A Class II malocclusion is one of the most commonly encountered problems in orthodontics, whether due to a skeletal or dental discrepancy. It has been suggested that mandibular retrognathism is more often the reason for the skeletal discrepancy than maxillary prognathism. Based on the patients' growth status, treatment options commonly include use of functional/fixed functional appliances (FFAs) to try to possibly enhance the mandibular growth, headgear to restrict maxillary growth and/or distalize the upper molars, camouflage by extraction of upper and/or lower premolars, or surgical correction of the underlying skeletal discrepancy when facial growth has completed. Functional appliances are often the preferred modality of treatment in growing Class II patients with mandibular deficiency. Among these appliances, semi-rigid FFAs are gaining popularity as patient compliance may be better with such fixed FFAs than with removable functional appliances.

It is generally agreed that teeth that have been moved tend to return to their former position. Pancherz studied retention with the rigid Herbst appliance and stated that most of the relapse that occurred was from the dental changes. Therefore, maintenance of treatment results is the true hallmark of the effectiveness and efficacy of any particular orthodontic appliance. The long-term results obtained with semi-rigid FFAs are still largely unknown. In the past, some case reports have demonstrated that the corrections achieved by these semi-rigid mandibular repositioning appliances are stable over long periods. The following cases highlight the efficacy of the Twin Force bite corrector (TFBC) appliance, a semi-rigid FFA in successful correction of Class II deep-bite malocclusion, with long-term evaluation of the corrections achieved.
Design and Biomechanics

The TFBC appliance\(^{5,6,7}\) is a semi-rigid, fixed "push-type" appliance clamped to archwires placed on the upper and lower arches bilaterally. Each unit is made of two 15-mm telescopic parallel cylinders. A plunger is incorporated within each cylinder at its opposite ends. At the end of each plunger, hex nuts are present to attach the appliance onto the archwires mesial to the upper molars and distal to the lower canines (Figure 1).

The centre of resistance of the upper and lower arch is considered to be in between the apex of the first and second premolar roots. The direction of force applied by a FFA on the maxillary denture base would be distal and intrusive, while the lower arch experiences a mesial and intrusive force. The forces delivered also produce a clockwise rotation of both arches, which can lead to canting of the occlusal plane. However, since the TFBC appliance is attached mesial to the upper molar, it thereby reduces the distance between the point of force application and the centre of resistance of the upper arch, causing lesser moment to be generated as compared to other bite jumping appliances where the point of application of the force is distal to the upper molar (Figure 2). This further results in maintaining or minimizing the steepening of the occlusal plane and maintaining the vertical dimension of the face.

Treatment Protocol

After the initial levelling and alignment, the archwires are progressively increased to 19- x 25-inch stainless steel in the upper arch and 21- x 25-inch stainless steel in the lower arch. Both archwires were cinched to move the arches as a single unit and prevent any spacing or flaring. A .032- x .032-inch stainless steel transpalatal arch is also placed to counteract the buccal forces by the TFBC appliance on the maxillary dentition.

Additionally, to minimize the lower incisor flaring, lower anterior brackets with a torque prescription of -6° are recommended. The standard TFBC version is attached by the hex nuts onto the archwires mesial to the maxillary molars and distal to the lower canines, posturing the mandible forward in an edge-to-edge occlusion. After 3 to 4 months of appliance wear, the patients are overcorrected to a super Class I relation to compensate for mild relapse which would occur after removal of the appliance. The TFBC appliance is then removed, and intermaxillary elastics are used to maintain the correction achieved. Finishing and detailing of the occlusion is performed as per individual case requirements.
Effects of TFBC Appliance

In an unpublished study\(^8\) at the University of Connecticut Health Centre, the effects of the TFBC appliance were analysed. A comparison was made between 20 subjects who received the TFBC appliance to an untreated Class II sample from the Denver growth study. The patients were matched for age, sex, and maturation status. The results showed that during the TFBC appliance phase, the A point in the maxilla moved 0.5 mm posteriorly and 1.7 mm inferiorly compared to 0.1 mm anterior and 0.4 mm inferior movement of the A point in the control sample. The absolute length of the maxilla (ANS-PNS) was similar in both the groups. The palatal plane rotated clockwise 0.5˚ in the TFBC sample compared to 0.1˚ for the control sample.

The mandibular length increased significantly by 2.1 mm compared to a 0.7-mm observation for the control sample. Dentally, the upper molar distalized -0.7 mm and intruded -1.1 mm compared to the control group, where the upper molar mesialized by 0.3 mm and extruded 0.2 mm. The upper incisors distally tipped -7.0˚ compared to 0.1˚ mesial tipping in the control sample. The lower molar protracted 1.8 mm compared to the control group, where only 0.2 mm mesial movement was observed. The lower incisors flared by 7.3˚ compared to 0˚ in the control group and mesialized 2.6 mm compared to 0 mm in the control group. Therefore, the Class II correction was made by a combination of skeletal and dental parameters.

Case with Long-Term Results

An 11-year-old postpubertal female reported with a chief complaint of an overbite. Intraoral examination revealed a 100% overbite, retroclined upper incisors, and an “end on” Class II relation due to a retrognathic mandible (Figure 3). The treatment plan was to correct the deep bite by relative intrusion and flaring of the upper incisors. Class II correction was to be attempted by seeking to enhance differential jaw growth using the TFBC appliance. After levelling and alignment, the archwires were gradually built up to upper 0.019 x 0.025 and lower 0.021 x 0.025 SS wires (Figure 4A). The TFBC appliance was used for 4 months (Figure 4B), which resulted in an overcorrection with an anterior edge-to-edge bite to accommodate for mild relapse after the appliance removal (Figure 4C). The patient was debonded after 20 months of active treatment (Figure 5). An upper removable and a lower fixed retainer were given. The patient was evaluated 4 years after removal of all orthodontic appliances and demonstrated stable occlusion with an improvement in facial aesthetics (Figure 6). The Class II correction was essentially due to forward movement of the lower molar along with differential jaw growth (Figure 7).
Conclusion

Class II correction with semi-rigid FFAs occurs due to a combination of mild skeletal changes and lower molar mesialization. Good posterior occlusion appears to be a factor associated with long-term stability of the Class II correction. The TFBC is a versatile appliance for the correction of the Class II malocclusion. Short- and long-term treatment results show that the corrections obtained are stable and favourable. **OP**

References


