Retainer in orthodontics

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Abstract
Retainer is a removable retainer that is popular in the present day. Compared with conventional fixed and removable orthodontic retainers, it is a more esthetic, comfortable, and inexpensive appliance.

Keywords: Retainer removable fixed.

Introduction

Malocclusion is not a disease by itself, it is s a morphological deviation from normal growth and development which might be or might not be associated with any pathological condition.[1]

Orthodontic treatment is recommended for all classes of malocclusion, in order to restore normal functions, improve jaws relation, and achieve the required aesthetic goals.[1] Besides achieving patient's goals, be it functional or esthetics, treatment result have to be retained for its long term success.[1]

A phase of retention is normally required to prevent the inherent tendency of the teeth to return to their original position.[2] Stability can only be achieved if the forces derived from the periodontal and gingival tissues, the orofacial soft tissues, the occlusal forces and post treatment facial growth are in equilibrium. Keeping in mind the importance of retention in Orthodontic treatment, various types of retainers i.e fixed or removable are given after completion of Orthodontic treatment.[2]

During formulation of treatment plan, type of retention depending on the correction achieved by Orthodontic treatment should also be documented before hand.[2] There are certain conditions like high placed canine, anterior crossbites and posterior crossbites with proper axial inclination required limited or no retention. Class I non extraction cases and condition like, maximum retention corrected deepbite, all first premolar extraction.[2]

Hellman gave nine theorems of retention whose principles should be followed while executing Orthodontic treatment and after the completion of active treatment i.e in retention phase[2].

This review article will list various types of retainers used in Orthodontics and these are broadly classified into:

1. Removable retainer
2. Fixed retainers

Removable Retainers

The removable retainers provide adequate retention for intra-arch stability and are useful as retainers in patients in where

Growth is remaining and are compliant. Various types of removable retainer are:[3]

1. Hawley's retainer and its modification
2. Clip on retainer
3. Wrap around retainer
4. Vander linden retainer
5. Clear retainer

Hawley's Retainer

The most common removable retainer is the Hawley retainer, designed in the 1920's by E H Hawley. It incorporates clasps on molar teeth and has a characteristic outer bowwith adjustment loops, from canine to canine.[4] There is an acrylic coverage of the palate, which automatically provides a potential bite plane effect to retain overbite correction and rigid enough to maintain palatal expansion achieved during Orthodontic treatment.[4](Fig. 1 a)

Mechanical retention can be a problem in patients with short clinical crowns or exfoliated deciduous teeth[4]

The clasp locations for a Hawley retainer must be selected carefully, since clasp wires crossing the occlusal table can disrupt rather than retain the tooth relationships, established during the treatment. Circumferential clasps on the terminal molar may be preferred over the more effective Adams clasp if the occlusion is tight.[4]

When first premolars have been extracted, standard design of Hawley retainer cannot keep the extraction space closed, rather it tends to open up the extraction space aswires of labial bow extends distal to canines, tending to act like a wedge at an extraction site. A common modifications of the Hawley retainer for use in such cases can be-

1. Labial bow soldered to the bridge of Adams clasps on the first molars, so that the action of the bow helps to hold the extraction space closed.[4]

2. Using long labial bow extending from 2nd premolar to 2nd premolar on the other side.[4]
3. Wrap the labial bow around the entire arch, till the first molars and using circumferential clasps on second molars for retention.(Fig. 1 d)[4]
4. Fitted labial bow:-A 22 gauge SS wire of appropriate length is taken and adapted according to the contour of the individual teeth at the level of the junction of the middle and incisal thirds, staring from the central incisors progressing towards the junction of middle and distal thirds of the labial surface of the canine.[4] At this point the free ends of the wires are bent at 90 degrees towards the apex and the further construction is carried out in a similar way as in case of a short labial bow. Used to retract anteriors when the space is present distal to canine.(Fig. 1 d)[4]
5. To bring the labial wire from the baseplate between the lateral incisor and canine and to bend or solder a wire extension distally to control the canines.(Fig. 1 b)

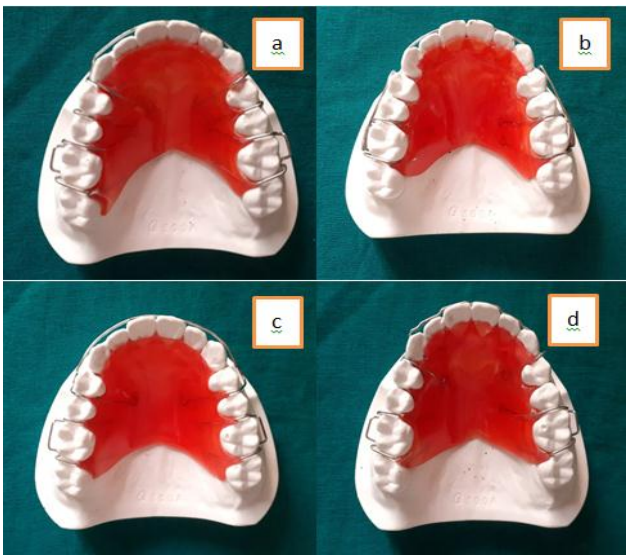

Fig. 1: A hawley retainer, b: Hawley with soldered labial bow, c: Hawley with long labial bow, d: Hawley with fitted labial bow

Removable wraparound retainers

Fig. 2: clip on retainer

Clip On Retainer

A second major type of removable retainer is a clip-on retainer (C3-3 clip or 4-4 clip).[4] It consist of acrylic bar (usually wire reinforced) along the labial and lingual surfaces of the teeth.[4]

This retainer though quite esthetic is often less comfortable than a Hawley retainer. It is used to control alignment of anterior teeth or preferred in mandibular arch when mandibular teeth were well aligned and prior to treatment, retention of these teeth is unnecessary and undercuts lingual to molars make to difficult to extend retainer posteriorly[4] (Fig. 2)

It is generally used in cases with anterior spacing and can also be used to realign mandibular incisor if mild crowding develop after the treatment.

Fig. 3: Begg's modified wraparound retainer

Begg's Modified Wraparound Retainer

Original Wraparound retainer was popularized by P.R.Begg

It consists of labial wire that extended till the last erupted molar and curves around it to get embedded in acrylic that spans the palate.[5] There was no cross -over of wires between the canine and second premolar there by eliminating the risk of extraction space opening up.[5]

The original design was modified by placing a single arrowhead in distal undercut of last tooth both first and second molar can be incorporated in the retainer to improve retention of the appliance.[6](Fig. 3)

Both these type of wraparound retainer have following advantage:

1. Overcomes the limitation of Hawley type retainers with Adam's clasps or labial wire crossing the occlusion that create interference or can open that up to the extraction space.[4]
2. Better retention than the conventional appliance

Vander linden retainer

The Vander linden retainer is constructed to offer complete control over the maxillary anterior teeth, with firm fixation provided by clasps on the canines. The continuous

0.028"labial arch and left and right three quarter 0.032"molar clasps are embedded in the palatal acrylic plate.[7] The premolars and molars should be of acrylic, except where there are clasps.[7] This retainer does not usually interfere with the occlusion, because most maxillary lateral incisors have rounded disto-incisal corners with sufficient space for the retainer wire on the palatal side.[7] Nevertheless the patient's occlusion should be checked to ensure that 0.028" wire can pass between the lateral incisor and canine without causing interference.[7]

Fig. 4

Clear retainer/invisible retainer are also a type of removable retainer made with varying thickness of preformed thermoplastic sheets.[8] They are considered as invisible ratianer that can be made by Biostar or Vaccum pressure machines using thermoform sheets. (Essix retainer, thermoplastic retainer, or vacuum‐formed retainer) were the first thermoplastic clear retainers introduced in 1993 by Dr. John Sheridan.[8]

As these retainers are made entirely of transparent plastic, which makes them less noticeable and more esthetic than the traditional wire retainers, they are easily accepted by the patients.[8]

These retainers also acts as positioners and gently guide the teeth into proper position and can correct tooth discrepancies. They can serve as temporary bridge for missing anterior teeth. They also act as a night guard for subjects who have the habit of Bruxism and also have a bite plane like effect. The delivery of these retainers require less chair side time. They encourage good dental hygiene as patients can take out their retainer and brush or floss their teeth.[8]

However clear retainer has certain disadvantages like they demand good patient compliance, interferen with settling of occlusion, and can be lost due to its transparency.[8]

There is certain contraindication to use of clear retainers like swollen interproximal tissue, Severe pretreatment dental rotations, in cases where arch expansion has been done or inpatient with anterior open bite.

Several Modifications of clear retainer have been given like

1. Clear retainer with bite plane- bite plane is added in anterior region
2. Clear retainer with a crown or denture teeth for missing teeth
3. Osamu active retainer for correction of mild relapse

This retainer consists of two superimposed layers. The inner layer, made of 1.5mm ethylene vinyl acetate copolymer adapts to the interproximal areas and covers the palatal and lingual aspects of the teeth.[8] The outer layer, made of 0.75mm hard elastic polycarbonate, covers the occlusal aspects of the teeth and makes the retainer elastic and stable. The Osamu active retainer is inexpensive, simple to make and It can correct individual tooth positions while maintaining close adaptation to the remaining teeth[8].

Fixed Retainers

A fixed retainer typically consists of a passively bonded wire to the lingual side of the teeth in maxillary and mandibular incisor region. The complete analysis of patients bite must be taken. Orthodontists prescribe fixed retainers, especially in cases where stability is questionable and long term retention is required[4]. As fixed retainer are easily acceptable by the patients and their popularity has increased in recent times. Initially, for fixed retainer rigid wire was used that did not provide physiologic tooth movement. However, nowadays we use flexible wires like multistranded or ligature were twisted together as fixed retainer.[4]

Types of Fixed Retainers

Based on type of attachment to teeth

1. Banded Retainers- canine were banded to fix the retainer that was esthetically unacceptable
2. Bonded Lingual Retainers -Retainer bonded on the lingual aspect for maintaining anterior tooth position relatively independence's of patient's cooperation.
3. Band and Spur Retainer- used in cases where a single tooth has been orthodontically treated for rotation, correction or labiolingual displacement. The tooth that has been moved is banded and spurs are soldered on to the bands so as to overlap the adjacent teeth.
4. 4-4 crozat retainer: 4-4 Crozat appliance has cribs on the first bicuspids, recurved double lapping lingual finger springs and a labial bow. It combines may of theadvantages of other types of retainers and offers firm retention, because of its clasping mechanism.[9] It prevent good labiolingual control of anterior teeth to maintain or restore arch form in the lower or upper arch and is a flexible retainer. It also provides adequate oral hygiene being removable.[9] The major disadvantages of the appliance are is that must be fabricated at a quality laboratory, not making it cost effective and can break easily.[9]

Based on the material used

1. First generation fixed retainer : Plain blue Elgiloy wire with a loop at each terminal end is used[10]
2. Second generationfixed retainer: Similar diameter multistranded wires are used
3. Third generation fixed retainer: Round 0.032" stainless steel or 0.030" gold coated wires are used[10]
4. Recent advancement includes Resin fiberglass bonded retainers

With introduction of resin resinforced fiberglass composites, Michael developed these retainers. The main advantages are that they are rigid and impervious. The Patients appreciate the tooth colored material and the comfort that is provided by smoothening of the margins with rubber abrasive points or wheels. Retainer sections can easily be recontoured, removed or repaired in the mouth. As no metal wires are used, additional material can be applied to the teeth or the fiberglass or both.[10]

Fig. 5: bonded canine to canine

Based on extensions of lingual retainer

1. Canine to canine retainer– These are commonly used in lower anterior region. Canine are banded and a thick wire is contoured over the lingual aspects and soldered to the canine bands.[11] The bands predispose to poor oral hygiene and are unesthetic, hence not preformed nowadays. Bonded canine to canine retainer overcome this limitation and are used commonly. These are used in non extraction cases or in mandibular incisor extraction cases.[11] (Fig. 5)
2. Bonded premolar to premolar retainer- These are commonly used in extraction cases, where extraction of first premolar had been planned[11] (Fig. 6)

Fig. 6: bonded premolar to premolar

3. Banded molar –molar retainer:-The molar to molar mandibular retainer is made by the heavy gauge wire soldered on the molar bands. It allows the mandibular canines and molars to settle naturally and maintain the arch [12]

Bonded Fixed Retainer

Indications

Zachrisson listed the following indications for clinical use of flexible wire retainer: [11]

1. Closed median diastema
2. Spaced anterior teeth
3. Adult cases with potential post-orthodontic tooth migration
4. Accidental loss of maxillary incisors requiring closure and retention of large anterior space
5. Spacing reopening, after mandibular incisor extractions
6. Severely rotated maxillary incisors or severe pretreatment crowding
7. Palatally impacted canines
8. Planned increase in mandibular intercanine width

Advantages

1. Invisible, are well-tolerated by patients
2. Virtually compliance-free.
3. No damage to the teeth and to the hard and soft tissues adjacent to the wire.

Disadvantages

1. Time-consuming
2. Technique sensitive
3. Difficult to maintain, encouraging plaque and calculus accumulation.

Conclusion

This review article suggest indication, limitation and precaution takes with various types of retainers used in orthodontics be it removable or fixed. The selection of appropriate means for providing retention should state from day one of orthodontic treatment planning for attaining optimal result post treatment that lasts for life time.

Conflict of Interest: None.

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How to cite this article: Anand RK, Tikku T, Khanna R, Maurya RP, Verma S, Shrivastava K, Retainer in orthodontics. *J Orthod Dentofacial Res* 2019;5(1):11-15