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First Aid for Orthodontic Retainers

Abstract: The need for long-term retention to prevent post-treatment tooth movement is now widely accepted by orthodontists. This may be achieved with removable retainers or permanent bonded retainers. This article aims to provide simple guidance for the dentist on how to maintain and repair both removable and fixed retainers.

Clinical Relevance: The general dental practitioner is more likely to review patients over time and needs to be aware of the need for long-term retention and how to maintain and repair the retainers.

Dent Update 2010; 37: 627–630

Retention is one of the most important phases of orthodontic treatment as an appropriate regime is essential to maintain the teeth in their corrected aesthetic and functional relationship. Relapse is the thing all orthodontists want to avoid and has been defined as the 'return, following correction, of features of the original malocclusion'.¹

Rationale for retention

Classic studies from the University of Washington have confirmed that stability following orthodontic treatment is a myth. The need for long-term retention to prevent post-treatment tooth movement is now widely accepted by orthodontists. Orthodontic retainers, if well made and well maintained, resist the inherent tendency of teeth to return to their pre-treatment positions under the influence of periodontal, soft tissues, occlusal and post-treatment growth forces. In addition, retainers can also maintain the

position of teeth which have, by necessity, been deliberately placed in unstable positions for aesthetic or functional reasons.

Orthodontists now stress to their patients that the only road to an 'everlasting straight smile' is to be careful with the retainers provided and keep wearing them for as long as they want the guarantee of straight teeth. The responsibility is then transferred to the patient, to look after and wear his/her retainers.

It is usual practise for orthodontists to review their patients for up to a year after the end of active orthodontic treatment. Beyond this period, the responsibility for the maintenance and repair of retainers is a controversial point. If possible, the orthodontist would like to arrange for the long-term follow-up to be carried out by the patient's general dental practitioner. This paper aims to provide simple instructions on repairing the most common retainers used by orthodontic providers in the United Kingdom.

Removable retainers

Monitoring retention

It is important to establish when and for how long the removable retainer is being worn. To inform the discussion it is also helpful to obtain a written copy of the retention protocol of

the particular clinician who provided the treatment. Patients can be asked how much they are actually wearing their brace and this can be compared with the instructions they were given.

There are a number of indicators of lack of compliance with retention:²

- Appliance doesn't fit well around the teeth;
- Appliance shows little sign of wear and tear;
- Appliance as clean as when it was dispensed;
- Patient lisps markedly, for example when counting from 60-70;
- No marks on the mucosa if wearing Hawley type removable retainers;
- Frequent breakages suggest the appliance is more out than in.

Instructions to patient

There are no accepted guidelines that specify exactly which is the best retention regime for any particular case. Patients should be encouraged to wear their retainers, at least on a part-time basis, for as long as they want a guarantee that the teeth will remain straight. A common retention regime involves wearing the retainers every night for the first year after active treatment, alternate nights for the next 12 months, then at least one night a week thereafter.

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Figure 1. Hawley retainer with prosthetic lateral incisors.



Figure 2. Begg retainer.



Figure 3. Barrer retainer.

Broken appliance/appliance not fitting

Removable retainers are often easy to repair where the breakage is minor, but if more extensive damage has occurred the appliance may need replacing. If you do not have a technician on site it is best to take an impression of the arch and send both the broken retainer and the impression to an orthodontic technician. The appliance can often be repaired if it has been worn well and there is a clean break of either the acrylic or wirework. If not, all the components will have to be replaced. The design of each type of retainer is outlined below.

Hawley retainers (Figure 1)

- Adams clasps on first molars (0.7 mm SS);
- Labial bow with U-loops (0.7 mm SS);
- Heat- or cold-cured acrylic baseplate;
- Variations include a labial bow with reverse U loops/acrylated labial bow/ anterior bite plane to maintain the correction of a deep overbite;
- If the patient has hypodontia, prosthetic teeth should be used to replace the missing units: spurs (0.5 mm SS) mesial and distal to the tooth space are absolutely essential to prevent any tooth movement at all.

It is always necessary to check the retention of the Adams clasps at the review appointment. If retainers are loose they should be adjusted at both the cribs and the labial bow.

Begg/Wraparound retainers (Figure 2)

- Used as an alternative to the Hawley

retainer, particularly if a few small spaces exist in the upper arch;

- No clasps or wires cross between contact points, thus allowing slight residual space to be closed and the occlusion to 'settle' during the retention period;
- Labial bow with U-loops placed at site of extraction or canine/premolar region (0.8 mm SS). These U-loops are tightened slightly if there is residual space to close;
- A variation to the above is an acrylated labial bow extending from UR3 to UL3;
- If loose at the review appointment, Begg retainers can be tightened by adjusting the labial bow. If broken or lost, the retainers can be replaced with a new Begg retainer or, alternatively, if all the space has now closed, with vacuum-formed retainers (see below).

Barrer/Spring retainers (Figure 3)

- These are removable retainers with active spring components to re-align minor incisor crowding with or without interproximal enamel stripping to create space;
- It is more common now for the orthodontist to re-align teeth with a sectional fixed appliance and then retain as normal;
- If they are damaged it is extremely hard to adjust them satisfactorily so they should be replaced.

Vacuum/pressure formed retainers (VFRs) (Figure 4)

- These are made of thermoplastic material in the same way as mouthguards except that they are thinner and made of



Figure 4. Upper and lower VFRs.



Figure 5. VFRs reclaimed from a dog.

slightly more rigid material;

- A translucent acrylic sheet is heated and either vacuum- or pressure-formed over the working cast;
- VFRs are fast becoming the most favoured type of retainer because of their low cost, ease of fabrication, aesthetics and patient acceptability;³
- They are more effective than Hawley retainers at holding the correction of maxillary and mandibular labial segments;⁴
- They are less suitable at retaining expansion. However, modifications with a 1.0 mm wire contained within the retainer have proved successful;
- If worn, broken or even chewed by a pet (Figure 5), they need to be replaced entirely.

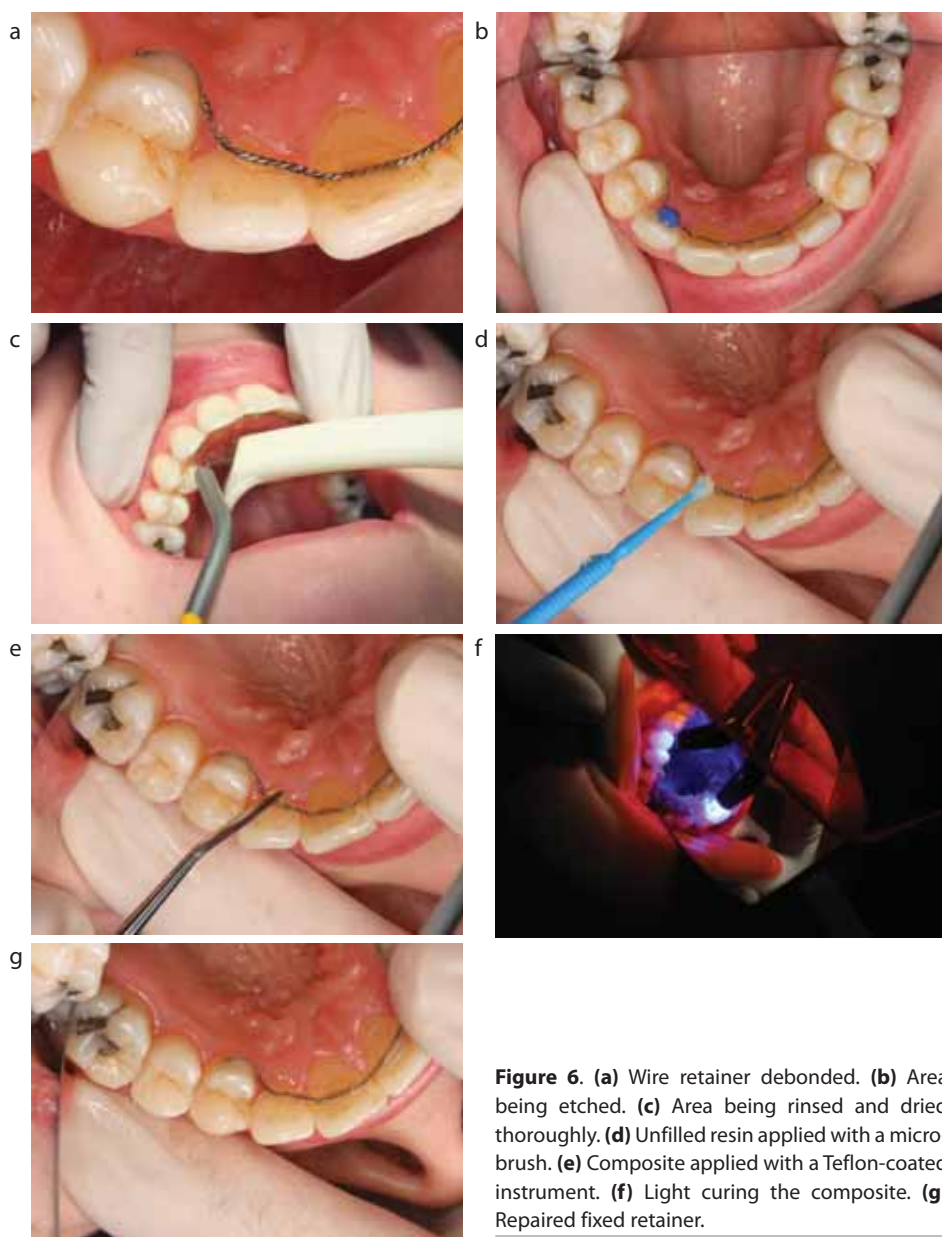


Figure 6. (a) Wire retainer debonded. (b) Area being etched. (c) Area being rinsed and dried thoroughly. (d) Unfilled resin applied with a micro-brush. (e) Composite applied with a Teflon-coated instrument. (f) Light curing the composite. (g) Repaired fixed retainer.

Fixed retainers

They are used for particularly difficult or demanding patients where even a tiny amount of tooth movement would be unacceptable. It is sometimes advisable to use fixed bonded retainers supplemented with removable retainers, in an attempt not only to provide long-term stability, but also as a fall back plan if the bonded retainer breaks. If this occurs they are instructed to place the removable retainers immediately until they can get back to see their dentist/orthodontist.

Indications for fixed retainers

Indications for fixed retainers include the following:

- Severe rotations which have been corrected;
- If significant lower incisor proclination has occurred;
- Combined periodontal/orthodontic treatment where the adequacy of support for the teeth is in doubt;
- Diastemas or closure of generalized spacing;
- Severely displaced teeth, particularly palatal canines;

- Non-surgically treated anterior open bite cases;
- Impacted teeth which have been individually extruded;
- Teeth moved from a crossbite situation where there is minimal overbite to retain the correction naturally;
- Teeth with no opposing tooth (to prevent overeruption).

Common types of fixed retainer

Common types of fixed retainer include the following:

- Rigid mandibular canine to canine (3–3) bonded retainer bar (0.30–0.32") attached to the canines only. These are good at maintaining intercanine width but less effective in preventing individual tooth rotations.

Flexible spiral wire (0.0175–0.0215") retainers are bonded to each tooth in the lower labial segment, the flexibility of the wires allowing physiological movement of the teeth.⁵ This design is very effective at preventing rotation of the bonded teeth provided the bonds remain intact. These retainers can be made directly at the chairside or indirectly from study models by the technician.

Advantages and disadvantages of bonded retainers

The main advantage of bonded retainers compared with removable retainers are that they are less visible, well tolerated by patients and require less patient compliance.⁶

Disadvantages of bonded retainers include the challenge of placing them well, the potential for teeth to move if the wire is distorted or debonded,⁷ the potential for increased plaque and calculus accumulation around the retainer⁸ and bond failures.⁹ Undetected bond failures also carry the risk of decalcification and caries of the affected teeth.

Maintenance of fixed retainers

Fixed retainers can be maintained as follows:

- Bonded retainers should be reviewed regularly and maintained or replaced where necessary. They should be checked thoroughly at least once a year to ensure



Figure 7. Diagram to illustrate the importance of a smooth ledge-free surface.

that the bonds are all intact and that there is not excessive calculus build-up around the wire. Calculus should be removed regularly. Studies have shown bonded retainers in well-maintained mouths have no significant detrimental effect to the periodontium.¹⁰

The sites of retainer failure include:

- Wire-composite interface;
- Composite-enamel interface;
- Stress fracture of the wire.

The need to use superfloss or similar oral hygiene aids should be reinforced and the patient should be advised to return if any of the bonds become loose.

Reasons for bond failure

Reasons for bond failure include the following:¹¹

- Distortion of wire during polymerization of the resin;
- Inadequate setting of the adhesive;
- Too little adhesive;
- Direct trauma to the retainer.

How to repair a bonded retainer

A bonded retainer can be repaired as shown in Figure 6 (a–g).

When the old retainer is *in situ*, attached to one or more teeth and lies passively against the other teeth:

1. Remove residual composite from the

lingual surface of the tooth and wire using a fluted tungsten carbide bur in a slow speed hand-piece. Ensure that the wire has not been distorted.

2. Etch enamel for 15–20 seconds with 35% phosphoric acid.
3. Rinse and dry thoroughly with moisture and oil-free air. An etched appearance should be seen on all teeth to be bonded.
4. Moisture control with cotton rolls and saliva ejectors.
5. Paint the etched surface with unfilled resin.
6. Any composite with high filler content can be used to bond the wire retainer to the tooth. The high filler content reduces the risk of failure due to wear of the composite.¹²

7. The composite can be applied either using Teflon-coated instruments or using a foam microbrush. The foam brush can be dipped in bonding agent and used to adapt the composite over the wire retainer on to the lingual surface of the tooth. Care should be taken not to over-dilute the composite with unfilled resin as this reduces the abrasion resistance.¹²

8. The composite should cover only the middle third of the crown and should be above and below the wire and just thick enough to cover the wire.
9. The composite can be light cured and a probe should be used to check that there is no ledge at the tooth-composite interface (Figure 7).

10. Any excess composite should be removed using a fluted tungsten carbide bur in a slow speed handpiece.

If the wire retainer has come off or is distorted beyond repair:

1. Refer to the orthodontist to replace the entire retainer as there may have been movement of the teeth, which needs to be addressed before reapplying the retainer.
2. Encourage the patient to wear his/her removable retainers in the meantime until the retainer can be repaired.

Conclusion

Retention is a very important phase of orthodontic treatment. Retention regimes invariably require good patient co-operation and, even with the most vigilant of patients, retainers need to be regularly checked, ideally by the general

dental practitioner. Patients should be informed prior to treatment about the need for life long retention if they wish to maintain the position of their teeth in their corrected position.

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