# Functional Appliance

## ▪ INTRODUCTION

Functional/myofunctional appliances are devices that alter patient's functional environment in an attempt to influence and permanently change the surrounding hard tissue. Most of the functional appliances are mainly designed to correct skeletal class II relationship by positioning the mandible downward and forward to theoretically enhance mandibular growth. All functional appliances are intraoral devices. Functional appliances may be removable or fixed.

## ▪ DEFINITION

- By Moyer: "Functional appliances are loose removable appliances designed to alter the neuromauscular environment of the orofacial region to improve occlusal development and/or craniofacial skeletal growth."
- By Proffit: "Functional appliances are appliances which alter the posture of the mandible, holding it open or closed and forward or backward."
- Functional appliances: are appliances which act by either harnessing the muscular forces or by preventing aberrant muscular forces.

## ▪ CLASSIFICATION

Functional appliances can be divided into removable or fixed functional appliances. Removable functional appliances can further be classified into removable tooth-borne functional and removable tissue-borne functional appliances. The Fixed functional appliances are tooth borne.

- ***Removable Tooth-Borne Appliances***: depend on the stretch of the soft tissues caused by the mandible being positioned downward and forward, as well as by the muscle activity generated by the mandible attempting to return to its original position. Examples: Activator, Bionator and Twin block appliance.
- ***Removable Tissue-Borne Appliances:*** are used to minimize unwanted tooth movement and to recontour the facial soft tissue adjacent to the teeth as well as posture of mandible downward and forward. Example: Functional regulator/functional corrector/ Frankel appliance.

• Fixed Tooth-Borne Appliances: are fitted on the teeth and cannot be removed by the patient at will. Example: Herbst appliances.

## ▪ MODE OF ACTION

Most of the functional appliances act by utilizing one or more of the following:
• A forced mandibular posture, which transmits forces to the teeth and jaws.
• Bite planes, which produce differential eruption.

## ▪ ADVANTAGES

1. Effective in vertical control of increased overbite.
2. Used in the mixed dentition.
3. Require minimal chairside adjustment.

## ▪ DISADVANTAGES

1. Therapy success solely depends on patient cooperation.
2. Precise tooth movement is not possible with functional appliances.
3. Treatment duration of functional appliances is often prolonged.
4. Often need two-phases treatment to complete the treatment. Phase-1 treatment is aimed at reducing the overjet, overbite and to correct sagittal jaw relationship, while phase-2 treatment is aimed at completing the final alignment using fixed mechanotherapy.

## ▪ EFFECTS

➢ ***On Dentition***

1. Typically cause some intrusion of maxillary incisors.
2. Protrusion of mandibular incisors.

➢ ***On Skeletal Structures***

1. Stimulate the growth in the condylar region and can also produce change in the direction of growth of the jaws.
2. Downward and forward remodeling of the glenoid fossa.
3. Restricting the growth of the jaws.

➢ ***On Muscles***

Functional appliances are designed to improve the tonicity of orofacial musculature.

## ▪ TYPES

There are several types of functional appliances which are as follow:

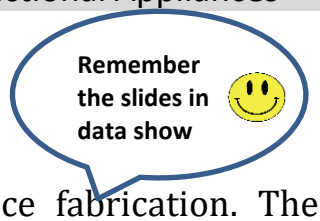
### ➢ *ACTIVATOR*

Although it was developed more than 70 years ago, the Andresen appliance, which is also known as an activator or monobloc, has been successfully used by many generations of orthodontists. It is generally used for the treatment of Class II division I malocclusion. Figure 1.

- **Indications**

1. Class I malocclusion with deep bite
2. Class II malocclusion with open bite
3. Class II division 1 malocclusion
4. Class II division 2 malocclusion after aligning the incisors
5. Class III malocclusion (reverse activator)
6. Serves as space regainer in mixed dentition where acrylic is extended into the space of missing tooth
7. Used for treating patients who snore during sleep.

**Figure 1: Activator functional appliance. Upper and lower acrylic blocks are fused together for the treatment of Class II division I malocclusion.**




- **Wax bite registration**

Bite registration is an important step in the appliance fabrication. The patient's bite is registered in which the mandible is protruded in a forward position of the in relation to the maxilla to reduce the increased overjet thus the appliance when inserted inside patient's mouth it will forcefully positioned the mandible in a correct position and enhancing the growth of the mandible.

- **Contraindications**

1. Crowded arch
2. Increase lower facial height
3. Extreme vertical mandibular growth
4. Severe proclined lower incisors
5. Retroclined upper incisors
6. Crossbite tendency
7. Gross intra-arch irregularities.

- **Advantages**

1. Treating mixed and deciduous dentition is possible
2. Appointments can be delayed over 2 months
3. Tissues not injured
4. Worn at night time only
5. Helps to eliminate abnormal habits
6. Oral hygiene is maintained.

- **Disadvantages**

1. Fully rely on patient cooperation
2. Little value in cases with crowding
3. Force on individual tooth cannot be controlled
4. Little or no response in older patients
5. Bulky and uncomfortable.

➢ ***BIONATOR***

Developed in Germany by Wilhelm Balter in the early 1950s to increase patient's comfort and facilitate daytime wear to increase the functional use of the appliance. Balter accomplished this by reducing acrylic bulk of the appliance, as shown in Figure 2.

**Figure 2: Bionator functional appliance. As in Activator but by reducing acrylic bulk of the appliance it become more comfortable to the patient.**

- **Components (See Figure 3)**

*Wire components:*

1. Palatal arch
2. Vestibular wire.

*Acrylic components:*

3. Maxillary acrylic part
4. Mandibular acrylic part
5. Interocclusal acrylic part.

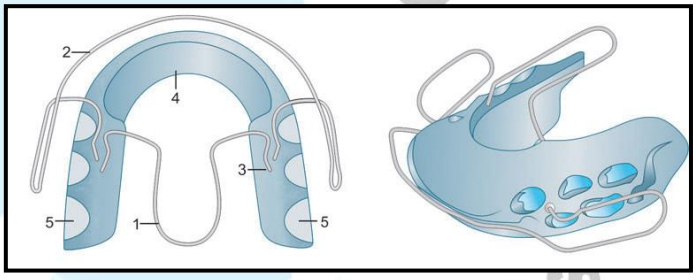



**Figure 3: Components of a Bionator appliance.**

- **Uses of Bionator**

1. Class II malocclusion.
2. Class III malocclusion.
3. Deep bite cases.
4. Open bite cases.

➢ ***FRANKEL APPLIANCE***

Developed by "Rolf Fränkel". Orthopedic exercise devices aid in the maturation, training and reprograming of orofacial neuromuscular system. It is re-establishing physiologic conditions within the orofacial complex, as shown in Figure 4. There are five types of Frankel's appliances:

1. FR-I is further divided into three types:
a. FR-I a
b. FR-I b
c. FR-I c
2. FR-II
3. FR-III
4. FR-IV
5. FR-V.

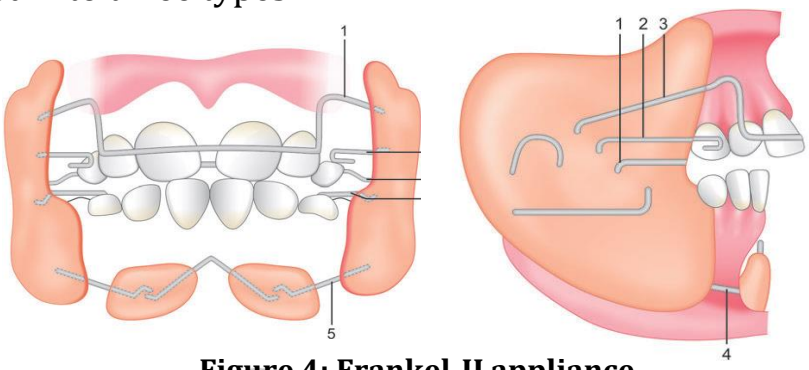



**Figure 4: Frankel-II appliance.**

- **Indications of Various Types of Frankel Appliances**

1. FR-I a: Treating Angle's class I malocclusion with deep bite.
2. FR-I b: Treating the cases of Angle's class II division 1 malocclusion where the overjet does not exceed 5 mm.
3. FR-I c: Indicated for treating the cases of the Angle's class II division 1 malocclusion where the overjet is more than 7 mm.
4. FR-II: treating cases of Angle's class II division 1 malocclusion and class II division 2 malocclusion.
5. FR-III: for Angle's class III malocclusion.
6. FR-IV: for treating bimaxillary protrusion and open bite.
7. FR-V: It is used with headgear.

➢ ***ORAL SCREEN "VESTIBULAR SCREEN"***

Newell in 1912 introduced oral screen. It is composed of acrylic base material, which fits in the buccal/labial vestibule of the mouth. See Figure 5.

- **Indications**

1. Oral habits, such as: Thumb sucking, Mouth breathing, Tongue thrusting and Lip biting.
2. In the cases of mild proclination of maxillary anterior teeth.

- **Mechanism of Action**

Oral screen acts like a mechanical barrier between teeth and lips, tongue, thumb and thereby help in correcting the oral habits, such as mouth breathing, thumb sucking, lip biting and tongue thrusting. Oral screen is made to contact the proclined teeth when it is used to retrocline the incisors. It transmits the forces of peri-oral musculature to the teeth and thereby retroclining the proclined anterior teeth. It is also used as a muscle exerciser to stimulate the hypotonic perioral muscles.

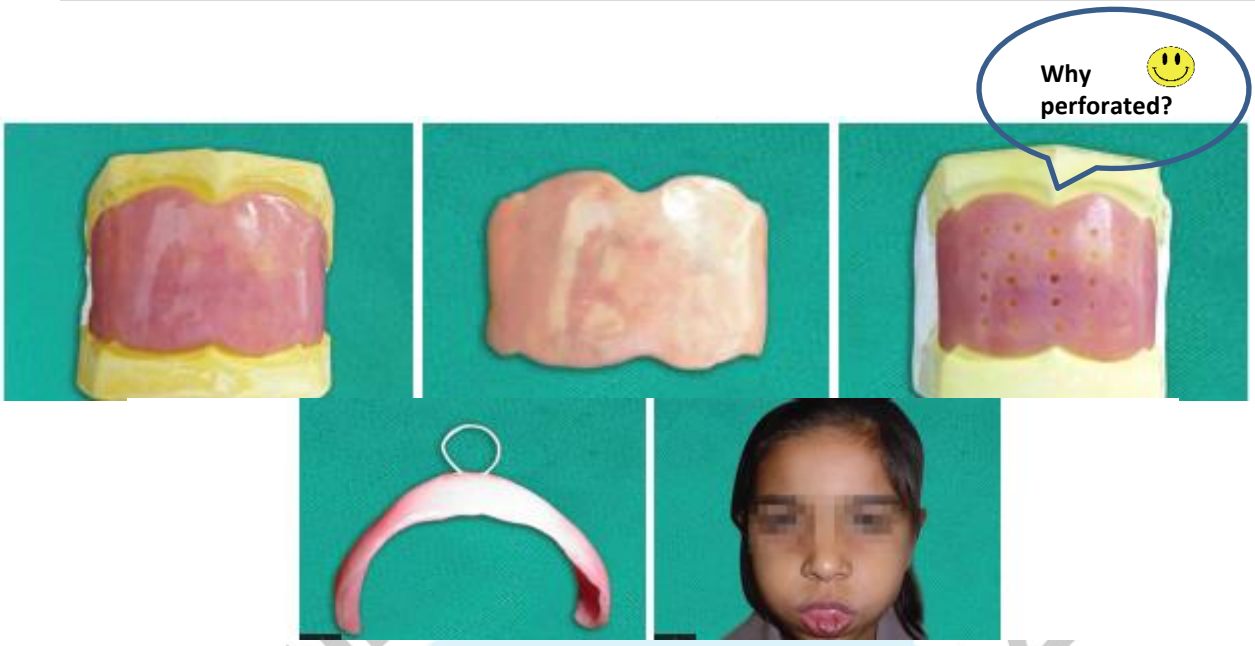



**Figure 5: Oral screen appliance used to treat oral habits.**

➢ ***LIP BUMPER***

It is a fixed functional orthodontic appliance that works by altering the equilibrium between cheeks, lips and tongue and by transmitting forces from perioral muscles to the molars where it is applied. See Figure 6.

- **<u>Uses</u>**

a. Lip bumper is used to treat lip suckling habit.

b. Lip bumper is used to treat lip biting habit.

c. Lip bumper is used as a molar anchorage.

d. Lip bumper is used for space gaining in the lower arch. How?

Remember the slides in data show

**Figure 6: Lip bumper appliance mainly used to treat oral habits with fixed orthodontic appliance.**

➢ ***HERBST APPLIANCE***

Herbst bite jumping mechanism was developed by Emil Herbst in the early 1900s. Herbst appliance is a fixed functional orthopedic appliance having passive tube and plunger system with the exact length of the tube determining the amount of anterior mandibular development. The tube is attached to a maxillary posterior root, whereas the plunger is fixed anteriorly to the mandibular dentition and slides through the tube during opening and closing movements, as shown in Figure 7. Herbst appliance is indicated in treating patients with skeletal class II mandibular deficiency.

**Figure 7: Herbst appliance is a fixed functional orthopedic appliance having passive tube and plunger system.**

➢ ***TWIN BLOCK APPLIANCE***

Twin-block appliance is a functional jaw orthopedic appliance developed by Scottish orthodontist William Clark in the year 1977. Twin-block appliance is composed of maxillary and mandibular retainers that fit tightly against the teeth, alveolus and adjacent supporting structures, see Figure 8. Adams' clasps are used bilaterally to anchor the maxillary appliance to the 1st permanent molars and 0.030-inch ball clasps are placed in the interproximal areas anteriorly.

**Figure 8: Twin Block appliance is composed of maxillary and mandibular retainers that fit tightly against the teeth, alveolus and adjacent supporting structures**

The twin block appliance has been shown to produce increase in mandibular length, incisor proclination and variations in lower anterior facial height. The posterior bite blocks of the twin block appliance can be trimmed to facilitate the eruption of the lower posterior teeth in patient with a deep bite and an accentuated curve of Spee.

- **Indications**

Twin-block appliance is most commonly used in the treatment of class II malocclusions.

- **Duration of Treatment**

Full time wearing of twin block appliance is advised and the duration of treatment usually is about (9–12) months.



1. Phulari B. S. Orthodontics: Principles and Practice. 2nd Edition. Jaypee Brothers Medical Publishers (P) Ltd: 2017. ISBN: 978-93-85999-89-5.
2. Graber L. W., Vig K. WL., Fleming P. S. ORTHODONTICS: Current Principles and Techniques. 7th Edition. Elsevier: 2023. ISBN: 9780323778596.
3. Mitchell L., Littlewood S. An introduction to orthodontics. 5th Edition. Bell & Bain Ltd. 2019. ISBN 978–0–19–253958–8.

❄ For further information can watch the videos presented during the lecture.

**Good Luck…**