In this case, the phased treatment strategy contributed to favourable skeletal, dental, and soft tissue outcomes. Forsus proved to be a dependable appliance for Class II correction in a late adolescent patient, when used with careful sequencing and torque control.

CONCLUSION

- The sequential approach combining bio progressive into pre-edgewise appliance helped to provide good treatment outcome.
- Soft tissue balance and esthetic harmony were restored, as evident with improvement in lip posture and smile arc.

- The treatment outcome remained stable at completion, and such an approach may yield even more pronounced skeletal effects if applied during peak growth velocity.
- The Forsus appliance proved effective in achieving sagittal correction with minimal reliance on patient compliance.
- Controlled torque mechanics and anchorage strategies prevented undesirable flaring of mandibular incisors.

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