Treatment of a Unilateral Class II malocclusion with Sabbagh Universal Spring: A Case Report

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Abstract: Unilateral class II malocclusion is a treatment challenge. Several treatment approaches have been recommended; each with particular limitations. Fixed functional appliances are quite popular because of invisibility, minimal interference with speech, and not relying on patient cooperation. This article describes a clinical case treated satisfactorily using unilateral Sabbagh Universal Spring.

Keywords: Class II malocclusion; Fixed functional appliance; Sabbagh Universal Spring.

Introduction

treatment planning, correction and retention of unilateral class II problems are among the most challenging situations in clinical orthodontics. The major difficulty encountering these patients arises from the fact that a proper diagnosis is not always unproblematic. Three-dimensional (3D) models are shown to be very helpful in detection of the problem. In otherwise skeletally normal and symmetric patients, early loss of maxillary deciduous teeth and space loss is a probable cause leading to class II malocclusion. This could be as well contributed to unilateral class II. Many treatment options are available for regaining this space in a unilateral class II case including unilateral extraction, unilateral use of class II elastics and use of an asymmetric head gear or distal movement of teeth using pendulum magnets or implant anchorage. Each of which require varying levels of patient cooperation and biomechanical complexity; not to mention side effects such as midline shift, risk of producing canting in frontal view and finally asymmetric smile. In addition, in recent orthodontics non-extraction treatments and non-compliance therapies have become more popular in correction of class II malocclusion.

This article describes unilateral class II correction and space opening in a patient in whom extra/ intra oral characteristics indicated a non-extraction approach.

Case Report

Diagnosis and Etiology

The patient was a 15-year-old boy with class II subdivision on the left side. Overjet and overbite were 2 mm and 20% respectively; in left canine area overbite was increased due to lower left canine super eruption. The facial photographs showed a normal profile with obtuse to straight nasolabial angle and moderate chin length. The pretreatment intraoral photographs and dental casts revealed a class II subdivision and a blocked out upper lateral incisor on left. In closer examination upper midline was slightly deviated to the right (Figures 1 a-h).

In radiographic examination all permanent teeth were present and erupted except for the third molars. Lateral cephalogram analysis revealed a skeletal class I patient with normal upper and lower incisal inclination (Figure 1i and j).

In view of the aforementioned findings a single-phase non-extraction treatment was designed in which SUS 2 appliance would be placed on the left side adjusted to produce dental effect in order to correct the class II molar relationship and regain the space.
Treatment Objectives

Treatment objectives for this patient were as following:
1- To correct the class II malocclusion on the left side by
   a) distalization of upper left quadrant, as shown in 3D scan of the pretreatment model (Figure 2a) upper left quadrant is mesialized causing the asymmetric malocclusion.
   b) to a lesser degree mesialization of lower left canine (Figure 2b)
2- To maintain the midline, overjet, and over bite
3- To correct the unilateral collapsed arch in lower left canine area
4- To obtain a 3-dimensionally symmetric upper and lower arch

Treatment Progress

All teeth were bonded except for upper left lateral and canine. Archwires were used sequentially up to 0.19 x 0.25 stainless steel meanwhile a sleeve was placed over the wire in upper left canine region in order to inhibit buccal mucosa irritation. At this level a Sabbagh Universal Spring (SUS2, Dentaurum Group, Turnstrabe 31, 75228 Ispringen, Germany) was placed on the left side adjusted to have solely dental effects (Figure 3a) and both arches were cinched tightly.

SUS2 is a fixed functional appliance device with similarities to the Herbst® appliance. It consists of a rod fitted into a guide tube (Figure 3b), inside the guide tube is an adjustable spring for different force levels. The Eye loop (Figure 3b) attached to the distal end of guide tube is designed to fit head gear tube of the maxillary first molar band with a pin bent distally (Figure 3c). The mesial end of the rod is attached to the lower archwire between canine and premolar via an arch adaptor (Figure 3c). Optionally a coil can be inserted in the mesial end for additional activation. (Figure 3a) When the inner spring is activated or the external spring is added, SUS will act as a spring achieving headgear effects (as in our case) but SUS can optionally be used for Herbst® effects (skeletal effect) (Figure 3c) when the inner spring is deactivated with the screw driver. The required length of advancement is set before fitting the appliance, additional length can be obtained through the use of spacers in the mesial side (Figure 3b).

After 5 months of distalization treatment when there was sufficient space opening, upper left canine and lateral incisor were bonded.

Treatment Results

After 14 months, proper class I molar and canine relationship were achieved and the
arch asymmetry was corrected. Records taken 6 months after debonding showed solid and stable class I occlusion with no signs of relapse (Figure 4). Cephalometric superimpositions indicating treatment/growth changes are shown in Figure 5.

Arch symmetry in transverse dimension was established. The antropostreior position of canines and molars were also symmetric in both sides in upper and lower arches (Figure 6).

Discussion

Currently, fixed functional appliances are quite popular because of invisibility, minimal interference with speech, and not relying on patient cooperation which would save the orthodontist both time and trouble. In addition, unilateral use of SUS 2 has many benefits over the other alternatives:

A) Asymmetric headgear: In addition to patient compliance, asymmetric headgear can cause unwanted side effects in transverse dimension leading to cross bites.

B) Unilateral maxillary extraction: Unilateral extractions must be followed by complex biomechanics to attain a symmetric smile and overbite control in that quadrant. In addition, extraction in one quadrant will occasionally cause posterior Bolton discrepancy.

C) Unilateral use of class II elastics: This approach seems like a convenient solution but there are several side effects that should be handled. First, class II elastics can cause upper canine extrusion which leads to frontal smile roll and asymmetric bite. In addition, canine extrusion tends to constrict upper arch in canine region which in part inhibits lower arch expansion, a necessary factor in this patient. SUS forces mostly act in a horizontal direction. This vertical component of class II elastics is pronounced in jaw opening and function. In contrast, SUS appliance which is a combination between the Herbst appliance (as a telescope) and the Jasper Jumper (as a spring) is deactivated in jaw opening and exerts forces mainly in horizontal direction upon closure. Second, provided that treatment plan is based on class II elastics, early bonding of upper left canine and lateral incisor is mandatory which will cause arch asymmetry and occlusal interference of these teeth. These side effects plus dubious patient compliance and potential rotation of occlusal plane and mesial rotation of lower molars limits class II elastic use in this case.

Through unilateral use of SUS2 application (as shown in Figure 6a...
and b (compared with Figure 2) transverse as well as anteroposterior arch symmetry was achieved with minimum such side effects.

D) A possible and quite rational alternative in this case is distalization through use of mini-implant anchorage in upper left quadrant.\(^7,15,16\) However, since some expansion in the lower left canine area is necessary, this could be better achieved with SUS 2 and its intrusive force on canine.\(^10\)

**Conclusion**

This case report found unilateral use of SUS2 quite satisfactory in reaching the treatment objectives. A three dimensionally symmetric occlusion was achieved. Class II malocclusion was corrected through upper left quadrant distalization, and to a lesser degree mesialization of lower left canine; both known as effects of fixed functional treatment. This was done while overjet, overbite, and midline relation was maintained. The SUS can replace class II elastics and is especially beneficial in noncompliant patients, the late class II, and when headgear or extraction are contraindicated. The appliance is effective 24 hours a day without being dependent on patient compliance. This is of particular interest in the case of non-motivated patients and late cases with little remaining growth. Possible disadvantages are added expense, marked protrusion of the lower anterior teeth and added oral hygiene problem. The combination serves well as a unilateral treatment as well.

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**References**