

## Treatment Of A Skeletal Class II Malocclusion In An Adolescent Using Fixed Functional Appliance

**Dr.Srikrishna Chattaraj<sup>1</sup>, Dr.Ekta Lahoti<sup>2</sup>**

<sup>1</sup>Associate Professor, Dept. of Orthodontics, Dr.R.Ahmed Dental College & Hospital, Kolkata, West Bengal,

<sup>2</sup>Assistant Professor, Dept. of Orthodontics & Dentofacial Orthopedics, Dr. R. Ahmed Dental College & Hospital, Kolkata, West Bengal,

**Corresponding Author:** Dr. Ekta Lahoti, Assistant Professor, Email : [13ekta@gmail.com](mailto:13ekta@gmail.com)

### ABSTRACT

Treatment of Class II malocclusion in adolescents has always relied on growth modification. The majority of treatment modalities, such as functional appliances, are directed at stopping

or redirecting maxillary growth and simultaneously stimulating mandibular growth. On the other hand, in adult patients with severe Class II malocclusions, generally involving extremely deficient mandibles, orthognathic surgery is often the only possible treatment. This article reports the treatment of a young patient having Class II division 1 malocclusion with functional

jaw retrusion who was treated using MBT 0.022" prescription and Forsus FRD appliance. 7 months of Forsus wear obtained stable and successful result with improvement in facial profile, skeletal jaw relationship and mild lower anterior proclination. Greater forward displacement of the mandible was the predominant factor for successful treatment Class II patient. Forsus gives good results for class II management and it would be wise to consider treating such cases by non-extraction approach rather than contemplating extractions.

**Keywords:** Class II malocclusion, Non Extraction, Functional Appliance, Forsus, Functional jaw retrusion.

**How to Cite:** Dr.Srikrishna Chattaraj, Dr.Ekta Lahoti, (2025) Treatment Of A Skeletal Class II Malocclusion In An Adolescent Using Fixed Functional Appliance, *Journal of Carcinogenesis*, Vol.24, No.1s, 141-148

### 1. INTRODUCTION

In orthodontics, patients' noncompliance with treatment has been a concern for over 40 years<sup>1</sup>, Therefore, much interest is presently shown in fixed appliances requiring minimal patient compliance. There are many fixed functional appliances proposed for management of non-compliant patients with Class II malocclusion, e.g., The Herbst appliance, mandibular anterior repositioning appliance (MARA), Jasper Jumper and Eureka Spring.

One fixed appliance for correcting Class II malocclusion is the Forsus™ fatigue resistant device (Forsus; 3M Unitek, Monrovia, CA, USA). It is a three- (L pin module) or two-piece (EZ module), semirigid telescoping system incorporating a Nickel Titanium coil spring that can be assembled at the chair side and is compatible with complete fixed orthodontic appliances. Forsus is attached to the maxillary first molar and mandibular archwire, distal to either the canine or the first premolar bracket. As the coil is compressed, opposing forces are transmitted to the sites of attachment (Figure 1). The appliance is relatively well accepted by patients, although some may experience initial discomfort and functional limitations, which generally diminish with time<sup>2</sup>. Jones et al<sup>3</sup> compared the therapeutic changes induced by Forsus with those induced by Class II elastics: they found no significant differences between the appliances with the exception of compliance. Franchi et al<sup>4</sup> evaluated the dental, skeletal, and soft-tissue changes following comprehensive treatment with fixed appliances including Forsus in patients with Class II malocclusion and reported that Forsus is effective in correcting Class II malocclusion via skeletal (mainly maxillary) and dentoalveolar (mainly mandibular) modifications. Recently, Gunay et al<sup>5</sup> analyzed the effects of Forsus from its insertion to its removal (6 months) by comparing 15 late-adolescent patients with 12 subjects having untreated Class II malocclusion and reported that Forsus corrected the Class II discrepancy

through dentoalveolar changes. The main limitation of their study was its small sample size. No previous study evaluated the contribution of active treatment with Forsus to the overall effects of comprehensive treatment.

#### CASE REPORT

A 13-year-old male presented with the chief complain of forwardly placed upper front teeth.

Clinical examination showed a convex, retrognathic profile, lip incompetence at rest, and protrusion of the upper lip [Figure 2a-c]. The patient had a Class II, division 1 malocclusion with an overjet of 10 mm and an overbite of 5 mm.[Figure 3a-c].

Cephalometric analysis revealed a convex skeletal profile with ANB angle of  $5^{\circ}$ , a severely retruded mandible, and a well-positioned maxilla. [Figure 8a, Table 1] Dentoalveolar readings suggested proclined maxillary anterior teeth with slightly proclined mandibular anteriors. The mandibular plane angle was normal, suggesting an average growth pattern. CVMI assessment indicated that the patient's growth was not completed.



Figure 1



Figure 3a



Figure 3b



Figure 3c



Figure 3d



Figure 3e



Figure 4a



Figure 4b



Figure 4c





Figure 5a



Figure 5b

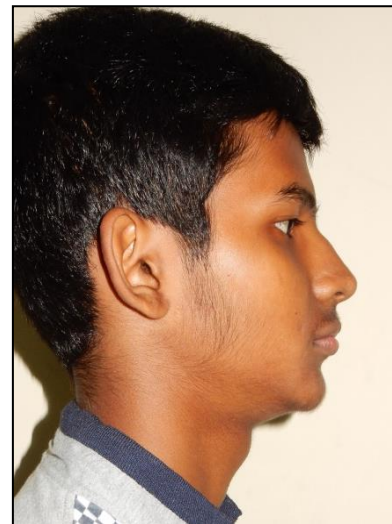


Figure 5c



Figure 6a



Figure 6b



Figure 6c



Figure 6d



Figure 6e

#### Treatment objectives:

1. Obtain a symmetrical Class I occlusion without extractions.
2. Improve facial appearance by inhibiting forward vertical growth of the maxilla and stimulating growth of the mandible.
3. Avoid any backward rotation of the mandible

#### TREATMENT PLAN

Considering the finding, non-extraction fixed mechanotherapy was planned using MBT 0.022" slot pre-adjusted appliance. After levelling and alignment, a fixed functional appliance would be given to advance the mandible into a class I relationship. Forsus FRD was the best option, considering age, patient comfort, ease of installation, lack of breakages in clinical use, predictable results, and no need for patient compliance.

#### Treatment progress

Treatment was started using 0.016" NiTi in both arches, which was followed by 0.019" × 0.025" NiTi wire and 0.019" × 0.025" Stainless Steel wire. Levelling and alignment was completed in 6 months. At the end of stage I, there was an 8 mm

overjet and 5 mm overbite. This was followed by mandibular advancement using Forsus FRD [Figure 4a-e]. 29mm length of push rod was selected. 0.019" × 0.025" SS in the lower arch was given labial root torque in lower anterior segment to prevent the flaring of the lower anteriors due to Forsus. Molar correction was achieved after 7months appliance placement. This was followed by 1 months of detailing and finishing of occlusion combined with light class II elastics, which were gradually tapered off. The patient was observed for 2months with the appliance in place, without any active forces to check the stability of correction and any occurrence of dual bite. The total active treatment time was 16 months.

## RESULTS

After completion of the active treatment and achieving desired results [Figure 5a-c & Figure 6a-e], a maxillary removable Hawley's retainer with anterior inclined plane to hold the corrected jaw relation was used for retention. Pre and post treatment OPG and Lateral Cephalograms along with superimposition has been shown in Fig.7a-b,8a-b,9.

| Parameters  | Pre-treatment Values | Post-treatment Values |
|-------------|----------------------|-----------------------|
| SNA         | 83°                  | 83°                   |
| SNB         | 78°                  | 80°                   |
| ANB         | 5°                   | 3°                    |
| UI to SN    | 120°                 | 114°                  |
| UI to NA    | 8mm/33°              | 6.5mm/29°             |
| LI to NB    | 4mm/22°              | 7mm/32°               |
| IMPA        | 99°                  | 101°                  |
| Md. Length  | 105mm                | 113mm                 |
| N Pr to A   | -1mm                 | -1mm                  |
| Pog to N Pr | -8mm                 | -5mm                  |

Table 1





Figure 8a



Figure 8b

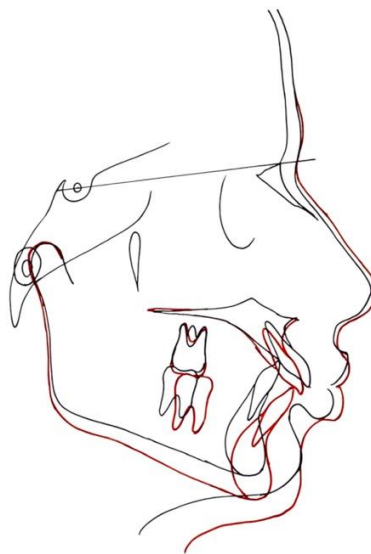


Figure 9

## DISCUSSION

The goal of functional appliance therapy is to encourage or to redirect the growth in a favorable direction. Several functional appliances are presented in the literature for the correction of Class II division 1 malocclusion. The major differences in the effects between various orthopaedic appliances are mainly related to the technique of fabrication, construction bites, and hours of wear. Removable appliances are considered uncomfortable and unesthetic by many patients and require patient compliance. Consequently, a primary advantage of fixed functional appliances is independence from the need for patient cooperation.

Many previous studies also reported restriction in the forward growth of maxilla by twin-block and also by many other functional appliances<sup>5,6,7</sup>. However, few studies reported no restraint effect in the forward movement of maxilla by the removable<sup>8</sup> and fixed functional appliances<sup>9</sup>.

Thus, the design of the appliance was not a major factor in the headgear effect of functional appliance therapy.

A general overview of the effects of Class II treatment with Forsus FRD leads to the consideration that skeletally one of the main outcomes of this protocol consists of a significant change in the sagittal position of the mandible. This mandibular advancement can be because of remodelling of the glenoid fossa or mandibular growth. According to Rabie et al<sup>10</sup> the Indian hedgehog gene is the mechano-transduction mediator in the condyle. The expression of Indian hedgehog elicited by mechanical loading of the mandibular joint promoted mesenchymal cell proliferation and initiated a cascade of cellular and molecular responses that led to condylar growth. Indian hedgehog, a member of the vertebrate hedgehog morphogen family, was reported to be key morphogen during skeletal development and regeneration. On the other hand, the skeletal outcomes of the FRD protocol with regard to the maxilla appeared to be rather limited. The lack of a significant effect of the FRD on the sagittal position of the maxilla might be correlated with the short duration of active treatment and the normal growth of maxilla.

There is net 8mm reduction of overjet in the present report. This is due to mainly four reasons. First, forward growth of the mandible (mandibular length). Second, anterior displacement of the mandible (Pog to N Perp.). Third, retroclination of maxillary incisors. Fourth, proclination of mandibular incisors. Retroclination of the maxillary incisors (U1) and proclination of mandibular incisors (L1) are a widely accepted consensus with various functional appliances<sup>11</sup>. In present case, the upper incisors tipped palatally. The palatal movement of the U1 was due to the reciprocal force that acted distally on the maxillary dental arch. The mandibular incisors tipped labially in present case. This could be due to the mesial force on the L1 induced by the forward posture of the mandible. This finding is in accordance with the effects of other functional appliances (Figure 8b, Table 1).

The outcomes reported in the current case report refer to the end of comprehensive Class II treatment. However, it should be noted that the patient completed his treatment protocol at very advanced pubertal stages in skeletal maturation. The amount of craniofacial growth occurring after those stages is very limited in Class II subjects, and, more importantly, growth differences between Class II and normal occlusion subjects after late puberty are insignificant. When orthodontic therapy of Class II malocclusion is completed at late puberty, close to completion of active craniofacial growth, relapse tendency due to a re-establishment of Class II growth characteristics is expected to occur less often.

As there are many factors involved in the correction of disproportionate jaw relationships, therefore above-mentioned findings should be interpreted with caution. Further studies including more parameters and larger sample size are required and the results of a long term follow-up are essential to address issues of stability.

## CONCLUSION

A comprehensive treatment plan, not only including the concepts of effectiveness and efficiency, but also considering the psychosocial and traumatic injury risks, should be addressed when a skeletal Class II malocclusion is diagnosed.

The FRD protocol led to a successful correction of Class II malocclusion. The protocol had a greater effect on the mandibular structures by advancing the mandible and mesial movement of mandibular molars.

The appliance was less efficient in restricting the forward growth of the maxilla. At the dentoalveolar level, mesial movement of the lower incisors and lower first molars occurred.

## REFERENCES

- [1] Bos A, Hoogstraten J, Pahl-Andersen B. On the use of personality characteristics in predicting compliance in orthodontic practice. *Am J Orthod Dentofacial Orthop.* 2003;123:568–570.
- [2] Bowman AC, Saltaji H, Flores-Mir C, Preston B, Tabbas S. Patient experiences with the Forsus Fatigue Resistant Device. *Angle Orthod.* 2013;83:437–446.
- [3] Jones G, Buschang PH, Kim KB, Oliver DR. Class II non-extraction patients treated with the Forsus Fatigue Resistant Device versus intermaxillary elastics. *Angle Orthod.* 2008;78:332–338.
- [4] Kale, N. (2022). To Study Efficacy of Jivantyadi Ghrit as Add-on Treatment in Ptb Treating with AKT (Dots) Regimen. *Journal of Ayurvedic Herbal and Integrative Medicine*, 2(1), 1–12. <https://doi.org/10.29121/j-ahim.v2.i1.2022.17>
- [5] Rajbongshi, D. (2023). Assamese Travel Literature Trend, Classification and Characteristic. *International Journal of Research -Granthaalayah*, 11(11), 90–102. <https://doi.org/10.29121/granthaalayah.v11.i11.2023.5401>
- [6] Toth LR, McNamara JA Jr. Treatment effects produced by the twin-block appliance and the FR-2 appliance of Frankel compared with an untreated Class II sample. *Am J Orthod Dentofacial Orthop* 1999 Dec;116(6):597-609.
- [7] Trenouth MJ. Proportional changes in cephalometric distance during twin-block appliance therapy. *Eur J Orthod* 2002 Oct;24(5):485-491.

- [8] Vanlaecken R, Martin CA, Dischinger T, Razmus T, Ngan P. Treatment effects of the edgewise-Herbst appliance: a cephalometric and tomographic investigation. *Am J Orthod Dentofacial Orthop* 2006 Nov;130(5):582-593.
- [9] Clark WJ. The twin-block technique. A functional orthopedic appliance system. *Am J Orthod* 1988 Jan;93(1):1-18.
- [10] Pangrazio-Kulbersh V, Berger J, Chermak DS, Kaczynski R, Simon ES, Haerian A. Treatment effects of the mandibular anterior repositioning appliance on patients with Class II malocclusion. *Am J Orthod Dentofacial Orthop* 2003 Mar;123(3):286-295.
- [11] Mangindaan, C. A. I. N., & Yekti, R. (2023). Description of the Level of Knowledge and Attitudes About Personal Hygiene Against Pityriasis Versicolor in Class 2016 Students at the Faculty of Medicine, Indonesian Christian University. *International Journal of Research -Granthaalayah*, 11(7), 150–156. <https://doi.org/10.29121/granthaalayah.v11.i7.2023.5258>
- [12] Ng TC, Chiu KW, Rabie AB, Hagg U. Repeated mechanical loading enhances the expression of Indian hedgehog in condylar cartilage. *Front Biosci* 2006 Jan;11:943-948.
- [13] Jena AK, Duggal R. Treatment effects of twin- block and mandibular protraction appliance-IV in the correction of Class II malocclusion. *Angle Orthod* 2010 May;80(3):485-491.
- [14] Valant JR, Sinclair PM. Treatment effects of the Herbst appliance. *Am J Orthod Dentofacial Orthop* 1989 Feb;95(2):138-147.