

Advansync 2 Appliance: A Narrative Review

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Abstract: Fixed functional appliances also known as “noncompliant Class II correctors” have gained significant ground in the last few years. With them in use, the treatment duration is reduced by 6 months. They are divided into rigid, flexible, and hybrid appliances. Rigid fixed functional appliances restrict the mandibular movements and flexible fixed functional appliances have frequency of breakage to a greater extent. To overcome these drawbacks, hybrid fixed functional (HFF) appliances have come into play. HFF appliances offer the advantages of previous ones, thus eliminating their pitfall. Recent advances have also led to the improvisation of HFF appliances. This review article explains about the Advansync appliance which is modification of herbst appliance.

Keywords: Class 2 malocclusion, Fixed functional appliance, Advansync 2

1. Introduction

The prevalence of class II malocclusion, one of the most frequent developmental defects, is from 15 to 30% in most populations. Dental and skeletal Class II malocclusion increases the risk of dental trauma, the perception of facial and dental esthetics as being less attractive, the quality of life and self - esteem being negatively impacted, the oropharyngeal space being reduced, and the incidence of sleep disorders being higher. The most suitable approach for clinical treatment depends on the severity of class II malocclusion that the following anomaly may exhibit at different ages.¹

The benefit of treating Class II malocclusion while the patient is still growing, that is, during the mixed or early permanent dentition period, is that it may be possible to alter the patient's pattern of growth and lower the risk of trauma to the maxillary incisors. Earlier methods for treatment of Class II patients typically involved removable compliance based removable functional appliances e. g. Activator, Bionator, Frankel's Functional regulator and Twin Block appliance and intermaxillary Class II elastics.²

Over time, lack of patient compliance and the desire to produce more predictable results in a more efficient manner led to the development of numerous fixed appliances. This led to the evolution of fixed functional appliances which are fixed to the upper or lower jaws for nonmotivated, noncompliant patients. They are well known as “non compliant Class II correctors.” They are rigid, flexible, and hybrid fixed functional (HFF) appliances.⁵

Fixed functional appliances:

Fixed functional appliances 1st appeared in 1900s when “Emil Herbst” presented his system at “Berlin International Dental Congress” (1909), which was reintroduced by “HANS PANCHERZ” of Malmo, Sweden in 1979 who brought the subject back into the discussion with the publication of several articles on the Herbst, who actually used this appliance to stimulate mandibular growth. It was only in the eighties several systems derived from Herbst's work have

appeared and gained popularity in recent years to achieve better results in non - compliant patients⁶

Classification Fixed functional appliances

A) Appliances producing pushing forces: These appliances deliver a push force vector forcing the attachment points of the appliance away from one another.

- Rigid: (Herbst Appliance and its modifications, Mandibular protraction appliance, Ritto appliance, Biopedic appliance, Mandibular anterior repositioning appliance, Functional Mandibular Advancer)
- Flexible: (Jasper Jumper, Scandee tubular jumper, Flex developer, Amoric torsion coils, Churro Jumper, Adjustable Bite Corrector, Klapper Super Spring II, Forsus nitinol flat spring)
- Hybrid: (Eureka spring, Forsus fatigue resistant device, Twin force bite corrector, Sabbagh universal spring)

B) Appliances Producing Pulling Force: These appliances act as a substitute for elastic and create pulling force vector between the points of attachment. Example - SAIF (Severable Adjustable intermaxillary Force) spring, Alpern class II closers, Calibrated force module.

Commonly used Fixed functional appliances are - Herbst appliance, MARS appliance, Jasper Jumper, MARA, Forsus Fatigue Resistant Device, Powerscope and Advansync.

Mode of action of Hybrid fixed functional appliances

The appliance is tooth borne and exerts its effects to the underlying bone via teeth by transmitting the forces developed as a result of the continuous forward posturing of the lower jaw. (Graber et al., 1997). The correction consists of advancing the mandible to a forced anterior position to stimulate growth (orthopedic - 30%–40%) and harmonize skeletal defects and also by eliciting dentoalveolar effects (60%–70%).

The general mode of action is one or the combination of following:

- Mandibular growth stimulation and supplementary lengthening

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- Maxillary growth restriction
- Dentoalveolar changes
- Adaptive changes occur in distracted condylar head and Glenoid fossa location to more vertical and anterior position.
- Changes in neuromuscular structure and function that induce bone remodelling.⁷

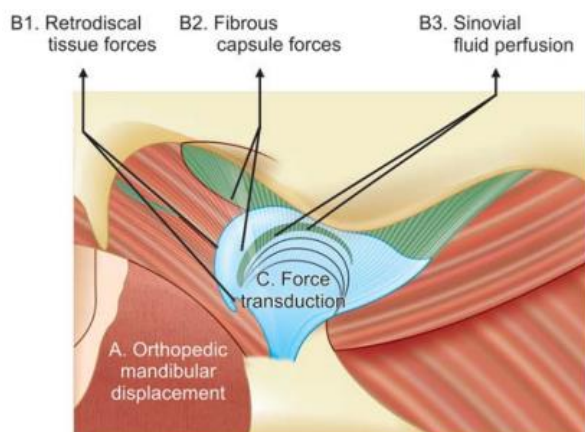


Figure 1: Growth relativity hypothesis for condylar and glenoid fossa growth with continuous orthopedic displacement

Advansync

Developed by Terry Dischinger in 2010. It is a molar - to - molar fixed functional assembly. As the name of the appliance suggests the mandible can be postured forward synchronously with the start of all other fixed appliance tooth movements. The appliance requires no laboratory work. The appliance is almost half the size of the MiniScope Herbst appliance. It has the advantage of allowing concurrent treatment with pre - adjusted edgewise appliances and therefore efficient normalization of the occlusion. The advansync appliance seems to shorten total treatment time by combining the anterior - posterior correction and fixed appliance phase.

Advantages of Advansync

1) Class II Treatment in Class I Time.

- a) Placed simultaneously with initial bonding, eliminating the need for two - phase treatment.
- b) It gives constant activation and has no need for patient compliance.
- c) Appliance can be given during the mixed - dentition phase.

2) Engineered for efficient correction.

- a) Reinforced Spirallock threading maximizes screw engagement.
- b) Advanced metal injection molding provides a highly durable and robust appliance.
- c) Upper and lower dual screw housing allow higher versatility throughout treatment.
- d) Electropolished manufacturing process provides smoother operation.

3) Convenient and Easy - to - Use.

- a) Easy to deliver for doctors and staff.

- b) Allows freedom of movements mesial to the molar crowns.
- c) Has built - in activation.

4) Improved patient comfort and satisfaction.

- a) Has 50% shorter arms which reduces discomfort and tissue irritation.
- b) Sits further back in the mouth than other Herbst appliances, for a more discrete appearance.
- c) Facilitates enhanced lateral jaw movement.
- d) Speech is unaffected– unlike removable appliances.
- e) Design enhancements facilitate increased hygiene.

Appliance Design of Advansync

The AdvanSync is a fixed tooth - born functional appliance consisting of crowns cemented on maxillary and mandibular permanent first molars, a position where orthopedic forces are applied

- Consists of metallic crowns on the maxillary molar and mandibular molar
- Molar tube
- Push rod with - Lumens are 16% larger with radiused internal edges for increased lateral movement

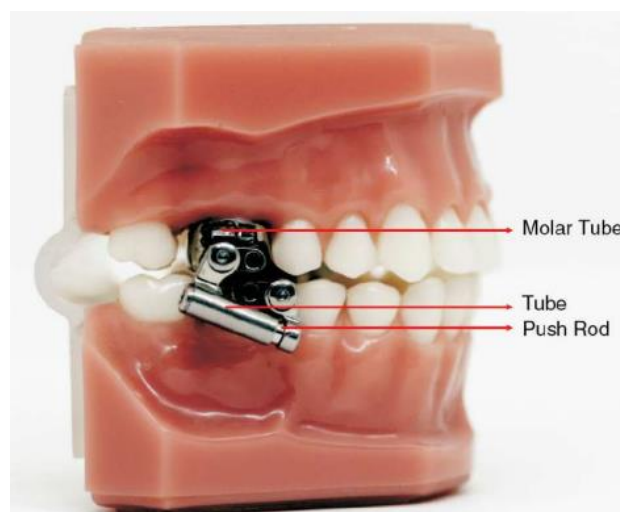


Figure 2: Advansync appliance



Figure 3: Lumen of 16% radius for lateral movements

Mode of action of Advansync appliance:

The AdvanSync is designed to allow simultaneous fixed orthodontic appliance treatment. (0.0220 ×0.028) slot edgewise bracket system is fully bonded with the brackets on the mandibular incisors having a built - in labial root torque.

Bonding lower anterior brackets also prevents the side effect of mesiolingual rotation of the molars.

This functional appliance includes stainless - steel crowns with single archwire tubes on permanent first molars. The AdvanSync did not include lower lingual holding arches, and the maxillary and mandibular crowns of this appliance are connected by telescopic rods. The telescopic mechanism acts to constantly posture the mandible forward upon closure, with the goal of enhancing mandibular growth. The treatment protocol includes stepwise activation as judged by the severity of the overjet. The appliances are activated 2 to 4 mm every 3 months for 6 to 12 - month duration until moderate dental overcorrection is achieved. The occlusion with the AdvanSync is overcorrected to an anterior crossbite and a Class III canine relationship with the maxillary canine in an end - to - end relationship with the mandibular first premolar or in a full - tooth relationship in the more severe cases. Over - correction is desirable to counteract some relapse of mandibular anterior repositioning. General principle is to counterbalance the relapse tendency, yet finish in a Class I position. This appliance is used during skeletal growth spurt as evaluated by the improved cervical vertebral maturation method, to avail maximum benefit.

Appliance activation

On the day of placement:

This gives approximately 4 mm activation.

1st activation: After around 6 - 8 weeks, the screw from the lower mesial casing is shifted to the distal casing, thus producing around 2 mm activation.

Subsequent activations: After 6 - 8 weeks to check the correction of mandibular advancement. If required, the spacers (1 or 2 mm are placed) for further activation. Spacers are needed unilaterally - to correct midline discrepancies, if any.

Multi - step advancement over single - step advancement helps to achieve better skeletal effect and soft tissue adaptation. The dental effect is minimized. Condylar adaptation is better achieved.

At each appointment, appliance breakage (if any), appliance fit, molar relation, midline shift, and occlusal disturbance are evaluated. Once the appliances are removed, edgewise fixed orthodontic treatment is continued to achieve correct anterior torque and occlusion and adequate finish.

Effects of advansync on skeletal and dental structures

Skeletal effects

- 1) Advansync2 has a head gear like effect by restraining the growth of maxilla which is beneficial in maxillary prognathic cases.
- 2) An anterior force to the mandible.
- 3) Increase in FMA angle (25° - 28°) and lower anterior facial height (ANS - Gn - 58° - 62°) have also been evidenced.
- 4) A significant increase in SNB and decrease in ANB angle.

- 5) Significant increase in the total length of the mandible (Co - Pog).

Dental effects

The direction of the forces generated by the advansync2 appliance includes sagittal, intrusive, and expansive vectors.

- 1) The molar - to - molar attachment brings about intrusion of the molars.
- 2) Mild proclination of the lower incisors shown by increase in IMPA angle. However, the amount of lower incisor proclination is lesser when compared to other fixed functional appliances where the attachment is fixed to the mandibular anterior segment thereby resulting in greater proclination of the lower anteriors.
- 3) Reduction in U1 - FH angle indicating reduction in axial inclination of upper central incisor.
- 4) A very high and significant reduction in overjet.
- 5) The sagittal force vector produces distal movement of the upper molars and mandibular molar mesialization.
- 6) Additionally, an intrusive force of the maxillary posterior region and mandibular anterior region is also evidenced.
- 7) The push force generated by the appliance also leads to 2 - 3mm of expansion of the maxillary dental arch. This can be evidenced by the increase in the maxillary intercanine, inter - premolar and the inter - molar widths in patients wherein an overall arch expansion of 3 - 4mm occurs⁸.

Retention protocol of the appliance:

The cases in which AdvanSync 2 is used can be best retained using a removable retainer with an anterior inclined plane. This helps in retaining the corrected mandibular position. Removable retainer should be worn daily for a maximum duration⁹

2. Conclusion

AdvanSync2 is the recently introduced fixed functional appliance. The advantage of this appliance is that there is no need to align and level the arches before its placement so that the treatment duration is drastically reduced¹⁰. This with early sagittal discrepancy correction is associated with better patient motivation and oral hygiene maintenance. Most of the fixed functional appliances result in increased proclination of lower incisors. The unique design of molar - to - molar attachments in the AdvanSync2 appliance is expected to reduce lower incisor proclination since there is no attachment in the lower anterior section. Functional appliances do not replace fixed attachments. Indeed combined use of brackets, bands and extraoral force has the potential for the best possible and most stable long - term results. It is important to note that functional appliance therapy is to be generally followed by the traditional full banded techniques for optimum results; since they deal more with the gross changes in the intermaxillary relations and are not designed for precise individual tooth movement.¹¹

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