

Removable Orthodontic Appliance – Review Article

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ABSTRACT:

The success of removable orthodontic appliance mainly depends upon good retention of the appliance. Adequate retention of a removable orthodontic appliance is achieved by incorporating certain wire components, called clasp, which engages the undercuts on the teeth. Clasps are the Retentive components of removable orthodontic appliances. There are various designs of clasps Advocated for various clinical situations. This article presents an overview of various clasp designs with advantages and disadvantages of each type and their uses in particular clinical situations. The success of removable orthodontic appliance mainly depends upon good retention of the appliance. Adequate retention of a removable orthodontic appliance is achieved by incorporating certain wire components, called clasp, which engages the undercuts on the teeth. Clasps are the retentive components of removable orthodontic appliances. There are various designs of clasps advocated for various clinical situations. This article presents an overview of various clasp designs with advantages and disadvantages of each type and their uses in particular clinical situations. The success of removable orthodontic appliance mainly depends upon good retention of the appliance. Adequate retention of a removable orthodontic appliance is achieved by incorporating certain wire components, called clasp, which engages the undercuts on the teeth. Clasps are the retentive components of removable orthodontic appliances. There are various designs of clasps advocated for various clinical situations. This article presents an overview of various clasp designs With advantages and disadvantages of each type and their uses in particular clinical situations. The success of removable orthodontic appliance mainly depends upon good retention of the appliance. Adequate retention of a removable orthodontic appliance is achieved by incorporating certain wire components, called clasp, which engages the undercuts on the teeth. Clasps are the retentive components of removable orthodontic appliances. There are various designs of clasps advocated for various clinical situations. This article presents an overview of various clasp designs with advantages and disadvantages of each type and their uses in particular clinical situations. Removable orthodontic appliances are those that can be removed by the patients themselves without the help of dentists or dental assistants. The success of a removable orthodontic appliance mainly depend upon good retention in oral cavity for which they are intended. Adequate retention of a removable orthodontic appliance is achieved by incorporating certain wire components. Springs, Clasps, bows, screws, elastics, base plate are various components of removable orthodontic appliances. This article presents a summary of removable orthodontic appliances, their components, advantages and disadvantages.

KEYWORDS: Removable appliance, clasp, active components, retentive components, tooth movement.

INTRODUCTION:

Orthodontic appliances can be defined as devices, which create and/or transmit forces to individual teeth/a group of teeth and/or maxillo-facial skeletal units so as to bring about changes within the bone with or/without tooth movement which will help to achieve the treatment goals of functional efficiency, structural balance and aesthetic harmony.^[1]

Orthodontic appliance is an apparatus to maneuver the forces which may be intrinsic (mechanical force) or extrinsic (functional force).^[1,2]

TYPES OF ORTHODONTIC APPLIANCE:

- Removable
- Fixed
- Removable –fixed (Semi fixed).^[2]

REMOVABLE ORTHODONTIC APPLIANCE:

As the name suggests, these appliances can be removed from the mouth by the patient. 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.^[4]

IDEAL REQUIREMENTS FOR AN ORTHODONTIC APPLIANCE:

- It should be easy to remove and insert.
- It should be easy to clean.
- It should be easily repairable.
- It shouldn't be heavy or bulky.
- It shouldn't cause any damage to the teeth or other tissue.
- It should be comfortable to use and be aesthetically acceptable.
- It should exert desired force in desired amount and direction.
- Design of the appliance should be simple
- It shouldn't interfere with normal function and growth.
- It should have adequate retention.^[3]

ADVANTAGES:

- The patient can continue with routine oral hygiene procedures without any hindrance.
- The oral cavity as well as the appliance can be kept clean.
- All restorative procedures can also be done during such an orthodontic appliance therapy.
- Most sorts of tipping movement can be carried out successfully.
- These appliances are less conspicuous than fixed appliances and hence, generally more acceptable to the patients.
- Since these are relatively simple appliances they can be delivered and monitored by the general dentist.

- Appliance fabrication is done in specialized labs and hence the chair side time for appliance delivery is considerably less as compared to the fixed appliances.
- Since only a few movements are carried out simultaneously with these appliances the time required by the clinician to activate an appliance is less. This allows the clinicians to see more patients in a lesser time.
- These appliances require a limited inventory to be maintained as compared to more complex fixed appliances.
- These appliances are relatively cheap as compared to the fixed appliances.^[3]

DISADVANTAGE:

- Patient cooperation is that the keyword in removable appliance therapy. The duration for which the appliance is worn is the duration for which the appliance is able to act. Hence, the treatment can become prolonged depending on patient compliance.
- These appliances are capable of only certain types of movements; they do not give three-dimensional control over the teeth to be moved. This limits their utility.
- Multiple movements are difficult, if not impossible to carry out. Since all corrections cannot be carried out simultaneously the treatment time may be increased considerably.
- The patient has to have a certain amount of skill to be able to remove and replace the appliance for successful treatment to be possible.
- The chance of appliance loss and/or breakage is more.^[3]

INDICATIONS:

- Growth modifications during mixed dentition.
- Limited tipping, rotation required.
- Arch expansion.
- Retention after fixed treatment.^[2]

COMPONENTS:

The removable orthodontic appliances are made up of three components:

1. Force or active components – comprises of springs, screws or elastics.
2. Fixation or retentive components - usually include clasps.

3. Base plate or framework – can be made of cold cure or heat cure acrylic.^[5]
4. **ACTIVE COMPONENTS:**
 - These constitute the components of the removable appliance, which apply forces to the teeth to bring about the desired tooth movement.
 - The active components include:
 - a. Springs
 - b. Bows
 - c. Screws.
 - d. Elastics.^[6]

RETENTIVE COMPONENT:

- Retentive component: Clasp.
- This part of removable orthodontic appliance holds the appliance in position and is referred to as clasp. It can also known to as the anchor unit of the removable orthodontic appliance.

BASEPLATE:

- The material most frequently used for base plate is cold cure or heat cure acrylic. It forms a major part of the removable appliance.
- Base plate acts as support for pressure sources and distributes the reaction of these forces to the anchorage areas.^[6]

SPRINGS:

- Spring is an active component of removable orthodontic appliances which Brings about the desired tooth movement.
- The different types of springs which could be used to bring about the Orthodontic tooth movement are:
 - Finger spring.
 - Single Cantilever spring.
 - Double Cantilever or “Z” spring.
 - “T” spring.
 - Self supporting buccal spring.
 - Mattress spring.
 - Coffin spring.
 - Canine retractor.

TYPES OF CANINE RETRACTOR:

- Based on the location:
Buccal canine retractor.
Palatal canine retractor.
- Based on the presence of helix or loop:
Helical canine retractor
Looped canine retractor.
- Based on the action:
Push type
Pull type.

- Springs provide extra length of wire to increase range of action and resiliency.^[7]

BOWS:

- Short labial bow.
- Long labial bow.
Modification: Labial bow soldered to Adams' clasp.
- Split labial bow.
- Reverse labial bow.
- Robert's retractor.
- Mills retractor.
- High labial bow.
- Fitted labial bow.

LABIAL BOW:

- These are components that are used for both overjet reduction and for providing anterior fixation.
- The primary function of the bow is to retrude the anterior teeth.
- It also can be used for retentive purposes.
- **COMPONENTS:**
 1. Incisor segment.
 2. Vertical loops.

3. The occlusal or cross over section.
4. The retentive ends.

SCREWS:

- Screws are active components that are used to provide intermittent forces in removable appliances. Screws can be used to bring about various kinds of tooth movement.
- Based on the location of the screw and the acrylic split, three types of tooth movements can be brought about by screw appliances:
 1. Arch expansion screw placed in the centre of the arch.
 2. Labial/buccal movement of one or a group of teeth.
 3. Mesial/distal movement of one or more teeth.^[11]

ELASTICS:

- Elastics are routinely used in conjunction with fixed appliances but can provide the force component in removable appliances in suitable circumstances. Elastics can be used along with removable appliances for retraction of anterior teeth.
- Advantage:
 - Better esthetics, as they are less visible.
- Drawbacks:
 1. Flattening of the arch form due to lack of control
 2. Gingival stripping due to slippage of the elastics.^[11]

CLASPS:

- Clasp can be defined as a component of removable orthodontic appliances that retains and stabilizes an orthodontic appliance in the oral cavity by contacting the surface of the teeth or by engaging the interproximal embrasures.
- Following are the types of clasps used on Orthodontics.
 1. Adam's clasp and its modifications such as:
 - A) Adam's clasp with single arrow head.
 - B) Adam's clasp with additional arrow head.
 - C) Adam's clasps with distal extension.
 - D) Adam's clasp with helix.
 - E) Adam's clasp with J-hook.
 - F) Adam's clasp with soldered buccal tube.
 - G) Adam's clasp on incisors and premolars.

✚ Devised by Professor **C Philip Adams** in 1948, the Adams' clasp is one of the most effective clasps. It makes use of the mesial and distal proximal undercuts of the first permanent molars. It is also referred as **modified arrowhead, universal and Liverpool clasp**. It is made from 0.7mm round SS wire. The Adams' clasp can be used on premolars,

permanent molars and even deciduous molars in which case 0.6 mm diameter wire is used.

- ✚ The Adams' clasp is made of the following constituents:
 - a. Two arrowheads
 - b. Connecting bridge
 - c. Two retentive arms with tags.^[8]

2. 'C' Clasp or Three-Quarter Clasps:

- ✚ This clasp is also known as the three quarter clasp. It is one of the simplest clasps in design and fabrication.
- ✚ It is made from 0.7 mm diameter SS wire. The C-clasp engages the buccal cervical undercut.
- ✚ It extends in the form of a "C" from one proximal undercut along the cervical margin to the other proximal side and is then brought occlusally over the embrasure to end as the retentive arm.
- ✚ It starts from the mesial side and ends on the distal side. However, it cannot be used in teeth that are partially erupted, as the cervical undercut cannot be seen.^[8]

3. Full Clasp or Jackson's Clasp:

- ✚ This "U"-shaped clasp was introduced by Jackson in 1906. It is also made from 0.7 mm SS wire. This clasp is adapted along the buccal cervical margin and extends along the mesial and distal undercuts, over the occlusal embrasure to end in two retentive arms on either side of the teeth.
- ✚ It can't be used on partially erupted teeth. In fully erupted teeth, it provides adequate retention.

4. Triangular Clasp:

- ✚ These are small triangular-shaped clasps, which are used to provide additional retention. When used alone, they can't provide adequate retention and are therefore used as accessory clasps.

5. Ball end clasp:

- ✚ This clasp is made up of a stainless steel wire (0.7 mm diameter) with a sphere or ball-like structure on one end. This ball makes use of the mesial and distal undercuts between 2 adjacent posterior teeth.
- ✚ The ball end clasp can be fabricated with silver solder and is also available in a preformed state. These also provide additional retention.

6. Southend clasp:

- ✚ This clasp is used for retention in the anterior region. The clasp is constructed along the gingival margin of both the maxillary central incisors and the distal ends end as retentive

areas on the palatal side. This clasp can be used when upper incisors aren't proclined and there's a limited undercut.

- ✚ In case of proclined incisors, the clasp is flexed unnecessarily during placement and removal of the appliance and can fracture frequently.

7. Schwarz Clasp:

- ✚ This clasp is made up of a number of arrowheads which make use of the proximal undercuts between the molars and between premolars and molars. Therefore, it is also called the **arrowhead clasp**.^[9]

8. Crozat clasp:

- ✚ It looks like Jackson's clasp, which has a piece of wire, soldered at the base. This wire engages the mesial and distal proximal undercut.
- ✚ The advantage is that the clasp offers better retention than the full clasp.^[10]

9. Delta clasp:

- ✚ Designed by William J.Clark.
- ✚ Similar to Adam's clasp.
- ✚ Used in twin block appliance.

MODE OF ACTION OF CLASPS:

- i. Clasps engage onto the undercuts (constricted areas on the teeth).
- ii. Two types of undercuts:
 - a. Buccal / lingual cervical undercuts.
 - b. Mesial / distal proximal undercuts.^[9]

- Clasps act by engaging constricted areas of the
- ✓ Teeth, called undercut. There are two types of
 - ✓ Undercuts found in natural dentition.
 - ✓ 1.Buccal and Lingual cervical undercuts
 - ✓ 2.Mesial and Distal proximal undercuts
 - ✓ The mesial and distal undercuts of the teeth
- [2]
- ✓ begin below the contact points. These
 - ✓ undercuts are accessible very soon after a tooth
 - ✓ Has erupted. The buccal and lingual undercuts
 - ✓ are much less extensive and are not accessible
 - ✓ Until the teeth are fully erupted. Thus, a clasp
 - ✓ that makes use of mesial and distal undercuts
 - ✓ is more useful and more efficient than a clasp

- ✓ which makes use of buccal and lingual
- ✓ Undercuts.
- ✓

- ✓ An ideal clasp should [1] :-
- ✓ •Offer adequate retention

BASE PLATE:

- Base plate preparation:
 - a) Trimming: Acrylic trimmers with Vulcanite and Stainless Steel bur
 - b) Finishing: Finishing stone and Sand paper or Emery paper
 - c) Polishing: Brush with Pumice on a Lathe
 - d) Glossy finish : Woollen Buff.^[2]

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