

Retention Procedures After Treatment with Orthodontic Braces

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Abstract

Retention is the most part of orthodontic treatment to keep teeth in the corrected positions after fixed orthodontic treatment. For this reason, to prevent the tendency of returning their initial position (relapse) is very important for successful orthodontic treatment to keep it for a long time. To prevent relapse patients will require some type of retention.

Keywords: *Post-orthodontic retention; tooth movement; lingual retainer; Essix Retainer*

Introduction

Permanent retention is the most part to stabilize orthodontic treatment outcomes. The correct diagnosis and proper treatment plan is needed but not adequate. Adaption of lips, chick and tongue to new positioned teeth and reorganization of periodontal, gingival, alveolar tissues take a year off after finishing treatment [1,2]. To prevent relapse, almost every person who has orthodontic treatment will require some type of retention [1,2].

The most recent preference of retention appliances are Hawley appliance, Vacuum Formed Retainer (VFR), fixed retainer. Hawley appliances have been using since 1900 to prevent relapse [3] VFRs were began to be popular at 1970s till now because they are esthetics, easy using and have low costs [4,5] Fixed retainers were extensive when adhesive system improved at 1980s. Zachrission is the first practioner with using 0.032 and 0.036 inches blue elgiloy wires to apply canine to canine [6,7]. It has been using different thickness, round or square shape, monofilament and braid wire as a lingual retainer in the later years.

Material and Methods

In this study, I compared Hawley appliances, VFR appliances and fixed retainers about their effects on effectiveness of preventing relapse, resistance to break up, occlusal relationship(settling), oral hygiene and periodontal health. High-impact factor randomized controlled studies were included and case reports excluded.

Results and Discussion

Effectiveness of an ideal retention method should prevent relapse and allow positive physiological tooth movement [8-10].

Retention of Incisor Alignment

Relapse at incisor region effects face and mouth esthetics negatively so it is important to have ideal results and keep them. Fixed appliances are commonly used at the incisor area for retention. A few studies are comparing different types of fixed retainers. Two types of fixed, customized canine-to-canine retainers (attached to six teeth) with wire diameters of 0.0215" and 0.0195" as well as one type of prefabricated canine-and-canine retainer (bonded to two teeth) were investigated in a total of 103 patients. Some retainers were inserted under dry field conditions using a rubber dam, and the others under relatively dry conditions using cotton rolls. In addition, two types of composite, Heliosit and Concise, were compared by Störmann and Ehmer. According to result of study the canine-and-canine retainer displayed an 18% detachment rate, a value significantly lower than the 29% determined for the 0.0195" canine-to-canine retainers. The

0.0215" canine-to-canine retainer had the highest detachment rate (53%). The 37% detachment rate with dry field bonding was slightly higher than the 32% with relatively dry field bonding. Comparison of the composites showed a significantly higher detachment rate for Heliosit (73%) than for Concise (27%). Tooth position with canine-to-canine retainers showed a good degree of stability. The canine-and-canine retainer induced frequent relapse of incisors not bonded to the retainer [11].

Naraghi and friends had a study group consisted of 135 study casts from 45 patients. Recordings from study models before treatment (T1), at debonding (T2), and 1 year after removal of the retainer (T3) were present. All patients had been treated with fixed edgewise appliances. The irregularity index (sum of contact point displacement [CPD]) and rotations of front teeth toward the raphe line were calculated at T1, T2, and T3. The results showed that regarding alignment of the maxillary front teeth, the contact relationship between the laterals and centrals seems to be the most critical. A significant positive correlation was found between the amount of correction of incisor rotation and the magnitude of relapse but not between the amount of correction of CPD and the magnitude of relapse. Eighty-four percent of the overcorrected CPDs returned to a desired position. Minor or no relapse was noted at the 1-year follow-up [12].

Rowland and his friends studied that 397 patients randomly allocated to either Hawley retainers (n = 196) or VFRs (n = 201). Maxillary and mandibular dental casts at debond and 6 months into retention were assessed for tooth rotations mesial to the first permanent molars, intercanine and intermolar widths, and Little's index of irregularity.

The results showed significantly greater changes in irregularity of the incisors in the Hawley group than in the VFR group at 6 months. VFRs are more effective than Hawley retainers at holding the correction of the maxillary and mandibular labial segments. There were otherwise no statistically significant differences [13].

Lindauer and Shoff (1998) compared effectiveness of Hawley and VFR appliances. 40 patients concluded. Patients warned to wear VFR appliances 12 hours for upper jaw, 24 hours for lower jaw at the first month; after following 5 months' patients worn both at night. Hawley appliances were worn 24 hours during 3 months, after following 3 months they worn only at nights. The results showed that no statistically differences found between retainers at the end of the 6 months' retention period [14].

In order to assess stability after orthodontic treatment, 132 patients who had been treated were examined 6 years on average after completion of their treatment. The influence of gender, Angle classification, treatment-induced changes, initiation, type and duration of therapy, and extraction of premolars on the development of relapse was also investigated. Lang and his friends found that the use of a removable mandibular retainer should not be dispensed with after bicuspid extractions, transverse expansion and, in female patients, in the lower jaw, as relapse in the buccal segment was more marked or more common in such cases. Fixed maxillary and mandibular retainers in the anterior region should be combined with a removable retainer and worn until the patients reach their late twenties [15].

Multi-stranded wires are commonly preferred instead of glass fibre reinforced (GFR) and glass fibre can use when patient is allergic to nickel. There are a few studies about their resistance and not enough extensive studies about their effectiveness [16,17].

Retention of Intercanine, interpremolar and intermolar distance

Strörmann and Ehmer (2002) evaluated 0.0195" canine-to-canine retainers and 0.0215" canine-to-canine retainers after 2 years' retention period. Tooth position with canine-to-canine retainers showed a good degree of stability [11].

Lang and friends compared fixed retainer and hawley appliance and two methods was effective to keep intercanine distance. In the study, they stated that the Hawley appliance should be used to keep interpremolar and intermolar distance [15].

Rowland and friends (2007) didn't found significant differences between effectiveness of VFR and Hawley appliances to keep intercanine and intermolar distance in their single-center randomized controlled trial [13].

Orthodontic Retention Protocols on the Periodontal and Dental Health

Effectiveness of retention protocols is important to prevent relapse as not giving negative effects on periodontal and dental health when using for a long time. Removable appliances don't prevent oral health hygiene, but in fixed retainers there is a retention area between wire and periodontal-dental areas so it increases plaque and calculus [7,18]. Artun and friends performed to test the tendency for plaque and calculus build-up along the wire of different types of bonded orthodontic canine-to-canine retainers, whether the presence of such retainers causes any damage to the teeth involved, the failure rate of the retainers, and any changes in incisor alignment during a 3-year period of retention. The results revealed no intergroup differences in gingival inflammation and plaque accumulation changes between baseline and follow-up examinations or status along the retainer wire for any of the variables [19].

Booth and his friends recalled Sixty patients who had had bonded canine-to-canine retainers placed a minimum of 20 years previously. Long-term retention of mandibular incisor alignment is acceptable to most patients and quite compatible with periodontal health [20]. Pandis and friends recorded plaque, gingival, and calculus indices, probing pocket depth, marginal recession, and bone level at the mandibular six anterior teeth for both groups. The purpose of this study was to evaluate the periodontal tissues of patients with mandibular fixed retention for long or short periods of time.

The long-term group presented higher calculus accumulation, greater marginal recession, and increased probing depth. They also suggested to control long-term fixed retainer frequently and perform hygiene protocols [21].

The current study was performed to evaluate whether significant differences in gingival conditions exist between patients who wear removable or fixed retainers. Differences in build-up of plaque and calculus were also investigated. Maxillary and mandibular measurements were taken at baseline (just before debonding) and 1, 3, and 6 months later, from canine to canine on 36 patients. Among these patients, 22 had fixed retainers, and 14 wore removable retainers. The gingival condition was scored according to three parameters: Modified Gingival Index, bleeding on probing, and gingival crevicular fluid flow. Gingival inflammation decreased from baseline throughout the entire period of retention. A comparable limited gingival inflammation was found in the presence of both types of retainers. Slightly more plaque and calculus were present on the lingual surfaces in the fixed retainer group. This did not result in more pronounced gingival inflammation than in the removable retainer group, within the evaluated period [22].

Effective on Occlusal Contacts with Use of Retainers

There are few studies on occlusal changing (settling). Canine to canine retainers and Hawley appliances allow posterior vertical movement but VFR appliances restrain them after debonding [8,10]. Sauget and friends found that Hawley appliances allow vertical teeth movement but VFR had no effect on them after 3 months' retention period [9]. Sari and friends performed 25 Hawley appliances and 25 canine-canine retainers. They found vertical occlusal contact increase at both groups but the most contact was found at canine-canine retainer group [9].

Only canine-canine VFR using causes posterior disocclusion and extrusion of posterior teeth with decreasing overbite. For this reason, these appliances shouldn't be used when the case is open bite. But Lindauer and friend found same effect between Hawley appliances group and the other group using VFR only night wearing for first four weeks with overbite decrease [14].

Crack Resistance of Retainers

When studies were evaluated on fixed retainers of crack resistance, it is seen that different shape and angulation incidence is not same. Zachrisson used 0,032 inches and 0,036 inches retainers to 43 patients. He founded only 5 (%2,15) broken retainers during 1-19 months [7]. Artun and friends performed made of thick plain wire bonded only to the canines (n = 11); thick spiral wire bonded only to the canines (n = 13); thin, flexible spiral wire bonded to each tooth (n = 11); or removable retainers (n = 14). They evaluated broken incidences after a 3-year period of retention. Failures were observed of one, four and three of the fixed retainer types, respectively. They suggested to use

thick spiral wire to decrease crack incidence [19]. Booth and friends evaluated crack incidence of 0,025 inches stainless steel retainers during twenty-year follow-up. This study showed thick wires doesn't allow physiological teeth movement for this reason crack incidence can be seen more. Thin retainers because of its flexibility can absorb some mastication forces so it can cause decrease of crack incidence. Furthermore, it is shown that the crack incidence is going to decrease with modern bonding techniques and materials [20].

When number of teeth decrease, retainers crack incidence increases. Segner and friends found when canines are included at the upper jaw and premolars at the lower jaw, crack incidence increases [23].

Störmann and friends showed that crack incidence is seen during first 3 - 6 months [11]. Foek and friends stated that crack incidence is decreasing after 6 months gradually [24]. This study examined the effects of a number of patient and clinical variables on the breakage of bonded retainers, and consisted of a retrospective review of the survival of 200 bonded retainers. The subjects comprised 198 patients of both sexes divided into three age groups. Retainers at both centres were made in 018-inch co-axial wire with Relyabond and Helioprogress adhesives used at each respective centre.

Breakage over a 5-year period with Relyabond was 38.8 per cent upper, 22.1 per cent lower, and with Helioprogress 75 per cent upper and 23.2 per cent lower. Upper retainers break more often than lowers ($P = 0.016$) and early breakage is more likely to occur at an adhesive pad than at a wire (9.6 versus 2.5 per cent within 6 months). Breakage appears to be unrelated to the materials used or to the age and sex of the patients [25].

Störmann and friends found that breakage of upper arch retainers is higher than lower arch and depends on adhesive. They also suggested that breaking percentage is usually because of mastication force and bad habits so patients should be warned about that [11].

Rose and friends found that in terms of reliability for permanently fixed orthodontic retention from canine to canine, the direct-bonded multi-stranded wire is superior to the plasma-treated polyethylene woven ribbon and resin retainer [16]. Tacken and friends found similar results as Rose study [17].

Hichens and friends showed a preference for VFRs compared with Hawley retainers. There were also fewer breakages than in the Hawley group [4,26].

Conclusion

According references we can say that;

- fixed retainers are the best with multi-strand wires.
- relapse of fixed retainers is shown at only canine bonded retainers.
- to prevent incisor relapse fixed retainers is effective than Hawley appliances.
- incisor relapse at Hawley appliances is higher than VFR appliances.
- there is no significant differences to keep intercanine distance between fixed retainers, VFR appliances and Hawley appliances and all methods are found successful.
- to keep intermolar distance VFR and Hawley appliances both successful.
- with proper hygiene protocols, doesn't negative effects on periodontal health.
- when there is inadequate posterior bite fixed retainer or Hawley which doesn't effect occlusion is proper.
- when wire is thicker, crack incidence is higher.
- crack incidence of upper jaw is higher than lower jaw.

Additional high-quality, randomized, controlled trials concerning these retainers are necessary to determine which retainer is better for orthodontic procedures.

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