4th Year Lec. No. 5

Introduction to orthodontic appliances

Orthodontic Appliances

The appliance that apply mild pressure to a tooth or a group of teeth and their supporting tissue in a predetermined direction to achieve tooth movement within the bone and other tooth supporting tissues.

Classification of Orthodontic Appliances:

The simplest classification is based on the patient's ability to remove the orthodontic appliance. Based on this the appliances can be classified as:

A. Removable appliance:

An appliance which can be removed for cleaning by the patient or for adjustment by the Orthodontist. These appliances can be taken out of the mouth by patient when required.

According to their *mode of action*, removable orthodontic appliances are divided into three main groups:

1- *Active removable appliances:*

These appliances are capable of exerting pressure and perform tooth movement.

2-*Passive removable appliances*:

These appliances remain passive in the mouth and exert no active pressure. Example as space maintainer, retainers, habit breaker.

3- *Functional appliances*: These appliances work by transmitting or modifyingmuscle forces to the teeth and their supporting tissues. Example as: Andersen appliance, Frankles functional regulators.

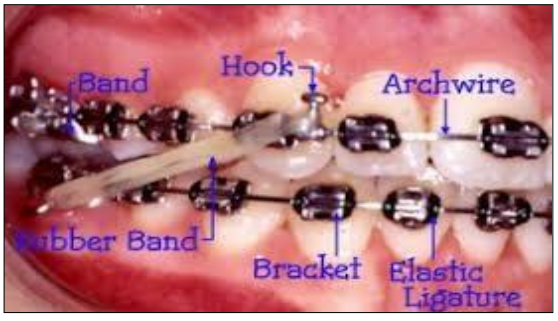
B. Removable-Fixed (combination) appliances:

Here some part of appliances can be removed by the patient and other parts remain fixed on the teeth.

C. Fixed appliances:

These cannot be removed by the patient and consists of:

1. Bands- cemented on teeth (occasionally cast metal caps).
2. Attachments or brackets of different types attached on the bandsor on teeth directly with bonding materials.
3. Labial or lingual archewires – These may themselves be active orpassive and may carry auxiliary springs for movement of teeth.



Removable orthodontic Appliances

The patient can insert and remove these appliances without the intervention of a clinician. They may be active or passive, depending upon their capability to exert / generate forces.

Active removable orthodontic appliances designed to achieve tooth movement (mainly tipping) by means of active components, e.g. wire springs, screws etc.

Advantages of removable appliances

1. The patient can continue with routine oral hygiene procedures without any hindrance.
2. Most forms of tipping movement can be carried out successfully.
3. These appliances are less complicated than fixed appliances and generally more acceptable to the patients.
4. Since these are relatively simple appliances they can be delivered and monitored bythe general dentist.
5. Appliance fabrication is done in specialized labs and hence the chair side time forappliance delivery is considerably less as compared to the fixed appliances.
6. Since only a few movements are carried out simultaneously with these appliances the time required by the clinician to activate an appliance is less.
7. These appliances are relatively cheap as compared to the fixed appliances.

Disadvantages of removable orthodontic appliances

1. Patient cooperation is the key word in removable appliance therapy.
2. These appliances are capable of only certain types of movements; they do not givethree-dimensional control over the teeth to be moved. This limits their utility.
3. Multiple movements are difficult, if not impossible to carryout.
4. The patient has to have a certain amount of dexterity and skill to be able to remove and replace the appliance for successful treatment to be possible.
5. The chance of appliance loss and/or breakage is more.

Types of tooth movement done by removable appliances:

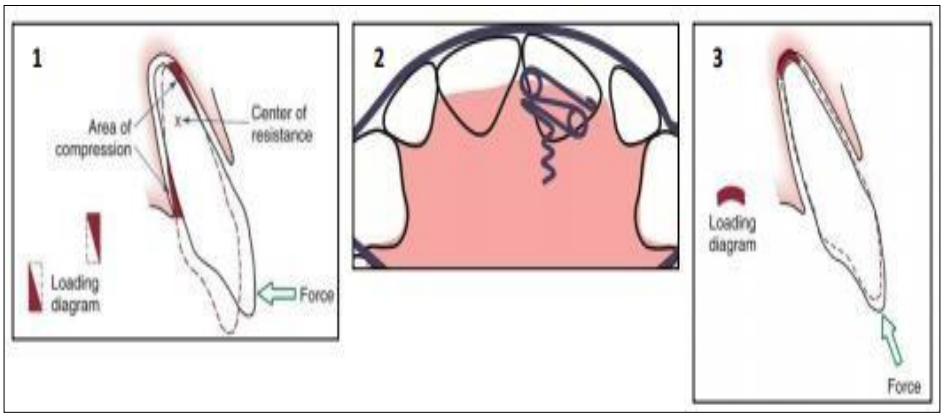
1. Tipping movement

a. Labio-lingual (bucco-palatal) direction

b. Mesio-distal direction

2. Rotation of less than 90° (couple force system)

3. Intrusion and extrusion (combination appliance)



Components of the removable orthodontic appliances:

According to their function:

1- Active components: which produce force for tooth movement, as springs, screw, elastics, active labial bows.

2- Retentive components: responsible for holding the appliance inside the mouth, as clasps

3- Acrylic base plate: as a major connector connecting the components.

4- Anchorage: which is an imaginary component resisting unwanted tooth movement, while certain teeth are being moved by the active components.

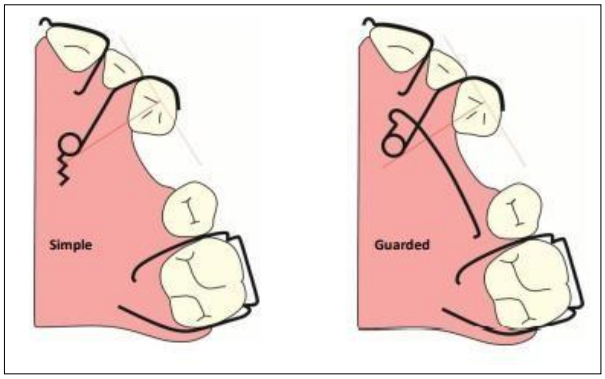
Active components:

It is responsible for producing the desired tooth movement. They can be categorized as springs, bows, screws and auxiliary elastics.

Springs:

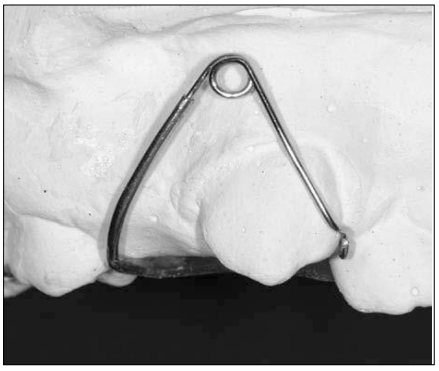
A- Palatal finger springs

Palatal finger springs are constructed in 0.5 or 0.6 mm stainless steel wire and used to move teeth mesially or distally along the dental arch. The incorporation of a helix increases the length of the wire and allows the delivery of lighter forces whilst a guard wire will protect the spring from distortion. By convention, the helix is placed such that activation of the spring is done by opening of the coil as tooth movement occurs; the spring should be positioned at right angles to the planned tooth movement.



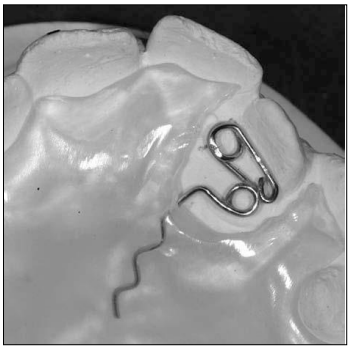
B- Buccal canine retractor

Buccal canine retractors are constructed in 0.7-mm stainless steel, reduced to 0.5-mm if sleeved. These springs can be used to retract buccally displaced maxillary canines.



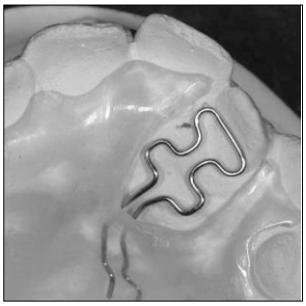
C- Z-spring

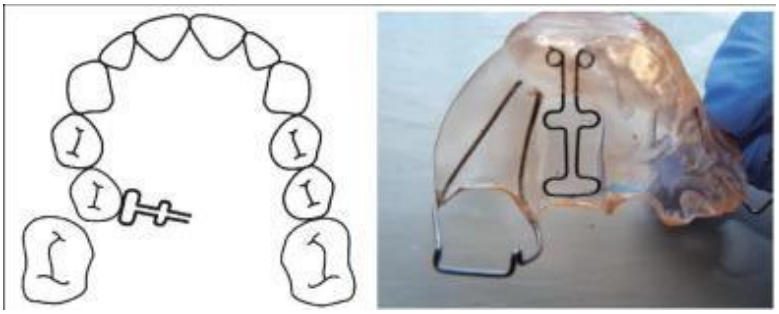
The Z-spring is constructed in 0.5-mm stainless steel wire and generally used to move one or two teeth (recurved or double) labially. Activation is achieved bypulling the spring away from the baseplate (opening the coils) at an angle of approximately 45° to the long axis of the tooth, which will tend to displace the appliance away from the palate; good anterior retention is therefore important.



D- T-spring

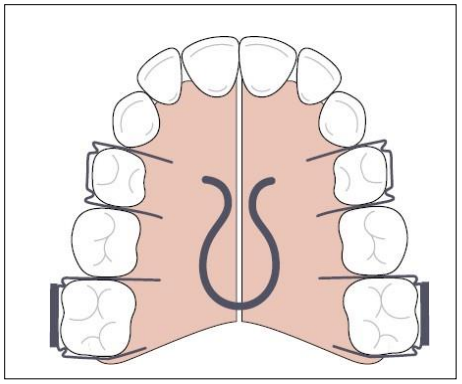
T-springs are constructed in 0.5-mm stainless steel wire and used to move individual teeth either labially or buccally. Activation is again produced by pulling the spring away from the baseplate and therefore retention also needs to be good.





E- Coffin spring

A coffin spring provides a useful alternative to a screw for expansion. This heavy spring is constructed in 1.25-mm wire and activated by pulling the two halves of the appliance apart manually or flattening the spring with pliers. Coffin springs deliver high forces that will tend to displace the appliance and good retention is important.



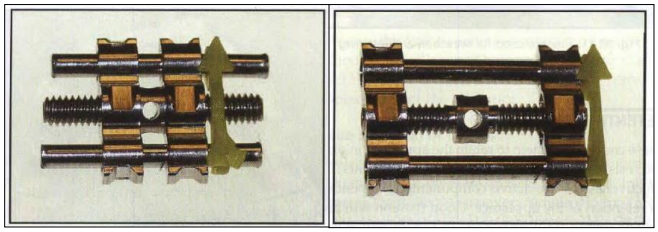
F- <u>Active labial bows</u>

An active labial bow can be used to reduce an increased overjet by tipping the teeth palatally if the upper labial segment is proclined and spaced. However, a normal labial bow will only allow a small range of activation and this can be improved either by increasing the amount of wire in the bow, as in a Mills bow, or byconstructing it in a lighter wire, such as a Roberts retractor.

Screws

- Screws may be designed to move a single tooth or groups of teeth. The direction of tooth movement is determined by the position of the screw in the appliance.
- Activation is achieved by turning the screw with a small wire key inserted into one of the holes of screw so that the two sections of the acrylic are moved a part, if the screwis over activated the appliance will not be fully seated.
- There are basically two types of screws

A. Jack screw: which is the most commonly used it consist of two halfes threaded centralcylinder, turned by means of a key which separates the two halfes by a distance, usually about 0.2 mm each quarter turn.

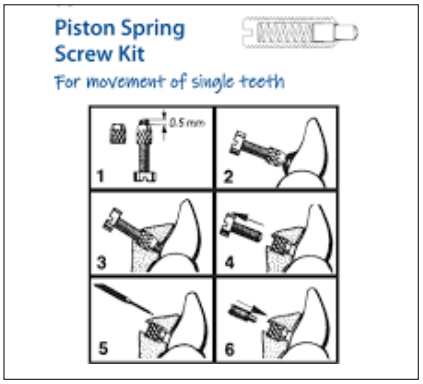


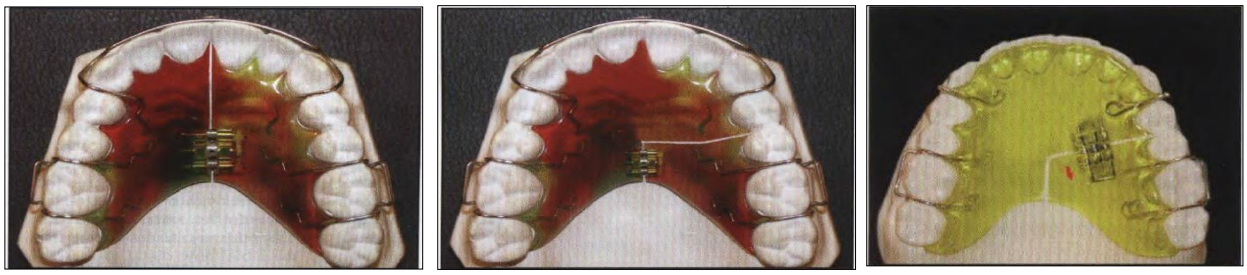
Screw before opening Screw after opening

B. Piston-screw (Landen screw) activated by moving the screwassembly forward by screwdriver.

- They are bulky, expensive and depends on patient's cooperation.
- It is mainly used for (direction of tooth movement depend on the position of the screw in the appliance):

i. Arch expansion; screw placed in the center of the arch.
ii. Labial/buccal movement of one or a group of teeth.
iii. Mesial/ distal movement of one or more teeth.



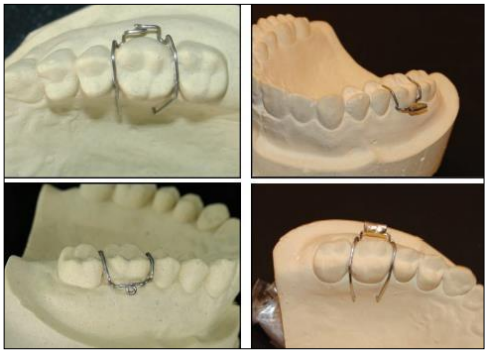


Retentive components

The retentive components are responsible for holding the appliance inside the patient mouth in the correct position and prevent dislodgement, they can also contribute in anchorage.

Adams clasp

Adams clasps are constructed in 0.7-mm stainless steel wire and most commonly used on the first molars, although they can be used on premolars and anterior teeth. The arrowheads of the clasp engage undercuts at the mesial and distal corners of the buccal tooth surface and can easily be adjusted at the chairside to increase retention. The bridge of an Adams clasp can also be used by the patient to remove the appliance from the mouth, whilst the orthodontist can use it to attach auxiliary springs or tubes for headgear.



Southend clasp

The Southend clasp is also constructed in 0.7-mm stainless steel wire, but is used for retention on the incisor teeth. This clasp is activated by bending the U-loop towards the baseplate, which carries the clasp back into the labial undercut of the tooth.

Ball-ended clasp

Ball-ended clasps engage into interproximal undercuts between the teeth and are activated by bending the ball towards the contact point.

Labial bow

A labial bow is constructed from 0.7-mm stainless steel wire and can provide retention from the labial surface of the incisor teeth, which can be increased by contouring the wire around these teeth in a fitted labial bow or by placing an acrylic facing on the wire of the bow. The labial bow has some flexibility by incorporating U-loops at each end, which allow activation by compressing the U-loop.