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Review Artic;e

Orthodontic retainers - An overview

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ABSTRACT

After orthodontic treatment completion, teeth have natural tendency to return to their original position, leading to loss of treatment goals achieved during orthodontic treatment. It is mainly due to stretch of periodontal fibres. So there is need to maintain teeth position into new corrected place. This can be achieved by using certain appliances, called as retainers. Retainers can be either removable or fixed. Removable retainers are those appliances which can be easily removed and placed by patients, and thus helping in complete cleaning of teeth and patient can wear retainer on part time basis. Fixed retainers are fixed to teeth. This article will discuss about various types of retainers used after completion of orthodontic treatment to prevent relapse.

1. Introduction

Orthodontic retention is the last phase of orthodontic treatment procedure and its aim is to preserve the teeth in their new position after correction of malocclusion at the end of orthodontic treatment. Teeth have a natural tendency to come back in their original position after malocclusion correction because of stretch in periodontal fibres, especially fibres present around the necks of the teeth. There are various factors which influence final stability of teeth after treatment. Appropriate orthodontic diagnosis, treatment planning and the achievement of appropriate occlusal and soft tissue treatment goals can help to reduce orthodontic relapse.[1] Orthodontic retention and relapse continue to be significant issues for all clinicians and must be managed properly. With thorough knowledge regarding retention, factors contributing to relapse and by following suggested guidelines, one can maintain the treatment outcome after completion of active treatment.[2]

Retainers are the orthodontic appliances which are used to prevent relapse that is return of teeth to their initial position after orthodontic correction. To date, for long term stability of treatment results and to reduce relapse, variety of retainers have been used in orthodontics. Retainers can be either removable or fixed. Removable retainers are those appliances which can be easily removed and placed by patients, and thus helping in complete cleaning of teeth and patient can wear retainer on part time basis also. However, in certain conditions fixed retainers are advocated which remain fixed to teeth for 24 hours a day every day.[3] Various authors recommend different time duration for which patients have to wear retainer. There is no definitive literature suggesting a fixed retention protocol that ensures

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long-term stability of orthodontic treatment.[4–6] There are various factors including clinician's preference, status of occlusion of patient, skeletal and soft tissue characters etc.[7] In 1990, a survey was conducted in UK and it was concluded that 12 months was the most commonly used time duration for wearing retainers.[8] When plates are used, their wear should be stopped gradually, first by leaving them out in the daytime and wearing at night for about six months, then every other night until they can be dispensed entirely. The maxillary retainer wear should be stopped some time before the mandibular retainer which allows the maxillary teeth to settle better with mandibular teeth.[9,10] It can be concluded that retainers are advised for full time wear for the first 3 to 4 months, and must be removed while eating. For at least 12 months, they must be worn part-time and also part time wear must be continued until growth is completed.[4]

Retainers are required after orthodontic treatment to allow reorganization of periodontal and gingival fibres, to reduce alterations in the orthodontic treatment result due to pending growth of patient, to allow neuromuscular adaptations to the corrected occlusion and to preserve new tooth positions that are unstable.[4]

2. Types of Retainers

Retainers are mainly classified into types

1. Removable retainers
2. Fixed retainers.

2.1. Removable retainers

2.1.1. Hawley retainer

It is the most popular removable retainer, which consists of acrylic resin plate and wire components. Wire components include a labial bow and clasps on molars (Figures 1 and 2).

2.1.1.1. Fabrication. Hawley retainer is fabricated with acrylic resin that covers the palate, a labial bow made up of stainless-steel contoured on the labial surface of maxillary anterior teeth, and consists of U loops extending from distal surface of canines and finally the wire adapted through canine and premolar to palate and is inserted into acrylic resin plate.[11] Along with labial bow it also consists of clasps like Adams clasp, circumferential clasp or ball-end clasp, for retention of appliance. The canine loops should be kept 2-3mm above the gingival margin and away from gingival tissue to prevent soft tissue injury. Labial bow is kept passive with gentle contact on anterior teeth. The acrylic plate can be fabricated from heat-cure or self cure resin. The thickness of plate is 2-3 mm so that it can retain wire components and also comfortable to the patient.[12]Distally it extends till the distal aspect of first molars, and is thinned to merge with the palatal mucosa.

Figure 1: Hawley retainer

Figure 2: Intra oral view of Hawley retainers

2.1.2. Modifications of hawley retainers

1. Hawley retainer with anterior bite plane: Anterior bite plane can be incorporated into palatal part to control bite depth, in patients with corrected deep bite.
2. Hawley retainer with bow soldered to Adams clasp: labial bow can be soldered to the bridge of Adams clasp which helps to maintain the closed extraction space.
3. Hawley retainer with long labial bow: Space can be reopened between canine and premolar, with standard Hawley retainer which can be controlled with the use of labial bow extending from premolar of one side to another side.
4. Hawley retainer with C-clasp on second molars distally: To avoid occlusal interference over posterior occlusion, c-clasp with distally approaching ring on

second molars can be fabricated.

5. Hawley retainer with fitted labial bow: Fitted labial bow anteriorly is used for better incisors control.
6. Hawley retainer with finger/Z-spring: The incorporation of finger/ Z-springs makes it active appliance and is used for tipping movement. [13]
7. Hawley retainer with clear outer bow: It is esthetic modification given by Needham et al in 2015. It consists of clear outer bow made of food-grade polyethylene terephthalate of 2.75 mm width, joined at a Coiltight-Joint® to the Adams clasp. The wire is more accurately adapted to all anterior teeth while posteriorly the wire segment provides retentive component. [14]

2.1.3. Wrap around (WA) retainer

In this appliance the labial bow wire extends to the posterior teeth, without molar retentive clasps [15] (Figure 3). It is useful in patients where treatment is done with extraction of teeth. The long extended wire is prone to distortion and mishandling during fitting and removal of appliance. Therefore Patients are instructed to remove it from the palatal acrylic plate with the help of thumb or forefinger, and experienced patients may also use their tongue. It is also advised to add acrylic on the labial bow to enhance its stability and prevent potential distortion. [16]

Figure 3: Wrap around retainer

2.1.4. Reinforced removable retainer (RRR)

This retainer is also a modification of Hawley retainer, being reinforced with metallic mesh, and also has ball clasps. The metallic mesh makes it resistant to breakage without adversely affecting soft tissue health, since it is completely incorporated into the body of the acrylic. The metallic mesh is kept very thin for easy handling during manufacturing, and to prevent increase of thickness of appliance as increased thickness of appliance makes it uncomfortable and unacceptable for patients. Ball clasps are added which enhance retention and stability of retainer. [17]

2.1.5. Clear plastic retainers

These are also called as Essix retainers (Figure 4) and have proven quite versatile. These are fabricated from a transparent thermoplastic sheet of adequate thickness. [4]

2.1.6. Advantages

1. Esthetically pleasing, easy to clean with soap and water.
2. These retainers usually need no adjustment when fitted and many orthodontists observed that these are more acceptable by patients because of their esthetics and easy use.
3. Also retainers can be fabricated quickly and easily with minimum technical skill. [18–23]
4. Their effect on speech is less as compared to Hawley retainer. [24]

2.1.7. Disadvantage

1. Compared to Hawley retainers, these retainers wear out more easily, and may not always prove to be dimensionally stable.
2. As the thermoplastic sheet covers the occluding surfaces of teeth which prevents vertical tooth movement and subsequent occlusal adjustment. [18,23]
3. These can wrap if exposed to heat.
4. These may become discolored with time.
5. If this retainer cracks or breaks, it cannot be repaired and need to be replaced. [24]

Figure 4: Essix retainer

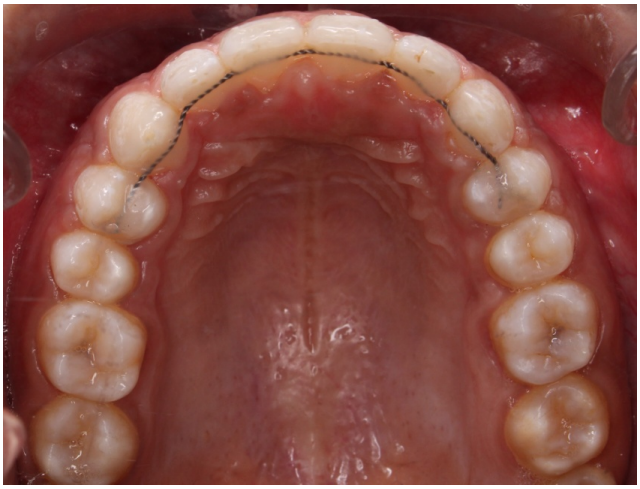

Figure 5: Fixed retainer

2.2. Fixed retainers

In 1965, Newman[25] introduced the direct bonding method for orthodontic attachments. Kneirim[26] in 1973 described firstly the use of fixed retainers (Figure 5). The wires which are used for fabricating fixed retainers are divided into generations since they have been introduced.[27] These generations are:

1. 1^{st} generation: These are 0.025–0.036 inch blue elgiloy or stainless steel round wires. These are bonded only to lingual surfaces of canines, and loops are made at each end of wire to enhance retention.
2. 2^{nd} generation: These wires are triple-stranded wires with 0.032 inch diameter and can be bonded to lingual surfaces of all anterior teeth.[28]
3. 3^{rd} generation: These are 0.032 inch stainless steel or 0.030 inch gold-coated plain wires. At the ends, wires are sandblasted with aluminum oxide to provide maximum mechanical retention.[29]
4. 4^{th} generation: These are 0.0215 inch 5-stranded wires that can be bonded to all anterior teeth.
5. 5^{th} generation: These are 0.032 inch, blue elgiloy plain wires that are sandblasted at the ends and bonded to canines only.

2.2.1. Criteria for bonding fixed retainers to just canines as recommended by Lee

1. In patients who have initially extreme lower incisors rotations and crowding.
2. In patients where lower inter canine width have changed during orthodontic treatment.
3. For situations where lower incisor proclination was used.
4. In cases having modest crowding and those do not require extractions for treatment.
5. Cases of significant overbite.[30]

With recent advancements, fixed retainers can be manufactured using CAD–CAM systems. The procedure and types of wires used for manufacturing bonded retainers using CAD–CAM technology is different for each firm. In one of the techniques used, the retainers are produced by bending of prefabricated wires by the handle of a machine.[31]

2.2.2. Memotain retainer

This retainer wire was introduced by Pascal Schumacher in 2012. The name Memotain is obtained by the mix of "memory" and "retainer" due to the unique application of Ni-Ti wire for the lingual aspect. It used technique for producing bonded retainers by carving out of a block of wire. It is a CAD/CAM manufactured lingual retainer made of 0.014 × 0.014 inch rectangular nickel–titanium wire which adapts closely to the tooth anatomy. As this can be adapted tightly in interproximal adaptation, so it is beneficial in common break-point areas, such as the embrasure between the lateral incisor and the canine or the step between the canine and the premolar, and it is digitally positioned to prevent hindrance with the mandibular teeth.[32]

3. Conclusion

Orthodontic retention and relapse continue to be significant challenges for all orthodontists. The main aims of orthodontic treatment are to achieve good esthetics and appropriate occlusal function along with stability of treatment results over the years. Thus, the retention phase is critical to maintain treatment results for longer time and it is necessary to plan about retention at the time of diagnosis and treatment planning as it is also important as the diagnosis and treatment planning.[33] With thorough knowledge regarding retention, factors contributing to relapse and by following suggested guidelines, one can maintain the treatment outcome after completion of active treatment. It is also responsibility of an orthodontist to select suitable retention protocol for each individual patient and to aware the patient regarding need and importance of retainers. The patient has also responsibility to follow the recommended retention protocol, maintain retainers properly, and arrange regular checkups with their orthodontist that will help in maintenance of treatment outcome.[2]

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None.

5. Conflict of Interest

None.

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