



Retention and Relapse in orthodontics

Dr. Sheetal Kanthali, Dr. Rakesh Thukral, Dr. Jaya Singh, Dr. Sakina Pata, Dr. Nikita Kala

ABSTRACT:

Retention and relapse are key concerns in orthodontics following active treatment. Retention involves maintaining teeth in their corrected positions, while relapse refers to their tendency to return to their original alignment. Contributing factors include periodontal elasticity, growth, occlusal forces, and patient compliance. Retention strategies—ranging from fixed to removable appliances—are tailored to individual needs to ensure long-term stability. Understanding the causes of relapse and implementing effective retention protocols are essential for preserving treatment outcomes. Thus the purpose of this article is to review various factors affecting retention of the orthodontic treatment and procedures to overcome this problem.

Key words: Retention, Relapse, Orthodontics.

INTRODUCTION

The challenge of retention and relapse has existed since the inception of orthodontics and continues to be a significant concern for clinicians and researchers. Despite advances in treatment techniques, maintaining post-treatment stability remains a complex issue. From the early 1900s, with Angle's concept of "Ideal Occlusion," to modern approaches focusing on occlusal function, esthetics, and long-term stability, the goals of orthodontics have evolved. Retention involves using passive appliances to maintain dental corrections, while relapse is the tendency of teeth to return to their original positions. Various factors—such as growth, periodontal condition, age, and third molars—contribute to relapse. Studies have emphasized the need for proper diagnosis, treatment planning, and individualized retention protocols to minimize post-treatment changes. Understanding the biological and mechanical influences on stability is essential, making the study of retention and relapse a continuing necessity in orthodontic education and practice.

Aims of orthodontic treatment have been summarized by Jackson as Jackson's triad. The three main objectives are:

- (a) Functional efficacy
- (b) Structural balance
- (c) Esthetic harmony

HISTORICAL PERSPECTIVE

In 1934, Oppenheim stated "Retention is one of the most difficult problems in orthodontia; in fact, it is the problem." Kingsley felt that occlusion was the key to stability.

The first century Roman writer *Pliny & Galen*, his countryman in the second century who was the founder of experimental medicine, both recommended filing when a tooth projected from trauma and other reasons.

Later in England, *Alfred Coleman (1865)* wrote about restoration of the former condition by muscular pressure in other words, the first illusion to relapse. In the following year, *C.A. Marvin (1866)* described the physiologic reasons for retention. Indeed, he went a step further in his writing and emphasized the necessity of the preservation of correct facial expression or "aesthetics" as one of the objectives of orthodontic treatment. Not long after, *Brown-Mason (1872) (in England)* described a retaining plate for surgically rotated teeth.

Jackson (1904) mentioned the importance of retention and designed many retaining devices.

Ferrar (1831-1913), also known as one of the fathers of orthodontics—that is, scientific orthodontics—the man who introduced the term "intermittent force". He wrote, according to *Weinberger*, the greatest text on orthodontia in his experience, said (about retention) that when the teeth are fully regulated they should be retained in position for a year, perhaps longer.

A variety of retaining appliance observations and opinions were advocated by the following orthodontic innovators and clinical scholars: *Hawley (1919)*, *Hahn (1944)*, *Lundstrom (1929)*, *Hellman (1936)*, *Mershon (1936)*, *Marcus (1938)*, *McCauley (1944)*, *Tweed (1954)*, and *Grieves (1944)*; experimentally trained research oriented orthodontists, *Skogborg (1929)* and

Oppenheim (1935) and the research-oriented periodontists, *Gottlieb (1938)* and *Orban (1936)*, who published histologic studies of alveolar tissue and periodontal membranes during tooth movement and retention in animals.

George Anderson's (1942) observations led him to the conclusion that nothing was stationary in the human masticatory field. In contrast, *Dallas McCauley (1944)* placed great emphasis on maintaining canine position, arch form, and width as related to functional jaw movements to achieve posttreatment stability. *Reitan's (1959, 1966, 1967)* microscopic studies of post retention treatment changes excited the orthodontic community worldwide. He demonstrated

in animal studies that the supracrestal gingival fibers (collagenous) appear histologically taut and directionally deviated after tooth rotation, and that this condition did not lessen even after years of retention. *Kole (1959)* removed the buccal and lingual cortical plates on human patients before initiating orthodontic movement, somewhat reminiscent of the septotomy of *Talbot (1896)* and *Skogsborg (1927)*.

Edward's (1970) clinical orthodontic study was based on *Bauer's (1963)* thesis describing mesial and distal incisions of transseptal fibers of rotated teeth in experimental animals and *Edward's* own similar animal study (1968). *Parker (1972)*, in a clinical study of transseptal fibers, states: Rotational relapse is a normal, predictable, physiological response to abnormal forces. *Little (1984)* reported on a 10-year post retention relapse study of 450 cumulative cases

The apical base school:

In the middle 1920s, a second school of thought formed secondary to the writings of Axel Lundstrom, who suggested that the apical base was one of the most important factors in the correction of malocclusion and maintenance of a correct occlusion.

2) The mandibular incisor school:

Grieve and Tweed suggested that the mandibular incisors must be placed and kept upright and over basal bone. Lower incisor irregularity after orthodontic treatment may either be due to growth and development, or result from relapse of tooth movements carried out during treatment (Little et al., 1988).

3) The musculature school:

Rogers introduced a consideration of the necessity of establishing proper functional muscle balance. Orthodontists have come to realize that retention is not separate from orthodontic treatment but that it is part of treatment itself and must be included in treatment planning.

THEOREMS OF RETENTION

1. Teeth that have been moved tend to return to their former positions.
2. Elimination of the cause of malocclusion will prevent recurrence.
3. Malocclusion should be overcorrected as a safety factor.
4. Proper occlusion is a potent factor in holding teeth in their corrected positions.
5. Bone and adjacent tissues must be allowed to reorganize around newly positioned teeth.
6. If the lower incisors are placed upright over basal bone, they are more likely to remain in good alignment.
7. Corrections carried out during periods of growth are less likely to relapse.
8. The farther teeth have been moved, the less likelihood of relapse.
9. Arch form, particularly in the mandibular arch, cannot be permanently altered by appliance therapy.

from the University of Washington group at Seattle,0. Many treated malocclusions require permanent retaining devices. led by *Riedel*.

Philosophies or schools of thought of retention

1) The occlusion school:

Kingsley (1880) stated, "The occlusion of the teeth is the most potent factor in determining the stability in a new position". Many early writers considered that proper occlusion was of primary importance in retention. The importance of a functional and stable occlusion is important to maintain retention.

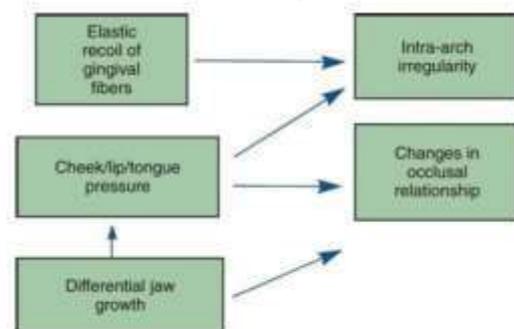


Fig: 1 Factors causing relapse in orthodontic treatment

NEED FOR RETENTION

1. The gingival and periodontal tissues are affected by orthodontic tooth movement and require time for reorganization when the appliances are removed.
2. Soft tissue pressures are likely to cause relapse if teeth are placed in an unstable position.
3. Changes produced by growth may alter the orthodontic treatment result. (Fig:1)

CAUSES OF RELAPSE

1. Incomplete correction of initial malocclusion
2. Relapse of the treatment result, due to deliberate lateral expansion, return of perverted habits, tongue and orofacial muscle activity
3. Inadequate retention
4. Imbalances between mandibular posture and occlusal forces.
5. Late mandibular growth
6. Alteration of arch form
7. Periodontal forces
8. Role of developing third molars

BIOLOGIC CONSIDERATION OF STABILITY IN EARLY ORTHODONTIC TREATMENT

The various biological considerations for stability are:-

1. Development of dental occlusion
2. Treatment timing
3. Reverse effects of some irregularities on normal jaw growth
4. Early orthodontic treatment and growth modification
5. Early Diagnosis and controlling etiologic factor
6. Preparing an environment for normal dentoskeletal development⁷

STABILITY CONSIDERATION BASED ON ORIGINAL MALOCCLUSION

Different malocclusions for stability considerations are:-

1. Class II corrections
2. Class III corrections
3. Deep bite corrections
4. Open bite corrections
5. Transverse corrections
6. Arch form and stability

RETENTION APPLIANCES

1. PASSIVE

I. REMOVABLE

- a) Hawley's & modification (Fig:2)
- b) Rickett's
- c) Circumferential
- d) Non acrylic removable
- e) Begg's splint
- f) Removable Plastic Herbst retainer
- g) Essix retainer

- h) Clip on Canine - Canine retainer (Fig:3)
- i) Esthetic removable retainer (Fig:4)
- j) Positioners & Trutains
- k) Crozat retainer



Fig: 2 Hawley's retainer



Fig: 3 Clip on canine to canine Retainer



Fig: 4 Vacuum formed retainer

II. FIXED

- a) Intra coronal
 - Gold Staples
 - Wire & composite splint (Fig:5)
 - Incisal edge splint
 - Wire, Amalgam in acrylic
 - Amalgam, acrylic & cast Cr-Co



Fig: 5 Composite splints

- b) Extra coronal
 - Fixed appliance after active treatment
 - Wire ligation
 - Cr-Co Perforated Bar (Fig:6)
 - Mesh & lingual Bar
 - Metal Cast Bar Splint
 - Canine-Canine bonded retainer
 - Resin Fiberglass retainer
 - Lingual arch retainer

- Band & spur
- Bonded lingual retainer
- Bonded labial retainer
- Prefabricated Bonded labial retainer
- Micromagnetic retainer



Fig: 6 Mandibular chrome cobalt retainer

2. ACTIVE

- I. Spring Retainers (Fig:7)
- II. Functional Appliance
- III. Headgear
- IV. Ant. & Post. bite plates



Fig: 7 Spring aligner

ADJUNCTS TO RETENTION

A number of adjuncts have been proposed that aid in retention. These include -:

1. Circumferential Supracrestal Fibrotomy
2. Reproximation
3. Frenectomy
4. Septotomy
5. Corticotomy
6. Immediate torsion

CONCLUSION

Historically, esthetics was the primary focus of orthodontic treatment, but over time, functional and structural considerations have gained importance. Achieving long-term stability requires careful attention to factors such as occlusion, arch form, periodontal adaptation, growth, and case-specific retention planning. Despite advances, post-treatment stability remains uncertain, and retention continues to be a debated and often underestimated phase. It is now recognized as a critical component of successful orthodontic outcomes. Improved results depend on thorough diagnosis, individualized retention strategies, and realistic communication with patients. Continued research is essential to better understand and manage the complexities of retention and relapse.

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