Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies ***NLM ID:*** *101716117*

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Index Copernicus value = 85.10

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Review Article

Retention and Relapse – A Review Article

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ABSTRACT:
In Orthodontics, although the patient may feel that the treatment is complete when the appliances are removed, an important stage lies ahead. The important phase of retention should be planned at the time of diagnosis and treatment planning. In the past, orthodontists had faced the problems of relapse of orthodontic treatment and it continues to be encountered by every orthodontist till today. 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.

Received: 14th January, 2021 Accepted: 2nd February, 2021

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This article may be cited as: Singh Y, Munjal S, Singh S, Singh H. Retention and Relapse – A Review Article. J Adv Med Dent Scie Res 2021;9(2):65-68.

INTRODUCTION

In 1904, Victor Hugo Jackson' said, "Not infrequently cases are presented that require more skill in retaining the teeth than in regulating them." Edward A. Angle* wrote in 1907, "Retention is too often lightly considered." Both statements may seem quaint or even casual to the orthodontist of the computer age, but these pioneers and others with similar concerns posed the problem of retention or its counterpart-relapse or treatment instability.[1]

Retention was defined by Moyers as "the holding of teeth followed by orthodontic treatment in the treated position for the period of time necessary for the maintenance of the results." Riedel defined retention as "the holding of teeth in ideal esthetic and functional position."

Moyers defined relapse as loss of any correction achieved by orthodontic treatment.

The goal of modern Orthodontics is creation of best balance among occlusal relations, dental and facial esthetics, stability of the results and its long term maintenance and restoration of dentition (TWEED).[2]

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 postretention 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 postretention relapse study of 450 cumulative cases from the University of Washington group at Seattle, led by *Riedel.*[1]

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.

2) 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.

3) 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).

4) 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.[3]

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.
10. Many treated malocclusions require permanent retaining devices.[4]

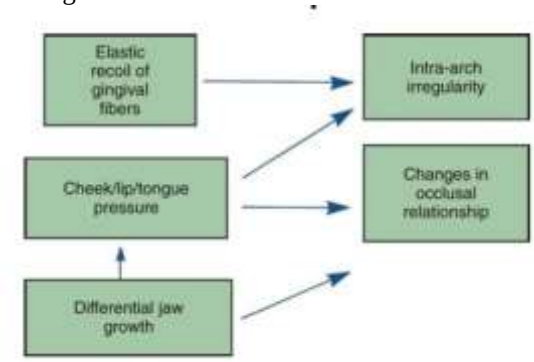

Fig: 1 Factors causing relapse in orthodontic treatment

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)[5]

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. Inadequate interdigitation of posterior teeth and lack of vertical contact in the anterior region in open-bite cases.
6. Postpubertal growth activity after the retention period.[6]
7.

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 development[7]

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[8]

RETENTION APPLIANCES

1. <u>PASSIVE</u>

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) Positoners & 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. Cicumferential Supracrestal Fibrotomy
2. Reproximation
3. Frenectomy
4. Septotomy
5. Corticotomy (Fig:8)
6. Immediate torsion

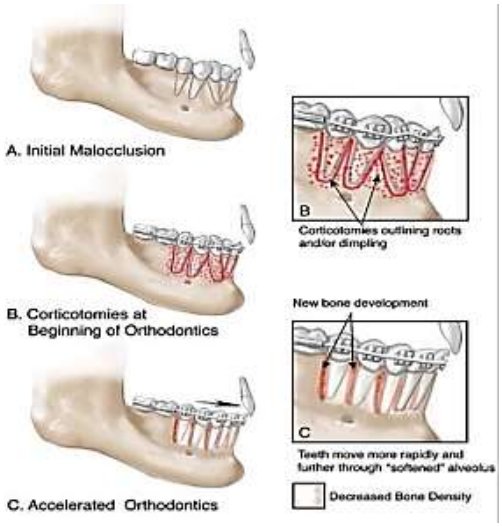

Fig: 8 Surgical procedure of Corticotomy

CONCLUSION

The problem of retention and relapse is likely to continue to tense the orthodontist because of the complexities of the etiological factors and one has to be thorough with all the implicating concepts.

It is therefore important to audit the results of our own clinical work, as well as being aware of the results of high quality research. There may be many different factors that relate to a specific patient that may affect the retention plan. This may include the patient's attitude to relapse, their ability or desire to clean around fixed retainers, financial implications of different retainer regimens, or willingness to remember to wear their removable retainers as instructed. The etiology of alignment instability following orthodontic treatment is still enigmatic and largely influenced by individual factors and different retention protocols.[9]

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Source of Support: Nil,

Conflict of Interest: None declared