Retention Appliances – A Review

Abstract

In Orthodontics the stability of the achieved result remains a fundamental issue of concern and debate. Usually a retention phase is required after active Orthodontic tooth movement to hold teeth in its ideal aesthetic and functional relation and prevent the teeth to return to their former position. Keeping in mind the importance of Retention in orthodontic treatment, this article makes an attempt to refresh our knowledge on retainers by exploring the literature.

Key words: Retention, Retainers, Relapse, Stability.

Introduction

In Orthodontics the stability of the achieved result remains a fundamental issue of concern and debate. Tirk has said “The result of Orthodontic therapy – good, bad or indifferent is only evident many years out of retention” (1). Maintaining teeth in their corrected positions after Orthodontic treatment has been and continues to be a challenge (2).

A phase of retention is normally required after active Orthodontic tooth movement to hold teeth in ideal aesthetic and functional relation and combat the inherent tendency of the teeth to return to their former position (3). 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 and development are in equilibrium (3). Keeping in mind the importance of retention in orthodontic treatment, this article makes an attempt to refresh our knowledge on retainers by exploring the literature.

Retainers: The retainers in Orthodontics can be chiefly classified into Removable and Fixed retainers and visible and invisible retainers.

Removable retainers: The removable retainers serve as retention for intra-arch stability and are useful as retainers in patients with growth problems. The available removable retainers are discussed briefly.

Hawley’s retainer (4): The most commonly used retainer, designed in 1920’s as an active removable appliance. It incorporates clasps on molar teeth and a characteristic outer labial bow with adjustment loops, spanning from canine to canine. The outer bow provides excellent control of the incisors even if it is not adjusted to retract them. When first premolars are extracted, one function of a retainer is to keep the extraction space closed, which the standard design cannot do. A common modification of the Hawley retainer for use in extraction cases is a bow soldered to the buccal section of Adam’s clasp on the first molars, so that the action of the bow helps hold the
extraction site closed. Alternative designs for extraction cases are to wrap the labial bow around the entire arch, using circumferential clasps on second molars for retention or to bring the labial wire extension distally to control the canines. Circumferential clasps on the terminal molar may be preferred over the more effective Adam’s clasp if the occlusion is tight.

**Removable wrap around retainer** (4)

The wrap around or clip-on retainer, which consists of a plastic bar along the labial and lingual surfaces of teeth. A full arch wrap around retainer should allow each tooth to move individually, stimulating reorganization of the periodontal ligament. In addition, a wrap around retainer, though quite esthetic, is often less comfortable than a Hawley retainer and may not be effective in maintaining overbite correction. A full arch wrap around retainer is indicated primarily when periodontal breakdown requires splinting of teeth together.

**Removable cuspid to cuspid retainer** (5)

These types of retainers can be made relatively quickly and by untrained personnel. The construction of the appliance is with the use of two 0.025” wires, bent and placed in the embrasure between the lower cuspids and lateral incisors after separating medium is placed on the cast. The salt and pepper method is used to apply a quick-cure acrylic covering the labial surfaces from cuspid to cuspid and the lingual surfaces from first bicuspid to first bicuspid or second bicuspid if first bicusps have been extracted. When the acrylic has set, the retainer is removed from the cast, trimmed, pumiced and polished. The acrylic should be cut down on the labial to avoid being struck by the maxillary central incisors, but left at the incisal edge on the lingual. The whole procedure requires about fifteen minutes of working time and produces a smooth, inconspicuous, easily fitted retainer that will do a positive job of controlling corrected lower rotations.

**Removable 6-6 Metal retainer** (6)

The lingual arch is formed of 0.045” hard SS wire. Adams clasps are formed of 0.028 or 0.035” SS wire. Bend clasp tails over arch wire so that stress is wire to wire and not on solder. In soldering, use Hydro flame or electro soldering. Heat expendable part of clasp tails. Use solder as heat sink to avoid overheating clasp. Add buccal wires, tubes, lingual finger springs, ball end clasps, and distal extensions to second molars.

**Positioners as retainers** (4)

A tooth positioner can also be used as a removable retainer, either fabricated for this purpose alone, or more commonly, continued as a retainer after serving initially as a finishing device. Positioners are excellent finishing devices and under special circumstances can be used to an advantage as retainers. For routine use, however, a positioner does not make a good retainer. The major problems with positioners as retainer are as follows.

- The pattern of wear of a positioner does not match the pattern usually desired for retainers. Because of its bulk, patients often have difficulty in wearing full time or nearly so.
- Positioners do not retain incisor irregularities and rotations as well as standard retainers. Also, overbite tends to increase while a positioner is being worn.

The positioner has one advantage over a standard removable or wrap around retainer – it maintains the occlusal relationships as well as intra-arch tooth positioners. For a patient with a tendency towards class III relapse, a positioner made with the
jaws rotated somewhat downward and backward may be useful.

**Thermoplastic retainers: Essix retainers** (7)

Essix thermoplastic copolyester retainers are a thinner, but stronger, cuspid to cuspid version of the full arch, vacuum formed devices. Essix retainers can be placed on the same day the fixed appliances are removed. The vinyl polysiloxane impression is taken immediately after debonding. Minor incisor rotations can be corrected by altering the cast, since the teeth will be slightly mobile. In no case, however, should more than two days elapse between appliance removal and retainer delivery. Seat the retainers over the incisors with firm finger pressure. If a retainer will not seat properly, it is usually because of internal plastic ridges formed by interproximal undercuts that were not adequately reduced. These ridges can be smoothed out at chair side with a scalpel. It is critical that the retainer does not slip easily over the teeth, but requires a reasonable amount of pressure to flex over the interproximal undercuts gingival to the contact points. First the patient may report that the retainer feels tight, but as the material warms in the mouth this sensation will dissipate. A slight fog may initially appear in the microspace between the appliance and the teeth, but this will disappear within a minute or so.

Essix retainers have proven quite versatile. Their flexibility and positioner effect make them an alternative to spring retainers in correcting minor tooth movements. They can be used to reduce occlusal forces from the opposing arch when moving posterior teeth with air-rotor stripping mechanics. They can serve as a temporary bridge for a missing anterior tooth, when thermoformed over a pontic placed in the edentulous space on the cast. They can also act as night guard for bruxism and as bite planes to relieve bracket impingement until the bite can be opened.

**FIXED RETAINERS** (4)

They are normally used in situations where intra-arch instability is anticipated and prolonged retention is planned, especially the mandibular incisor area. There are mainly four major indications, they include the following:

1. **Maintenance of lower incisor position**

An excellent retainer to hold these teeth in alignment is a fixed lingual bar, attached only to the canines and resting against the flat surface of the lower incisors above the cingulum. This prevents the incisors from moving lingually and is reasonably effective in maintaining correction of rotations in the segment. Fixed canine to canine retainers must be made from a wire heavy enough to resist distortion over the rather long span between these teeth. Usually 28 or 30 mil stainless steel is used for this purpose with a loop bend in the end of the wire to improve retention. These fixed retainers are categorized into three generation as follows:

**The three different generation’s are** (8)

The first generation is designed in plain, round 0.032 to 0.036” blue elgiloy wire with a loop at each end. In 1983, this was replaced by a twisted, three stranded 0.032” wire. The second generation retainer did not have terminal loops, since adequate retention was provided by the wire spirals and was thus neater and easier to fit. This second design has worked well for more than 10 years, with long-term bond failure rates of about 10-15%. Although the twisted wire does not appear to be any more plaque-retentive than the round wire, some disadvantages have emerged. First, the largest-diameter twisted wire available (0.032”) is not as stable as would be desirable. In few cases, it has been dislodged,
probably by the force of mastication and has then become slightly distorted. Furthermore, the twists in the wire seem to be less comfortable to the tongue than a smooth, round wire is.

The third generation 3-3 retainer is more solid and easier to place than the twisted 0.032" version. This allows the retainer to conform more closely to the lingual surfaces of the incisors during bonding, reducing the risk of unwanted side effects due to distortion in bonding of from mastication. The present design also has advantages over mandibular retainers in which all six anterior teeth are bonded. The only disadvantage of the third generation 3-3 retainer may be that even if the retainer bar is well contoured at the time of fabrication and the incisors fit snugly against the wire, slight labial movement may still be possible. However, labial movements are generally prevented by the maxillary incisors when there is a normal horizontal overbite.

**Diastema Maintenance**

A second indication for a fixed retainer is a situation where the teeth must be permanently or semi permanently bonded together to maintain the closure of space between them. This is encountered most commonly when a diastema between maxillary central incisors has been closed. Even if frenectomy has been done, there is a tendency for a small space to open up between the upper central incisors. The best retainer for this purpose is a bonded section of flexible wire. The wire should be contoured so that it lies near the cingulum to keep it out of occlusal contact. The object of the retainer is to hold the teeth together while allowing the some ability to move independently during function. An alternative is a solid wire to avoid the tooth contacts to facilitate flossing, which also can incorporate stops to prevent deepening of the bite.

**Maintenance of pontic or implant space**

A fixed retainer is also the best choice to maintain the space where a bridge pontic or implant eventually will be placed. Using a fixed retainer for a few months decreases the mobility of the teeth and often makes it easier to place the fixed bridge. Implants should be placed immediately after the orthodontic treatment is completed, so that integration of the implant can occur simultaneously with the initial stages of retention. The preferred orthodontic retainer for maintaining space for posterior restorations is a heavy intra coronal wire, bonded to adjacent teeth.

**Keeping extraction space closed in adults**

A fixed retainer is both more reliable and better tolerated than a full time removable retainer and spaces reopen unless a retainer is worn consistently.

**Bonded flexible wire lingual retainer**

The flexible spiral wire retainers were found to be excellent in the following indication:

- In midline diastema cases
- Spaced anterior teeth
- Adult cases with potential post orthodontic tooth migration
- Accelerated loss of maxillary incisors, requiring the closure and retention of large anterior space.
- Severely rotated tooth.

**4-4 Crozat retainer**

A 4-4 Crozat appliance has cribs on the first bicuspid, recurved double lapping lingual finger springs and a labial bow. It combines may of the advantages of other types of retainers and has been well received by patients. Its advantages include the following.
Firm retention, because of the Crozat clasping mechanism.

Labiolingual control of anterior teeth to maintain or restore arch form in the lower or upper arch.

Flexible, because it is all wire. It can be left out for months and still fit.

Maintenance of adequate oral hygiene, because it is removable.

Esthetic, because only a single labial wire shows.

The major disadvantages of the appliance are: a- it must be fabricated at a quality laboratory, making it cost prohibitive and b- it is breakable.

**Molar to molar mandibular retainer** (11)

The molar to molar mandibular retainer is done with the heavy gauge wire and with the use of molar bands. The advantages of molar to molar mandibular retainer over a Hawley’s or a cuspid to cuspid retainer include the following.

- Allows the mandibular canines and molars to settle naturally.
- Mandibular arch can be expanded or contracted.
- Rotations can be corrected by ligating the teeth to the lingual arch.

**Resin fiberglass bonded retainer** (12)

The Resin fiberglass bonded retainer was developed by Michael a direct technique that solves the major problem with cuspid to cuspid retainer and takes 20 minutes or less with previsit preparation. The system uses glass fiber from woven fiberglass fabric or fiber bond.

The main advantages of the resin fiberglass retainer have proven rigid and impervious. Patients appreciate the tooth colored material and the comfort that is provided by smoothing the margins with rubber abrasive points or wheels. Retainer sections can easily be recontoured, removed or repaired in the mouth. Because no metal wires are used, additional material can be applied to the teeth or the fiberglass or both. Many patients need only the canines to be retained. In cases of severe incisor rotations, however, this technique is flexible enough to allow the incisors to be bonded as well.

**Osamu active retainer for correction of mild relapse** (13)

The transparent removable appliance that can correct individual tooth position during the retention phase. The 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. 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 and simple to make. It is well accepted by patients because it is transparent and does not impair speech. It can correct individual tooth positions while maintain close adaptation to the remaining teeth.

**Vander linden retainer** (14)

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. The premolars and molars should be of acrylic, except where there are clasps. This retainer does not usually interfere with the occlusion, because most maxillary lateral incisors have rounded disto-incisal corners with suffient space for the retainer wire on the palatal side. Nevertheless the patient’s occlusion should be checked to ensure that an 0.028” wire can pass...
between the lateral incisor and canine without causing interference.

**Conclusion**

The next quarter century may witness the much needed additional of a more scientific dimension to the retention literature such as clinical reports of the duration of a variety of retaining appliances and the observations and opinions advocated by many orthodontic innovations and clinical scholars (15).

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