

## Treatment of Skeletal Class II Malocclusion Using The “Forsus” Appliance: A Case Report

Ankur Chaukse, Sandhya Jain, M.S. Rami Reddy, Rachna Dubey, Shan Mammen John, Suma S.

Department of Orthodontics, People’s Dental Academy, People’s Campus Bhanpur, Bhopal-462037.

### Abstract:

Fixed functional appliances are valuable tools introduced to assist in the correction of skeletal class II malocclusions at the deceleration stage of growth for achieving stable results. The most commonly used such appliances are the Herbst appliance and the Jasper jumper. The recent advance in the field of fixed functional appliance is the Forsus appliance. We are reporting a 16 year old patient with a skeletal class II malocclusion treated using the Forsus appliance. The appliance was worn for 4 months after the initial alignment with fixed mechanotherapy (MBT O22). The mandible was brought forward to a class I skeletal and dental relationship by the end of this treatment.

**Key Words:** Fixed functional appliance, Forsus, Class II malocclusion, Growth modulation.

### Introduction:

Treatment of class II malocclusion has always been an enigma to the orthodontic fraternity. Skeletal class II malocclusion has been treated by various forms of functional appliances to achieve better esthetics and functional harmony (Pancherz, 1979). Correction of skeletal class II malocclusion by growth modulation during active growth can be achieved using various myofunctional appliances like activator, Frankel’s regulator and the twin block (David et al, 2009; Beckwith et al, 1999). Treatment of class II malocclusion during deceleration stages of growth has been a challenge and a bone of contention for various schools of thoughts (Adams et al, 1972). Few orthodontists have proven that skeletal correction can be achieved even during deceleration phase of growth by using certain fixed functional appliances (Gianelly et al, 1984).

The Herbst appliance is an upper and lower fixed appliance linked by a telescopic mechanism. This mechanism holds the mandible forward in a protruded position throughout treatment to modify mandibular growth. The appliance allows opening and closing movements of the mandible, and some lateral movement. Use of Herbst appliance gives remarkable results as compared to other methods of Class II correction. The Herbst appliance and many of the inter-arch appliances used to correct Class II malocclusions suffer from problem of breakage of the constituent parts. The Herbst appliance is also expensive and

difficult to make. Considering the disadvantages of Herbst appliance, in the present study Forsus appliance was used. Here, we are presenting a case of a class II skeletal malocclusion treated by using the Forsus appliance.

### Case Report:

A 16 years old boy reported to department of Orthodontics with the chief complain of irregular teeth. Clinical examination showed Angle’s class II molar as well as canine relationship with increased overjet and overbite. Maxillary arch was constricted showing mesially inclined peg laterals with mild imbrications in the mandibular arch and cross bite on right 1<sup>st</sup> pre



Fig. I: Pre-treatment cephalogram.

**Corresponding Author:** Dr. Ankur Chaukse, Senior Lecturer, Department of Orthodontics, People’s Dental Academy, People’s Campus Bhanpur, Bhopal-462037.

**Phone No.:** 9827287656

**E-mail :** ankurchaukse@rediffmail.com



Fig. II: Post-treatment cephalogram.

molar region. Mild hypo-mineralization of right upper and lower molars was seen (Fig. IV). Profile was convex with 100% incisal exposure. Cephalometric analysis revealed skeletal class II malocclusion with retrognathic mandible. Orthopentogram (OPG) revealed erupting 3<sup>rd</sup> molar in all 4 quadrants. On radiographic examination of cervical vertebrae, 65% of adolescence growth was still expected according to Hassel & Farman (1995) system of skeletal maturation (Fig I& II).

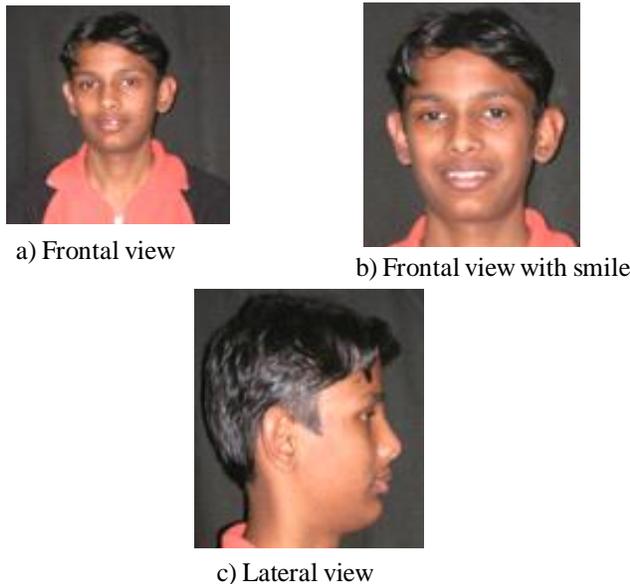


Fig. III: Extra-oral pre-treatment photographs.

**Treatment Plan:**

The Forsus fixed functional appliance was the appliance of choice to be used along with MBT O22 mechanics. The anchorage was reinforced by using

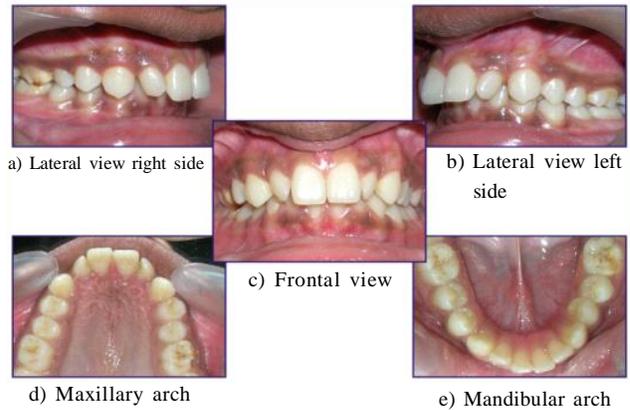


Fig. IV: Intra-oral pre-treatment photographs.

trans-palatal arch in the maxillary arch and the arch wire was cinched back in the mandibular arch. For initial 2 months, alignment was done with 0.016 NiTi wires in upper and lower arches. This was followed by 0.017 x 0.025 rectangular NiTi wires and then by 0.019 x 0.025 stainless steel wire in the lower arch and 0.017 x 0.025 stainless steel wire in the upper arch as a main arch wires. Forsus appliance was then used actively for 4 months. During this phase, the appliance was activated every 4 weeks by distalising the stopper in the mandibular arch wire by 1mm (Fig. V).

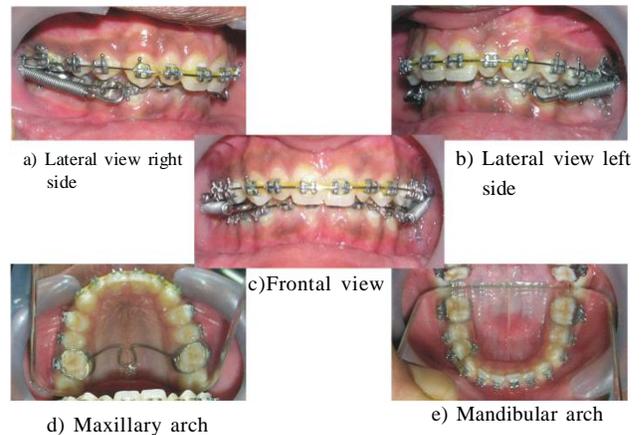


Fig. V: Mid-treatment photographs.

Superimposition of pre and post-treatment cephalograms showed an increase in the length of mandible with increase in lower facial height, correction of overjet and soft tissue competency.

**Result & Discussion:**

Treatment of class II skeletal malocclusion has always been a challenge for an orthodontist, especially in the deceleration stages of growth (Nelson et al, 2000).

Over the years many fixed functional appliances have been used by orthodontists and only a few have shown well acceptance and favourable results on the patient (Cope et al, 1994; Karacay et al, 2006). Forsus appliance which has been recently introduced, is well accepted showing stable results (Heinig & Goz, 2001).

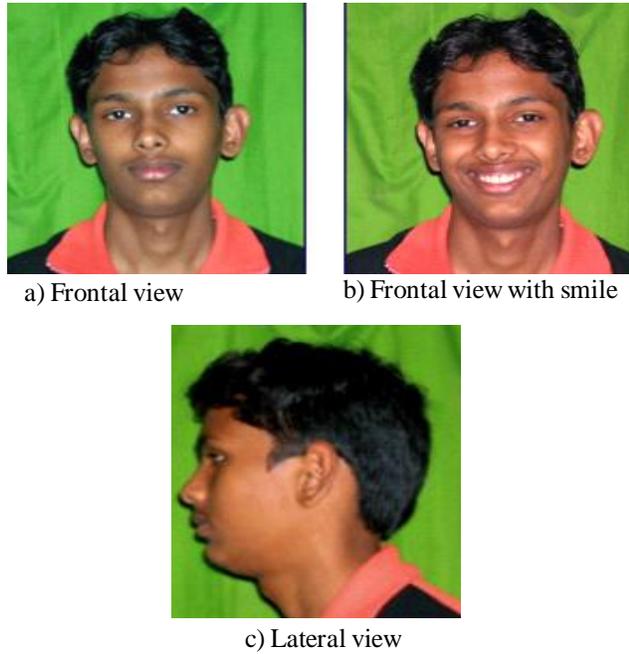


Fig. VI: Extra-oral post-treatment photographs.

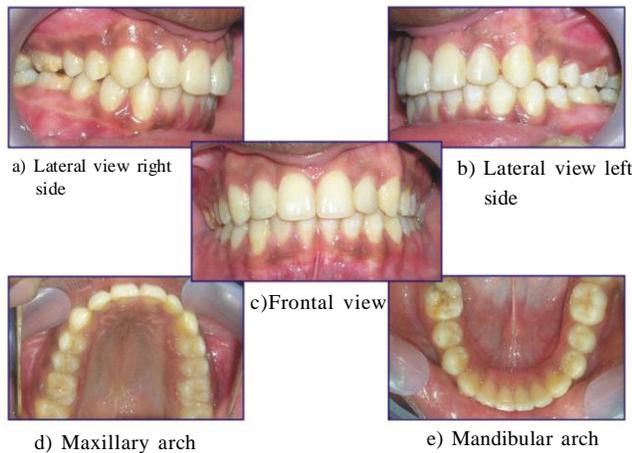


Fig. VII: Intra-oral post-treatment photographs.

The result achieved after using Forsus appliance in the present case are shown in table I a, I b, I c & II.

The post-treatment measurements showed favourable sagittal skeletal changes: Sella-Nasion-A Point (SNA) angle remained the same, increase in Sella Nasion-B Point (SNB) angle from 77° to 79°, 3° reduction in A Point-Nasion-B Point (ANB) angle & Wit's reduction of 2 mm (Table I a). At the end of

treatment vertical skeletal changes indicated increase in lower facial height (Table I b). Schwarz mandibular length increased only by 2 mm, while there was no change in maxillary length. Harvold length increased by 1mm in maxilla and 5mm in mandible (Table I c) was noticed. The dento-alveolar changes showed that maxillary incisors were retracted significantly by 3.5mm linear and 7° angular while mandibular incisors were proclined by 1mm linear and 2° angular (Table II). The soft tissue improvement was seen with a trend towards Orthognathic profile (Fig. VI & VII).

The similar results were achieved by Graham et al (2008) in their study. They concluded that the Forsus is an acceptable substitute for Class II elastics for patients who appear to be noncompliant. They further added that the greater forward displacement of the mandible is the predominant factor contributing to success when treating Class II patients with either Class II elastics or the Forsus appliance.

Table I a: Showing skeletal changes in sagittal plane.

	Pre-treatment	Post-treatment
SNA	82°	82°
SNB	77°	79°
ANB	5°	2°
WITS	4mm	2mm

Table I b: Showing skeletal changes in vertical plane

	Pre-treatment	Post-treatment
Go Gn – SN	20°	22°
Basal plane angle	16°	18°
Y-axis	61°	62°
Jarabak ratio	74.1%	72.7%
FMA	25°	25°
Lower gonial angle	66°	68°
Sum of 3 angles	383°	386°

GoGn - SN - Gonion Gnathion-Sella Nasion angle, Y-axis - The angle of a line connecting the sella turcica and the gnathion, FMA - Frankfurt Mandibular Plane Angle.

Table I c: Showing skeletal changes in schwarz & Harvold length.

Schwarz length	Pre-treatment	Post-treatment
Maxillary	50mm	50mm
Mandibular	77mm	79mm
Harvold length		
Maxillary	95mm	96mm
Mandibular	117mm	122mm
Ramus length	61mm	65mm

**Conclusion:**

The Forsus is an effective and comfortable fixed functional appliance which is very effective in repositioning the mandible in a forward position for the treatment of skeletal mandibular retrognathism. The mandible is free to move laterally while not allowed to

Table II: Showing dento-alveolar & soft tissue changes in Maxillary and Mandibular incisors.

Maxillary incisor	Pre-treatment	Post-treatment
U1-NA angle	25 <sup>0</sup>	18 <sup>0</sup>
U1-NA (mm)	6.5mm	3mm
U1-SN angle	107 <sup>0</sup>	104 <sup>0</sup>
U1 – PP	112 <sup>0</sup>	104 <sup>0</sup>
U1 – FHP	109 <sup>0</sup>	103 <sup>0</sup>
<b>Mandibular incisors</b>		
IMPA angle	100 <sup>0</sup>	103 <sup>0</sup>
L1 – NB angle	27 <sup>0</sup>	29 <sup>0</sup>
L1 – NB mm	6mm	7mm
Interincisal	126 <sup>0</sup>	124 <sup>0</sup>
L1 – Apog line	0.5mm	1mm
Holdaway ratio	6:7	7.5:7
<b>Soft tissue</b>		
Nasolabial angle	106 <sup>0</sup>	117 <sup>0</sup>
Rickett's line		
For upper lip	2mm ahead	1mm behind
For lower lip	4mm ahead	0mm

U1-Upper incisor, L1-Lower incisor, PP-Palatal plane, FHP-Frankfort horizontal plane, IMPA- Incisor mandibular plane angle, Pog- Pogonion

move posteriorly. However patient compliance is a minor drawback but well tolerated comparatively. The Forsus may be a comfortable alternative to conventional anterior repositioning appliances.

**Bibliography:**

1. Adams C D, Meikle M C, Norwick K W, Turpin D L: Dentofacial remodelling produced by intermaxillary forces in *Macaca mulatta*. *Archives of Oral Biology*, 1972;17(11):1519-1535.
2. Beckwith FR, Ackerman RJ (Jr), Cobb CM, Tira DE: An evaluation of factors affecting duration of orthodontic treatment. *American Journal of Orthodontics and Dentofacial Orthopedics*, 1999; 115:439-447.
3. Cope J B, Buschang P H, Cope D D, Parker J, Blackwood H O 3<sup>rd</sup>: Quantitative evaluation of craniofacial changes with Jasper Jumper therapy. *Angle Orthodontist*, 1994;64 (2):113-122.
4. Freeman D C, McNamara J A (Jr), Tiziano Baccetti T, Franchi L, Frankel C: Long – term treatment effects of the FR-2 appliance of Frankel. *American Journal of Orthodontics and Dentofacial Orthopedics*, 2009; 135(5):570.e1-570.e6.
5. Gianelly AA, Arena S A, Bernstein L: A comparison of Class II treatment changes noted with the light wire, edgewise, and Frankel appliances. *American Journal of Orthodontics*, 1984;86(4):269-276
6. Hassel B, Farman A G: Skeletal maturation evaluation using cervical vertebrae. *American Journal of Orthodontic & Dentofacial Orthopedics*, 1995; 107(1):58-66.
7. Heinig N, Goz G: Clinical application and effects of the Forsus spring. A study of a new Herbst hybrid. *Journal of Orofacial Orthopedics*, 2001;62(6):436–450.
8. Jones G, Buschang P H, Kim K B, Oliver D R: Class II non-extraction patients treated with the Forsus Fatigue

Resistant Device *versus* intermaxillary elastics. *Angle Orthodontist*, 2008;78(2): 332-338.

9. Karacay S, Akin E, Olmez H, Gurton A U, and Sagdic D: Forsus Nitinol Flat Spring and Jasper Jumper corrections of Class II division:1 malocclusions. *Angle Orthodontist*, 2006;76(4):666–672.
10. Nelson B, Hansen K, Hagg U: Class II correction in patients treated with class II elastics and with fixed functional appliances: a comparative study. *American Journal Of Orthodontics and Dentofacial Orthopedics*, 2000;118(2):142–149.
11. Pancherz, H: Treatment of class II malocclusions by jumping the bite with the Herbst appliance: A Cephalometric investigation. *American Journal Of Orthodontics*, 1979;76(4):423–442.