Non-extraction treatment of skeletal class II malocclusion

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Abstract

Every orthodontist at some point in his clinical practice has faced the dilemma of how ‘best’ to manage a mild to moderate Class II malocclusion. To demonstrate the efficacy of Forsus™ Fatigue Resistant Device in the management of Class II malocclusion. A patient having Class II division 1 malocclusion with functional jaw retrusion was treated using MBT 0.022” prescription and Forsus FRD appliance. Pre- and post-treatment photographs and lateral cephalograms were taken. Cephalometric analysis was done, and results were superimposed. 7-8 months of Forsus wear obtained stable and successful results with improvement in facial profile, skeletal jaw relationship, and mild increase in IMPA. 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: Fixed functional appliance, forsus fatigue resistant device, malocclusion, non-extraction

Introduction

Class II malocclusion presents a major and a common challenge to orthodontists. When mandibular retrusion is a factor in Class II malocclusion, a functional appliance is often used to advance the mandible. Fixed functional appliances would be the better choice, if the patient reports after the pubertal growth spurt or during the late stages of puberty, and it also reduces the need of patient compliance.[1]

Forsus™ fatigue resistant device

The Forsus™ FRD* is a three-piece, telescoping system, which incorporates a super-elastic nickel-titanium coil spring. The FRD attaches at the maxillary first molar and on the mandibular archwire, distal to either the canine or first premolar bracket. As the coil is compressed, continuous opposing forces are transmitted to the sites of attachment without the possibility of fatigue, thereby correcting Class II malocclusions.[2,3]

This article shows non-extraction treatment of a skeletal Class II patient using the Forsus appliance.

Case Report

A 14-year-old female presented with the chief complain of protruding upper front teeth. Clinical examination showed a convex, retrognathic profile, lip incompetence at rest, and protrusion of the upper lip [Figure 1a-c]. The patient had a Class II, division 1 malocclusion with an overjet of 10 mm and an overbite of 7 mm and a pronounced curve of Spee [Figure 2a-c].

Cephalometric analysis revealed a convex skeletal profile with ANB angle of 7°, a severely retruded mandible, and a well-positioned maxilla. [Figure 6, Table 1] Dentoalveolar readings suggested proclined maxillary anterior teeth with mildly retroclined and retruded mandibular anteriors. The mandibular plane angle was normal, suggesting an average growth pattern. Hand X-rays indicated that the patient’s growth was not completed.

Treatment objectives were to:
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 leveling 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 0.018” stainless steel wire with curve of spee, 0.018 × 0.025” and 0.019 × 0.025” NiTi. Finally, a 0.019” × 0.025” stainless steel wire was placed after alignment of 2nd molars. Leveling and alignment was completed in 8 months. At the end of stage I, there was an 8 mm overjet and 6 mm overbite. This was followed by mandibular advancement using Forsus FRD [Figure 3a-b]. 29 mm length of push rod was selected. 0.019” × 0.025” SS in the lower arch was given labial root torque in order to prevent the flaring of the lower anteriors due to Forsus. Molar correction was achieved after 7 months of wearing the appliance. This was followed by 3 months of detailing and finishing of occlusion combined with light class II elastics, which were gradually tapered off. The patient was observed for 2-3 months 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 21 months.

**Retention**

A maxillary removable Begg’s wrap around retainer with anterior inclined plane to hold the corrected jaw relation was used for 6 months. This was followed by placement of permanent bonded mandibular cuspid-to-cuspid lingual retainer.

**Discussion**

Class II malocclusions resulting from mandibular retrusion are generally treated with functional orthodontic appliances that create orthopedic forces directed at the mandibular structures. These appliances influence the jaws via the following mechanisms: Remodeling of the mandibular condyle, remodeling of the glenoid fossa, repositioning the mandibular condyle in the glenoid fossa, and autorotation of the mandibular bone.[4]

Amongst the fixed functional appliances available, Forsus-FRD has long been proved to be one of the best treatment modality for mild to moderate class II malocclusion. It is capable of achieving class II correction in 3 to 6 months, depending upon the baseline situation and the biological response. The correction achieved is by a

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**Table 1a: Skeletal changes in sagittal plane**

| Pre-treatment | Post-treatment |
|---------------|----------------|
| SNA | 84 | 83 |
| SNB | 77 | 79 |
| ANB | 7 | 4 |
| WITTS | 9 | 7 |

**Table 1b: Skeletal changes in vertical plane**

| Pre-treatment | Post-treatment |
|---------------|----------------|
| GO Gn-SN | 25 | 27 |
| Basal plane angle | 25 | 23 |
| Y-Axis | 64 | 68 |
| Jarabak ratio | 64.7 | 63.5 |
| FMA | 18 | 22 |
| Lower gonial angle | 67 | 69 |
| Sum of 3 angles | 385 | 388 |

**Table 1c: Skeletal changes in Schwarz and Harvold length**

| Pre-treatment | Post-treatment |
|---------------|----------------|
| Schwarz length | 52 | 52 |
| Mandibular | 76 | 78 |
| Harvold length | 92 | 92 |
| Schwarz length | 113 | 116 |
| Mandibular | 59 | 61 |

**Table 2: Dento-alveolar and soft tissue changes in Maxillary and mandibular incisors**

| Pre-treatment | Post-treatment |
|---------------|----------------|
| Maxillary Incisor | 40 | 23 |
| U1-NA (Angle) | 6 mm | 4 mm |
| U1-NA (MM) | 125 | 107 |
| U1-PP | 117 | 108 |
| U1-FHP | 118 | 109 |
| Mandibular Incisor | 102 | 106 |
| IMPA ANGLE | 24 | 32 |
| L1-NB ANGLE | 16 mm | 8 mm |
| Interincisal Angle | 110 | 118 |
| L1-Apog LINE | 0 mm | 4 mm |
| Soft Tissue | 96 | 107 |
| Nasolabial angle | 0 mm | -1 mm |
| E Line-U LIP | 0 mm | 1 mm |

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

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combination of skeletal and dental effects, 66% being dental and remaining 34% skeletal. The mandible experienced a shift anteriorly as the most significant effect of the Forsus appliance. The results achieved after using Forsus appliance in the present case are shown in Tables 1a-c and 2. Active treatment produced excellent correction of skeletal and dental relationships. [Figure 7]

The post-treatment measurements showed favorable sagittal skeletal changes: SNA angle decreased by 1°, SNB angle showed increase from 77° to 79°, 3° reduction was seen in ANB angle and in Wit’s reduction of 2 mm was seen [Table 1a]. At the end of treatment, vertical skeletal changes indicated increase in lower facial height [Table 1b]. Schwarz mandibular length increased only by 2 mm, while there was no change in maxillary length. Harvold length was same in maxilla and increased by 3 mm in mandible [Table 1c]. The dento-alveolar changes showed that maxillary incisors were retracted significantly by 2 mm linear and 17° angular while mandibular incisors changes by 8 mm linear and 8° angular [Table 2]. The soft tissue improvement was seen with a trend towards orthognathic profile [Figures 4 and 5].

One undesirable effect with all fixed functional appliances is protrusion of the lower anteriors as the force is concentrated on the lower anterior segment. This can, however, be prevented with the use of Forsus FRD by use of sectional arch, using a pre-torqued wire prior to insertion
of the forus or using brackets with built-in labial root torque. MBT appliance was used for both patients, with 6° torque in the lower incisor brackets. The lower archwire was securely cinched distal to lower second molars. This helped to counteract the protrusive effect of Forsus on mandibular incisors. IMPA showed a mild increase from 102° to 106°. IMPA up to 105° is acceptable and stable. Another significant effect of Forsus is the distal tipping effect on the maxillary incisors and molars. Even though the attachment to maxilla is at the molar tubes, the effect is seen on the incisors as well, since the entire maxillary arch is consolidated with a multi-bracket appliance.

Normal interincisal angle was established. Superimposition of pre- and post-treatment cephalograms showed an increase in the length of mandible with increase in lower facial height, distal tipping of maxillary first molars, and correction of overjet and soft tissue competency.

Significant improvement was noted in the soft tissue profile, and pleasant smile was achieved for the patients [Figures 1,5]. The position of lower lip in relation to E line showed improvement from 0 mm to 1 mm. The results achieved were stable and highly satisfying for both the clinician as well as the patients.

**Conclusion**

Most class II situations are on account of a functional retrusion of the mandible. It would be very unwise to consider extractions in such situations. Forsus FRD provides one of the best treatment options for class II correction, especially for non-compliant patients, with stable long-term results achieved by sagittal forward displacement of mandible and remodeling at glenoid fossa.

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