

# Fixed Functional Appliances - Right Time, Right Choice, Right Age

<sup>1</sup>Dr. Pooja Katkade, <sup>2</sup>Dr. N. G. Toshniwal, <sup>3</sup>Dr. Shubhangi Mani, <sup>4</sup>Dr. Nilesh Mote, <sup>5</sup>Dr. Vishal Dhanjani  
<sup>1</sup>PG. Student, <sup>2</sup>H.O.D, <sup>3,4,5</sup>Professor, Dept of Orthodontics, RDC, Loni, Maharashtra, India.

**Abstract** - Fixed functional appliances are normally described as “Non compliance Class II correctors”. The correction consists of advancing the mandible to a forced anterior position to stimulate growth and harmonize skeletal defects and also by eliciting dentoalveolar effects. They also improve the soft tissue profile. Fixed functional appliance was introduced first in dentistry by Dr. Emil Herbst of Germany.

Fixed functional appliances can be Rigid appliances, Flexible appliances or combination of both – Hybrid appliances. While headgear, elastics, and many other appliances treat Class II cases, most do not simultaneously correct malocclusions while advancing the mandible. The AdvanSync 2 Class II Molar To Molar appliance makes it possible to combine two distinct treatment phases by achieving skeletal and dental corrections at the same time. Functional appliances used to correct Class II malocclusion can modify the neuromuscular environment of the dentition and associated bones. The ensuing skeletal alterations have been attributed to morphologic adaptations to altered muscular tone and to a change in the traction direction exerted by the masticatory muscles. However, bone and muscle interaction, and the mechanism of neuromuscular adaptation to functional appliance are complex. Andresen and Häupl claimed that a myostatic reflex is produced leading to isometric contractions from the activity of the jaw – closing muscles, which in turn stimulates the protractor muscles and inhibits the mandibular retractor muscles.

**Keywords** – fixed functional appliances, hybrid appliances.

## I. CLASSIFICATION OF FIXED FUNCTIONAL APPLIANCES

By Ritto A.Korrodi(2001) Fixed functional appliances are classified into four categories, depending upon the features of force system used to advance the mandible:

- Rigid Fixed Functional Appliances.
- Flexible Fixed Functional Appliances.
- Hybrid Appliances.
- Appliances acting as substitute for elastics.

A. Rigid fixed functional appliances(RFFA) include the following:

- 1.Herbst Appliance.
- 2.The Mandibular Protraction Appliance(MPA)
- 3.The Mandibular Anterior Repositioning Appliance(MARA)
- 4.Biopedic Appliance.
- 5.Ritto Appliance.
- 6.The IST appliance

B. Flexible fixed functional appliances(FFFA) include the following:

- 1.Jasper Jumper.
- 2.The Adjustable Bite Corrector
- 3.The Churro Jumper
- 4.Scandee Tubular Jumper.

5.Amorc Torsion Coils.

6.Adjustable Bite Corrector.

7.Bite Fixer.

8.Klapper SUPERspring II.

C. Hybrid fixed functional appliances(HFFA) include the following:

- 1.Eureka Spring.
- 2.FORSUS-Fatigue Resistant Device
- 3.Twin Force Bite Corrector.
- 4.Alpern Class II Closers
- 5.The Calibrated Force Module

## II. FLEXIBLE FIXED FUNCTIONAL APPLIANCES

Flexible appliances are described as consisting of an intermaxillary coil spring or a fixed spring. Elasticity and flexibility are typical of these appliances. They allow for satisfactory free mandibular movement, with lateral guidance being easily performed. The amount of force varies and can be controlled by the clinician.

Their major drawback is the likelihood of both appliance and supporting system fractures “especially in the mandible”. On one hand, flexibility is an advantage; on the other hand, it really tends to produce fatigue of springs.

It is important to advise patients to avoid opening their mouths too widely because this could result in breakage. Additionally, they are not very aesthetic appliances. If spring curvature is considerable, protuberances may appear in patient's cheeks.

Examples of flexible appliances include: Jasper Jumper and Jasper Vektor.

### III. RIGID FIXED FUNCTIONAL APPLIANCES

These appliances are different from flexible ones in two respects: They are not easily fractured, however, they are not elastic nor flexible; after fitting and activation, they do not allow the patient to bite in maximum intercuspation as usual. This means the mandible is in forward position 24 hours a day, thereby providing more stimulus for growth. This group really results in mandibular protraction.

Rigid appliances work on the basis of a telescopic mechanism stimulating anterior repositioning of the mandible while the patient bites in occlusion. Skeletal effects produced by these appliances are greater than those produced by flexible ones.

Examples of rigid appliances include: Herbst, AdvanSync 2 and MARA.

### IV. HYBRID FIXED FUNCTIONAL APPLIANCES

Hybrid appliances are a combination of flexible and rigid ones. They are rigid appliances with spring systems. The purpose of these appliances is to move teeth by applying continuous elastic force 24 hours a day. This replaces conventional Class II elastics. Use of open spring to produce force is typical of this type of appliance. Force produced varies from 150 to 260 g.

The main purpose of hybrid appliances is not to reposition the mandible in forward position. It is possible to claim that flexible and hybrid appliances produce greater tooth movement during treatment, in comparison to rigid ones. This is probably due to not moving the condyle from the mandibular fossa.

Examples of hybrid appliances include: Forsus, Twin Force Bite Corrector, Sabbagh Universal Spring (SUS) and Powerscope.

The following characteristics are typical of this new generation of appliances:

- Spring inserted into the telescopes, to avoid hurting patient's cheek and prevent food from accumulating during meals.
- Reduced size, to provide more comfort and favour patients adaptation.

### V. INDICATIONS FOR FIXED FUNCTIONAL APPLIANCE USE

- As Class II mechanics.
- Cases of Class II with mandibular retrusion. Preference is given to rigid appliances.
- Cases of Class II with maxillary protrusion.
- Residual Class II correction after treatment with extractions.
- Class II, Subdivision, with no extraction treatment.
- As anchorage after distalization of maxillary molars.
- As anchorage in cases with extractions.
- As anchorage for space closure with mesialization of posterior teeth in cases of agenesis of mandibular second premolars or extraction of mandibular first molars.
- Compensatory treatment of mandibular deficiency in adult patients.

### VI. CONTRAINDICATIONS FOR FIXED FUNCTIONAL APPLIANCE USE

There are some clinical situations in which the clinician needs to avoid the use of mandibular protraction appliances, namely:

- Patients with periodontal issues.
- Patients with gingiva in the mandibular anterior region.
- Patients with mandibular incisors tipped or anteriorly projected.
- Patients with marked gingival smile.
- Patients with a tendency to open bite.

### VII. MODE OF ACTION OF FIXED FUNCTIONAL APPLIANCES

The mechanism of mandibular adaptation to the forward posturing by fixed functional appliance is the same as that seen in removable functional appliance. The appliance is tooth-borne and exerts its effects via teeth to the underlying bone by transmitting the forces developed as a result of the continuous forward posturing of the lower jaw.

Despite of the various differences in concept, the general mode of action is one or combination of the following:

- Mandibular growth induction.
- Maxillary growth restriction.
- Dentoalveolar changes.
- Glenoid fossa relocation.
- Changes in neuromuscular anatomy and function.

### VIII. COMPLICATIONS WITH USE OF FIXED FUNCTIONAL APPLIANCES

Certain complications are seen with the use of fixed functional appliances which are as follows:

- Breakage of bands or splints.
- Breakage of telescopic mechanism.
- Loosening of bands or splints.
- Trauma to buccal mucosa.

[14] An EMG investigation of the response to activator. Ahlgren. *Am. J. Orthod.* 1960; 46(1): 57.

## IX. CONCLUSION

Removable functional appliances are effective but rely heavily at mercy of patient cooperation for achieving predictable results in reasonable time frame. Patient cooperation is variable and is not always fourth coming, with appliances such as head gear or removable functional appliances.

## REFERENCES

- [1] Twin Force Bite Corrector Device. Henry Schein Orthodontics. 2014.
- [2] Gentle, effective, and efficient Class II correction that sets a new standard for treatment. The Jasper Vektor™ – the first edgewise Class II corrector. *Orthodontic Practice*, Volume 6 Number 5: 54 – 55.
- [3] Simplified correction of Class II using Powerscope. Alexandre Moro. *OrthoTown*, March 2016: 20 – 27.
- [4] The Bite Fixer. *Clinical Impressions*. Awbrey JJ. 1999; 8: 10-17.
- [5] AdvanSync advancing the mandible simultaneously with bracketed orthodontic treatment. Terry and Bill Dischinger. *Orthotown*, April 2012.
- [6] A comparison of the MARA and the AdvanSync functional appliances in the treatment of Class II malocclusion. Thikriat S. Al – Jewair, Charles B. Preston, Eva – Maria Moll, Terry Dischinger. *Angle Orthod.* Vol 82, No 5, 2012: 907-914.
- [7] Comparison of AdvanSync and intermaxillary elastics in the correction of Class II malocclusions: A retrospective clinical study. Santosh Jayachandran, William A Wiltshire, Sandra M. Hayasaki and Fabio H. S. L. Pinheiro. *Am. J. Orthod.* 2016, Vol 150, Issue 6: 979-988.
- [8] Skeletal Class II Case Presentation: Utilization of the AdvanSync 2 Appliance. *APOS Trends in Orthodontics*, Vol 8, Issue 3, July-September 2018.
- [9] A Herbst journey. Bill Dischinger. *Orthodontic Practice*, November 2016.
- [10] Soft Tissue Changes with Fixed Functional Appliances in Class II Division 1, A Systematic review. Carlos Flores-Mir, Michael P. Major. *Angle Orthodontist*, Vol 76, No 4, 2006: 712 – 720.
- [11] Surface electromyography studies on masticatory muscle activity related to orthodontics: A review of literature. Pattra Sumonsiri, Udom Thongudomporn. *J. Dent. Assoc. Thai*, Vol 67, No. 2, April-June 2017.
- [12] The adaptive response of jaw muscles to varying functional demands. Thorsten Grünheid, Geerling E. J. Langenbach. *Eur. J. Orthod* 31(2009): 596-612.
- [13] Temporomandibular muscle contraction patterns in Angle's Class II Div 1 malocclusions. An EMG analysis. Moyers. R. E. *Am. J. Orthod* 1949; 35: 837-857.