

# Stability in Orthodontics

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## ABSTRACT

Orthodontic relapse can be defined as the tendency for teeth to return to their pretreatment position, and this occurs especially in lower front teeth (lower canines and lower incisors). Retention, to maintain the position of corrected teeth, has become one of the most important phases of orthodontic treatment. It is important to prevent the relapse of orthodontically treated teeth to their pretreatment positions for successful orthodontic treatment outcomes. Relapse can occur as a result of forces from the periodontal fibers around the teeth, which tend to pull the teeth back toward their pretreatment positions, and also from deflecting occlusal contacts if the final occlusion is less than ideal. Age changes, in the form of ongoing dentofacial growth, as well as changes in the surrounding soft tissues, can also affect the stability of the orthodontic outcome. Relapse following orthodontic treatment is caused by the lack of reorganization and subsequent reorientation of the supracrestal periodontal fibers. Post-retention outcomes in adults have been shown to be at least as stable as those in adolescents in relation to midline alignment, overjet, overbite, molar relationship, and incisor alignment. Edwards reported a simple and efficacious surgical technique that could attenuate the presumed influence of supracrestal periodontal fibers on rotational relapse.

**Keywords:** Relapse, Removable retainer, Retention, Stability.

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## INTRODUCTION

Retention is "the holding of teeth in optimal esthetic and functional positions" defined by Joseph and Riedel.<sup>1</sup> The physiological stability is the practical outcome of successful orthodontic treatment. The retention protocol is often decided during diagnosis and treatment planning. Esthetics, function of the ideal position of teeth, and the permanent retention of these ideals are achieved by accurate diagnosis, clear treatment plan, and the duration of treatment plan. Orthodontic corrections that require indefinite retentive measures would be the dental arch expansion, irregular arch form, incomplete treatment of the anteroposterior malocclusions, and incompletely treated rotations.<sup>2</sup>

Factors to be considered during diagnosis and treatment planning for retention are:

- Corrected and detailed diagnosis.
- Logical treatment plan in harmony with craniofacial growth, developmental, and clinical parameters.
- Ideal timing of treatment initiation.
- Objectives directed to ideal esthetics and function.
- Permanent maintenance that is a separate phase of long-term retention and occlusal management.
- Dependent on the original malocclusion, etiological factors, growth implications, and cooperation of the patient with retention protocol; this long-term retention management could be as simple as no retention advocated by WILLIAMS.<sup>3,4</sup>

Relapse is the return of the orthodontically corrected teeth position to a former position. Relapse can be defined as "to fall back into or to revert to a former habit or state, a falling back into error, wrong doing back sliding, the fact of falling back again into an illness after a partial recovery".<sup>4</sup>

## GENERAL CONSIDERATIONS CAUSING RELAPSE

There are numerous factors like periodontal and gingival status, occlusal interferences, soft-tissue pressures, and dentition;

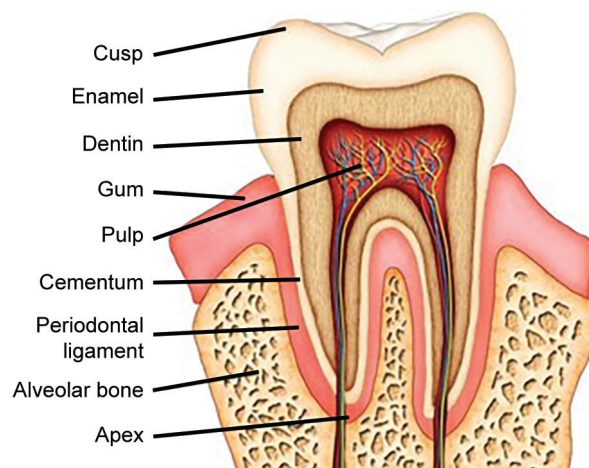
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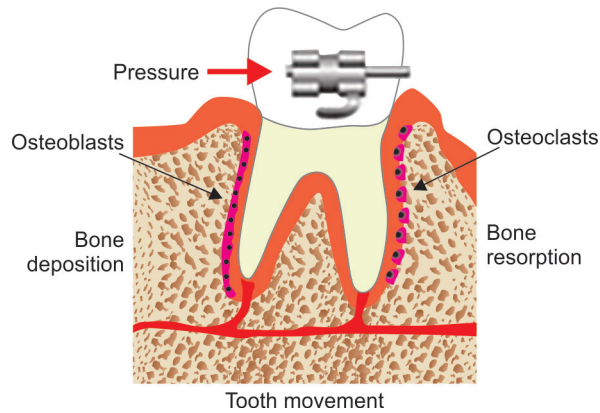


**Fig. 1:** Periodontal ligament

physiological relapse contributes to the posttreatment crowding or spacing.<sup>5</sup>

## Periodontal and Gingival Factors

The periodontal ligament (Fig. 1) has the ability to serve as an anchorage as it invests its fibrils into alveolar bone and cementum



**Fig. 2:** Changes in bone during tooth movement

during deposition. The structures connected to the root are responsible for much of the relapse propensity, although very little relapse takes place adjacent to the middle and apical thirds.<sup>6</sup>

### Bone

Endochondral bone may respond differently as its growth centers than the membranous bone. Both tension and pressure produce a loss of bone tissue. Changes in functional forces (Fig. 2) lead to a reduction or increase in the density of bone. The space between bone spicules is filled by new bone during retention. The bone spicule structure and calcification result in a thick bone, thereby preventing relapse.

### Occlusal Factors

It was claimed that gross occlusal interferences and abnormal loading of teeth may lead to mobility that causes relapse. So, a sound interdigitated dentition, normal loading of teeth, and even occlusal contacts were recommended to prevent relapse.

### Soft Tissue Factors and the Dentition

It is necessary to position the teeth according to the neutral zone, that is, the soft-tissue balance. If the teeth are positioned away from the neutral zone, the orthodontically corrected position becomes unstable. This concept is specifically proved for the lower anterior if incisors are outrageously proclined or retroclined.

### Physiological Relapse

Growth, although aids in the correction of malocclusions, also causes relapse in orthodontic patients when treated during the growth phase. There will be age-related changes throughout life, like minor changes in the maxilla, mandible, and soft tissues adapting to it. Therefore, the dentition is in such an environment that changes constantly throughout life.<sup>3,7</sup>

## MODALITIES OF RETENTION<sup>8</sup>

Retainers	Modalities
1. Removable retainer	• Supracrestal fiberotomy
Hawley retainer	• Proximal stripping
Wraparound retainer	• Drug administration
Mandibular spring retainer	
Thermoplastic retainer	
Tooth positioner	
2. Fixed retainer	



**Fig. 3:** Hawley's retainer



**Fig. 4:** Wraparound retainer

## Removable Retainers<sup>9</sup>

### Hawley's Retainer

Hawley's retainer (Fig. 3) is the most commonly used retentive device for retention. The labial bow is fabricated from canine to canine in nonextraction cases and from premolar to premolar in some extraction cases, and a retention clasp is fabricated in the first molar. The acrylic part holds the wire parts on the palate.<sup>10,11</sup>

### Wraparound Retainer

Circumferential maxillary retainers (Fig. 4) eliminate potential occlusal interferences, thereby providing excellent retention.<sup>11</sup>

### Mandibular Spring Retainer

A mandibular spring retainer (Fig. 5) includes only six anterior teeth from canine to canine used in recrowding of the lower incisors, which is caused by late mandibular growth.

### Thermoplastic Retainer

An alternative to the conventional removable retainer is the thermoplastic retainer (Fig. 6). This type of retainer is durable, esthetic, easy to clean, and less expensive than a conventional Hawley retainer.<sup>12</sup>



Fig. 5: Mandibular spring retainer



Fig. 6: Thermoplastic retainer

#### *Tooth Positioner*

Gingival hyperplasia that has occurred during treatment will also be re-established with normal tissue tone with a tooth positioner (Fig. 7). Easy to clean and unbreakable, simulates tissue tone, and constantly aids in maintaining or improving tooth position.

#### **Fixed Retainers**

Fixed retainers (Fig. 8) are also commonly used to prevent relapse more rigidly and also useful in lifelong permanent retention, especially in cases of midline diastema, severe rotations, changes in intercanine width, deep overbite, etc.<sup>12,13</sup>

#### **Modern Retention Procedures<sup>14</sup>**

Reitan in his microscopic studies of post-retention treatment changes surprised the orthodontic community. In his animal studies, he demonstrated that the supracrestal gingival fibers appear deviated after tooth rotation from its direction and that this condition did not change or reduce even after years of retention.<sup>15</sup>

Williams showed a 2-year follow-up of a case and stated that in addition to stripping, five other treatment keys will eliminate the need for lower retainers.<sup>3</sup>



Fig. 7: Tooth positioner



Fig. 8: Fixed retainer

Begg deduced that it was the Australian aborigine's primitive rough diet responsible for well-aligned teeth. It was also believed that lack of comparable attrition and broad contact areas following orthodontic treatment would require a technique for realignment, thereby preventing relapse.

#### **Pharmacological Agents Aid in Retention**

There will be decrease in RANKL, and a moderate increase in OPG due to the administration of Raloxifene during both retention and relapse phases, which leads to a raise in bone volume.<sup>16</sup>

Aspirin administration inhibited relapse and orthodontic tooth movement through inhibition of CD4+ T lymphocytes. Administration of aspirin is also one of the effective methods to prevent orthodontic relapse.<sup>17</sup>

Other systemically and locally administered drugs have been reported by various authors to reduce or prevent the amount of relapse in animal studies, such as bisphosphonate, osteoprotegerin, simvastatin, relaxin, and low-level laser therapy.<sup>18–21</sup>

Bonded retainers for lifelong retention are increasing in the minds of orthodontists over the globe.

#### **CONCLUSION**

Posttreatment stability is essential for the success of orthodontic treatment, and the retention phase is mandatory for the



orthodontic treatment, which should be decided during diagnosis and treatment planning.

The retention should be assessed before starting the treatment as well as any procedures to help in retention of the final esthetic outcome and functional occlusion.

Posttreatment stability is commonly ensured by long-term permanent retention.

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