REVIEW

Bonded Orthodontic Retainers

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ABSTRACT:

Despite major advances in orthodontic tooth movement, orthodontic retention still remains a major problem. It has been estimated that only 10% of the population who have received orthodontics are still in acceptable occlusion as judged by orthodontists 20 years after retention. In addition, very little is known about patient's perception in relation to orthodontic relapse. Various studies have shown that fixed retention bonded only to canines have relapse, while others have shown that even though relapse exists, it is not significant or clinically relevant. This article summarize about each aspect of fixed retention.

Key words: Retention, Fixed, Relapse, Generation

Introduction

Many appliance types have been used for the retention of post-treatment tooth position. The first appliances proposed were based on banded fixed appliances, and then removable retainers were advocated. Recent workers have concluded that those cases that will relapse cannot be predicted and that indefinite retention is necessary if the finished result of active orthodontic treatment is to be maintained. There is no agreement in the literature of a uniform system of retention, and the clinical orthodontist, in consultation with each patient, must determine the appropriate retention regime for each case.[1-2]

Most recently the use of bonded fixed retainers has been introduced. Bonded fixed retainers consist of a length of orthodontic wire bonded to the teeth with acid-etch retained composite. At present three generations of fixed retainers are available.[1,3] These are:

- First generation-Plain blue Elgiloy wire with a loop at each terminal end for added retention
- Second generation- Similar diameter but multistranded wire
- Third generation–Round 0.032 inch stainless steel or 0.030 inch gold coated wire

Development of Bonded Retainers[1-7]

Kneirim published the first report of the use of this technique to construct bonded fixed retainers.

Early bonded fixed retainers were made with plain round or rectangular orthodontic wires, but Zachrisson[13] proposed the potential advantages for the use of multistranded wire and their construction. Artun and Zachrisson first described the clinical technique for the use of a multistranded wire canine-to-canine bonded fixed retainer. In this retainer the wire was bonded to the canine teeth only. In 1983, Zachrisson reported the use of multistranded wire in a bonded fixed retainer in which the wire was bonded to all the teeth in the labial segment. The proposed advantages of the use of multistranded wire are that the irregular surface offers increased mechanical retention for the composite without the need for the placement of retentive loops, and that the flexibility of the wire allows physiologic movement of the teeth, even when several adjacent teeth are bonded. As an alternative to multistranded wire, the use of resin fiberglass strips has been developed. The fiberglass strips are soaked in composite and bonded to acid-etched enamel. Although this technique has the advantage of reducing the bulk of the retainer, it has the disadvantage of creating a rigid splint, which limits physiologic tooth movement and contributes to a higher failure rate.

Indications for Bonded Retainers

Lee considered the following to be indications for placement of a bonded canine-to-canine retainer:

- Severe pretreatment lower incisor crowding or rotation
- Planned alteration in the lower intercanine width
- After advancement of the lower incisors during active treatment
- After nonextraction treatment in mildly crowded cases
- After correction of deep overbite.

Zachrisson listed the following indications for clinical use of flexible wire retainer:

- Closed median diastema
- Spaced anterior teeth
- Adult cases with potential post orthodontic tooth migration
- Accidental loss of maxillary incisors, requiring closure, and retention of large anterior spaces
- Spacing reopening, after mandibular incisor extractions
- Severely rotated maxillary incisors
- Palatally impacted canines.

Techniques for Construction of Bonded Retainers[1-4]

Construction of bonded fixed retainer might appear to be simple, but if good long-term success is to be ensured, meticulous attention to detail is required. Two techniques have been described:

- Direct technique
- Indirect technique

Direct Technique:

The direct technique requires a length of wire to be prefabricated to accurately fit a recent cast. Loops are not required at the ends of the wire. The adaptation of the wire is checked clinically to ensure it locates passively against all tooth surfaces to be retained. The teeth are subsequently pumiced and acid etched as for direct bonding of orthodontic attachments. The wire is then accurately located on the teeth. At this point authors differ in their approach, and many methods for locating the wire have been described. These include the use of dental floss, orthodontic elastics, wire ligatures, wires tack welded to the retainer wire localizing devices, or fingers. It is recommended that a small amount of composite be used to tack the retainer in place at each end before adding the bulk of material. The composite can be shaped with an instrument dipped in unfilled resin or alcohol to produce the desired contour.

Indirect Technique:

The use of an indirect technique has been described to simplify the clinical procedure. The wire is prepared on the model, and inlay wax placed in the sites for the composite. A silicone impression material is placed over this and allowed to set. The wax is removed with boiling water. The teeth are prepared in the usual way and the composite is placed in the voids left by the wax. The impression complete with the retainer wire and composite is then placed over the teeth and held firmly in position until the composite has set. This indirect technique can be modified by placing composite directly on the model in place of the wax allowing the composite to set, then covering this with a vacuum-formed plastic sheet for subsequent location of the retainer in the mouth. In this technique, it is an unfilled resin-bonding agent that is then used to bond the retainer to the enamel.

Why fixed retention in some cases???[5-13]

The major cause of lower incisor crowding in the late teen years, is late growth of the mandible in the normal growth pattern. Especially if the lower incisors have previously been irregular, even a small amount of differential mandibular growth between ages 16 to 20 can cause crowding of these teeth. Relapse into crowding is almost always accompanied by lingual tipping of the central and lateral incisors in response to the pattern of growth. An excellent retainer to hold these teeth in alignment is a fixed lingual bar, attached only to the canines (or to canines and first premolars) and resting against the flat lingual surface of the lower incisors above the cingulum. This prevents the incisors from moving lingually and is also reasonably effective in maintaining correction of rotations in the incisor segment. Fixed canine to canine retainers must be made from a wire heavy enough to resist distortion over the rather long space between these teeth. Usually 30 mil steel is used for this purpose, with the end of the wire sandblasted to improve retention when it is bonded to the canines.

A second indication for a fixed retainer is situation where teeth must be permanently or semi-permanently bonded together to maintain the closure of a space between them. This is encountered most commonly when diastema between maxillary central incisor has been closed. Even if a frencectomy has been carried out, there is a tendency for a small space to open up between the upper central incisors. Since this is unsightly, prolonged or permanent retention usually is needed. The best retainer for this purpose is bonded section of flexible wire. The wire should be contoured so that it lies near the cingulum to keep it out of occlusal contact. The object of the retainer is to hold the teeth together while allowing them some ability to move independently during function, hence the importance of a flexible wire.

A fixed retainer is also the best choice to maintain a space where bridge, pontic or implant eventually will be place. Using a fixed retainer for a few months reduces mobility of the teeth and often makes it easier to place the fixed bridge that will serve, among other functions, as permanent orthodontic retainer. If further periodontal therapy is needed after the teeth have been positioned, several months or even years can pass before a bridge is placed, and a fixed retainer is definitely required. Implants should be place as soon as possible after the orthodontics is completed, so that integration of the implant can occur simultaneously with the initial stages of retention. It may be better in adults to bond a fixed retainer on the facial surface of posterior teeth when spaces have been closed.

The major objection to any fixed retainer is that it makes inter-proximal hygiene procedures more difficult. It is possible to floss between teeth that have a fixed retainer in place by using floss threading device. With proper flossing, there is no reason that fixed retainers, if needed, cannot be left in place indefinitely.

Failure of bondable retainer

Failure rates reported for bonded retainers range from 10.3% to 47.0%.The failure rate amongst bonded retainers was 22.9% and the majority of failures occurred during the third year of observation (Årtun et al (1997). Zachrisson also favours bonding

to mandibular canines only but uses a 0.032" stainless steel or 0.030 gold-plated wire which is microetched at each end and claims a failure rate of only 8.4% or 4.2% of bonded sites. Oesterle et al (2001) have shown that optimum bond strength for fixed retainers is achieved with the use of a straight 0.030" stainless steel wire with no terminal bend but a microetched end Zachrisson found significantly lower failure rates with the use of 0.0215-inch Penta One multi-strand wire.

The failure rate is approximately twice as great in the maxilla as the mandible, and this is most likely because of occlusal factors. When placing maxillary retainers, care must be taken to ensure the retainer is free from occlusal trauma to reduce the likelihood of failure. The most common site of failure is at the wire/composite interface. Placements of insufficient adhesive and material loss because of abrasion are implicated in the detachment of the wire from the surface of the composite. The use of increased bulk of composites or materials of greater abrasion resistance may improve the longevity of the retainer.

Rogers and Andrews (2004) have claimed a failure rate of 0.009% for lower 3-3 retainers. They suggest using:

- Maintaining a dry field
- Polishing the lingual surfaces of the lower canines with a finishing bur (other authors have suggested sandblasting)
- Using loops rather than pads for retention (we prefer no loops and microetching)
- Covering the loops with at least 0.25 mm of composite
- Using a posterior composite filling material as a bonding adhesive
- Using 0.025" diameter wire for the retainer so that the increased flexibility makes it less likely those masticatory forces will dislodge the wire
- Contouring the composite carefully
- Only bonding to the canines

Krause Retainer

He used pads that are bonded to the cingulum of anterior teeth.

0.0195 round or 0.016x..022 rectangular braided s.s. wire is used.

Disadvantages

Difficulty in positioning accurately in the mouth.

Difficulty in maintaining oral hygiene, more chances of caries and decalcification.

If used in maxillary arch there are chances of interference with lower incisor.

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