



Prevention of Relapse After Orthodontic Treatment: A Review on Retainer Selection and Long Term Use

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Abstract

Introduction: Orthodontic relapse refers to the return of teeth and skeletal structures to their original positions after treatment, leading to the reappearance of malocclusion. This occurs primarily due to the failure of retention therapy and the inability of surrounding tissues to adequately adapt to the new positions. Although the exact causes of relapse are not fully understood, several factors such as unfavorable skeletal growth patterns, incorrect treatment planning or implementation, poor patient compliance, muscle functions, changes in arch form, and the effects of transseptal fibers are believed to contribute to this process. One of the most common reasons for relapse is inadequate or faulty retention therapy. The goal of retention treatment is to prevent the regression of the obtained results and maintain stability by applying passive retention techniques following active orthodontic treatment.

General Information: Retention approaches in orthodontics have varied throughout history, with no single consensus among clinicians. There are two primary types of retention-passive and active retention-with both fixed and removable appliances being used to ensure treatment outcomes are preserved. Passive retention involves monitoring without the use of an appliance, relying solely on occlusal relationships to maintain tooth positions. Active retention involves the use of appropriate retainers to prevent relapse. Fixed retainers, often used in the lower anterior region, are advantageous due to their ability to provide long-term stability without patient compliance, whereas removable retainers offer more flexibility and aesthetic appeal but depend heavily on the patient's consistent usage. However, long-term studies suggest that removable retainers may not provide the same stability as fixed ones.

Conclusion: In conclusion, preventing orthodontic relapse relies heavily on selecting the appropriate retainer and ensuring long-term use. Fixed retainers provide long-term stability without patient cooperation, while removable retainers offer flexibility but require consistent patient adherence. Advances in digital technology, such as scanning and 3D printing, have enhanced retainer precision and customization, improving post-treatment outcomes. Educating patients about retainer use and maintaining regular dental check-ups are crucial for long-term success. Ultimately, proper retainer choice and patient compliance are key to maintaining treatment results.

Keywords: Gingival Recession; Miller Class I; Caf; Hyaluronic Acid

Introduction

Relapse in orthodontics is defined as the reappearance of malocclusion when the teeth and skeletal structures return to their original position after treatment. This situation develops due to the failure of the reinforcement treatment and the failure of the surrounding tissues to adequately adapt to the new position. Although the causes of relapse are not known exactly, it is thought that many factors such as negative changes in skeletal growth patterns, incorrectly planned or applied treatment methods, inadequate adaptation of patients to treatment, muscle functions and habits, changes in arch form and the effect of transseptal fibres play a role in this process [1].

There are many reasons that cause relapse but one of the most common one is inadequate or incorrect reinforcement treatment [2]. The passive process applied to ensure that the desired aesthetic, functional and occlusion states of the teeth and jaw structures are permanent after active orthodontic treatment is called reinforcement treatment. This treatment aims to prevent the reversal of the results obtained and to maintain stability [3]. Different approaches have been developed throughout history on reinforcement treatment and there is no consensus among clinicians [4-6]. Four basic approaches stand out in modern orthodontics. The first approach, as suggested by Kingsley in 1980, argues that a good occlusion plays a key role in maintaining the new positions of the teeth [7]. Names such as Angle, Dewey and Hawley have also joined this view [8-10]. The second view, proposed by Lundstrom in 1969, emphasises that stabilisation of the apical base is important in the treatment of malocclusion [11]. McCauley stated that maintaining intercanine and intermolar distances would reduce reinforcement problems [12]. The third view, advocated by Tweed and Grieve, suggests that the vertical positioning of the incisors on the basal bone is critical in preventing relapse [13,14]. Finally, Rogers emphasised that the muscles should be in functional balance at the end of treatment [15]. These four approaches offer different perspectives on ensuring orthodontic stability.

Various approaches have been proposed to prevent relapse after orthodontic treatment and each of them is based on different strategies. In line with these approaches, the patient's growth pattern, growth period, initial malocclusion, habits and co-operation should be taken into consideration in order to decide on the appropriate post-treatment reinforcement appliance and protocol [16]. There is no single reinforcement appliance recommended for each case, each treatment plan is determined by choosing the most appropriate one for the individual. The most appropriate reinforcement appliance should be determined individually by evaluating the pre and post-treatment situation [17].

General Information

In orthodontic practice, there are passive and active reinforcement types and fixed and mobile reinforcement devices [6]. Passive reinforcement is the follow-up period in which no appliance is used during the reinforcement period, based only on the occlusal relations of the teeth. Reinforcement with a suitable appliance to prevent recurrence after treatment is called active reinforcement [18]. A good reinforcement appliance should prevent recurrence and at the same time allow physiological tooth movements and optimisation of occlusal relations and should not interfere with functional occlusion. It should be easy to construct and repair, the patient should be able to clean and use the appliance easily, its shape should not deteriorate in long-term use and it should be aesthetic [19].

Fixed and removable reinforcement devices used to maintain the new position of the teeth after orthodontic treatment play an important role in ensuring the permanence of the treatment results. Various types of removable appliances are used such as Hawley, Wraparound, Elastic Wraparound, Van der Linden retainer, Sarhan all retainer, Spring aligner, Coregg appliance, Osamu retainer and vacuum formed transparent aligners (Essix). In order to prevent relapse of growth modification while maintaining the stability of the teeth, part-time use of functional appliances (monoblock, twin block) or headgear may sometimes be recommended. Among fixed retention devices, lingual retainer wires are the most common choice and are generally used when permanent stability is required [16,20]. Today, orthodontists frequently prefer Hawley appliance, vacuum-formed Essix plates and fixed lingual retainer wires [21-23].

Specialists often prefer fixed retainers in order to minimise the dependence on patient co-operation and to keep the areas with a high probability of post-treatment recurrence more stable [24]. These appliances are used in cases where intra-arch stability and continuous retention are required, especially in the mandibular incisor region. There are four main indications for the use of fixed reinforcement appliances. Firstly, maintaining the position of the mandibular incisors in the late period is an important application area. Secondly, in cases of polydiastema, stabilisation of the gaps is achieved after closure of the tooth spaces. The third indication is the preservation of implant or prosthesis gaps. Finally, another indication for the use of fixed reinforcement appliances in adult patients is the stable maintenance of the extraction gaps after closure of the extraction gaps. In line with these indications, fixed reinforcement appliances play a key role in ensuring the long-term stability of treatment results [6].

These appliances provide important advantages such as maintaining the stability of the treatment results, providing

minimal mobility in the teeth to which they are applied, offering practicality in terms of hygiene, being aesthetically invisible, and not interfering with interarch closure in cases where removable reinforcement appliances are not sufficient. In addition, the fact that they can be used both alone and in combination with removable appliances and that they do not require patient co-operation makes them particularly preferable [25,26].

However, these appliances also have disadvantages. The difficulty of hygiene, especially in the interproximal areas of the teeth, increases the need for patients to pay attention to oral hygiene. In addition, if the wire is active or thin, there may be a risk of tooth instability. Therefore, appropriate material selection and hygiene education during the use of fixed reinforcement appliances are important in terms of increasing success [6].

Removable braces, which can be worn and removed by the patients, are generally manufactured using acrylic material and stainless steel. In these appliances, elements such as clasps, vestibular arch and acrylic base function as retaining elements. After the completion of orthodontic treatment, these appliances are prepared in the laboratory environment based on the intraoral measurements taken from the patient [27]. In order to meet the different needs of reinforcement treatment, many types of removable appliances have been developed and offered to the use of specialists. These appliances play an important role especially in terms of keeping tooth movements under control after treatment and protecting the treatment results [28].

Although removable appliances offer advantages in terms of aesthetics and ease of use, it is critical that the patient wears the appliance for the recommended periods in order to be effective in the long term. In addition to its advantages, it is a disadvantage that it depends on the person's usage. Essix type transparent aligners are more preferred by patients due to their aesthetic advantages and can provide aesthetic and functional satisfaction. However, studies have shown that removable retainers do not provide long-term stability as much as fixed retainers and that improper use or inadequate wearing time of these appliances increases the risk of relapse in teeth [4,17].

In addition to the retainers used to prevent recurrence after orthodontic treatment, regular follow-up and compliance of the patients are of great importance for the long-term success of the treatment process. Patients should be explained in detail why the use of retainers is necessary and their motivation should be kept high during this process [29]. In addition, orthodontists informing their patients about the problems that may occur during the use of retainers and monitoring the treatment results with regular controls will

greatly reduce the risk of recurrence and will be a source of motivation for the patient. Preservation of treatment results in the long term is a great gain for both the patient and the orthodontist and makes the success of orthodontic treatment permanent [30].

Conclusion

As a result, the prevention of relapse after orthodontic treatment is closely related to the correct choice of retainers and their long-term use. Fixed and removable retainers play a critical role in maintaining the new positions of the treated dental arches. Fixed retainers provide long-term stability by reducing the dependence on patient co-operation, while removable retainers offer advantages in terms of aesthetics and ease of use. However, the effectiveness of removable retainers depends on the patient's wearing habits. Digital scanning and 3D printing technologies have improved post-treatment processes by enabling more precise and personalised production of retainers. However, in order to minimise the risk of recurrence, it is important to raise awareness of patients about retainer use and oral hygiene, and to have regular dental check-ups. In conclusion, proper retainer selection, patient compliance and integration of technological innovations are of great importance for a successful orthodontic treatment in the long term.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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