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Research Article

FIXED LINGUAL RETAINER: REVIEW ARTICLE

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ABSTRACT

Long-term retention may be required to prevent post-treatment changes and the bonded orthodontic retainer constructed from composite and multi-strand orthodontic wire provides an esthetic and efficient system for maintained retention. The bonded orthodontic retainer constructed from multi-strand wire and composite is an efficient esthetic retainer, which can be maintained long-term.This paper reviews the rationale for the use of fixed lingual retainer its success and failure rates and also different technique for stabilizing lingual retainer.

INTRODUCTION

Moyer defined retention as "maintaining the newly moved teeth in position long enough toaid in stabilizing their correction". It is considered as a major step in stabilizing the resultsaccomplished through active orthodontic treatment (Thamer Adel Alkhadra 2011). Retention is usually necessary following orthodontic treatment to overcome the elastic recoil of the periodontal supporting fibers and to allow remodeling of the alveolar bone. The degree of change is variable and largely unpredictable (Nikhilanand Hegde 2011). Newman was the first to report direct bonding of orthodontic attachments to tooth surfaces in 1965, and Kneirim2 published the first report of the use of this technique to construct bonded fixed retainers (SamaTabrizi 2010). There are two types of retainers: a removable and a fixed retainer. They can further be classified into: temporary, semi-permanent and a permanent retainer. The retainer should be well tolerated by the patient with minimal negative effects on speech, mastication, oral hygiene, comfort and the general health of the oral tissue. The retention phase is initiated after orthodontic treatment completion to prevent orthodontic relapse (Thamer Adel Alkhadra 2013).

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Fixed retainers have proven fallible, however, with problems stemming from distortion or residualactivity of the wireand the potential for periodontal consequences related to plaque stagnation, although fixedretainers have also shown compatibility with periodontal health.A significant problem continues to relate tobond failures, estimated at 6% to 25%, depending on the placement technique and the observation period (Nikolaos Pandis *et al.,* 2013). There is general agreement on the necessity of fixed lingual retainers to prevent relapse inmany patients after active orthodontic treatment. Several methods for delivering fixed lingualretainers have been introduced. However, bonding a lingual retainer is still challenging because it requireslong working time and has a risk of contamination from saliva and moisture, which can cause bonding failure.In addition, it is difficult to adapt the retainer wire to perfectly fit the lingual surfaces of an anterior tooth (Shin – Jae Lee *et al*., 2004). In orthodontics, although the patient may feel that treatment is complete when the appliances areremoved, an important stage lies ahead, which is the retention phase.Relapse has been defined as a return of teeth to their original position or a shift in arch relationship after the end of treatment, because teeth tend to move back to their pre-treatment positions if they are not retained. . The etiology of relapse is multifactorial and can be divided into three main areas: physiological recovery, unfavourable growth, or "true relapse" due to the placement ofthe teeth in an unstable

position (Mustafa M. Al-Khatieeb 2012). In addition, research has shown that alveolar bone is laid down after one month and supracrestalfibers require one year to remodel, therefore, retention and relapse are considered as vital issuesof a complete and a successful orthodontic treatment **(**Mustafa M. Al-Khatieeb 2012). The upper incisor region has a high esthetic value, but it also exhibits a high relapse tendency after orthodontic treatment (Eva Schinder *et al.,* 2011). Fiber-reinforced composites (FRCs) have been developed as esthetic and metal-free alternatives for various dental materials, including prosthodontic bridges and crowns, periodontal splints, and orthodontic retainers. In orthodontics, Burstone and Kuhlberg have advocated the use of FRCs for both passive and active applications (Marc Geserick 2004). The Hawley retainer is often prescribed by the practitioner for part-time wear during the retentive period subsequent to a program of active maxillary arch orthodontic therapy. The labial bow of this retainer, while engaged, may be subjected to contact forces from sources other than the maxillary anterior teeth. The bow also experiences small deformations during placement and removal of the appliance from the mouth. Potential failures of the bow are: 1) inelastic bending from individual masticatory actions that change its as-prepared shape; and 2) fracture due to fatigue arising from many cycles of removing and replacing the retainer (Thamer Adel Alkhadra 2011).

SURVIVAL AND FAILURE RATE

Possible predisposing factors for bonded retainerfailure are mainlythe thickness and quality of the retainer wire, the typeof composite used for bonding, the manner in whichdeficiencies are handled in terms of wetness ordryness of the bonding field, and occlusal trauma tothe wire (Eva Schinder *et al.,* 2011). Patients exhibiting failures during treatmentshowed a significantly (P , .05) higher loss rate thandid patients without failures. This might be due to aconsistent difference regarding the level of patientcompliance during both active treatment and retention. Furthermore, patient-specific anomalies, such asdifferences in enamel structure caused by fluorosisor eating or soft drink consumption habits, may have contributed to this outcome (Lumsden Kw *et al*., 1999). While the incidence of total losses and detachmentshad a peak during the first 6 months of retention, fractures peaked after 24 months. These results are inline with those of the literature.[10]The early bondingfailure peak may be explained by either bonding erroror the increased tooth mobility short term afterappliance debonding. The late retainer fracture peakseems to be due to bite deepening, resulting in caninetrauma to the wire and fatigue fracture (Eva Schinder *et al.,* 2011).

Upper bonded retainers exhibited frequent failures (odds 1 5 1.26 failures per retainer).N Detachments were the most frequent failure.N One or more defects during active MB treatmentwere associated with significantly higher detachmentand total loss rates. N The detachment and total loss rates were significantlyinfluenced by operator experience—both rateswere lower for experienced practitioners (Eva Schinder *et al.,* 2011). Fixed retainers have proven fallible, however, withproblems stemming from distortion or residualactivity of the wireand the potential for periodontal consequences related to plaque stagnation, although fixedretainers have also shown compatibility with periodontalhealth.

A significant problem continues to relate tobond failures, estimated at 6% to 25%, depending onthe placement technique and the observation period (Renkema Am *et al*., 2009). When these flexible spiral wire retainers are placed meticulously, they have the advantage of allowing for safe retention of the treatment results. On the other hand, when correct retention is difficult or impossible to achieve with traditional removable appliances, flexible spiral wire retainers are considered appropriate, and they are independent of patient cooperation (D.J. Lie Sam Foek 2008). Despite the various forms ofretainers, the most commonly used are the thick mandibularcanine-to-canine (3-3) bonded retainer bar (0.030 or 0.032inch) and the thin 0.0215 inch, flexible, spiral wire retainers. For a thin flexible spiral wire in themandible, failure rates of less than 10 per cent have beenreported, particularly with the five-stranded Penta-One ®wire up to 2 – 3 years ((Thamer Adel Alkhadra 2013). The success rate of the flexible, braided, bonded lingualretainers was 63 per cent over 41.7 months.The survival rate for the mandible was 68.4 per cent. Most failures occurred during the first 6 months. Gender and age of the patient and operator experiencedid not affect the failure rate (D.J. Lie Sam Foek 2008). Flexible wires have the highestfailure rate among common materials, with manybond failures due to fracture of the wires themselves (Pawel Pazera *et al.,* 2012)

Different techniques for placing lingual retainer

Modified Kesling's separators for stabilizing lingual retainer wire (Nagar Namit *et al.* 2011)

Bonding of an upper or lower fixed lingual retainer is a common procedure carried out in orthodontic practices. Stainless steel wires of different sizes and shapes are the most frequently used material for fixed orthodontic retainers.

Modified Kesling's separator

Kesling introduced wire separators for slow separation in area offering tight contacts. The conventional Kesling's separator was modified by incorporating a perpendicular bend in lower arm to form a 'U'. The U would exert pressure on lingual retainer wire against palatal tooth surface.

- A canine to canine 0.0175" coaxial wire was adapted on palatal surface of cast.
- Modified Kesling's separators were fabricated using 0.014" AJW Special plus wire and checked on the cast.
- A canine to canine figure of eight ligature tie was placed in order to prevent interdental space opening due to force exerted by separator.
- After pumicing, etching and conditioning, lingual retainer wire was stabilized on palatal surface using modified Kesling's separators.
- Composite was applied and cured to bond lingual retainer onto tooth surface. Kesling's separators were removed thereafter.

Stabilizing retainer using separators (Thamer Adel Alkhadra 2011)

The technique presented here for stabilizing theretainerwire prior to bonding provides good stabilization, adaptation, and

proper positioning of the retainer wirewhile eliminating contamination of etched surfaceswhichmight occur during wire positioning before bonding.

Chairside Steps ofRetainerConstruction

To prepare the ligature wire, hold two or threestrands of 0.010 (3M UnitekInc, USA) stainless steel ligature wire together at both ends withmosquito forceps or use 0.0175 Respond® (Ormco, USA) arch wire.

- Then twist the strandsinto a single wire and bend the wire into a gentlecurve and cut the desired length.
- Isolate the arch using cotton rolls and slowsalivary ejectors and retract the lips using a lip retractor (AmercianOrthdotnics,USA)
- Clean the lingual surfaces of the teeth withpumice (Reliance Orthodontics Inc, USA), rinsewithwater and dry it.
- Pass the band separators through the contactpoints between the canines and between the lateral incisors and the central incisors.
- Pass and adapt the measured wire, above thecingula, between the band separators and the lingual surface of each tooth.
- Acid-etch (Etchant Gel, Reliance Orthodontics Inc, USA) the lingual surfaces that are to be bonded for one minute. Rinse and air-dry them until they appear chalky.
- Apply a light-cured bonding agent (MaximumCure Sealant, RelianceOrthodonticsInc, USA) tothe lingual surfaces and activate it with a light source.
- Add the light-cured flowable composite (FlowTain, Reliance Orthodontics Inc, USA) to theretainer wire and tooth surfaces. A small amount of the flowable composite needs to be placed onthe lingual surface of lower canines and subsequently cured.
- The amount of the flowablecomposite should be enough to cover the wire only in themiddle of the crown and not all theway Light-cure each tooth for 40 seconds to achieve afinal set of the composite .
- Remove the band separators.
- Polish the retainer wire and remove the excess adhesive with the non- cutting edge fissure bur(BrasselrInc, USA); smoothen the surfaces with the finishing bur (BrasselrInc,USA)

Time-saving fixed lingual retainer usingDuraLay resin transfer (Shin – Jae Lee *et al.,* 2004)

A method of fabricating a fixed lingualretainer using DuraLay resin (Reliance Dental Manufacturing,Worth, Ill) and have used this method withsatisfactory results for nearly 10 years on thousands ofpatients.

PROCEDURE

A few weeks before debonding, take an impressionand pour an accurate cast in hard stone. Placing thefixed lingual retainer before debonding provides severaladvantages, including avoiding the relapse that mightoccur immediately after debonding, giving a patienttime to adapt to the lingual retainer before debonding, and reducing complications at the debonding appointment.Gently bend a length of multi-stranded wire toaccurately fit the cast. Apply DuraLay separating medium to the cast andfix the shaped wire to the cast. Then mix the DuraLayresin and apply it gently between the distal surface ofthe second premolar and the mesial surface of the firstmolar (Remove the wire from the cast and accuratelytransfer it to the teeth, using the DuraLay resin guide.Fix the transfer resin portion firmly with utility wax. Each tooth is then bonded individually with theTransbond XT system (3M/Unitek). 14,15 First, bond allteeth other than the 2 terminal teeth. Cut the terminalportions of the wire and remove the DuraLay resin, andthen bond the 2 terminal ends

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