

IMPORTANCE OF RETENTION AND RELAPSE IN ORTHODONTICS- A REVIEW

Nidhi Sharma¹, Anil Miglani², Madhurima Nanda³, Nikita Sonawane⁴, Sharon Ann Abraham⁵

Post Graduate^{1,4,5}, Professor & Head², Reader³

1-5- Department Of Orthodontics and Dentofacial Orthopedics, ITS Dental College, Hospital and Research Centre, Greater Noida

Abstract

Retention has been one of the controversies of today's orthodontic practice. Post treatment stability has always been a topic of concern to all the orthodontist. There are some important post-treatment factors that could influence the result. In Orthodontics, maintaining the stability of the achieved result still remains an important issue of concern and debate. In spite of the fact that long term stability is questionable, there still remains a controversy regarding the type of retention and the retention protocols followed. In this review article, we have discussed the importance of retention, factors responsible for relapse and the methods to minimize relapse. Our aim, here is to provide the information that will help the clinician to understand and formulate different retention strategies that can be followed to minimize the relapse.

Key Words: Retention, Relapse, Stability.

INTRODUCTION

Post treatment stability after Orthodontic treatment has been a challenge for orthodontist.¹ It is evident from the history, that orthodontists have always tried to sought methods to ensure that the teeth are maintained in their corrected positions after treatment. Long-term posttreatment stability is an issue of great concern to all orthodontists. Moyers has defined² Retention as "the holding of teeth following orthodontic treatment in the treated position for the period of time necessary for the maintenance of the result" or Riedel defines it³ as "the holding of teeth in ideal aesthetic and functional position. A phase of retention is normally required after orthodontic tooth movement to hold the teeth in their treated position and is as important part of the treatment as the active orthodontic treatment. It is well known fact that after active orthodontic therapy, additional time is required for reorganization of periodontal and gingival fibres; nevertheless, the aetiology of orthodontic relapse still remains unclear and controversial. There has been variation in Alignment instability within the population and may occur through various mechanisms, some of which are beyond the orthodontist's control⁴. Arch expansion, periodontal fibres rebound, remodelling of alveolar bone, growth pattern, occlusal settling, mesial drift of posterior teeth, parafunctional habits, final occlusion and poor patient's compliance are few of the potential factors that may play a role in post-orthodontic relapse.^{5,6} Various methods have been advocated to ensure stability and prevent post treatment changes so as to reduce relapse. A proper understanding of the changes occurring and the factors affecting retention and relapse is important, to achieve such goals.⁷

NEED FOR RETENTION

The rationale for maintaining the teeth in their corrected positions is:

- 1) To allow time for rearrangement of gingival and periodontal tissues affected by orthodontic tooth movement.
- 2) To maintain the teeth in their inherently unstable position after the treatment which may be necessary due to compromise or aesthetics.
- 3) To minimize the changes produced by growth.

4.) To allow for neuromuscular adaptation in the achieved position.

If the growth is complete or teeth are not in an unstable position, retention period is still considered necessary to permit for gingival and periodontal reorganisation.

FACTORS RESPONSIBLE FOR RELAPSE

Although numerous factors have been considered to play a role in post treatment relapse, a definite conclusion regarding the relative contribution of these factors has not been reached. Some of the important factors responsible for relapse are discussed here.

ALTERATION OF ARCH FORM

With some striking exceptions, it is generally agreed that arch form and width should be maintained during orthodontic treatment.^{8,9} There is ample evidence to show that inter-canine and intermolar widths decrease during the post-retention period, especially if expanded during treatment.¹⁰⁻¹³ It has also been seen that greater the change, greater is the tendency for posttreatment change. For this reason, it is generally recommended to maintain the pre-treatment arch form.

PERIODONTAL AND GINGIVAL TISSUES

Orthodontic movement to correct tooth rotations is results in stretching of the principal periodontal fibres. These fibres maintain a state of equilibrium between the teeth and the soft tissue envelope. Orthodontic tooth movement disrupts this equilibrium and a certain period is required for reorganization of these fibres. Edwards¹¹ also demonstrated incomplete reorganization of gingival tissues over a 5-month post-retention period. Brain¹² and Edwards¹³ advocated gingival fibre surgery (Circumferential Supracrestal Fiberotomy) to allow for the release of soft tissue tension and reattachment of the fibres in a passive orientation after achieving derotation. After fiberotomy, fibres reorganized in a fashion similar to the control group were seen. It was concluded that relapse of rotation may result because of the elastic properties of the whole gingival tissue rather than stretching of the gingival fibres as believed earlier. It is because of the slow remodelling of the gingival fibres that relapse occurs after orthodontic treatment. So

early treatment of rotation is suggested in the treatment so as to allow for sufficient time for reorganisation.

MANDIBULAR INCISOR DIMENSIONS

Mandibular incisor dimensions correlation with lower incisor crowding has been reported by authors^{14,15}. Reduction of mandibular incisors to a given labiolingual/mesiodistal ratio has been advocated to increase stability. Boese¹⁶ introduced the concept of lower incisor re-proximation to provide broader contact points and increase the available arch space.

INFLUENCE OF ENVIRONMENTAL FACTORS AND NEUROMUSCULATURE

Mandibular inter-canine and inter-molar arch widths are considered as accurate indicators of the individual's muscle balance and dictate the limits of arch expansion during treatment.

According to Weinstein¹⁷ and Mills¹⁸, lower incisors lie in a zone of stability between the two zones and hence their positions should not be altered. The initial position of the lower incisors has been shown to provide the best guide to the position of stability in many studies.^{19,20}

Continuing Growth

The role of continued facial growth in posttreatment changes is controversial. It has been seen that the amount and direction of facial growth in the post-retention period may be at least partially responsible for the maturational changes seen in the dentition. To compensate for such ongoing changes, a phase of retention is invariably required. A longer retention period for the skeletal deep bite patients is advised to counteract the continuing effect of dentofacial growth after the completion of orthodontic treatment.¹⁰

STABLE AND FUNCTIONAL OCCLUSION

A functional and stable occlusal relationship is considered as an important factor in preventing relapse.^{10,21} Adequate interincisal contact angle and good posterior intercuspation and a perfect molar relationship are important factors in preventing relapse of both crossbite and antero-posterior correction.²²

ROLE OF THIRD MOLARS

The role of third molars in lower incisor crowding still remains a controversy. There have been studies supporting the role of third molars in incisors crowding²³, However there have been studies reporting no influence on incisor crowding with impacted, erupted, missing or extracted third molars.^{24,25} It can be summarized that the role of third molars, if any, is of little significance.

Original malocclusion

Different types of malocclusion tend to differ in their relapse tendency. Deep bite has seen to have a greater rate of relapse. Maximum relapse occurs in the first two years of treatment.^{26,27} Class II Division 1 malocclusion

without any spacing or crowding shows less relapse tendency as compared with other malocclusion groups.^{28,29} Class II Division 2, Class I with spacing are seen to have more chances of relapse.

FACTORS TO BE CONSIDERED TO MINIMIZE RELAPSE

1. Tooth Size Discrepancy

A discrepancy in tooth size is an often-overlooked problem in retention. When maxillary anterior teeth are too large in relation to mandibular anterior teeth, the maxillary teeth must be placed in one of the following positions¹

- Deeper overbite
- Greater overjet
- Combinations of greater overbite and overjet
- Crowded anterior segment, or Out of proper occlusion buccal segment (the maxillary teeth fitting into a more or less distal relation with the mandibular because the posterior teeth generally do not remain stabilized in an end-to-end occlusion). When anterior tooth size discrepancies exceed 2.5 mm in patients whose teeth are otherwise normally formed. If the teeth can only be occluded in a normal relationship with interproximal tooth size reduction as determined by a trial setup, clinicians must include the "stripping" of these same teeth in the mouth. Between 2 and 4 mm of enamel can be removed from the maxillary or mandibular six anterior teeth. Inclusion of the maxillary or mandibular first premolars also is occasionally desirable, especially when incisors have minimal interproximal taper.

2. Axial Inclination

Importance of achieving correct axial inclinations and root parallelism has been emphasized. Tipping maxillary and mandibular incisors into too upright a relation usually results in deep anterior overbite. Periodontists suggest that this type of occlusion has potentially damaging functional implications. Bolton³⁰ found that in excellent occlusions, the angles of the labial surfaces of the maxillary and mandibular central incisors to their occlusal plane totaled about 177 degrees. In other words, the labial surfaces of these teeth in profile formed almost a straight line.

3. Transverse Discrepancy

Numerous authors have documented the tendency for relapse associated with rapid palatal expansion techniques, particularly in the permanent dentition. Typically, the clinicians must significantly overcorrect in the transverse dimension, anticipating that a more normal relationship will occur during the post guidance stages. Additionally, the expansion appliance must be maintained passively for approximately 16 weeks followed by a removable retention appliance. Anatomically, the limitation of palatal expansion is not fusion of the midpalate suture but rather changes in the morphology of the suture that take place once an

individual stop growing and the suture becomes non-adaptive.

4. Apical Base

One must recognize that the normal mandibular dental eruption pattern may be upward and backward away from the chin and that bony apposition may occur at pogonion itself. Thus, the relationship of the mandibular incisor teeth to pogonion at age 9 to 12 years is not likely a permanent position for these teeth. Hence, when attempting to relate incisors in inclination and bodily positions by means of a standard such as the ANB point angle or angle of convexity, the clinician must be aware of the implications of future growth changes in these relationships and of the tooth positions achievable by orthodontic treatment.

5. Implications of Growth

The amount and direction of mandibular growth may be of great importance in the correction and retention of corrected malocclusions. Maturation changes can and do occur, particularly in boys, in relation to the apical bases and alveolar processes a restriction of the mandibular denture may be produced in the process, resulting in up righting of the mandibular incisors. Several studies have demonstrated that during growth, the permanent dentition has a natural tendency to become more recessive in relation to the body of the mandible and that, particularly in boys, the mandibular denture can be expected to erupt distally relative to the pogonion. Continued posterior traction may be desirable on the maxillary arch in corrected Class II malocclusions, especially in patients whose mandibular growth is primarily downward or downward and backward.

6. Occlusal Adjustments

Treatment objectives should include the basic principles of gnathology such as canine disocclusion and incisal guidance whenever possible. Stability can be improved with occlusal adjustment concomitant with or following orthodontic treatment that includes removal of interferences in centric relation and elimination of cross-tooth and cross-arch deflective interferences.

SUMMARY AND CONCLUSION

The primary goal of an orthodontic treatment is to achieve an ideal and functional occlusion and to maintain teeth in their corrected positions. To accomplish such objectives, it is important for the clinician to have adequate knowledge regarding the need for retention, factors causing relapse, methods to minimize relapse and the retention protocols to be followed.

The problem of "retention and relapse" is likely to continue to be a night mare for the Orthodontist because of the complexities involved. So, the correct diagnosis, proper treatment planning and the right retention protocol are prime requisites for the long-term success of a treated case.

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Corresponding author

Dr. Nidhi Sharma
 Post graduate student
 Department Of Orthodontics and Dentofacial
 Orthopedics
 ITS Dental College, Hospital and Research Centre,
 Greater Noida

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