"Case Report"

**Treatment of Tooth Relapse Using Removable Orthodontics Appliances**

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**Abstract**

At present, fixed orthodontic appliances treatment is extensively utilized with excellent outcome. Nevertheless, complications frequently arise following the conclusion of orthodontic treatment, predominantly relapse. Relapse refers to repositioning teeth to their pre-treatment state; its progression is stochastic, thereby rendering relapse possible for each individual. Patients who fail to wear retainers consistently will relapse after orthodontic treatment. Therefore, this case report details the successful treatment of tooth relapse with a removable orthodontic appliance. A 22-year-old female patient complained of irregular alignment of her lower front teeth. The patient received two years of treatment with fixed orthodontics; however, she ceased using retainers regularly after treatment concluded. An objective examination indicated that the teeth in the upper jaw remain in a well-aligned position; however, the lower jaw exhibited that tooth 32 was mesiolabiotorsion, tooth 33 was distolinguotorsion, tooth 41 was labiobversion, tooth 42 was mesiolinguotorsion, with an overjet of 3 mm and an overbite of 2 mm. Afterward, the malposition of the lower jaw teeth was corrected with an expansion plate for a removable orthodontic appliance. Following 20 follow-up treatments over five months, the malposition of the lower jaw teeth has been corrected. As a result, it can be deduced that removable orthodontic appliances continue to be efficacious in rectifying mild malposition caused by dental relapse, thereby obviating patients' need to reapply costly fixed orthodontic appliances.

**Keywords:** Expansion; malposition; relapse; removable orthodontic appliance

**INTRODUCTION**

Using fixed appliances for orthodontic treatment has emerged as the prevailing method in orthodontic practice worldwide. Epidemiological investigations reveal that approximately 30% of the populace exhibits a moderate to significant need for orthodontic treatment.¹ Fixed orthodontic appliances, which enable three-dimensional control of dental movement and serve multiple functions, have become integral to comprehensive orthodontic treatment. Throughout the years, considerable effort has been devoted to optimizing orthodontic appliances to increase their treatment efficiency, with the primary objective of developing interventions that either prolong orthodontic treatment or enhance the therapeutic effect of fixed appliances.² Ultimately, the goal is to yield the most favorable treatment outcomes when utilizing fixed orthodontic appliances.

Nevertheless, maintaining teeth in the correct position after orthodontic treatment is a considerable challenge.³ After treatment, the patient must wear a retention device (retainer) so that the orthodontic treatment results do not return to their original position before treatment or experience a relapse. Relapse is a malocclusion and malposition that returns to before treatment position, either in whole or in part; alternatively, there is a difference in the relationship of the teeth as a result of treatment. Relapse is influenced by many factors, such as inaccurate diagnosis and treatment, inappropriate use of retention devices, patients not disciplined in using retention devices, and incomplete treatment.⁴ Another opinion states that relapse after orthodontic treatment can be caused by orthodontic factors and regular age changes. These orthodontic factors encompass periodontal and gingival factors, occlusal factors, and factors related
to soft tissue pressure and tooth boundaries. In addition, relapse after orthodontic treatment results from tooth movement back to its original malocclusion/malposition, but changes in tooth position can also occur as a normal part of the growth and aging process. Since relapse cannot be predicted, it must be assumed that each patient has the potential to experience long-term changes. As part of the informed consent process for orthodontic treatment, patients must be fully aware of their commitment to wearing a retainer for as long as they wish to keep their teeth in their correct position.

This case report describes a patient who experienced a relapse, where the patient had undergone fixed orthodontic treatment with the extraction of the four first premolars over a long period and a high cost. However, the good lower anterior teeth became crowded again due to not using a retainer regularly. Considering that the malposition of the lower anterior teeth was not too severe, the upper jaw teeth were still in a good position, the interdigitation was still good, and the patient had paid a large amount of money for treatment with fixed orthodontic appliances, then to correct the patient's tooth relapse, treatment was carried out using a removable orthodontic appliance, i.e., expansion and active plates.

Using a removable orthodontic expansion appliance has the advantage of being easy to remove and use; the process of making the appliance is minimal; and it is easier for patients to maintain oral hygiene because it is removable, cost-effective, simple, and efficient. The components of a removable orthodontic appliance comprise several parts, including retentive, active, passive, and acrylic plate components. Specifically, the active component functions to apply pressure to the teeth so that the teeth move to the desired location. The active components consist of an auxiliary spring, expansion screw, elastic, retractor, and labial bow.

For patients using removable orthodontic appliances, the more often the appliances are used, the more satisfying the treatment results obtained will be. On the other hand, if patients rarely use removable orthodontic appliances, the results will not be optimal. In other words, treatment success depends on patient compliance with the appliance. This is because the patients can remove the orthodontic appliances themselves.

**CASE REPORT**

A 21-year-old female patient complained of her lower front teeth having become irregularly aligned again. The patient had previously undergone fixed orthodontic treatment with the extraction of the four first premolars for approximately two years, but after treatment, she did not routinely use a retainer. The retainer was only used for approximately six months after fixed orthodontic treatment. From objective examination results, the overjet and overbite appeared normal, the teeth arrangement in the upper jaw was still very good, and the posterior interdigitation was good. However, the anterior teeth in the lower jaw were crowded again, where tooth 32 was Mesiolabiotorsisversion, tooth 33 was Distolinguotorsisversion, tooth 41 was Labioversion, and tooth 42 was Mesiolinguotorsisversion (Figure 1).
CASE MANAGEMENT
The patient had previously undergone orthodontic treatment using a fixed appliance for approximately two years at quite a high cost. To correct lower anterior teeth that were crowding again due to relapse, treatment was carried out using removable orthodontic appliances that are much cheaper. From the analysis results of arch determination (ALD/Arch Length Discrepancy) in the model study, it was found that there was a lack of space which was not too much in the lower jaw (1.5 mm), so treatment was performed by searching for space using a removable expansion plate consisting of Adams clasp on teeth 36 and 46 as retention, short labial arch with U loop on teeth 43 and 33, base plate (acrylic plate), and expansion screws. The expansion screw was placed on the part of the acrylic plate, which was placed in the middle of tooth 41, not in the middle of teeth 41 and 31, so that the pressure of the acrylic plate when the expansion screw was activated and pressed on the mesial side of teeth 42 and 31 (Figure 2B). Expansion screw activation was performed 1-2 x 1/4 turns per week. A slight reduction of the acrylic plate was also conducted on the right and left posterior lingual sides to maintain the interdigitation of the posterior teeth. Each control was thoroughly checked, ensuring the expansion plate device was stable and retentive before and after activation.

Once there was sufficient space, treatment continued using an active plate consisting of Adams clasp on teeth 36 and 46 as retention, a short labial arch with U loop on teeth 43 and 33, a base plate (acrylic plate), and a simple active component on tooth 31 for pushing the mesial side which was still slightly experiencing Mesiolinguoversion, as well as the simple spring on tooth 33 which was experiencing Distolinguotorsiversion. Slight activation of the labial arch and acrylic reduction was performed lingually on tooth 41 to correct the Labioversion of tooth 41 (Figure 3A).

DISCUSSION
The case experienced by the patient was mild crowding caused by the teeth experiencing relapse after orthodontic treatment with fixed appliances. The results of the space requirements analysis only required 1.5 mm of space. Many techniques exist for gaining space in orthodontic treatment. Extraction therapy is a decision that, in some clinical situations, is the preferred solution. On the contrary, jaw expansion is one of the most widely used methods to avoid removing healthy teeth. Another treatment option is interproximal enamel reduction. However, this method has a drawback, i.e., partial removal of the enamel surface can make the patient more susceptible to interproximal demineralization, caries, or periodontal lesions. In the patient, the four first premolars had been removed during treatment using a fixed appliance, so the space requirements in this case were carried out by expansion.
Treatment using removable orthodontic appliances with expansion techniques is one option that can be performed. This appliance can improve function, have minimal traumatic occlusion, and easily maintain periodontal health. In addition, because this appliance can be removed and installed by the patients, they can clean the orthodontic appliance themselves.\textsuperscript{10} The expansion screw is a component used to apply intermittent force to the removable appliance and gain space without tooth extraction.\textsuperscript{11} The screw can be installed on the base plate of the appliance and activated by gradually turning the key. Every quarter turn of the screw will activate it by about 0.2 mm, and therefore, it should be done once or twice a week.\textsuperscript{12} In this case, the expansion screw was placed on an acrylic base plate, which was placed in the middle of tooth 41, which was placed in the median line in general, namely in the interdental teeth 41 and 31 (Figure 2.B). Control and activation of screw rotation were carried out once a week for 1-2 x \( \frac{1}{4} \) turns. This position is highly effective because, at the time of activation, the pressure of the acrylic plate pressed on the mesial side of teeth 42 and 31 so that the space requirement was sufficient in a short time (nine controls).

Treatment continued by replacing the appliance using an active plate equipped with a simple spring to correct tooth 31, which was still experiencing Mesiolinguoversion, and tooth 33, which was experiencing Distolinguotorsion (Figure 2.A). Activation was carried out once a week, and within 20 control periods (five months), crowding in the lower anterior teeth was corrected (Figure 3B). Using a simple spring, in this case, aligns with the case report by Utomo (2020), correcting mild crowding in the lower anterior teeth using a simple spring, and within five months 14 days, it could be corrected.\textsuperscript{13} The results of this treatment are also in line with the treatment carried out by Wardana (2023). Using bilateral expansion plate followed by an active plate with a simple spring, could be used to correct mild anterior crowding due to relapse caused by eruption of third Molars.\textsuperscript{14} Indisputably, patient cooperation in using removable orthodontic appliances greatly influences treatment success. Maximum results will be obtained if the patient regularly and disciplined uses them.\textsuperscript{6} Several studies asserted that using a removable orthodontic appliance at least 12-15 hours per day and if the patient uses it as recommended will result in maximum results.\textsuperscript{7} The patient's ardent desire to carry out treatment can increase patient cooperation. In addition, satisfactory treatment will be attained by motivating patients to understand the function and benefits of regular visits (controls).\textsuperscript{15} In this case, the patient had strong motivation because she had experienced teeth that were already good but were crowded again because she was not disciplined in using a retainer. Hence, during treatment using this removable appliance, the patient was very cooperative in getting well-aligned teeth back, and the patient would pay more attention to using a retainer so that relapse did not re-occur.

CONCLUSION

Removable expansion plate orthodontic appliances followed by active plates have been proven to be highly effective for correcting mildly mispositioned teeth due to relapse. Appropriate appliance design and strong patient cooperation and motivation will increase treatment success. This case can also be a motivation for other patients to pay more attention to the use of retainers after orthodontic treatment so that they do not experience relapse and have to undergo repeated orthodontic treatment.

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