



## ORIGINAL RESEARCH PAPER

## Orthodontology

## RELAPSE

**KEY WORDS:** relapse, post retentive phase, stability, retention

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## ABSTRACT

The most challenging aspect of post orthodontic treatment has been stability. Considering the view of different authors regarding this, it was found that there have been a lot of differences of opinion and controversies regarding the factors that are responsible for relapse. Studies that record the long term changes in post retentive phase have been found to be less, thus we have a limited knowledge of the same. In this review of literature, we are shedding a limelight on the factors that are cause relapse in long term cases, which in turn can help to improve the efficiency of retention appliances.

## INTRODUCTION

Every time an orthodontist takes up a malocclusion, as odds to the favour of its success, the relapse after the removal of the appliances is almost inevitable. And sadly relapse is a major reason for patient fall out and dissatisfaction. The goal of an orthodontist is to have stability on the tooth position and arch in post treatment phase. Stability over long term has always been questionable and has not been serendipitous. To ameliorate the relapse tendency, we need access to the major factors that are responsible, change the post retentive treatment modality accordingly. Different schools of thought came up regarding the idea of relapse.

## Schools of thought

## a) Occlusal school

Kingsley stated that occlusion is the most important factor in determining the stability. Edward H Angle, Martin Dewey, Calvin Case, B E Lischer, and C A Hawley also considered the same.<sup>1</sup>

## b) Apical base school

Axel Lundstrom in middle 1925 suggested, apical base as the most important factor in the correction of malocclusion and also for maintaining corrected occlusion. McCauley said that the intercarine width and intermolar width should be maintained as originally present. This was further supported by Strang. Nance said that arch length can only be increased to a limited extend.<sup>2</sup>

## c) Mandibular incisor school

Tweed and Grieve suggested that mandibular incisors should be placed and kept upright without angulation over the basal bone.

## d) Musculature school

Paul Rogers emphasised on the importance of establishing proper functional muscle balance, this was followed by Dewey, McCoy and Ray Webster. Stability is said to be the primary objective, without this there wouldn't be aesthetic or functional harmony.<sup>3</sup>

## HISTORICAL PERSPECTIVES

Webster defined relapse as falling back into former bad shape. In 1944, McCauley and Strang said that molar width and cuspid width in mandible should be fixed quantities, and to be maintained.<sup>1</sup> 1950 Dona, the mandibular canine width returned to its original width after appliances were removed. Little et al found that in 10years there was 30% of success rate which further reduced to 20% in 20 year post retention phase<sup>4</sup>. Hellman said in one of his summary that, we are in ignorance of the reasons that cause relapse. Arnold said that 5years without the use of retention appliance, there was a tendency to return to original the malocclusion. Oppenheim said that retention is the most difficult problem in orthodontia. Karina Maria Salvatore in 2017, said that the relapse of maxillary was more in short term and remained stable in long term, in mandibular relapse was continues in short and long term of post retentionphase.<sup>5</sup> De La Cruz et al did a

10year post retention study on 87 patients, in post retention period it tends to go back to its original position<sup>6</sup>.

## FACTORS THAT HAVE AN INFLUENCE ON RELAPSE

## A) TOOTH SIZE DISCREPANCY

Ballard said that this exist in 90% of patients that he had examined. Gilmore and Little did a 10year post retention study and found a weak relationship between tooth crowding and width of the incisors (accounts for 6% of the crowding). Discrepancy in tooth material was found to be 0.25mm between crowded and uncrowded teeth<sup>6</sup>. Borse undertook a 4-9 year follows up after interproximal reduction and the stability was found to be increased in these cases and the Little's irregularity index was reduced to 6.2mm<sup>6</sup>.

## B) AXIAL INCLINATION

Bolton found that the angles of the labial surface of the maxillary and mandibular central incisors to their occlusal plane totalled 177° i.e. almost a straight line. Greater tipping of maxillary and mandibular incisors makes the relapse tendency higher.

## C) FUNCTIONAL INTERFERENCES AND MUSCULAR/ NEUROMUSCULAR ENVIRONMENTAL FACTORS

The muscle balance of the individual dictate the position of the teeth i.e. Weinsterl et al and Mills said that the tooth position should be accepted and not altered and it should be kept in equilibrium with muscle pressure and tongue pressure<sup>6</sup>. High attachment of gingival papilla also, cause spacing, and this has a high relapse rate, to overcome this the thick fibrous tissue causing spacing has to be surgically removed. But the time of removal is still controversial, whether to be removed before or after orthodontic treatment. Permanent retentive aid is the best choice.

## D) GROWTH AND SEX DIFFERENCES

Study by Zinad K<sup>7</sup> in 2016 there was gender specific differences in PAR score, where initial increase of score in males in adolescence and it reduces by age of 22. Women had an increase in PAR score in 2-3 decades of life and also in 10-15 years of post-retention phase. Richardson evaluated that mandibular growth increases from 0.2 to 2.5mm in 18-50 years. Kenneth C Dyer<sup>8</sup>, said that a relationship exist between mandibular crowding and growth of the mandible, as forward downward rotation of the mandible occurs, there is a lingual directed pressure, leading to crowding of lower incisors. Mandibular incisor crowding was less than 3.5mm in 77% of the patients, and that with time the changes in the dentition are minor.

## E) FURTHER IMPLICATIONS OF GROWTH

During structures, there is reduction in convexity, mandibular plane angle, and overbite. Implications are that the treatment should be started earlier in females and continued retention in males as long as growth is completed. In boys retention has to be maintained till there is completion of growth. Functional

appliances aid a lot in compensating with the relapse changes that can occur.

**F) RECOVERY FROM INDIVIDUAL TOOTH MOVEMENTS**

Mandibular Plane Angle (MPA) flattens with age. Implication is that, if increased it can be expected to return to former angle or less, if growth persists, there can be increase in MPA. Lower laterals, canines and second premolars tend to migrate to original position more frequently; short sectional arches with retention appliances can be worn. Rotated teeth have highest chances of relapse, over correction should be done to compensate for the relapse.

**G) LOCAL POST TREATMENT TISSUE CHANGES**

Decrease in cell number during retention phase, osteoblast form bony spicules which re arranges, if not rearranged can cause compression. Periodontal ligament stretches during treatment and after tooth movement the PDL fibres rearrange themselves in 8-9 weeks back to its original position, but the supra alveolar fibres (circular ligament) remains stretched for longer duration and increases in thickness. Reopening of spaces may occur in this phase, so the insertion of tooth positioner applies heavy force on the tooth leads to instability and root resorption. To overcome this, leave bands and tie ligature wires between them, rearrangement of fibrous tissue occurs<sup>9</sup>. Simon Little wood <sup>10</sup> found that Circumferential Supracrestal Fibrotomy (CSF) and full time removable retainer together decreased the chances of relapse for about 2mm per year. Brain and Edward in 1971 did a study of 14years post retention, after CSF, on 160 patients showed a result of reduced relapse<sup>6</sup>.

**H) DIRECTION OF TOOTH MOVEMENT**

Distal tipping and up righting over basal bone, bodily movement in mesial or distal direction reduce relapse. Distal movement of teeth with extra oral forces are an exception. Tipping of teeth in labial or lingual direction leads to relapse.

**I) TIME FACTOR** Placement of retention appliance must be soon after removal of appliances. Karina Maria in her study evaluated that, maxillary there is a significant relapse that occur in short term (3yrs) and remained stable from short term to long term (33yrs) after removal of retention. But in mandibular there was continued relapse in long term post retention period.

**J) ROLE OF THIRD MOLAR**

Role of third molar is quite conflicting; Woodside said that if third molars are absent there is distal adjustment of teeth to prevent crowding. Broadbent found that there is no much difference in crowding between absence and presence of third molar in dentition. Belfast Growth study supports the same<sup>6</sup>.

**CONCLUSION**

Comparing these different studies, the aetiology of relapse is quite controversial. As an orthodontist our prime agenda should be to prevent the relapse of treatment success acquire by us at the end of orthodontic treatment. It was noticed that there was a shortage of articles on long term studies on relapse, and also the study that have already been done do not give a finite result on the extend of post retention aids to be used. The various insights given by different authors regarding the aetiology of relapse did not suffice the clinical point of view. Further studies are to be done for better understanding of this problem, which is a question in every orthodontic treatment. Numerous factors are said to be responsible for relapse, but a final conclusion has not yet been made.

Condensing the above said reasons for relapse, the following documented principles decrease the impact of relapse

- Circumferential Supracrestal Fibrotomy along with Hawley's appliance gave a very positive result<sup>10</sup>
- Mandibular relapse was found to be more than maxillary relapse<sup>11</sup>.
- In tooth size arch length discrepancy minimal expansion approach by maintaining the occlusal plane in initial position<sup>11</sup>.
- Maintenance of retention till completion of growth occurs.

- Proper interdigitation of teeth is very significant in stability,
- Retentive phase should start as soon as the treatment is completed.
- Removal of the aetiology of malocclusion, as in, if habits are responsible for malocclusion, even after correction there are chances of relapse due to abnormal muscle function.
- When considering treatment, even though there is an increase in inter canine width, there is high chance of decrease in the width in post retentive phase, even lesser than re treatment width. Thus in need of permanent retention.<sup>1</sup>

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