Fixed Orthodontic Appliances

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Introduction

Fixed orthodontic appliances are the most commonly used appliances for orthodontic treatment in use today. As the name suggests they are bonded to the teeth and are not removable by the patients.

The purpose of this video is to acquaint the dental student with the basic features of orthodontic appliances and some of the more commonly encountered auxiliaries. The component parts of a fixed appliance are:

- Orthodontic brackets
- Molar bands
- Archwires
- Ligatures (elastomeric, steel ties)
- Auxiliaries (power chain, active coil, intermaxillary elastics)

Orthodontic Brackets

The orthodontic brackets that are in current use are a modification of the original Edgewise appliance which was developed in the early 20th century by Dr. Edward Angle. This original appliance was comprised of brackets which were welded to bands which were then placed onto the teeth. All of the brackets were identical and all tooth movements were accomplished by means of placing elaborate bends into the archwires.

Current orthodontic treatment utilizes what are known as PRE-ADJUSTED EDGEWISE brackets. This system was developed by Dr. Larry Andrews. In this system the brackets have in built features to control the labio-lingual, mesio-distal and inclination of the teeth. These in-built features are known as the prescription of the bracket. The prescription of the bracket is expressed when a rectangular orthodontic archwire is placed through the slots of the brackets on the teeth. Having brackets with the prescription built in minimizes, but does not eliminate the need for wire bending to achieve the ideal positions of the teeth.

Parts of an orthodontic bracket

Hook: hooks are present on some orthodontic brackets. They are used for the attachment of auxiliaries such as coil springs and elastics

Identification mark: Coloured dots or indentations are placed on the disto-gingival ties wings of brackets. This ensures that the brackets are placed in the correct orientation on the tooth. Typically the brackets for lower incisors do not have an identification mark. To orient these brackets look at the underside of the bracket, from this perspective it can be seen that the bracket has a curved portion and a straight edge, when placing the bracket on the tooth, the curved part of the bracket should be positioned toward the gingival margin

Slot: this is the part of the bracket where the orthodontic archwire is placed. Orthodontic bracket slots are typically manufactured with a slot width of either 0.018 inch or 0.022 inch. The brackets in the undergraduate clinic are 0.018 inch width

Tie Wings: are located at the corners of the bracket and they stand out beyond its base. Elastomeric or stainless steel ligatures are placed around the tie wings of the brackets to secure the wire into the bracket slot.

Molar bands

While it is possible to place bonded attachments onto every tooth, there are some instances when a more robust means of attachment to the tooth may be indicated. Situations in which bands might be placed instead of molar tubes include but are not limited to:

- partially erupted teeth
- when head gear must be used
- When an appliance such as a lingual arch is needed
- teeth with large metal restorations.

Inscribed on the mesial side of the molar band are markings which indicate the size of the band and quadrant of the mouth it is for.

Some molar bands may have an auxiliary tube in addition to the tube for the arch wire. This auxiliary tube is typically larger than the arch wire tube and can be located either incisal or gingival to the arch wire tube. Once the appropriate sized band is selected, it is cemented with glass ionomer cement onto the tooth.

Arch wires

Once orthodontic brackets are placed on the teeth, an arch wire must be placed within the slots of the brackets to start the movement of the teeth. Arch wires come in a various shapes, such as round, square and rectangular and materials such as nickel titanium, stainless steel and beta titanium. The choice of which particular wire is to be used is largely dependent on the stage of treatment and the type of tooth movement that is required.

Ligatures

Once the arch wire is positioned within the slot of the orthodontic bracket, it must be secured in place with a ligature. There are two main means of ligation; elastomeric or stainless steel. There is a category of orthodontic bracket which does not require ligatures to secure the arch wire to the bracket slot, these are known as self-ligating brackets.

Elastomeric ligation

Small diameter elastic bands are stretched over the tie wings of the orthodontic bracket using a Mathieu's plier or mosquito haemostat to secure the wire into the bracket slot. These elastomeric ligatures come in a variety of colours and are changed at every visit.

Stainless steel ligation

Another option for securing the arch wire into the bracket slot is a stainless steel ligature. These ligatures are made from 0.010 inch dead soft stainless steel. They are placed around the tie wings of the bracket using a Mathieu's plier, the terminal ends of the wire are then twisted multiple times until the wire ligature is firmly secured. The wire is then cut with a pin and ligature cutter and the end of the steel tie is then tucked under the arch wire so that it does not irritate the patient.

Auxiliaries

Power chain

Power chain is composed of an elastomeric material and consists of links of small circles. It is used during orthodontic treatment for the closure of space but it can also be used for other purposes such as rotating a tooth. When using power chain, a length of chain shorter than the amount of space to be closed should be cut. The teeth on either side of the space to be closed should be ligated with stainless steel ligatures and the power chain stretched over the space. Power chain should only be utilised when a stainless steel arch wire is in place. Care should be taken to ensure that the force imparted by the power chain is light so that controlled movement of the teeth can be achieved. If the force level is too great, then the teeth may tip and distortions to the occlusal plane could occur.

Intermaxillary Elastics

Intermaxillary are elastic bands of varying diameters and force levels which are used to apply a force between the maxilla and mandible to move the teeth and to some extent, the jaws into place. The two main ways in which intermaxillary elastics are utilised are in a Class II or Class III configuration. In the Class II configuration, the elastics are placed from the lower molar and attach to the upper canine or onto a post on the upper arch wire. In the Class III configuration, the elastics are place on the upper molar and attach to the lower canine.

Active or Open Coil Spring

Active coil is used to open space within the arch. Coils can be made from nickel titanium or stainless steel. When attempting to open space between two teeth with an open coil spring, a length of coil larger than the interbracket span between the teeth is cut. The coil is then placed over the arch wire and compressed between the two teeth. The teeth on either side of the coil spring much be ligated with stainless steel ligatures to prevent their rotation, in addition the patient must be in a stainless steel arch wire to prevent distortion of the arch form.

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