

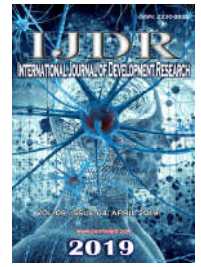


ISSN: 2230-9926

Available online at <http://www.journalijdr.com>

IJDR

International Journal of Development Research
Vol. 09, Issue, 04, pp. 27271-27275, April, 2019



REVIEW ARTICLE

OPEN ACCESS

RETENTION AND RELAPSE –A REVIEW

***Dr. Ram Priya S., Dr. Priya Singh and Dr. Prasoon Killa**

Post Graduate Student, Department of Orthodontics and Dentofacial Orthopaedics, Manipal College of Dental Sciences, Mangalore, Karnataka, India

ARTICLE INFO

Article History:

Received 08th January, 2019
Received in revised form
17th February, 2019
Accepted 21st March, 2019
Published online 30th April, 2019

Key Words:

Stability, Retention appliance,
Retainer.

ABSTRACT

Long-term post treatment stability and methods to prevent relapse is major interest to all orthodontists. This review article highlights the biological basis and possible factors reported to play a role in orthodontic relapse and to review various long-term retention studies evaluating the stability of various treatment modalities and different retention methods and its comparison for render better Post treatment stability.

Copyright © 2019, Dr. Ram Priya S. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Dr. Ram Priya S., Dr. Priya Singh and Dr. Prasoon Killa. 2019. "Retention and relapse –A review", *International Journal of Development Research*, 09, (04), 27271-27275.

INTRODUCTION

Orthodontist role do not end in achieving a good stable buccal occlusion with ideal overjet and overbite and harmonious facial balance it continues during retention and post retention stages as they pose greater challenge in maintaining the results obtained. Thus, Holding of teeth following orthodontic treatment in the treated position for the period of time necessary for maintaining the result (Blake, 1998), and to restrain the tendency for teeth to move away from the positions in which they were placed by the orthodontist"

Normal physiology and biological basis for relapse:

Majority of case teeth disturbed by the orthodontic treatment have tendency to return towards their original relationship. Anteroposteriorly, they have a stronger tendency to move mesially within their respective jaw and vertically if encroached into the freeway there is a tendency to relapse to original position (3). Similarly, change in patients original arch form has tendency to return back to the previous form. Among the tooth movements, de-rotation is difficult to perform and retain with more tendency to move back to towards it is

*Corresponding author: Dr. Ram Priya S.,

Post Graduate Student, Department of Orthodontics and Dentofacial Orthopaedics, Manipal College of Dental Sciences, Mangalore, Karnataka, India

original position especially when teeth are rotated rapidly and to considerable amount of degree. Microscopically, On rotation, supra alveolar fibres are more resistant and do not altered as the surrounding bone remodels. they remains in more stretched position than principle fibres because they are attached to movable fibrous system and contain elastic fibres which may yield to traction during rotation result and they remained stretched during the retention period causing relapse. Thus, Fibres of the marginal region require long retention period of 232 days and while the principle fibres require 28 days. It is also blamed on the (Edwards, 1968), existence of a type of intermediate plexus- oxytalan fibres in marginal gingiva as one of the anatomic explanations for relapse tendency of the orthodontically rotated teeth.

Factors contributing to relapse: There are numerous factors have been reported in literature regarding the contribution in post treatment crowding, no conclusive evidence regarding the relative contribution any of these factors have been reached.

Third Molar: Role of third molars in aggravating the relapse of dental arch alignment after orthodontic treatment remains still controversial. Authors have (Rossouw, 2016), reported that if there is no sufficient space for eruption of third molar in the dental arch they might exert forces on the adjacent teeth, and has potential to cause crowding. On contrary Bjork

et al attributed that late incisor crowding is due to reduction in arch length occurs as a result of up righting of the incisors, the cause of which may be muscular force. Which further supported by Berit Lindqvist, et al. (Lindqvist, 1982), in his longitudinal split mouth study. Based on long term study of 15.7 years mean it was found lot of other factors are involved in the relapse and the clinical relevance of third molar cause of relapse has to be regarded as questionable (Kaplan, 1974; Ades, 1990 and Zelli, 1991). However, Recent meta-analysis which (12)evaluated the role of third molar and concluded that, than impacted third molars, erupting third molars might produce more anterior force and cause crowding of the mandibular incisors. This study Suggests removal of mandibular third molar for preventing or alleviating long-term incisor irregularity.

Continuing Growth: Growth is obvious and appreciable during adolescence but continues to reach the saturation state as we grow older but mandible continues to grow in slower rate that is not appreciable. During orthodontic treatment in spite of the giving consideration to the skeletal relationships ,during post retention stages, skeletal changes that occur during retention may attenuate, exaggerate, or maintain the dentoskeletal relationship (Cheng, 2017). Condylar growth during the terminal phase of jaw growth proceeds in a predominantly vertical direction. With decrease in the angles SN-occlusal plane ,SNMP , ANB, and the gonial angle .Thus mandible moves forward more than the maxilla .The linear Condylar growth of the high angle cases had a relatively large horizontal component, while that of the low angle cases was nearly all vertical altering the facial profile (Schudy, 1974). This post pubertal /terminal growth, Facial development may result in secondary crowding especially in extreme growth patterns such as forward mandibular growth rotation due lingual movement of lower incisors as mandible continues to grow forward ,thus requiring long retention period to counter act the continuing growth.

Neuromuscular and Periodontal Forces: Malocclusion of the teeth and the broader spectrum of dentofacial deformity is due to interplay between innate genetic factors and external environmental factors. Considering the equilibrium theory it is been claimed teeth tipped either labially or lingually during treatment are more likely to relapse (Blake, 1998), ie, if more than 2mm of the antero-posterior position of lower incisor indicates the need for long term or indefinite retention (Rossouw, 2016). Thus it is recommended to place the incisal edge of the lower incisor on the A-Pog line or 1 mm in front of it (1 ± 2 mm) giving a the optimum position for lower incisor stability. Regardless of orthodontic treatment of all the position most stable positions of the teeth are their pre treatment positions.

The Anterior Component of Occlusal Force (ACF) (Southard, 1990): As stated by southward, he believed crowding occurs as a result of the mesial axial inclination of the permanent teeth and forces of occlusion that are dissipated axially and anteriorly , through the proximal tooth contact points and which might influence the mesial migration of teeth and subsequent dental malalignment attributed mainly due to slipped mandibular contacts .However cause and effect relationship has not been proved and may not exist. Patients with clenching and bruxism or in any other way load posterior teeth axially for extended periods of time , ACF can cause dental malalignment.

Alteration in arch form and intercanine width: Apical base place a role in determining the occlusion and arch form and expansion. Orthodontic experiments show that a normal occlusion attained by mechanical treatment is not necessarily accompanied by a development of the apical base in harmony with the position of the teeth, with the result that the occlusion obtained cannot be maintained. After a moderate increase in width of the dental arches during mixed dentition,there is usually decrease arch width and arch length decreases in both the anterior and posterior regions with increasing age more in mandible than maxilla. This mainly contributed to continued mandibular growth.

Tooth Dimension and Position: Tooth size variation is one of causes postulated for crowding. Based on classical study by peck et al teeth which are smaller mesiodistally and larger faciolingually are more stable with ratio of 88 to 92% for a central incisor and 90 to 95 % for a lateral incisor. When the ratio exceeded these values, reproximation (“proximal stripping ’ ‘) was indicated to reduce the mesiodistal dimension, thereby normalising the ratio so that it was in the favourable range for long-term post retention stability of the lower anterior segment. Thin contact area of lower incisors has more change for slippage however broader contact points provide good stability with a post retention irregularity index, thus Boese et al advocating reproximation. The question of whether or not above ratios are more useful than simple measurements of incisor mesiodistal length has not been addressed (Smith, 1982).

Various Modalities for Retention: Retention is the phase of orthodontic treatment which maintains the teeth in their orthodontically corrected positions after the active orthodontic tooth movement. As relapse has various factors contributing to its cause ,general rule post orthodontic treatment is the long /short term standing retention appliance. Various retention modalities have been invented and investigated in the literature.

Types	
Removable :	Charles Hawley in 1919
Hawley’s retainers	
Begg wrap around retainer	Raymond Begg
Positioner	Harold dean kesling 1943 (42)
Vacuum formed retainer :	Thermoplastic retainer - 1 st -Remensnyder 1923
	Term invisible retainer & popularized by pontiz 1971
	Essix retainer -John sherindan 1993 (43)
Fixed :	1987, Diamond and in 1990,Orchin
Fibre reinforced bonded lingual retainer	
Bonded lingual retainer	1 st -- Kneirim, 1973 (44)
	Clinical technique : Zachrisson, 1977 , 1983 ; Årtun and Zachrisson, 1982)
	First generation: Plain blue Elgiloy wire with a loop at each terminal end
	Second generation: Similar diameter but multistranded wire used
	Third generation: Round 0.032” stainless steel or 0.030” gold coated wire
	V loop FR –lee 1981 (45)
Adjuvant procedure	Edward 1970 (46)
Pericision	Term - Campbell, Moore, and Matthews 1975
Reproximation	1972 peck and peck (18);boese et al

Relapse between different retention methods:

Hawleys vs Vacuum formed retainer: Heidi Rowland(47) compared removable retainers between Hawley and VACUUM FORMED RETAINER and showed significantly greater changes in irregularity of the incisors in the Hawley group than in the VACUUM FORMED RETAINER group at 6 months. Although this difference is unlikely to be clinically significant in the maxillary arch, it could be considered clinically significant in the mandibular arch. In contrast Rowland et al., Demir et al., Wenjia Mai (48) who found there is no static difference between them.

Bonded lingual retainer vs vacuum formed retainer: The Millett 2007 study compared a lower thermoplastic (vacuum-formed) retainer with bonded multistrand stainless steel wire and showed no statistically significant difference between the groups for changes in Little's irregularity index at 12 and 18 months. He stated bonded retainers have a better ability to hold the mandibular incisor alignment in the first 6 months after treatment than do vacuum-formed retainers.

Maxilla vs mandible Bonded lingual retainer: Jeanett Steinnes *et al* (49) evaluated the stability of orthodontic treatment outcome and retention status 7 or more years. Fixed canine-to-canine retainers seem effective to maintain mandibular incisor alignment, whereas in the maxilla a fixed retainer may not make any difference in the long term.

Adjuvant procedure: Edward (46)1988 on his long term prospective study found CSF procedure appears to be most effective in alleviating relapse during the first 4 to 6 years for alleviating pure rotational relapse after orthodontic treatment as there is significant difference between control and CSF group. Boese based on his 9 years of long term study he advocated reproximation in combination with circumferential supracrestal fibrotomy to enhance orthodontic treatment results. Taner et al, and S.J Little wood systemic review 2006 (50) -revealed that CSF and full time removable retainer wear of the Hawley type provides a significant reduction in relapse over 1 year compared to using a removable retainer alone.

Failure of the appliance: The Årtun 1997 studied the failure rate of removable acrylic and different type of fixed wire retainer and found no statistical difference. However Millett 2007 on comparing thermoplastic (vacuum-formed) retainer with a multistrand stainless steel wire found there was a statistically and clinically significant difference of more failures in the removable retainer group than the bonded retainer group (Bovali, 2014). Based on the 2-armparallel single-centre trial was to compare placement time and numbers of failures of mandibular lingual retainers bonded with indirect procedure vs a direct bonding procedure. It was found bonding time was shorter for the indirect procedure but showed similar risks of failure (Bolla 2012; Rose 2002; Salehi 2013) found there is no statistically significant between failure rates between Polyethylene ribbon bonded versus multistranded bonded retainers. When comes to multistranded bonded retainer failure rate ranges from 10.3 % to 47 % mainly at the wire /composite interface due to mechanical wear and insufficient material.

Adverse effect of the appliance: Major adverse effect with the fixed retainers is the plaque and calculus accumulation affecting the gingival and periodontal tissue. Jovana Juloskia(52) long-term investigation regarding the influence of fixed lingual retainers on the development of

mandibular gingival recession among treated and untreated individuals showed lingual retainers does not seem to increase the development of mandibular gingival recession, but does increase calculus accumulation. While Pandis et al(44) evaluate the periodontal tissues of patients with mandibular MS fixed retention for long(9 years) or short periods of time and found The long-term group presented higher calculus accumulation, greater marginal recession, and increased probing depth. Miller 2007 found on comparing round plain and multistranded wire studies have found there is no difference in the plaque deposit in contrast to the Nimri et al On comparing plain fixed retainer and wave form fixed retainer by LEW for better flossing and oral hygiene maintenance it was found from recent meta analysis that wave form found no significant advantage over plain fixed retainer hence such complex design in fabrication provide no better advantage to patient over fixed retainer.

Conclusion

Retention is as important as active treatment in producing an outstanding and lasting quality orthodontic result. Till now there is no universal protocol for retention to prevent relapse. In spite of good finish, some amount of relapse is inevitable requiring long term retention protocol to combat the relapse tendency.

Acknowledgment: NIL

REFERENCES

- Ades AG, Joondeph DR, Little RM, Chapko MK. A long-term study of the relationship of third molars to changes in the mandibular dental arch. *Am J Orthod Dentofac Orthop.* 1990;97(4):323–35.
- Backlund BE. The Facial Skeleton in Children From 7 to 11 Years of Age ; a Longitudinal. 46(6).
- Berger JL, Pangrazio-Kulbersh V, Borgula T, Kaczynski R. Stability of orthopedic and surgically assisted rapid palatal expansion over time. *Am J Orthod Dentofacial Orthop.* 1998;
- Blake M, Sc B, Orth FDS, Bibby K. Retention and stability: A review of the literature. 1998;299–306.
- Bovali E, Kiliaridis S, Cornelis MA. Indirect vs direct bonding of mandibular fixed retainers in orthodontic patients: A single-center randomized controlled trial comparing placement time and failure over a 6-month period. *Am J Orthod Dentofac Orthop.* 2014;
- Brodie AG. Muscular factors in the diagnosis and treatment of malocclusions [Internet]. Vol. 23, *The Angle Orthodontist.* 1953. p. 71–7. Available from: [http://www.angle.org/doi/abs/10.1043/0003-3219\(1953\)023%3C0071%3AMFITDA%3E2.0.CO%3B2](http://www.angle.org/doi/abs/10.1043/0003-3219(1953)023%3C0071%3AMFITDA%3E2.0.CO%3B2)
- Chamberland S, Proffit WR. Short-term and long-term stability of surgically assisted rapid palatal expansion revisited. *Am J Orthod Dentofac Orthop.* 2011;
- Cheng H, Peng B, Hsieh H. ScienceDirect Impact of third molars on mandibular relapse in post-orthodontic patients : A meta- analysis. *J Dent Sci* [Internet]. 2017;1–7. Available from: <https://doi.org/10.1016/j.jds.2017.10.005>
- De la Cruz A, Sampson P, Little RM, Årtun J, Shapiro PA. Long-term changes in arch form after orthodontic treatment and retention. *Am J Orthod Dentofac Orthop.* 1995; 107(5):518–30.

- Ding Y, Xu T, Lohrmann B, Gellrich N, Schweska-polly R. Stability Following Combined Orthodontic-surgical Treatment for Skeletal Anterior Open Bite – a Cephalometric 15 -Year Follow-up Study Stabilität nach kombiniert kieferorthopädisch-chirurgischer Behandlung eines skelettal offenen Bisses – eine kephalome. 2007; (3):245–56.
- Edwards JG. A study of the periodontium during orthodontic rotation of teeth. *Am J Orthod.* 1968;54(6):441–61.
- Edwards JG. A surgical procedure to eliminate rotational relapse. *Am J Orthod.* 1970;
- Erdinc AE, Nanda RS, İşiksal E. Relapse of anterior crowding in patients treated with extraction and nonextraction of premolars. *Am J Orthod Dentofac Orthop.* 2006;
- Francisconi MF, Janson G, Freitas KMS, Oliveira RCG De, Oliveira RCG De, Freitas MR De, et al. Overjet, overbite, and anterior crowding relapses in extraction and nonextraction patients, and their correlations. *Am J Orthod Dentofac Orthop.* 2014;
- Hernandez JL. Mandibular bicanine width relative to overbite. *Am J Orthod.* 1969;56(5):455–67.
- Horowitz SL, Hixon EH. Physiologic recovery following orthodontic treatment. *Am J Orthod.* 1969;
- Isaacson RJ, Ingram AH. Forces Produced By Rapid Maxillary Expansion. II. The Angle orthodontist. 1964.
- Janson G, Valarelli DP, Rizzo M, Valarelli FP. Prevalence of extraction space reopening in different orthodontic treatment protocols. *Am J Orthod Dentofac Orthop.* 2017;
- Janson G, Valarelli FP, Beltrão RTS, de Freitas MR, Henriques JFC. Stability of anterior open-bite extraction and nonextraction treatment in the permanent dentition. *Am J Orthod Dentofac Orthop.* 2006;
- Juloski J, Glisic B, Vandevska-Radunovic V. Long-term influence of fixed lingual retainers on the development of gingival recession: A retrospective, longitudinal cohort study. *Angle Orthod.* 2017;
- Kahl-Nieke B, Fischbach H, Schwarze CW. Post-retention Crowding and Incisor Irregularity: A Long-term Follow-up Evaluation of Stability and Relapse. *Br J Orthod* [Internet]. 1995;22(3):249–57. Available from: <http://www.tandfonline.com/doi/full/10.1179/bjo.22.3.249>
- Kaplan RG. Mandibular third molars and postretention crowding. *Am J Orthod.* 1974;66(4):411–30.
- Lagravere MO, Major PW, Flores-Mir C, Orth C. Long-term dental arch changes after rapid maxillary expansion treatment: A systematic review. *Angle Orthod.* 2005;
- Lagravere MO, Major PW, Flores-Mir C. Long-term skeletal changes with rapid maxillary expansion: a systematic review. *Angle Orthod.* 2005;
- Lee KD, Mills CM. Bond failure rates for V-loop vs straight wire lingual retainers. *Am J Orthod Dentofac Orthop.* 2009;
- Lee RT. Arch width and form: a review. American journal of orthodontics and dentofacial orthopedics: official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics. 1999.
- Lindqvist B, Thilander B. Extraction of third molars in cases of anticipated crowding in the lower jaw. *Am J Orthod.* 1982; 81(2):130–9.
- litowitz 1948(1).pdf.
- Littlewood SJ, Millett DT, Bearn DR, Worthington H V. Orthodontic retention : A systematic review. 2006;33:205–12.
- Lustig JR, Rossouw PE, Peter H, Behrents RG, Woody RD. Author ' s Accepted Manuscript. *Semin Orthod* [Internet]. 2016; Available from: <http://dx.doi.org/10.1053/j.sodo.2016.12.005>
- Mai W, He J, Meng H, Jiang Y, Huang C, Li M, et al. Comparison of vacuum-formed and Hawley retainers: A systematic review. *Am J Orthod Dentofac Orthop* [Internet]. 2014; 145(6):720–7. Available from: <http://dx.doi.org/10.1016/j.ajodo.2014.01.019>
- Maia FA, Janson G, Barros SE, Maia NG, Chiqueto K, Nakamura AY. Long-term stability of surgical-orthodontic open-bite correction: Editor's comment. *American Journal of Orthodontics and Dentofacial Orthopedics.* 2010.
- Mew J. Relapse following maxillary expansion. A study of twenty-five consecutive cases. *Am J Orthod.* 1983;
- Moussa R, O'Reilly MT, Close JM. Long-term stability of rapid palatal expander treatment and edgewise mechanotherapy. *Am J Orthod Dentofac Orthop.* 1995;108(5):478–88.
- Nanda RS, Nanda SK. Considerations of dentofacial growth in long-term retention and stability: Is active retention needed? *Am J Orthod Dentofac Orthop.* 1992;101(4):297–302.
- Pandis N, Vlahopoulos K, Madianos P, Eliades T. Long-term periodontal status of patients with mandibular lingual fixed retention. *Eur J Orthod.* 2007;29(5):471–6.
- peck 1972(25).pdf.
- Prado GPR, Furtado F, Aloise AC, Biló JPR, Masako Ferreira L, Pereira MD. Stability of surgically assisted rapid palatal expansion with and without retention analyzed by 3-dimensional imaging. *Am J Orthod Dentofac Orthop.* 2014;
- reitan 1959 (2).pdf.
- Rossouw PE, Malik S. Author's Accepted Manuscript The retention protocol. *Semin Orthod* [Internet]. 2016; Available from: <http://dx.doi.org/10.1053/j.sodo.2016.12.011>
- Rowland H, Hichens L, Williams A, Hills D, Killingback N, Ewings P, et al. The effectiveness of Hawley and vacuum-formed retainers: A single-center randomized controlled trial. *Am J Orthod Dentofac Orthop.* 2007;
- S KKKLBD, Adel MDS, Lew KKK, The MDSA, Tooth O. The Orthodontic Tooth Positioner — An Appraisal The Orthodontic Tooth Positioner-An Appraisal. 2016; (August).
- Schudy GF. Posttreatment craniofacial growth: Its implications in orthodontic treatment. *Am J Orthod.* 1974;65(1):39–57.
- Shapiro PA. Mandibular dental arch form and dimension. Treatment and postretention changes. *Am J Orthod.* 1974;
- Sheridan JJ, LeDoux W, McMinn R. Essix retainers: fabrication and supervision for permanent retention. *J Clin Orthod.* 1993;
- Simons ME, Joondeph DR. Change in overbite: A ten-year postretention study. *Am J Orthod.* 1973;64(4):349–67.
- Smith RJ, Davidson WM, Gipe DP. Incisor shape and incisor crowding: A re-evaluation of the Peck and Peck ratio. *Am J Orthod.* 1982;82(3):231–5.
- Southard TE, Behrents RG, Tolley EA. The anterior component of occlusal force. Part 2. Relationship with dental malalignment. *Am J Orthod Dentofac Orthop.* 1990;97(1):41–4.
- Steinnes J, Johnsen G, Kerosuo H. Stability of orthodontic treatment outcome in relation to retention status: An 8-year follow-up. *Am J Orthod Dentofac Orthop.* 2017;
- swason good rortaion article.pdf.

Vardimon AD, Brosh T, Spiegler A, Lieberman M, Pitaru S. Rapid palatal expansion: Part 1. Mineralization pattern of the midpalatal suture in cats. *Am J Orthod Dentofacial Orthop.* 1998;

Resorption and Alveolar Crestal Bone Levels 1986--Chicago , . 1991; (December 1985):1991.

Zelli MD, Sharpe W. The Effect of Lower Third Molar Position , Path of Eruption , and Mandibular Growth to Lower Anterior-Crowding Relapse of Orthodontically Treated Cases The Relationship of Relapse to Apical Root