



# Long-Term Stability and Relapse Following Orthodontic Treatment: The Role of Retention Protocols and Contributing Factors

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## Abstract

Orthodontic treatment aims to achieve optimal functional occlusion and esthetic alignment; however, long-term stability remains a significant challenge. Relapse, defined as the tendency of teeth to return toward their original positions, is influenced by multiple biological and mechanical factors. This review evaluates the etiology of orthodontic relapse, including periodontal fiber memory, growth changes, occlusal forces, and patient compliance. Additionally, the effectiveness of various retention protocols—fixed and removable—is analyzed. Evidence suggests that prolonged or even lifelong retention may be necessary to maintain treatment outcomes. Understanding relapse mechanisms and

implementing appropriate retention strategies are essential for achieving long-term stability.

## I. Introduction

Orthodontic treatment has advanced significantly in terms of efficiency and esthetic outcomes; however, maintaining these results over time continues to be a major concern. Relapse is a well-documented phenomenon that can compromise treatment success and patient satisfaction.

Despite achieving ideal alignment at the end of active treatment, post-treatment changes frequently occur due to biological adaptation, residual growth, and inadequate retention. Therefore, retention is considered a critical phase of orthodontic therapy.

## Etiology of Orthodontic Relapse



### 1. Periodontal and Gingival Fiber Reorganization

#### After orthodontic tooth movement:

- Periodontal fibers (especially supracrestal fibers) remain stretched
- These fibers tend to pull teeth back to their original position
- This is particularly significant in rotated teeth, where relapse rates are higher.

- Continued craniofacial growth can influence tooth position
- Mandibular growth may contribute to late lower incisor crowding
- Changes can persist into adulthood

### 3. Occlusal and Functional Forces

- Masticatory forces and soft tissue pressures (tongue, lips)
- Parafunctional habits (bruxism, tongue thrust)

### 2. Growth and Developmental Changes



- Unstable occlusion can contribute to relapse

#### 4. Treatment-Related Factors

- Degree of initial malocclusion
- Amount of tooth movement
- Expansion beyond biological limits
- Overexpansion and unstable corrections increase relapse risk.
- Retention Protocols in Orthodontics

### 1. Fixed Retainers

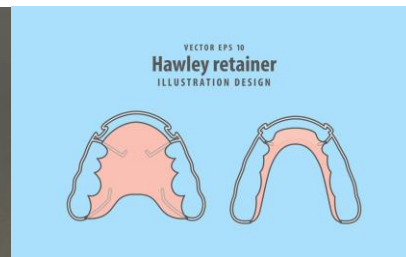


- Bonded to lingual surfaces (usually anterior teeth)
- Provide continuous retention independent of patient compliance
- Highly effective for maintaining alignment, especially in lower incisors

#### Limitations:

- Hygiene challenges
- Risk of debonding or wire distortion

### 2. Removable Retainers



#### Types include:

- Hawley retainers
- Essix (clear) retainers

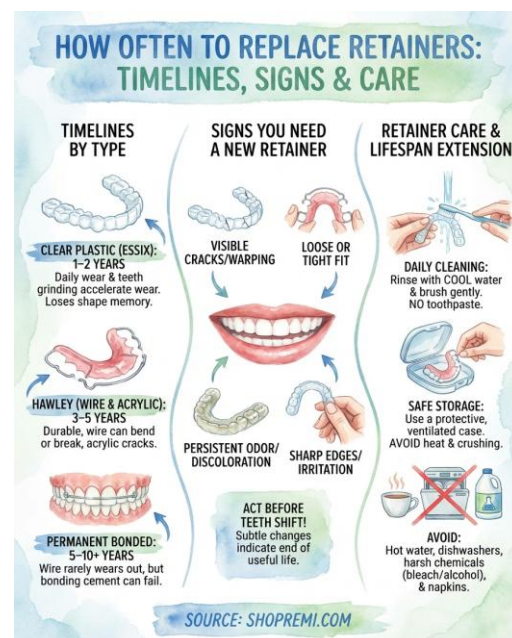
#### Advantages:

- Easier to clean
- Adjustable (Hawley)

#### Limitations:

- Dependent on patient compliance
- Risk of loss or damage

### 3. Duration of Retention





**Evidence suggests:**

- Short-term retention is insufficient
- Long-term or lifetime retention is often recommended
- Night-time wear is commonly advised after initial full-time phase
- Factors Influencing Stability

**Key determinants of long-term stability include:**

- Final occlusion quality
- Periodontal health
- Patient age
- Type of malocclusion
- Compliance with retention protocols
- Lower anterior crowding remains one of the most unpredictable outcomes.

**Clinical Recommendations**

- Implement individualized retention plans
- Use fixed retainers for high-risk cases (e.g., lower incisors)
- Reinforce patient education and compliance
- Monitor patients periodically even after treatment completion
- Consider fiberotomy procedures in cases of severe rotation

**II. Conclusion**

Orthodontic relapse is a multifactorial and inevitable challenge in clinical practice. While ideal alignment can be achieved through orthodontic treatment, maintaining these results requires a comprehensive understanding of relapse mechanisms and long-term retention strategies. Fixed and removable retainers both play essential roles, and their selection should be tailored to individual patient needs. Ultimately, long-term or lifelong retention is often necessary to preserve treatment outcomes and ensure patient satisfaction.

**References**

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