ORTHODONTICS

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Myofunctional Orthodontic Appliances

Myofunctional or functional appliances are devices that alter the patient's functional environment by forces generated by the masticatory and facial musculature in an attempt to influence and permanently change the surrounding hard tissues. Most of the functional appliances are designed to correct skeletal class II relationship by positioning the mandible downward and forward to enhance the mandibular growth, functional appliances could be fixed or removable and all are intraoral device.

Advantages of functional appliances:

- Effective in vertical control of increased overbite.
- Can be used in mixed dentition.
- Require minimal chairside adjustment.
- Easier to maintain oral hygiene.

Disadvantages of functional appliances:

- The result of treatment mainly depends on patient cooperation.
- Cannot be used for correcting dental malocclusion.
- Duration of treatment is often prolonged.
- Sometimes it requires a final phase of fixed appliance therapy to achieve final detailing or final alignment of tooth position.
- It is not useful in managing adult patients where the active growth is completed.

Effects of functional appliance on dentition

Functional appliances typically result in distal movement of the upper dentition and mesial movement of the lower dentition, with tipping of the upper incisors palatally and the lower incisors labially.

Effects of functional appliances on skeletal structures

Functional appliances are designed to stimulate the growth in the condylar region and can also produce change in the direction of growth of the jaws. Functional appliances can also bring about remodeling of the glenoid fossa more anteriorly, they are also capable of restricting the growth of the jaws.

Effects of functional appliances on muscular structures

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

Principles of Functional appliances treatment

1. Most of the functional appliances are used to correct Class II malocclusions and some cases of Class III malocclusion, and deepbite.

2. A Class II division 1 malocclusion caused by a prognathic maxilla is not a good case for functional appliance therapy. While, retrognathic mandible are generally cases indicated for functional appliance therapy.

3. Functional appliances can be utilized in the correction of Class II division 2 malocclusions. In such cases it may be helpful to have a pre-functional phase to procline the retroclined upper incisors, this can be achieved by using a removable appliance.

4. Functional appliances should be used when the patient is growing. As girls complete their growth slightly earlier than boys, functional appliances can be used a little later in boys, it has been suggested that treatment should, if possible, coincide with the pubertal growth spurt (10-14 years for girls, 12-16 years for boys). Generally it is better to start the functional appliance treatment in the late mixed dentition, provided there is still growth remaining, this means that the patient is ready to progress to the fixed appliance stage which typically follows the functional appliance. If the functional appliance is started too early then there will be a need for further treatment during the mixed dentition and again in the early permanent dentition to maintain the correction.

5. Functional appliances should be preferably fitted on well aligned dental arches.

6. Functional appliances should be worn for 12-16 hours per day. Typically between 8 pm and midnight or 1 am the appliance should be worn, so it is suggested that children wear functional appliances after the evening meal until they awake in the morning which should be approximately 12 hours per day.

Types of functional appliances

There are many designs of functional appliances. One of the earliest designs was pierre Robin's Monobloc which was designed to hold the mandible forward in infants with extreme mandibular retrognathism (Pierre Robin syndrome).

- ✓ **Activator:** it is a monobloc design, Viggo Andresen in 1908 in Denmark, designed a loose fitting appliance, which he first used on his daughter and found a remarkable results. The disadvantages of Activator are fully rely on patient cooperation, bulky and uncomfortable.

Components of the Activator

1. Acrylic portion
2. Upper and/or lower labial bow

The upper and lower acrylic appliances fused together, the lower incisors are capped to minimize the tendency for them to procline during overjet reduction, the appliance has no clasps since the looseness in the mouth causes the patient to bite into it, many patients find this difficult in the early stages of treatment and the appliance comes out during the night, common modification to solve such problem is to clasp the upper first molar.`

Indications

1. Class II division 1 malocclusion.
2. Class II division 2 malocclusion after aligning the incisors.
3. Class III malocclusion (reverse activator).

Contraindications

1. Crowded arch.
2. Increased lower facial height.
3. Severe proclined lower incisors.

Fabrication

1. Impressions: The impressions should reproduce the whole alveolar process to the depths of the sulci.

2. Bite Registration

- Before taking the wax bite, the study models can be used to help decide if the overjet can be corrected with one activator or whether a second one will be needed.
- In cases that corrected with one activator appliance, the wax bite can be taken with the mandible protruded sufficiently to bring the incisors almost edge-to edge.
- A piece of good quality pink wax will be needed.
- The softened wax is pressed onto the upper teeth and then the lower jaw protruded to the correct anteroposterior and vertical position by watching the midline relationships and the incisal separation. Then the wax bite is cooled and if necessary, trimmed with a sharp knife. It should be checked on the study modes and in the mouth if possible.

3. The study models are carefully mounted on an articulator ensuring that the bite is correct.

✓ Twin- Block Appliance

The twin block appliance was developed by Clark in 1977.

Components of the Twin-block

It consists of separated upper and lower parts that fit together using posterior bite blocks with interlocking inclined bite planes, which posture the mandible forwards. The upper part often includes an expansion screw. The appliance became popular due to a number of advantages over other functional appliances:

1. ***Have greater freedom of movement and cause less interference with normal oral function as it is constructed in two parts.***

2. Appearance is noticeably improved.

3. Less bulk, therefore better patient compliance.

4. Can be used in later stages of growth (Late mixed dentition/early permanent dentition).

5. It can be easily modified to correct dental problems.

Indication

It is mainly used for correction of CI II malocclusion cases (mandibular deficiency) for growing patients.

✓ Frankel Appliance

Frankel appliance originally called function regulator (FR) appliances, they are developed by "Rolf Frankel".

Components of the Function regulator

The function regulator composed of acrylic shields in the buccal sulci and little or no acrylic lingually, the buccal shields are intended to cause expansion of the arches by holding the cheeks away from the teeth and also to enlarge the alveolar process by stretching the periosteum in the depth of the sulcus, thus causing bone to be laid down on the buccal aspect.

Types of Frankel Appliance:

1. **FR-I:** is used for treatment of Cl II div 1 malocclusion, incorporates lip pads labial to the lower incisors to allow forward development of the mandibular alveolar process.
2. **FR-II:** is used for treatment of Cl II div 2 malocclusion, in addition to the lip pads, it has a palatal wire to procline the upper incisors.
3. **FR-III:** is used for treatment of Cl III malocclusion, it has acrylic shields labial to the upper incisors which together with a palatal arch>>>procline them, and a lower labial bow to retrocline the lower incisors.

✓ Oral Screen

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

Indications

1.Oral habits (thumb sucking, mouth breathing, tongue thrusting, 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 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 perioral musculature to the teeth and thus by retroclining the proclined anterior teeth.
- It is also used as a muscle exerciser to stimulate the hypotonic muscles.

✓ Lip Bumper

The lip bumper 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.

Uses

a. Treat lip sucking habit.

b. Treat lip biting habit.

c. Lip bumper is used as a molar anchorage.

d. Lip bumper is used for minor space regaining in the lower arch.

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