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# Orthodontic Retention: a Clinical Guide for the GDP

**Abstract:** Retention is normally required after active orthodontic tooth movement in order to maintain tooth position and minimize the effects of age-related changes to the dentition. The aim of this article is to define stability, retention and relapse with reference to the literature and to review the evidence with regards to clinical effectiveness of different types of fixed and removable retainers and wear regimens, with emphasis on systematic reviews and Randomized Controlled Trials (RCTs). Furthermore, to discuss the general dental practitioner's role and responsibility in managing patients after active orthodontic treatment.

**CPD/Clinical Relevance:** It is common practice for orthodontists to review patients for one year after active orthodontic treatment. Beyond this period, monitoring of the patient's long-term retention is often carried out in general dental practice. This paper provides an overview of orthodontic retention, including retainer types, wear regimens and a discussion of the common problems associated with retainers and advice on management.

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Orthodontic relapse can be disheartening for both patient and clinician alike; it is therefore common practice to provide retainers to maintain tooth position after active orthodontic treatment. Relapse was defined by the British Standards Institute (BSI) in 1983 as 'The return, following correction, of the original features of the malocclusion'. A more contemporary definition states that 'it is unfavourable change(s) from the final tooth position at the end of orthodontic treatment'.<sup>1</sup> This latter definition encompasses the notion of positional changes of the dentition that are seen to occur with advancing age.<sup>2</sup> Orthodontic retention can be defined as 'the

phase of orthodontic treatment following completion of the desired tooth movement, focused solely on maintaining the finished treatment result and preventing relapse'.<sup>3</sup>

Retainers can be either removable or fixed. In practice a combination of the two is often utilized. Although many variations of retainers are available, the Hawley retainer (HR) and the vacuum-formed retainer (VFR)/thermoplastic retainer are two of the most commonly used removable retainers.

This paper aims to explore the common types of fixed/removable orthodontic retainers in depth and outline some of the common problems associated with retainers that can be encountered by the GDP.

## Rationale for retention

**1. Reorganization of periodontal apparatus**  
Reitan, in 1967 and Edwards, in 1988, demonstrated that reorganization of the gingival and periodontal tissues occurs following orthodontic tooth movement.<sup>4,5</sup> This

reorganization time varies according to fibre type and can take up to a year. During this period, retainers act to resist 'physiological relapse'.

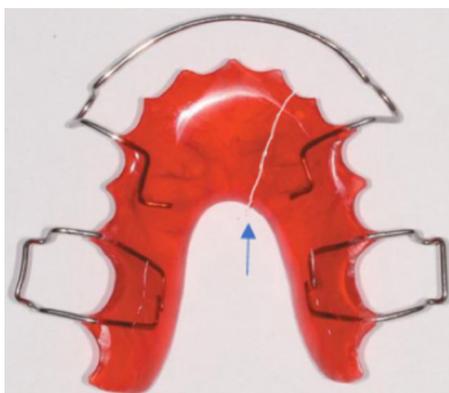
### 2. Prevention of unwanted tooth movement resulting from growth changes

Prolonged retention of the lower labial segment, until the end of facial growth, may reduce the severity of future lower incisor crowding.<sup>6</sup>

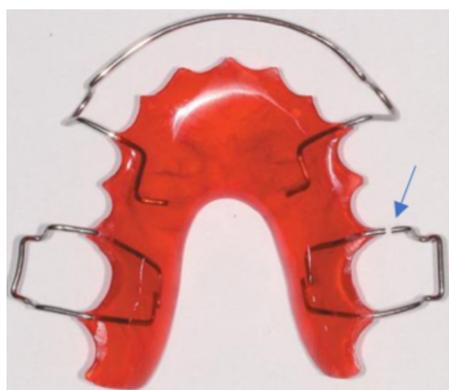
### 3. Reducing relapse tendency of teeth that have been moved to an inherently unstable position

A 'zone of equilibrium' exists when the forces derived from the periodontal and gingival tissues, the orofacial soft tissues, the occlusion and post-treatment facial growth and development are in balance.<sup>7</sup> If teeth are moved out of this zone, there will be a tendency for relapse. This is often referred to as 'true relapse'. Examples include increasing intercanine width,<sup>8</sup> significant alteration of the archform,<sup>9</sup> change in the intermolar

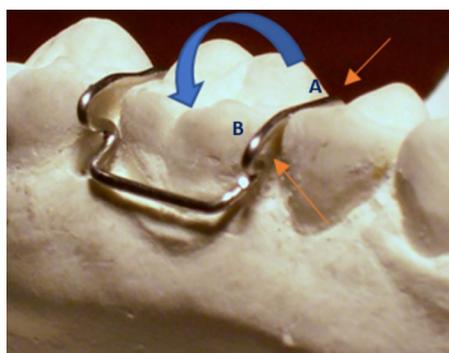
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**Figure 1.** Clean break of the acrylic baseplate. Can be repaired chairside with cold-cured acrylic. Alternatively, an impression of the arch can be sent to the lab for indirect repair.



**Figure 2.** Breakage of Adam's clasp due to cyclic fatigue. A new impression of the arch should be taken and sent to the lab for construction of a new retainer.



**Figure 3.** To tighten the Adam's clasp, hold the clasp with pliers (eg Adam's pliers) at either point A or B and bend inwards so that the arrowheads engage the undercuts.

width<sup>10</sup> and change in labio-lingual position of lower incisors.<sup>11</sup> This could be considered an iatrogenic cause of relapse since the teeth are actively placed in a position considered



**Figure 4.** An example of TwistFlex wire fabricated chairside and closely adapted to lingual surface of mandibular anterior teeth utilizing a sectional model.

to be unstable.<sup>7,12</sup> In these circumstances, indefinite retention may be required to resist relapse.

### Age-related changes

These changes are normal physiological changes but might be confused with relapse by a patient who has received earlier orthodontic treatment.<sup>12,13</sup> Some of the normal maturational changes to be expected include:

- A decrease in arch length after adolescence;
- Intermolar width increasing until age of 13 years then becoming static with some reduction in females thereafter;
- Arch length and intercanine width all increasing until 13 years then reducing, especially in females
- A small decrease in overjet and overbite.

### Common types of removable retainers

A variety of removable retainers are available. Table 1 summarizes the common removable retainers, including typical design features. The most frequently utilized removable retainers are Hawley and thermoplastic vacuum-formed retainers (VFRs).

### Broken/ill-fitting removable retainers

Removable acrylic retainers are often easy to repair where the breakage is minor/there is a clean break of the acrylic. It is good practice to take an impression of the arch with the retainer *in situ* and send this to the laboratory for repair (Figure 1).

If there is a break in the wirework, good practice requires remake

of the retainer, as soldering the wirework will only be a short-term temporary solution (Figure 2). Retention of the appliance should always be checked on review and clasps, if poorly retentive, can be tightened easily, as shown in Figure 3. Replacement is required for broken VFRs.

### Fixed retainers

Treatment of certain malocclusions are particularly prone to relapse. These are detailed in Table 2. In these cases, fixed retainers are often utilized. Table 3 summarizes the advantages and disadvantages of fixed retainers.

In some cases, fixed retainers can be combined with removable retainers, so called 'dual retention'. The rationale for dual retention is to allow for breakage in the fixed retainer, which can go unnoticed by the patient; in addition this maintains posterior alignment.

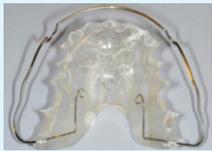
In the lower arch, fixed retainers are usually placed on the six lower anterior teeth and, in the upper arch, they often span all four incisors.

In some cases, modifications might be indicated, for example extension to the lower premolars occlusally, where the canines are severely rotated before treatment or there was space/step between the premolar and canine. Upper fixed retainers can be extended to canines in cases of alignment of significantly palatal displaced canines to account for their tendency to relapse.

### Fabrication and placement of fixed retainers

Fixed retainers can either be made directly at the chairside by bending a suitable stainless steel wire to fit the relevant lingual/palatal surfaces, or in the laboratory utilizing a model created from an impression of the anterior teeth (Figure 4). To fit a bonded retainer, the tooth surface should be thoroughly cleaned. A dry field is maintained after etching, and the wire should be held passively in position while using a flowable composite resin as the adhesive. It is essential that bonded retainers are passive when fitted and there should be no spaces between the wire and tooth surface. The retainer can then be held and secured with dental floss, elastic bands or an occlusal jig, against the lingual/palatal surface of teeth and flowable composite

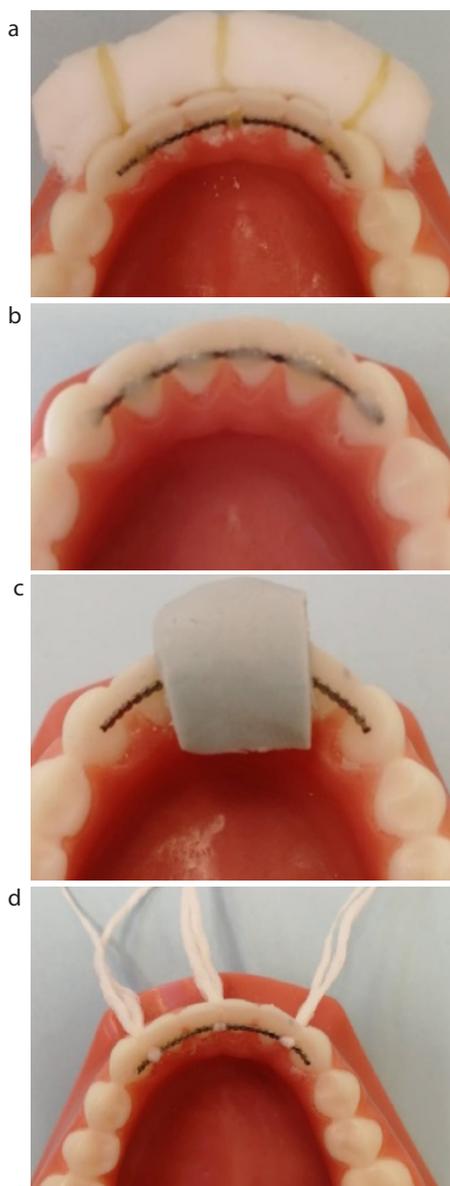
| Retainer  | Design Features  | Advantages   | Disadvantages  |
|---|--|--|--|
| <p>Hawley</p>                            | <p>Labial bow UR3–UL3 or LR3–LL3, 0.7 mm.<br/>           Adam's cribs upper 6s or lower 6s, 0.7 mm.<br/>           Palatal baseplate (full coverage or horseshoe design).<br/>           Variations:<br/>           – reverse 'U' loop labial bow, which provides better control of the canines<br/>           – labial bow soldered to the Adam's Cribs, which means there are fewer wires to interfere with the occlusion<br/>           – acrylated labial bow, which helps prevent relapse of corrected rotations<br/>           – the addition of anterior bite planes to control the reduction of a deep overbite<br/>           – Hawley retainers can also be used in the lower arch</p> | <ul style="list-style-type: none"> <li>■ Facilitates posterior occlusal settling</li> <li>■ A bite plane can also be incorporated to maintain overbite reduction</li> <li>■ Pontics can be added to temporarily replace a missing tooth</li> <li>■ Can be activated to close residual spaces</li> <li>■ Maintain lateral expansion due to rigidity</li> </ul>                  | <ul style="list-style-type: none"> <li>■ Compromised aesthetics due to the labial bow</li> <li>■ May cause initial speech interferences due to the palatal coverage. However, this can be minimized by opting for 'horse shoe' design</li> </ul>   |
| <p>Thermoplastic VFR 'Essix'</p>       | <p>Fabricated from a variety of thicknesses of polyvinylchloride sheets by heating to 475 degree and vacuum pressure of 1.5b for 50 second.<br/>           Full coverage of all teeth generally extending to halfway across the terminal tooth. The most posterior tooth must be at least half covered to prevent overeruption</p>   | <p>Aesthetic appliance</p> <ul style="list-style-type: none"> <li>■ Easy to construct and use</li> <li>■ Cheap</li> <li>■ Pontic can be added to replace a missing tooth temporarily</li> <li>■ They provide good aesthetics and better control of incisor alignment than Hawley type retainers</li> <li>■ Wire can be added on the palatal side in expansion cases</li> </ul> | <ul style="list-style-type: none"> <li>■ Less effective in retaining expansion cases unless it is supported by thick wire</li> <li>■ Ineffective in retaining intrusion or extrusion movement</li> <li>■ Less settling of the occlusion is possible</li> <li>■ If a partial VFR is used, the patient may develop an open bite due to overeruption of teeth</li> <li>■ Increase the risk of decalcification in the presence of a cariogenic diet as the retainer may act as a reservoir.</li> </ul> |
| <p>Modified Barrer</p>                 | <p>Acrylated labial bow 0.7 mm<br/>           Acrylated lingual bow 0.7 mm<br/>           Adam's cribs UR6 and UL6 or LR6 and LL6 0.7 mm</p>   | <ul style="list-style-type: none"> <li>■ Allows minor corrections of lower labial segment</li> <li>■ Useful in cases where minor lower incisor relapse has already occurred and can be used to restore alignment whilst continuing retention</li> <li>■ Very rapid alignment in co-operative patients</li> </ul>   | <ul style="list-style-type: none"> <li>■ Risk of inhalation with the original Barrer (only extends to lower canines)</li> <li>■ Owing to the potential for dislodging, swallowing or aspirating the appliance, the design has been modified to include acrylic flanges posteriorly, to improve retention</li> <li>■ Interproximal stripping may be required prior to fitting the appliance to create sufficient space for alignment of the displaced incisors</li> </ul>                           |
| <p>Positioners 'active' retainers</p>  | <p>Elastomeric or rubber removable retainers<br/>           Pre-formed or custom-made (custom-made positioners are made on articulated models in which the teeth have been sectioned and re-aligned to achieve the desired result)</p>   | <ul style="list-style-type: none"> <li>■ Provide further minor correction following deboned and thus 'guide' the settling of the occlusion</li> <li>■ They may also be useful in instances when the desired finish was not achieved or the case had to be discontinued early.</li> </ul>   | <ul style="list-style-type: none"> <li>■ Expensive</li> <li>■ For finishing stages of the treatment</li> <li>■ Will need to be replaced by other forms of retainers after achieving final teeth alignment</li> <li>■ Poor at maintaining rotational control and overbite</li> <li>■ Lack of patient compliance and acceptance</li> </ul>   |

| Retainer  | Design Features   | Advantages   | Disadvantages   |
|---|---|--|---|
| Begg 'wraparound' retainer<br>   | Begg wire extending from UR6–UL6 or LR6–LL6, 0.8 mm<br>U loops at site of extraction or premolar region<br>Palatal baseplate in the case of upper Begg retainer | <ul style="list-style-type: none"> <li>■ It has no clasps and therefore there are no wires crossing the occlusion which is therefore free to settle the occlusion during the retention period</li> <li>■ A bite plane can also be incorporated to maintain overbite reduction</li> <li>■ Acrylic tooth can be added to temporarily replace a missing tooth</li> <li>■ Can be activated to close residual spaces</li> <li>■ Maintain lateral expansion</li> </ul> | <ul style="list-style-type: none"> <li>■ Less aesthetic due to the labial bow</li> <li>■ May cause speech interference due to the palatal coverage</li> <li>■ Less retentive than Hawley</li> </ul>   |
| Hawlix 'aesthetic' retainer<br> | Clear VFR UR3–UL3 or LR3–LL3<br>Ball end clasps between 6s and 7s<br>0.7 mm<br>Palatal baseplate in the case of upper Hawlix                                    | <ul style="list-style-type: none"> <li>■ Combines the anterior aesthetic advantage of the VFR and the palatal acrylic of the Hawley retainer</li> <li>■ It is particularly useful following treatment in cleft lip and palate patients in order to improve the aesthetics of anterior maxillary dento-alveolar cleft defects</li> </ul>  | <ul style="list-style-type: none"> <li>■ Could contribute to occlusal disruption, such as the creation of anterior open bites or reduced overbites, attributable to the retainer having occlusal coverage only in the anterior portion</li> </ul> |
| Damon 'splint'<br>             | Made from one of the following:<br>hard pressure-formed, dual hardness/soft liner, and elastic silicone upper and lower splints joined together with acrylic    | <ul style="list-style-type: none"> <li>■ Holds teeth and arches in corrected position</li> <li>■ Retentive splint for Class II, Class III, bilateral crossbite treatment and orthognathic cases</li> <li>■ Assists in tongue training</li> </ul>   | <ul style="list-style-type: none"> <li>■ Can only be worn at night-time</li> <li>■ Less widely used as very limited clinical indications</li> </ul>   |

**Table 1.** Different types of removable retainers showing the most common design features. All the wires described above are made from stainless steel.

|  |
|--|
| ■ Severe rotations which have been corrected   |
| ■ If lower incisors have been proclined by >2 mm   |
| ■ Teeth moved out of the zone of equilibrium   |
| ■ 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 with incisor extrusion   |
| ■ Impacted teeth which have been individually extruded and aligned   |
| ■ Corrected anterior crossbites where there is minimal overbite to retain the correction naturally                                   |
| ■ Teeth with no opposing tooth (to prevent overeruption)   |
| ■ Cleft Lip/Palate patients. In these cases bonded retainer is combined with removable appliance to maintain transverse relationship |
| ■ Extraction space closure in adults   |
| ■ Alteration in intercanine width  |

**Table 2.** Clinical scenarios in which one may wish to consider fixed retainers.



**Figure 5.** Different methods of securing the wire before bonding. **(a)** Threading the retainer through elastics and cotton roll on labial side. **(b)** The retainer was bonded without utilizing any auxiliary methods. **(c)** Using a transfer jig and **(d)** securing the retainer with dental floss through contact points.

added and light cured (Figure 5). Any activation of the retainer wire during bonding can cause unwanted tooth movement.<sup>15</sup>

## Classification

### 1. Banded retainers

Bands placed on the lower premolars with a

| Advantages  | Disadvantages   |
|---|---|
| Easy and well tolerated by the patient  | Their placement is time-consuming   |
| Unlikely to compromise on aesthetics  | Technique-sensitive   |
| Unlikely to interfere with speech   | Interference with the occlusion, especially in cases with increased overbite  |
| Less compliance dependent than removable retainers  | Gingival/periodontal disease and caries may develop due to plaque accumulation  |
| It may reduce the risk of development of late lower labial segment crowding                             | May prevent settling of the occlusion   |
| Allow some physiological movement of the teeth  | Do not retain transverse expansion  |
| Retain derotations well   | High failure rates 23% <sup>14</sup>  |
| Can be fabricated indirectly in the lab therefore reducing chairside time and complexity of fabrication | Fixed retainers can fail without the patient realizing – this may result in unwanted tooth movement                         |
| No evidence of increased periodontal or enamel damage   | A back-up removable retainer should also be supplied to the patient to preserve tooth position if the fixed retainer fails. |

**Table 3.** Advantages and disadvantages of fixed retainers.



**Figure 6.** An example of banded retainer that extends from first premolars used historically to maintain the inter-premolar and intercanine widths.

connecting soldered, heavy archwire (0.030"), closely adapted to the lower labial segment above the cingulum of lower anterior teeth (Figure 6). This type of retainer is now rarely used.

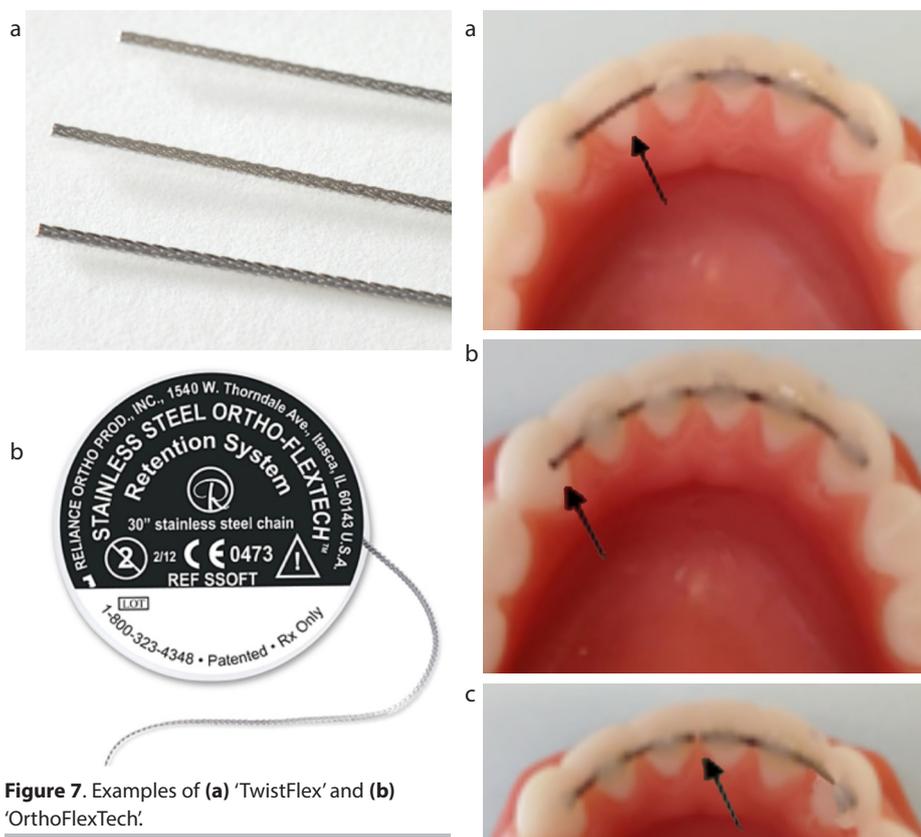
### 2. Bonded retainers

Numerous wire materials have been proposed

but the multi-stranded wire, introduced by Björn Zachrisson in 1982<sup>16</sup> is now the gold standard.<sup>17</sup>

Flexible retainers bond on the lingual/palatal surface of each individual tooth and allow physiological tooth movement. The materials used are:

- 'TwistFlex' (Figure 7a): Multi-stranded wire is round in cross-section and formed from strands that are twisted, made from 0.015", 0.0175", 0.0195" or even 0.0215" stainless steel strands.
- Round, sandblasted stainless steel wire, 0.030"–0.032" in diameter.
- 'OrthoFlexTech' (Figure 7b) braided chain made from stainless steel (often for direct placement).
- Reinforced fibres (often for direct placement). The fibreglass strips are soaked in composite and bonded to prepared enamel surface. This technique has the advantage of reducing the bulk of the retainer. However, these retainers tend to



**Figure 7.** Examples of (a) 'TwistFlex' and (b) 'OrthoFlexTech'.

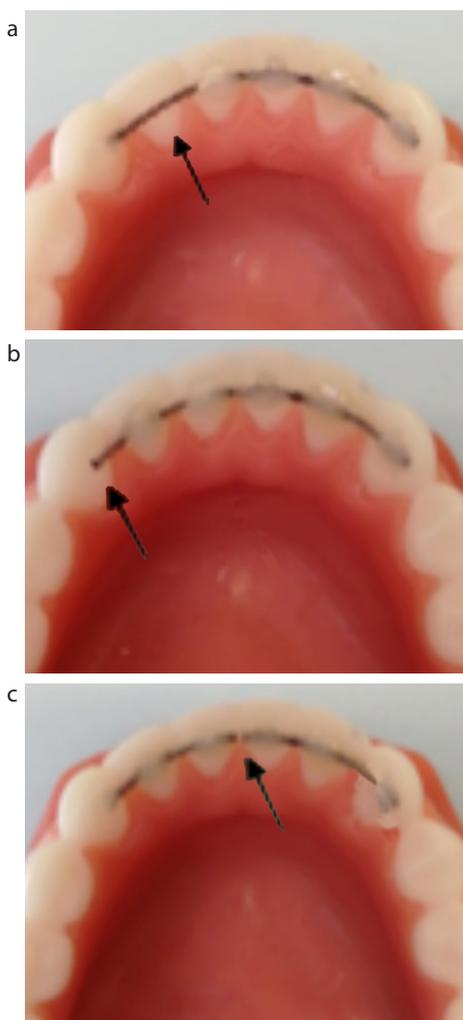
fracture more frequently.

Rigid retainers (bonded on canines only, touching but not bonded to lower incisors) are made from 0.30"–0.32" SS bar. Bearn considered the following to be indications for placement of a bonded canine to canine retainer:<sup>17</sup>

- Severe pre-treatment lower incisor crowding or rotation;
- Planned alteration in the lower intercanine width;
- After proclination of the lower incisors during active treatment;
- After non-extraction treatment in mildly crowded cases;
- After correction of deep overbite.

Multi-stranded wires are a popular choice and some advantages include:

1. The irregular surface offers increased mechanical retention for the composite without the need for the placement of retentive loops;
2. The flexibility of the wire allows physiologic movement of the teeth, even when several adjacent teeth are bonded;<sup>17</sup>
3. Less failure rate than round wire because of the flexibility. Al-Nimri *et al*, however, found



**Figure 8.** Examples of common problems with bonded retainers. (a) Retainer debonded at one of the incisors. (b) If a terminal tooth had debonded, then bonding the tooth again can be done by simply preparing the surface as usual. (c) A fractured retainer needing to be replaced with a new one following the usual bonding protocol.

no difference between multistrand or round wire except more plaque accumulation with the former.<sup>18</sup>

### Bonded retainers: monitoring and managing problems

Fixed retainers should be reviewed periodically and maintained or repaired where necessary. They should be checked thoroughly at least annually to ensure that the composite and wire components are intact, with no distortions, and that there is no excessive

calculus build-up around the retainer. Any calculus build-up should be removed and the need to use Waterpiks, Superfloss, TePe brushes or similar oral hygiene aids should be reinforced regularly.

The sites of retainer failure

include:

- Wire-composite interface;
- Composite-enamel interface;
- Wire fracture.

If the composite is lost completely from one tooth, then simply cleaning the tooth and replacing the lost composites will suffice. If the composite is difficult to remove completely from the wire, then the retainer may need to be replaced. A fractured retainer will require removal and replacement following the usual bonding protocol (Figure 8).

Patients should be advised to return as a matter of urgency if their bonded retainer/s become loose or break. In addition, if comfortable, they should be advised to wear their removable retainer on a full-time basis until they are assessed. This will help maintain tooth position. Full-time wear refers to wearing the retainers all the time except for eating and cleaning.

### Effectiveness of different retainer types and wear regimens

Several published studies have attempted to compare the different types of retainers in terms of clinical effectiveness. Table 4 summarizes the latest systematic reviews on this topic.

There is no universal removable retainer wear regimen. Proponents exist for both full- and part-time wear. Full-time wear regimens often reduce to part-time and some examples include:

- Full-time wear for three months followed by night-only for three months;<sup>19</sup>
- Full-time wear for one week followed by night-only for six months;<sup>19</sup>
- Full-time wear for six months;<sup>20</sup>
- Full-time wear for three months gradually reducing to one or two nights a week.<sup>21</sup>

Some examples of part-time wear regimens include:

- Night-only for six months;<sup>20</sup> and
- Reducing from 10 hours daily in the first six months to one or two nights weekly.<sup>21</sup>

### Cost-effectiveness

One of the important factors to consider when

| Study/Design   | Type of Trials    | Retainers  | Clinical Parameters   | Wear Regimens   | Conclusion  |
|--|-------------------|--|---|---|---|
| Kaklamanos <i>et al</i> <sup>22</sup><br>Systematic review                   | 3RCTs             | VFR  | <ul style="list-style-type: none"> <li>■ Little's Irregularity Index</li> <li>■ Intermolar and intercanine widths</li> <li>■ Arch length</li> <li>■ Overjet</li> <li>■ PAR score</li> </ul>                           | <ul style="list-style-type: none"> <li>■ VFR: full-time vs part-time</li> </ul>   | <ul style="list-style-type: none"> <li>■ 'Full-time VFR wear is not superior to part-time'</li> </ul>   |
| Littlewood <i>et al</i> <sup>23</sup><br>Cochrane review                     | 15 RCTs           | <ul style="list-style-type: none"> <li>■ VFR v multistrand fixed retainer</li> <li>■ Polyethylene ribbon fixed v multistrand</li> </ul>  | <ul style="list-style-type: none"> <li>■ Little's Irregularity Index</li> <li>■ Failure of retainers</li> </ul>   | <ul style="list-style-type: none"> <li>■ VFR: full-time vs part-time</li> <li>■ Hawley: full-time vs part-time</li> </ul> | <ul style="list-style-type: none"> <li>■ Slightly poorer stability in the lower arch with VFR</li> <li>■ No evidence of difference</li> <li>■ 'There is insufficient high quality evidence to make recommendations on retention procedures'</li> <li>■ 'No evidence that wearing thermoplastic retainers full-time provides greater stability than wearing them part-time'</li> </ul> |
| Al-Moghrabi <i>et al</i> <sup>24</sup><br>Systematic review                  | 18 RCTs<br>6 CCTs | <ul style="list-style-type: none"> <li>■ Multistrand fixed retainer</li> <li>■ Round SS</li> <li>■ VFR</li> <li>■ Pre-fabricated positioners</li> <li>■ Fibre-reinforced resin composite fixed retainer</li> <li>■ Glass fibre reinforced retainer</li> <li>■ Hawley</li> <li>■ VFR</li> </ul> | <ul style="list-style-type: none"> <li>■ Effect on periodontal health</li> <li>■ Risk of failure</li> <li>■ Patient-reported outcomes</li> <li>■ Cost-effectiveness</li> </ul>  | <ul style="list-style-type: none"> <li>■ VFR: full-time vs part-time</li> <li>■ Hawley: full-time vs part-time</li> </ul> | <ul style="list-style-type: none"> <li>■ There is a lack of high-quality evidence to endorse the use of one type of orthodontic retainer'</li> </ul>  |
| Mai <i>et al</i> <sup>25</sup><br>Systematic review                          | 5 RCTs<br>2 CCTs  | VFR vs Hawley  | <ul style="list-style-type: none"> <li>■ Intercanine width</li> <li>■ Intermolar width</li> <li>■ Occlusal contacts</li> <li>■ Cost-effectiveness</li> <li>■ Patient satisfaction</li> <li>■ Survival time</li> </ul> | <ul style="list-style-type: none"> <li>■ Hawley: full-time vs part-time</li> <li>■ VFR: full-time vs part-time</li> </ul> | <ul style="list-style-type: none"> <li>■ 'Some evidence suggested that there are no differences with respect to changes in intercanine and intermolar widths between HRs and VFRs after orthodontic retention'</li> </ul>   |
| Littlewood <i>et al</i> <sup>26</sup><br>Systematic review and meta-analysis | 2 RCTs<br>3 CCTs  | <ul style="list-style-type: none"> <li>■ Thick spiral 0.032" fixed multistrand</li> <li>■ Thick plain 0.032" fixed multistrand</li> <li>■ Polyethylene ribbon re-inforced resin composite</li> <li>■ Hawley</li> <li>■ VFR</li> </ul>  | <ul style="list-style-type: none"> <li>■ Little's Irregularity Index</li> <li>■ Survival of retainers</li> </ul>  | <ul style="list-style-type: none"> <li>■ Hawley: full-time vs part-time</li> <li>■ VFR: full-time vs part-time</li> </ul> | <ul style="list-style-type: none"> <li>■ 'There is currently insufficient evidence on which to base the clinical practice of orthodontic retention'</li> <li>■ 'There was also weak, unreliable evidence that teeth settle quicker with a Hawley retainer than with a VFR after 3 months'</li> </ul>  |

**Table 4.** Clinical effectiveness of different types of fixed and removable retainers and wear regimens from systematic and Cochrane reviews. RCT: Randomized Controlled Trial; CCT: Controlled Clinical Trial; PAR: Peer Assessment Rating index.

selecting and prescribing an orthodontic retainer is cost-effectiveness. Regarding the most widely used retainers in the UK, VFRs were found to be more cost-effective than Hawley.<sup>27</sup> This was not only from the perspective of the patient (mean difference in cost per patient: £4) but particularly the NHS (mean difference in cost per patient to the NHS: £31) and the orthodontic practice (mean difference in cost per patient to the practice: £32).<sup>27</sup>

Regarding the long-term burden of care, the British Orthodontic Society (BOS) accepts that asking patients to wear retainers indefinitely adds to the 'burden of care'. The patients, however, have to be responsible for wearing and looking after the retainer, as well as getting it checked, repaired and replaced, which may have financial costs. It is therefore essential that this is discussed as part of the process of informed consent at the commencement of treatment and again on placement of the retainers.

## Discussion

Orthodontic retention is essential to prevent unwanted tooth movement. To this end the BOS launched the 'Hold that Smile' campaign in September 2017.<sup>28</sup> The campaign has three main elements, a Twitter campaign, two short YouTube information videos produced by the BOS and news articles published on the BOS website. The videos comprise a 'Hold that Smile' animation and a captioned short film which communicate the benefits of using retainers. These are now available for orthodontic and dental clinics to share with their patients:

BOS Retention Campaign – Hold that Smile; <https://www.youtube.com/watch?v=P5FxoThkHMg>, 2125 views as at 27 June 2018 Hold that Smile – Why are retainers so important? <https://www.youtube.com/watch?v=5wC1FjIStzc>, 1900 views as at 27 June 2018.

The *British Dental Journal* recently published an article exploring the BOS initiative on 'Hold that Smile' campaign from a GDP's perspective.<sup>29</sup> We advise the readers to refer to this article to explore in more depth the role and responsibility of the GDP in post orthodontic retention. A response from BOS discussed in more detail the scientific background that supports the 'Hold that Smile' campaign.<sup>30</sup>

### Patient commitment to retainer wear

Currently there are no accepted guidelines that specify a gold standard/universally accepted retention regimen. However, the BOS encourages patients to adhere to life-long orthodontic retention in order to maintain tooth alignment. It is generally accepted that patients should be encouraged to wear retainers, at least on a part-time basis, for as long as they want the teeth to remain well aligned. Retainer wear is the patient's responsibility and this should be emphasized. Furthermore, long-term maintenance and repair of the retainers should be sought and the patient should be made aware of this commitment prior to starting treatment.

### Role of the GDP

General dental practitioners are integral to the management of the orthodontic patient. Johnston and Littlewood suggested the following notes for the GDPs in relation to retention:<sup>31</sup>

- Informing potential orthodontic patients before referral to a specialist that wearing retainers after orthodontics is an essential part of orthodontic treatment.
- Reinforcing the need for patients to wear their retainers as advised and instruction on how to look after them.
- At dental 'check-up' appointments, ensuring that patients are adhering to their retention regimens as set by the treating orthodontist.
- Adjustment, repair or replacement of removable retainers and ensuring that they still fit well. (Responsibility for the replacement or repair may depend on whether the patient remains under the care of the orthodontist who completed the treatment).
- For patients with bonded orthodontic retainers, checking that retainers are still intact, bonded and that the patient is maintaining good oral hygiene around them. Fractured or de-bonded retainers should be repaired (with appropriate advice/referral if required).

If at any stage the GDP feels that managing a particular situation is out of his/her personal scope of expertise, then a referral to an appropriately qualified colleague should be made with the information that this care may only be provided on a private basis.

## Conclusions

Current practice dictates that the responsibilities of maintaining retainers and regular reviews are shared between the

patient, the orthodontist and general dental practitioner. Close co-operation between all the parties involved is required. Retention is a complex issue and relapse is multifactorial in nature. Retention regimens invariably require considerable patient co-operation, which is usually forthcoming if the patient is fully informed, both before treatment and on placement of the retainers, and understands the planned regimen as well as the need for it.

### Compliance with Ethical Standards

Conflict of Interest: The authors declare that they have no conflict of interest.

Informed Consent: Informed consent was obtained from all individual participants included in the article.

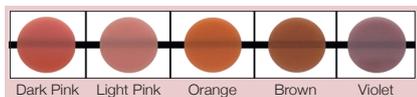
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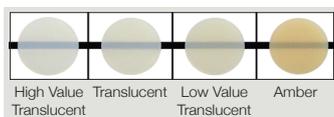
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