

University of Babylon
College of Dentistry
4th stage

Orthodontics

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Lec. 7,8 *Removable Appliances*

There are many types of orthodontic appliances according to the mode of action and type of attachment, by mean if it is removed or fixed in side patient mouth:-

1. **Removable appliance.(R.A)**
2. Fixed appliance.
3. Myofunctional appliance
4. Combination of fixed and removable.



Removable orthodontic appliance

Orthodontic devices that can be removed by the patient for cleaning and which may be designed to apply forces to the teeth by means of springs, screws and other mechanical components.

The types of removable appliance :-

It can be either

- Active: producing tooth movement by springs, screws, etc. or
- Passive: has no active component (retainer, space maintainer, habit breaker).



Any removable appl. Made of the following:-

1. Stainless steel wires.
2. Acrylic.
3. Others: as screws and elastics.

Action of removable orthodontic appliance:

All the removable appl. Can be used in a number of clinical situations and can achieve :-

1. Tipping of teeth (Tipping tooth movement (labio-lingual or mesio-distal)).
2. Tooth rotation less than 90⁰ (couple force system).
3. Correction of anterior or posterior crossbites
4. Over jet and Overbite reduction
5. Growth modification

Advantages of R.A. :

1. It can be removed on socially sensitive occasions.
2. Short chair side time (because it is fabricated in the laboratory rather than in patient's mouth).
3. Its components are relatively cheap.
4. Simple (can be done by dental practitioner).
5. It does not make oral hygiene difficult since it can be removed.

Disadvantages of R.A.:

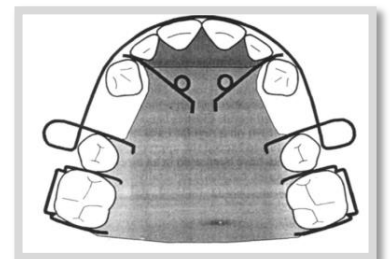
1. Heavily dependent upon the patient co-operation.
2. Unable to perform complex tooth movements (limited to tipping and simple rotation) so can be used only to treat simple cases.
3. Few teeth move at one time.
4. Uncomfortable to the patient and affects speech in the first few days.

Indications of R.A. in general :

1. Limited (tipping) tooth movements.
2. It may be used for space maintenance or habit breaking.
3. Correction of individual tooth malposition.
4. Arch expansion.
5. Retention (retainer) after comprehensive orthodontic treatment "fixed appliance".

The Components of R.A.:-

- I. Active components :which produce force for tooth movement.
- II. Retentive components: responsible for holding the appliance inside the mouth, as clasps.
- III. Acrylic base plate: as a major connector connecting the components.
- IV. Anchorage.: It is an imaginary component resisting unwanted tooth movement.



I.Active components: classified according to the direction of the force and orthodontic tooth movement into:-

1. For labial (buccal) movement:
 - a. Z-spring.
 - b. Recurved Z-spring.
 - c. T-spring.
2. For palatal (lingual) movement:
 - a. Hawley arch.
 - b. Robert's retractor (simple and sleeved).
3. For mesio-distal movement:
 - a. Finger spring (simple and modified).
 - b. Buccal canine retractor (simple and modified).
4. Additional active components , different directions:
 - ❖ Screws and elastics.

1-For labial movement:

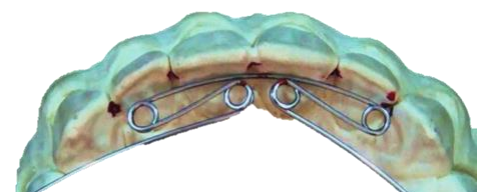
1.1. Z-spring:

- a. Shape:- It is 'Z' in shape.
- b. Location:- it is palatally situated
- c. Wire gauge :- 0.5 mm HS.
- d. Uses :-It is mainly used in:
 - Correction of an anterior crossbite of single tooth by pushing it in labial direction.
 - It is used to correct the rotation of one incisor $<90^0$ together with Hawley arch (couple force system: labial force + palatal force).



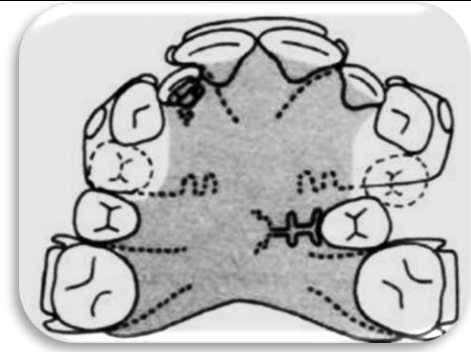
1.2. Recurved Z spring:

- a) Shape:- It is a combination of 2 Z-spring joined at the anterior region to form one active arm.
- b) Location:- it is palatally situated.
- c) Wire gauge :- 0.5 mm HS.
- d) Uses:- It is used in the correction of crossbite of more than one incisor (2 incisors, or 3 incisors, or 4 incisors), and in the correction of mild rotation and irregularities of more than one incisor together with Hawley arch (couple force system).

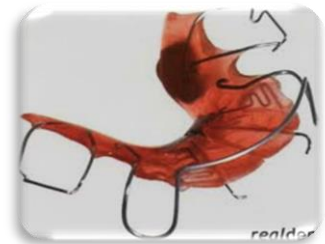


1.3. T-spring:

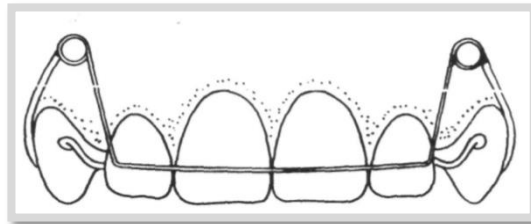
- Shape :- it is T in shape
- Location:- :- it is palatally situated
- Wire gauge:- 0.5 or 0.6 mm HS.
- Uses :-it is used to push one posterior tooth in buccal direction (premolars).

**2-For palatal movement:****5.1. Hawley arch:**

- Location : it is labially situated, it touches the most prominent teeth
- Wire gauge : 0.7 mm H.S.
- Uses: it is used for retraction of incisors (when the overjet is 6 mm or less) and retention
- It is less flexible than Roberts retractor.

**5.2. Roberts retractor:**

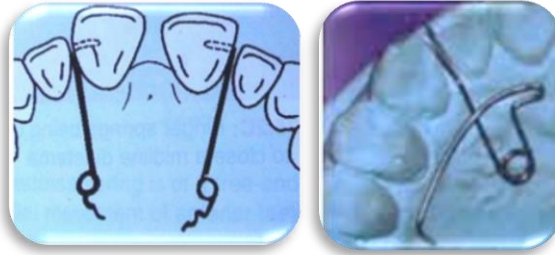
- Shape: It consists of two sleeved buccal canine retractors joined at the midline.
- Location: it is labially situated.
- Wire gauge: 0.5 mm H.S. with sleeved distal arms, or 0.7 mm H.S. at all.
- Uses: It is used for retraction of the incisors to reduce the overjet which is more than 6 mm; It is usually used in 2nd stage of treatment of class II division 1 malocclusion.

**3-For mesio-distal movement:****3.1. Finger spring:**

- Shape: It is finger like in shape.
- Location: it is palatally situated.
- Wire gauge: 0.6 mm H.S. (simple), 0.5 mm H.S. (guarded).
- Uses: it is used for mesio-distal movement of any tooth **which is located within the line of the arch**. However it is mostly used for distal movement of canines.

e- There are two types:

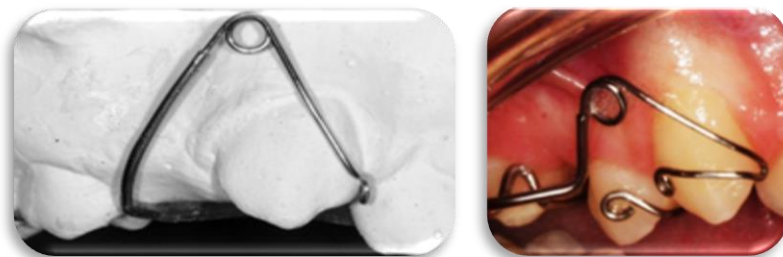
1. Simple finger spring (self-supported finger spring).
2. Guarded finger spring (supported finger spring).



3.2. Buccal canine retractor (BCR).

- a- Location: it is buccally situated.
- b- Wire gauge: 0.7 mm H.S.
- c- Types : simple or modified.
- d- Uses:

- The *simple* BCR type used for distal movement of a **mesially angulated canine which is located within the line of occlusion** , while
- The *modified* BCR type used to move the **mesially angulated buccally malposed canine** distally and palatally.



4-Additional active components:

4.1. 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.



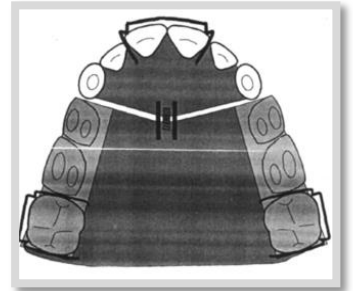
- **Jack screw:** which is the most commonly used, it consist of two halves threaded central cylinder, turned by means of a key which separates the two halves by a distance, usually about 0.25 mm each quarter turn.



- They are bulky, expensive and depends on patient's co-operatrion.
- ***It is mainly used for arch expansion:***

a. Anterior expansion of maxillary incisors:

One of the simplest uses of an active plate for expansion is to correct a maxillary anterior cross bite when there is room to accommodate the teeth in their appropriate positions within the arch. It need posterior bite plane .



b. Transverse expansion of the arch (with displacement):

The most common circumstance in which arch expansion is appropriate is a constricted maxillary arch, with a tendency toward crossbite. An active plate split in the midline will expand the arch almost totally by tipping the posterior teeth buccally, not by opening the midpalatal suture and widening the maxillary itself. For this reason, removable plates are not indicated for skeletal crossbites or for dental expansion of more than 4-5 mm.



4.2. Elastics:

- Although elastic deteriorates rapidly in the mouth, it is still used where no suitable spring is available.
- Commonly used for intermaxillary traction with fixed and removable applications. Adams clasp can be used. The hooks for the elastics may be incorporated in the clasps or may be separated.

They are not commonly used as the active component of a removable appliance because they tend to ride up the teeth and damage the gingival tissues.



II. Retentive components :

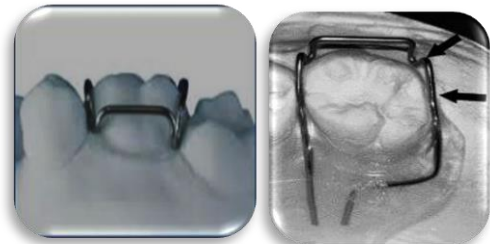
Retention of appliance: it is the stability of the appliance in the patient's mouth, which can be achieved by the mean of **Retentive components**.

Retentive components of appliance include the following types :-

(Adam's clasp, fitted labial arch, C- clasp, ball ended clasp, South end clasp).

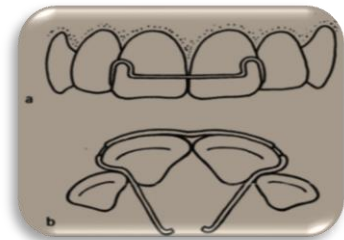
1-Adams clasp:

- a- It is the major retentive component; it aids in anchorage and allows the active components to work properly.
- b- Found in almost all removable appliances.
- c- It provides excellent retention, it engages in the mesiobuccal and distobuccal undercuts of the individual posterior teeth (mostly).
- d- It is made of 0.7mm HS wire .



2-Fitted labial arch (FLA):

- a- It is fitted to the labial surfaces of the teeth (incisors).
- b- It provides anterior retention and anchorage.
- c- Can be used on 2,3,or 4 incisors.
- d- It is made of 0.7 mm H.S wire.



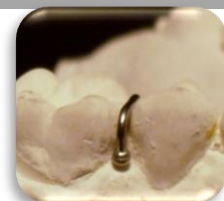
3-Circumferential clasp (C-clasp):

- a- More of a supporting than a retentive role.
- b- Mainly used on deciduous teeth and in retainers.
- c- Keeps clear of occlusal contact.
- d- It is made of 0.7 – 0.8 mm H.S wire.



4- Ball end clasp:

- a- It extends over the embrasure between two adjacent teeth and uses undercuts on the buccal surface.
- b- Mainly used in conjugating with fixed appliance or in retainers.
- c- It is made of 0.7mm H.S wire.



5- Arrowhead clasp:

- a- Usually several arrowheads are used, the clasp embracing the complete buccal segment. For two teeth one arrowhead are required, for three; two arrowheads and so on.
- b- It is made of 0.7 mm H.S wire.



III-Acrylic base plate:

- ☒ This is usually made of cold-cured acrylic but may be heat-cured.
- ☒ It connects the other components as a major connector.
- ☒ The baseplate should be as thin as possible to reduce bulk yet thick enough for strength. It should be closely adapted to all teeth except those which are to be moved.
- ☒ It aids anchorage by contact with the palate and with teeth intended not to move. Protect palatal springs.
- ☒ Modifications of acrylic base plate \Rightarrow Bite plane.

✚ Occlusion can be changed by the addition of a bite plane, which can be added to the anterior or posterior area of the maxillary or mandibular appliance.

✚ Modifications of acrylic base plate:

1) Anterior bite plane (ABP):

a-Flat anterior bite plane (FABP):

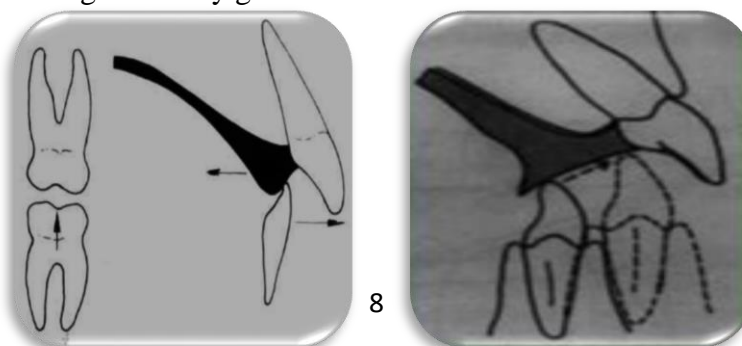
- ✓ Action: the anterior bite plane is added to the maxillary plate to prevent the posterior teeth from occluding.
- ✓ Properties: the bite plane should be wide enough that the patient can not bite behind it. It should be flat, not slanted posteriorly, to avoid a mandibular retrusion effect. This is particularly important in class II malocclusion.
- ✓ Indication: it corrects deep bite by separating the molars allowing them to over-erupt and so decreasing the overbite of growing patient.

After opening the bite, the bite plane is cut lingually but not occlusally to allow for upper incisor retraction.



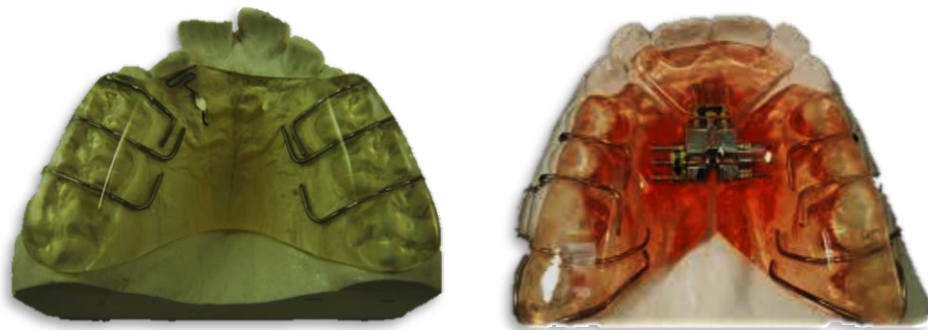
b- Inclined anterior bite plane:

- ✓ It also corrects deep bite, but in addition to that it corrects increased overjet as well by proclining lower incisors and acting as a myofunctional appliance enhancing mandibular growth and retarding maxillary growth.



2) Posterior bite plane:

- ✓ **Action:** the posterior bite plane can be added to the maxillary or mandibular plate. It usually covers the occlusal surfaces of all the posterior teeth, so that when the teeth are brought together the mandibular canines, premolars and molars occlude on the bite plane, thus leaving the incisors out of contact and free to be moved without occlusal interferences.
- ✓ **Indications:**
 - It opens the bite anteriorly to allow correction of anterior crossbite.
 - Treatment of false unilateral crossbite (with mandibular shift) by expansion screw. The bite plane is flat on both sides to allow for mandibular repositioning after crossbite correction.



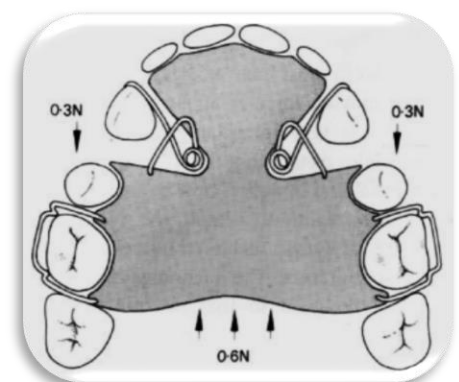
Component	Description
Passive acrylic base plate	Complete palatal coverage and extension ensures no undesired tooth movement and vertical anchorage
Flat anterior bite plane	For reduction of an increased overbite in a growing patient. Separation of the posterior occlusion by 1-2 mm encourages the posterior molars to erupt, reducing the overbite
Inclined anterior bite plane	Can encourage and retain musculoskeletal correction of a skeletal II malocclusion following functional appliance treatment
Posterior bite plane	Used to open the bite during correction of anterior and posterior crossbites
Incorporation of a midline screw	Correction of a buccal crossbite through activation of a midline expansion screw (1 turn per week at 0.25 mm per turn)
Addition of prosthetic teeth	As well as offering an aesthetic solution prosthetic teeth can act as a space maintainer following premature loss of a tooth, particularly an incisor, where they prevent drifting of adjacent teeth, loss of space and maintain the centreline

IV-Anchorage:

It is an imaginary component of the R.A. resisting unwanted tooth movement.

So we increase anchorage by:

1. Full extension of the acrylic to engage many teeth.
2. Many retentive components (Adams clasp and fitted labial arch) to adapt the acrylic to the teeth and palate.
3. Extra oral anchorage (headgear).



Fitting removable appliance

a. Before inserting the appliance

1. Check that you have the correct appliance and design for the patient.
2. Show the appliance to the patient and explain how it works.
3. Check the fitting surface for any roughness.

b. Inserting the appliance

1. The appliance should be inserted into the mouth with the anterior part lightly into position and then press the acrylic base upwards until the molar engages.
2. Adjust the retentive components and check the retention.
3. Activate the springs and check the teeth if they are free to move (trim acrylic if necessary).
4. Demonstrate to the patient how to insert and remove the appliance.

c. Instruction to the patient

1. You might face some discomfort during eating and speech in the first few days.
2. You should wear the appliance during day and night .
3. You should clean your teeth and the appliance regularly.
4. You should insert the appliance correctly according to the doctor instructions.

How do you know that the patient is not wearing the appliance?

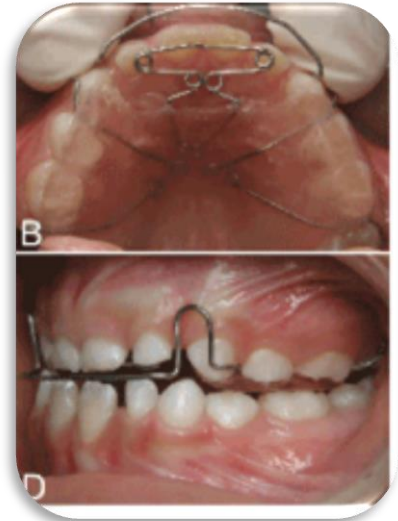
1. There is little or no tooth movement.
2. The appliance still looking new.
3. The patient has difficulty in removing and more importantly in inserting the appliance.
4. Springs are still active and patient speech still affected.

Mistakes done by the doctor (if no tooth movement happens)?

1. Improper way and amount of activation.
2. Presence of acrylic in the way of tooth movement.
3. Improper instruction to the patient.

Q/ Give the components of the following orthodontic removable appliance.

- 1- Active component:-recurved z-spring on $\overline{BA|AB}$
- 2- Retentive component:- Adams clasps on $\overline{6|6}$
- 3- Acrylic base plate
Posterior bite plane
- 4- Anchorage :- obtain from adams clasps, full coverage of acrylic base plate
- 5- Hawley arch used to keep the anterior teeth within the line of occlusion.



- 1- Active component:- Hawley arch
- 2- Retentive component:- Adams clasps on $\overline{6\ 4|4\ 6}$
- 3- Acrylic base plate
- 4- Anchorage :- obtain from adams clasps , full coverage of acrylic base plate



Q/ Depending on your knowledge, what is the design of removable appliance for the following malocclusion case?

- 1- Active component:- MBCR on $\overline{3}$.
- 2- Retentive component:- Adams clasps on $\overline{6\ 4|4\ 6}$
Fitted labial arch on $\overline{1|1}$
- 3- Acrylic base plate.
- 4- Anchorage :- obtain from adams clasps , fitted labial arch and full coverage of acrylic base plate .



GOOD LUCK