

Permanent Fixed Lingual Retention

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Most patients seek orthodontic treatment for cosmetic reasons^{1,2} and assume that their orthodontic alignment, especially of the visible anterior teeth, will last a lifetime. Long-term post-treatment studies have shown, however, that some degree of relapse has been inevitable.³⁻⁹ The only sure way to prevent it is by using permanent retention with either removable or fixed appliances.

I began using bonded fixed lingual retainers¹⁰⁻¹⁵ (FLRs) cautiously about 17 years ago, in cases with high relapse potential such as Class II, division 2; severely crowded lower incisors; small, crowded premaxillas; and palatal upper canines. Today, the success of the technique is so obvious that nearly all of my patients have retainers bonded to one or both arches, to be left in place indefinitely.

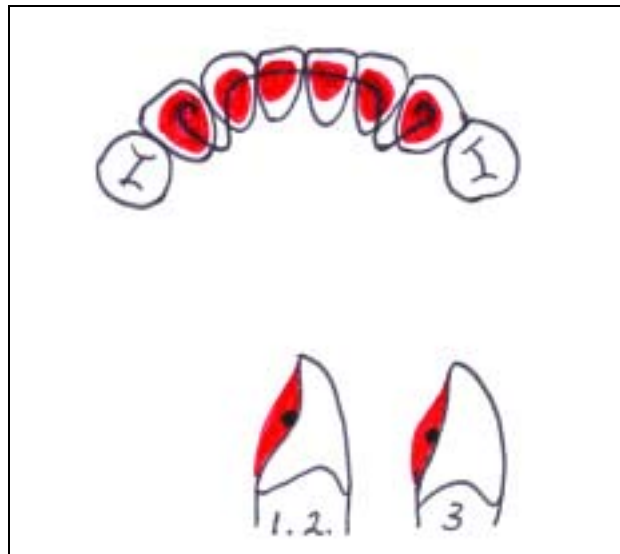
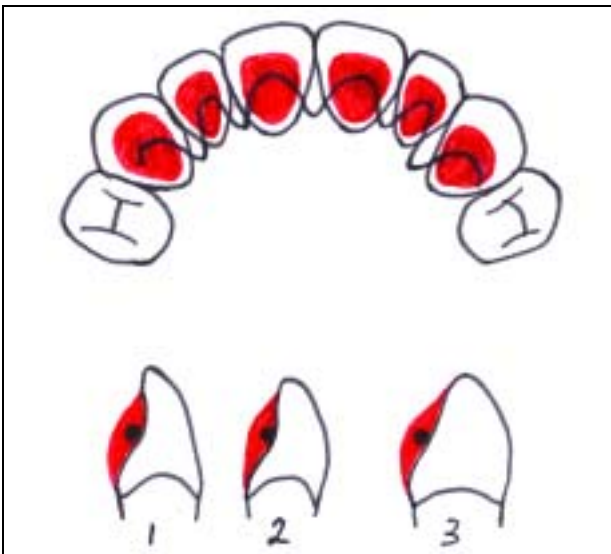


Fig. 1 Current FLR design, with looped .018" Wilcock wire allowing interproximal access and flex. Note at least 1mm of composite coverage on each tooth.



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FLR Design for “Lifetime” Retention

Some clinicians have recommended that fixed retainers should be removed after growth ceases, or in the patient’s mid-to-late 20s,^{16,17} but their rationale has been based more on conjecture than on long-term studies of the effects of permanent retention. If fixed retainers could be safely left in place, as with crowns, bridges, and implants, they could prevent most relapse of the anterior teeth.

Potential problems of using FLRs indefinitely include reduced effectiveness, hygiene difficulties, discomfort, physiological harm to the dental or periodontal tissues, durability, and reparability. Other concerns include difficulty of fitting and general acceptance by patients, parents, and the dental profession. Many parents and patients are worried about the ramifications of permanent retention.

Taking these concerns into account, we have made three design changes in our practice over the past 17 years: from nearly straight .018" Twistflex* wire to nearly straight .018" Wilcock wire to .018" Wilcock wire with loops placed between all teeth except the lower incisors, where the interproximal distance is too short (Fig. 1). These loops allow interproximal access for cleaning, flossing, and dental restorations, should they ever be required. They also increase the length of wire between adjacent teeth, providing a flexibility that allows more individualized, physiologically desirable tooth movement. Fewer bond failures occur with this design, especially around the canines, where 45% of all fractures occurred with the straight-wire designs. The loops also prevent relapse of root torque.

Bonding Technique

The teeth to be bonded must be meticulously cleaned, etched, and primed, avoiding any

contamination from saliva or moisture. Each anterior tooth is individually bonded with ultra-violet-cured composite resin, tapering to smooth, feathered edges to make cleaning easier and prevent overhanging ledges, which heighten the risk of caries and periodontal disease. Composite coverage should be at least 1mm wherever possible for optimum strength¹⁸ and comfort. With the FLR attached to all six or eight anterior teeth, the risk of detachment and swallowing or inhalation of the wire is greatly reduced; to date, this has never been known to happen in our practice. Individual bonding of each tooth prevents the relapse that sometimes happens when lower 3-3

*3M Unitek, 2724 S. Peck Road, Monrovia, CA 91016.

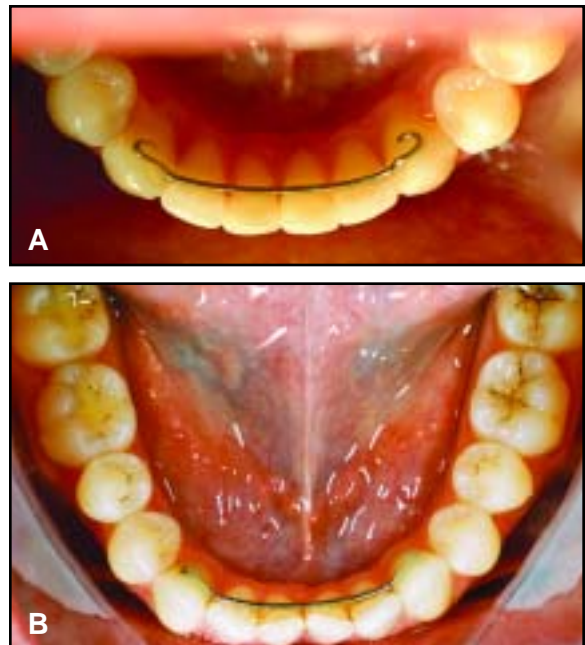


Fig. 2 A. Original 3-3 FLR bonded only to canines. B. Fifteen years later, all four lower incisors have rotated.



Fig. 3 Adult patient after closure of severe maxillary spacing, retained for six and a half years without any adjustments, restorations, periodontal treatments, or repairs.



Fig. 4 Sectional repair to FLR where wire fractured between upper lateral and central incisors.

retainers are bonded only to the canines (Fig. 2).

Any resin overhangs or tags can be removed with a fine flame bur in a high-speed drill after the composite has set. No composite material should be left in the contact points, so that dental floss can pass freely through these areas.

The usual time required to fit a six-unit FLR is 20 to 30 minutes. This time is recovered later, however, because few adjustments are ever required. Patients and parents are happy with the short, infrequent follow-up appointments. Retreatments are extremely rare and usually result from trauma.

Since fitting FLRs has become a standard procedure in our practice, fiberotomies are rarely required to prevent rotational relapse, to the relief of all involved. Frenectomies for maxillary midline diastemas are also seldom needed. Diastemas and other anterior interdental spaces, which were previously reported to have a 49% relapse rate,⁸ are held closed permanently (Fig. 3).

Long-Term Study

A survey of fixed lingual retention was carried out on 350 patients treated in my practice over a 17-year period.

Fractures

Fractures rarely occurred: 4.2% of the bonds over 17 years, and only 2.4% over the past five years, due to the new looped designs and improved composite materials (Table 1). Most of the fractures were due to intraoral trauma from biting hard materials or food. Less frequent causes include external trauma (a blow to the dentition) and technical or material errors such as moisture contamination or wire fracture.

Repairability

Zachrisson has shown the effectiveness of microetching before making bond repairs.¹⁹ If a section of an FLR needs to be repaired, it is necessary only to remove most of the composite

adhesive from the damage site, since microetching provides enough surface roughness for reliable rebonding with fresh composite material.

If the wire fractures, that part can be removed, and a piece of wire fitted across the fracture site and bonded into place using a high-speed drill to cut channels into the existing composite (Fig. 4). A microetcher is then used for roughening. Repairs take an average 10 minutes of chairtime.

Effectiveness

The overall effectiveness of the FLRs was excellent; they held the bonded teeth securely in place. The teeth distal to the FLRs occasionally showed rotations or spacing from labial or lingual movement.

Hygiene

There was no significant increase in caries or periodontal disease that could be attributed to the FLRs. This finding corroborates the studies of Artun²⁰ and Heier and colleagues.²¹

Some patients showed a build-up of lower anterior calculus that required removal at their regular dental checkups. These patients were made aware of the need for special attention. FLRs do not cause calculus to form, but they do make its removal more difficult.

Comfort

In a survey of 100 patients, the duration of awareness of wearing the FLR was reported to be:

Less than 3 days	74%
Less than 1 week	92%
Less than 2 weeks	99%
2 weeks or more	1%

Although 1% of the patients said they were always aware of their FLRs, only three patients in 17 years have accepted our offer to replace them with removable retainers. Of patients who had worn both removable and fixed retainers, nine of 10 found the FLRs more comfortable.

Physiological Harm to Dental and Periodontal Tissues

Independent assessments by general dentists of some long-term FLR patients found no damage to the dental tissues.

Overall Acceptance

The question arises, "Who is responsible for the FLR—the patient or the orthodontist?" In our practice, we repair broken retainers at no charge for five years, after which any damage is an additional cost to the patient. This policy was adopted after consultations with other dentists regarding their replacement criteria for general dental restorations and crown and bridge work.

We have had almost no negative feedback

TABLE 1
SUMMARY OF FIXED LINGUAL RETENTION OVER 17 YEARS

Length of Retention	No. Patients	No. Bonds	Breakages		Pct.
			No. Patients	No. Bonds	
1 year	66	703	6	9	1.3
2-5 years	137	1,113	24	34	3.0
6-10 years	106	610	18	51	8.4
11-15 years	35	148	11	14	9.4
16-17 years	6	21	1	1	4.8
TOTAL	350	2,595	70	109	4.2

from patients or parents regarding FLRs. In fact, we are sometimes asked by parents noticing relapse in their older children why these patients did not receive fixed retainers. Parents who have experienced both orthodontic treatment and relapse themselves are uniformly positive about FLRs for their children and for themselves if retreated.

A survey of 66 referring general dentists after 17 years of fixed retention asked, "How do you rate FLR?"

Very good	60%
Good	49%
Poor	1%

When asked how long FLRs should remain in place, their response was:

Less than 5 years	20%
5-10 years	35%
More than 10 years	45%

The dentists' main concerns with FLRs were oral hygiene (55%), periodontal disease (27%), duration (15%), caries (9%), restorations (8%), and repairs (6%).

Conclusion

Fixed lingual retention is an effective and attractive method of preventing orthodontic relapse, thus guaranteeing the long-term results that patients seek. After 17 years of use in my practice, there are no indications that FLRs have a limited life span, nor does there appear to be any reason to remove them. They are simple for the orthodontic practice to use and well-tolerated by patients, especially since they can be easily removed should the need arise.

REFERENCES

1. Jenny, J.; Ed, D.; and Cons, N.C.: *Guidelines for Using the DAI—The Dental Aesthetic Index*, University of Iowa, Iowa City, 1988, pp. 1-55.
2. Isaacson, R.J.: In response: Oral health in the United States: Prevalence of malocclusion, *J. Dent. Educ.* 49:397, 1985.
3. Little, R.M.: Orthodontic stability and relapse (summarized by H.C. Bergh), *PCSO Bulletin*, Spring 1991, pp. 35-38.
4. Little, R.M.; Wallen, T.R.; and Riedel, R.A.: Stability and relapse of mandibular anterior alignment: First premolar extraction cases treated by traditional edgewise orthodontics, *Am. J. Orthod.* 80:349-364, 1981.
5. Bishara, S.E.; Treder, J.E.; Damon, P.; and Olsen, M.: Changes in the dental arches and dentition between 25 and 45 years of age, *Angle Orthod.* 66:417-422, 1996.
6. Parker, W.S.: Retention: Retainers may be forever, *Am. J. Orthod.* 95:505-513, 1989.
7. Woods, M.; Lee, D.; and Crawford, E.: Finishing occlusion, degree of stability and the PAR Index, *Austral. Orthod. J.* 16:9-15, 2000.
8. Shashua, D. and Artun, J.: Relapse after orthodontic correction of maxillary median diastema: A follow-up evaluation of consecutive cases, *Angle Orthod.* 69:257-263, 1999.
9. Sheridan, J.J.: The Readers' Corner, *J. Clin. Orthod.* 35:31-35, 2001.
10. Mayne, W.R.: Retention after orthodontic therapy, in *Orthodontics: Principles and Practice*, 3rd ed., ed. T.M. Graber, W.B. Saunders Co., Philadelphia, 1972, pp. 597-608.
11. Knierim, R.W.: Invisible lower cuspid to cuspid retainer, *Angle Orthod.* 43:218-220, 1973.
12. Cohl, M.E.: Fabrication of a direct bonded retainer using an ultraviolet-sensitive adhesive: A new technique, *J. Clin. Orthod.* 8:145-148, 1974.
13. Chan, K.C. and Andreasen, G.F.: Conservative retention for spaced maxillary central incisors, *Am. J. Orthod.* 67:324-329, 1975.
14. Rubenstein, B.M.: A direct bond maxillary retainer, *J. Clin. Orthod.* 10:43, 1976.
15. Zachrisson, B.U.: Clinical experience with direct-bonded orthodontic retainers, *Am. J. Orthod.* 71:440-448, 1977.
16. Zachrisson, B.U.: Important aspects of long-term stability, *J. Clin. Orthod.* 31:562-583, 1997.
17. Behrents, R.G.: The consequences of adult craniofacial growth, in *Orthodontics in an Aging Society*, ed. D.S. Carlson, Monograph 22, Craniofacial Growth Series, Center for Human Growth and Development, University of Michigan, Ann Arbor, 1989, pp. 53-100.
18. Bearn, D.R.; McCabe, J.F.; Gordon, P.H.; and Aird, J.C.: Bonded orthodontic retainers: The wire-composite interface, *Am. J. Orthod.* 111:67-74, 1997.
19. Zachrisson, B.U.: Third generation mandibular bonded lingual 3-3 retainer, *J. Clin. Orthod.* 29:39-48, 1995.
20. Artun, J.: Caries and periodontal reactions associated with long-term use of different types of bonded lingual retainers, *Am. J. Orthod.* 86:112-118, 1984.
21. Heier, E.E.; De Smit, A.A.; Wijngaerts, I.A.; and Adriaens, P.A.: Periodontal implications of bonded versus removable retainers, *Am. J. Orthod.* 112:607-616, 1997.