

LONG-TERM STABILITY OF DIFFERENT RETENTION PROTOCOLS

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ABSTRACT:

The goals of orthodontic treatment are to improve facial appearance, functional occlusion, and dental alignment. Orthodontic retention protocols are indispensable for preserving treatment stability; however, the question of the optimal retention strategy is still unsettled. Relapse, or the shifting of teeth back toward their original position, is a persistent and challenging issue in orthodontics. It significantly compromises successful treatment outcomes and is a major cause of patient dissatisfaction. Post-treatment orthodontic retention plays a pivotal role in preserving the hard-earned alignment of teeth, preventing relapse, and ensuring the durability of the treatment outcome. This review article addresses this gap in the orthodontic literature by comprehensively evaluating the effectiveness of different orthodontic retention protocols in maintaining post-treatment tooth alignment. We will assess the outcomes of three distinct retention methods: removable retainers, fixed retainers, and a combination of both, as well as the factors that influence retention.

KEYWORDS: Removable Retainer, Fixed Retainers, Orthodontics, retention, orthodontic appliances

INTRODUCTION:

Achieving straight teeth is only one part of orthodontic treatment; the other, equally important goal is to maintain that straightness. This is why retention protocols are crucial—they are the necessary steps taken after treatment to prevent the teeth from shifting back (relapse) and ensure the long-term stability of your new smile. Despite the clear need for post-treatment care, orthodontists are still debating the best way to maintain results. There are many different protocols and devices available,

and experts have not yet agreed on a single, optimal retention strategy^[1-3]. Orthodontic retention protocols encompass a spectrum of strategies, including removable retainers, fixed retainers, and combinations thereof, each with advantages and drawbacks^[4]. An appropriate retention protocol should be selected based on carefully considering patient preferences, compliance, and the orthodontist's clinical judgment^[5]. There is no single consensus on orthodontic retention, as research and clinical experience offer varying opinions on the protocol's effectiveness, patient satisfaction, and impact on long-term stability. Nevertheless, the fundamental objective of all retention strategies remains consistent: to preserve the alignment of teeth achieved during active orthodontic treatment^[6]. This review will analyze how patient compliance, the length of retention, and the type of malocclusion affect the decision-making for retention protocols and the resulting treatment success.

ROLE OF REMOVABLE RETAINER:

In 1919, removable retainers were introduced by Hawley. In the late nineteenth century, dentists recognised the need for post-orthodontic retention. The most popular retainer that is still in use from this era is the Hawley retainer, originally comprising a vulcanite palate and precious metal labial bow shown in Figure 1^[7]. The introduction of 'Essix' materials in the 1990s heralded material properties that increased the effectiveness of clear plastic retainers Shown In Figure 2^[8].

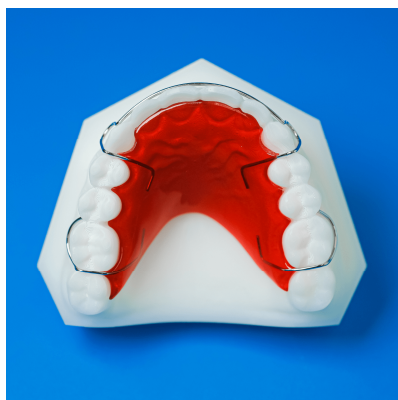


FIGURE 1- HAWLEYS RETAINER



FIGURE 2 – ESSIX RETAINER

Graber's criteria for ideal retainer

1. Should retain all teeth that have been moved into desired positions.
2. Should permit normal functional forces to act freely on the dentition.
3. Should be self cleansing.
4. Should permit oral hygiene maintenance.
5. Should be strong enough to bear the rigors of day to day usage.

Factors that modify the Retention protocol:

- a. Corrected rotations of anterior teeth^[9]
- b. Lower incisor alignment^[10]
- c. Changes in the antero-posterior lower incisor position^[11]
- d. Correction of deep overbite^[11]
- e. Patients with a history of periodontal disease or root resorption^[11]
- f. Correction of anterior open bites^[11]
- g. Growth modification treatment^[12]
- h. Correction of posterior and anterior crossbites^[13]
- i. Adult Patients^[14]
- j. Spaced dentitions^[15]

Retention protocol:

There is no universal standard prescribing which specific retention protocol should be followed or which type of retention appliance (like a retainer) should be used. Authors have cited a retention period ranging from a duration of 2–3 weeks to life-long retention ^[14]. A Cochrane review published in 2016 has reported insufficient high-quality evidence to favor a particular retention appliance or a retention protocol. Hence, the choice of retention protocol and appliance preference is largely determined by the orthodontist's experience, patient's expectations, and clinical circumstances^[16]. There is some evidence to suggest that, at least in the short-term, patients prefer the appearance and comfort of thermoplastic retainers, which are more cost-effective and slightly more effective in maintaining stability, particularly in the lower arch ^[17,18].

ROLE OF FIXED RETAINER:

These are bonded onto the lingual/palatal surfaces of the teeth and cannot be removed by the patients at their will. Fixed retainers offer the advantage of being in place permanently, hence removing the need for patient compliance with retainer wear. However, as they cannot be removed for cleaning, they are more prone to plaque and calculus accumulation^[19]. A variety of methods have been developed, but the most common technique—and what's considered best practice after correcting crowding in the front teeth—involves using an orthodontic wire combined with composite resin (a tooth-colored bonding material). It can be applied to both the upper and lower anterior segments, but it is electively avoided in the maxilla as it may interfere with occlusion and mastication. Two alternatives have been used, namely an intercanine lingual/palatal wire bonded on all six anterior teeth (canine to canine) or lingual/palatal intercanine wire bonded only to the canine lingual/palatal surfaces (canine and canine), shown in Figure 3 ^[20]. If the retainer is only bonded to the canine teeth, the dentist may need to remove a small amount of enamel from the sides of the adjacent teeth (in the interproximal regions). This is done to create flat contact surfaces instead of just points, which ultimately aims to increase the stability of the bonded wire. The above practice might prevent micro-rotation, but not totally prevent bodily tooth movement. The research by Störmann and Ehmer (2002) found that

splinting all six front teeth generally results in minimal discomfort for the patient. However, a drawback is that there's a higher likelihood of the resin (bonding material) coming off one or more of those teeth [21].



Figure 3 – Lingual Retainer

The indications by Zachrisson^[20] for bonding fixed retainers to all teeth as follows:

- cases in which median diastema is closed,
- cases with diastemas between the anterior teeth,
- adult patient with a potential for migration of the teeth after orthodontic treatment,
- cases with tooth loss or large diastemas in the maxilla before treatment,
- cases treated with mandibular incisor extraction,
- cases with severely rotated teeth before treatment,
- cases in which the position of a palatinally impacted canine is corrected.

RETENTION PROTOCOL:

in certain conditions, fixed retainers are advocated, which remain fixed to teeth for 24 hours a day, every day^[22]. Various authors recommend different time durations for which patients have to wear a retainer. There is no definitive literature suggesting a fixed retention protocol that ensures long-term stability of orthodontic treatment ^[23,24]. In 1990, a survey was conducted in the UK, and it was

concluded that 12 months was the most commonly used time duration for wearing retainers ^[25]. 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 with entirely. The maxillary retainer wear should be stopped some time before the mandibular retainer, which allows the maxillary teeth to settle better with the mandibular teeth ^[26,27]. 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 part-time wear must be continued until growth is complete ^[23].

DISCUSSION:

There is inadequate evidence to suggest that fixed retention systems are more effective in maintaining the results of orthodontic treatment. Fixed retainers are more effective at maintaining incisor alignment during the first semester^[28]. There is no statistically significant long-term difference between fixed and removable devices regarding irregularity indices, the intercanine or intermolar distances or the arch length, and the fate of post-extraction spacing^[29]. Only relative indications may be considered for any particular mean of retention. The selection should be individualized because the risk of recurrence and other factors differ between patients. In essence, success in retention relates to the degree of communication and cooperation with the patient^[30]. Evaluating the patient profile and the feedback throughout the active phase of orthodontic treatment contributes to a more feasible application of an effective retentive appliance. Indeed, it is particularly important that the patient becomes informed in advance that treatment does not end with appliance removal, but proceeds with the equally important stage of preserving the therapeutic result^[16]. Similarly, Sawesh et al. (2010) [31] found no significant difference between part- and full-time Hawley retainer use and so they suggested that the orthodontist should prescribe nighttime-only use of the Hawley, lasting for one year, immediately after the conclusion of active treatment. Comparing different retention protocols, Edman

Tynelius et al. (2015) [32] found that all the techniques of interest (fixed maxillary and mandibular retention with tooth stripping, Positioner) can prove effective in stabilizing the dentition. Potential future relapse after the end of active treatment or the plan for future intervention (e.g., extractions, indicated orthognathic procedures) are equally important factors to consider when choosing a retainer. Fixed retention is effective and reliable, the gold standard in post-orthodontic mandibular anterior stability. However, composite bond failure is the most common problem and it has been associated with the individual shape of the mandibular incisors' lingual surfaces[33,34]. Reportedly, the incidence of failing fixed retainers appears greater during the first six months following placement[35].

CONCLUSION:

While fixed retainers remain the most commonly utilized retention modality, removable retainers and combination protocols also demonstrate the potential for maintaining treatment outcomes. The retention phase is vital, making it necessary to understand its influencing factors for long-term stability. By properly managing these factors and implementing the right protocols, orthodontists can minimize relapse and maximize the longevity of treatment, ensuring superior oral health and patient satisfaction. However, the choice of retention protocol should be individualized, considering patient preferences and the potential for adverse events.

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