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Removable retainers in Orthodontics

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Abstract---One of the most challenging phase for an orthodontist is to retain the corrections achieved during the course of orthodontic treatment. Retainers are passive orthodontic appliances that help in maintaining and stabilizing the position of teeth long enough to permit reorganization of supporting structures after the active phase of orthodontic therapy. This article provides a comprehensive review about the various types of orthodontic retainers available today.

Keywords---retainers, orthodontics, therapy.

Introduction

“It’s not over until it’s over” and this dictum holds completely true for an orthodontic treatment. Even after completing an orthodontic treatment successfully, the daunting task of keeping the teeth in their rightful position persists. The onus of this responsibility lies on both the orthodontist and the patient. On the one hand, it is the job the orthodontist to provide with well-fitting, comfortable retainers with proper instructions and motivation for the patient to wear it regularly. On the other hand, the patient is incumbent to wear the retainer as directed by the orthodontist. But, easy said than done, the retention stage remains the most difficult part of the orthodontic treatment. Many reputed personalities in orthodontics like Angle, Case, Tweed, and Hawley have highlighted the concerns in retention and attributed it to professional negligence¹. Such is the problem of retention that once Tweed and his orthodontist friend said that “I would gladly pay someone half my fee if he relieves me of the responsibility of successfully carrying my patients through their retention periods.”²

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Retention can involve appliances that are removable, fixed or both. Removable retainers are effective when worn on a part-time basis (8–12 hours/day).^{3,4,5} Owing to the predisposition to relapse as well as post-treatment and age-related changes,⁶ long-term use is advisable. As such, retainer wear could be considered an essential part of an orthodontically treated patient's regular dental behaviour, in addition to brushing, flossing and attending for regular dental check-ups.^{7,8,9} If teeth are not maintained in its new position it tends to “relapse”. The major causes of relapse after orthodontic treatment include are:

- Elasticity of gingival fibers
- Cheek/lip/tongue pressures,
- Jaw growth.
- Gingival fibers and soft tissue pressures are especially potent in the first few months after treatment ends, before PDL reorganization has been completed.
- Unfavourable growth is the major contributor to changes in occlusal relationships.¹⁰

History of removable retainers

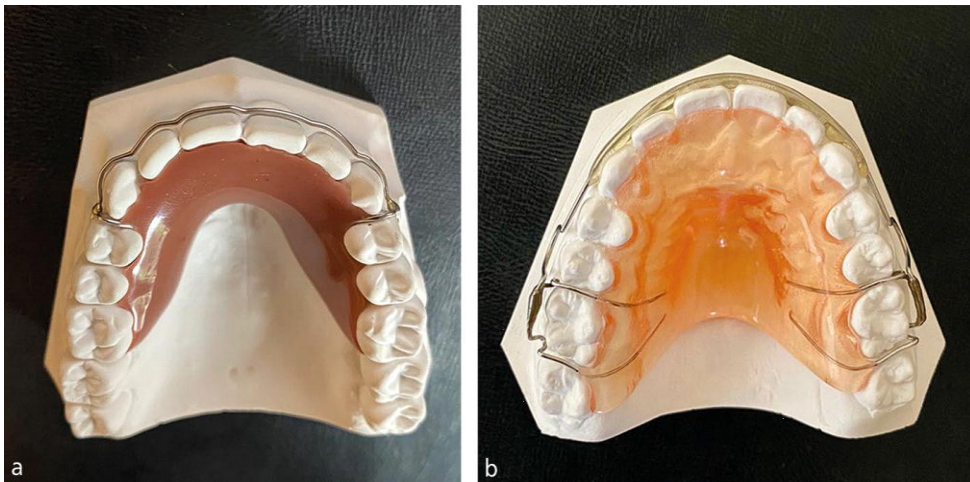


Fig 1. a) Original design of Hawley retainer. Note fitted labial bow.
b) Contemporary Hawley

In 1919, removable retainers were introduced by Hawley.¹¹ (fig.1). In the late nineteenth century, dentists recognised the need for post-orthodontic retention. The most popular retainer that is still in use from this era is the Hawley retainer (Fig. 1a),¹¹ originally comprising a vulcanite palate and precious metal labial bow. Thereafter, in an attempt to improve the quality of result and close residual band spaces, a removable tooth positioner was described in the 1940s.¹² Vacuum-formed plastics were described in 1964,¹³ but the original materials were prone to cracks and fracture. The introduction of ‘Essix’ materials in the 1990s heralded material properties that increased the effectiveness of clear plastic retainers.¹⁴

Factors which may modify the retention protocol

- Corrected rotations of anterior teeth.15
- Lower incisor alignment.16
- Changes in the antero-posterior lower incisor position.17
- Correction of deep overbite.17
- Patients with a history of periodontal disease or root resorption.17
- Correction of anterior open bites.17
- Growth modification treatment.18
- Correction of posterior and anterior crossbites.21
- Adult Patients.19
- Spaced dentitions.20

Graber's criteria for ideal retainer

- Should retain all teeth that have been moved into desired positions.
- Should permit normal functional forces to act freely on the dentition.
- Should be self cleansing.
- Should permit oral hygiene maintenance.
- Should be strong enough to bear the rigors of day to day usage.

Removable retainers

Are the most common retainers because they are patient friendly and can be removed and reinserted by the patient.

Removable retainers :	• Hawley's retainer
	• Begg's wraparound retainer
	• Barrer/Spring retainers
	• Thermoplastic vacuum-formed retainers
	• Essix retainers

Hawley's retainer

This retainer was designed in 1920 by Charles Hawley. It is by far the most frequently used retainer till date. It consists of clasps on molars and a short labial bow extending from canine to canine having adjustment loops.²²

Begg's retainer

Consists of a labial wire that extends till the last erupted molar and curves around it to get embedded in acrylic that spans the palate. Advantage: There is no

cross over wire that extends between the canine and premolar thereby eliminating the risk of space opening.²³

Clip – on retainer / spring aligner

This appliance is made of a wire frame work that runs labially over the incisors and then passes b/w the canine and premolar and is reserved to lie over the lingual surface. Both the labial as well as lingual segments are embedded in a strip of clear acrylic. It brings about corrections of rotations commonly seen in lower anterior region.²⁴

Wrap around retainer

It is a type of spring aligner. It consists of wire that passes along the labial as well as lingual surfaces of all erupted teeth which is embedded in a strip of acrylic. It helps in stabilizing a periodontally weak dentition.²⁴

Kesling tooth positioner

It is made of thermoplastic rubber like material that spans the inter – occlusal space and covers the clinical crowns of the upper and lower teeth and a small portion of the gingiva. It needs no activation at regular intervals and is durable.²⁵
Drawbacks: - This retainer can cause difficulty in speech and risk of TMJ problems.

Invisible retainers

It fully cover the clinical crowns and a part of the gingival tissue. It is made of ultra thin transparent thermoplastic sheets using a Biostar machine. It is esthetic and highly popular due to its invisible form.²⁶ (fig.2)

Crozat retainer

A 4-4 Crozat appliance has cribs on the first bicuspids, recurved double lapping lingual finger springs and a labial bow. Advantages of this retainer are, firm retention, labiolingual control of anterior teeth, flexible, maintenance of adequate oral hygiene, because it is removable and esthetic. The major disadvantages of the appliance are: It is cost effective and it is breakable.²⁷

Vander linden retainer

The Vander linden retainer is constructed to offer complete control over the maxillary anterior teeth, with firm fixation provided by clasps on the canines. This retainer does not usually interfere with the occlusion.²⁸

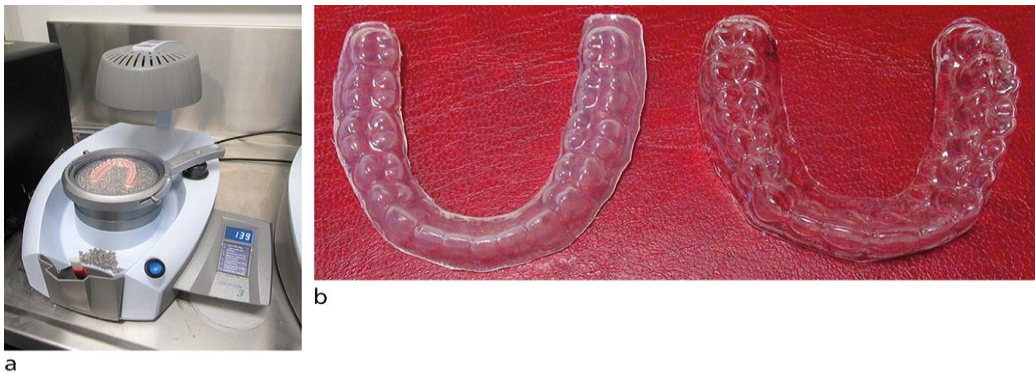


Fig 2. a) Manufacturing of clear plastic retainer in vacuum-thermoforming unit. b) Polypropylene lower (left) and PET-G upper (right) clear plastic retainers (untrimmed)

Advantages of removable appliance

- Effective for simple malocclusions.
- Smaller anchorage requirement.
- Uncompromised oral hygiene.
- Short chair side time.
- Ease of adjustment.
- Less professional training for management.

Disadvantages of removable appliances

- Dependant on patient compliance
- Difficulty in speech
- Prone to breakage and loss

Retainer wears and care instructions

- Wear the retainer(s) at least 8–12 hours every day. If it is easier, this can be at evenings and night-time, including when you sleep. Check the retainer fits closely around or over your teeth
- Your speech will sound different but should improve as you get used to the retainer
- Remove your retainer(s) using the tips of your fingernails, pulling down from the metal arms or plastic on both sides towards the back. Never pull the retainer out from the front
- Store the retainer in a strong container, away from heat and sunlight, when you are not using it.
- Clean the fitting surface daily with a toothbrush and cold tap water, over a sink or bowl of water.
- If your retainer does not fit, is broken or lost, contact your dentist or orthodontist straight away for advice.

Retention protocol

Unfortunately, there is no universal consensus on the type of retention protocol to be followed or the retention appliance to be used. Authors have cited a retention period ranging from a duration of 2–3 weeks till life-long retention.²⁹ Cochrane review published in 2016 has reported insufficient high-quality evidence to favor a particular retention appliance or a retention protocol. Hence, the choice of retention protocol and appliance preference is largely determined by the orthodontist's experience, patient's expectations, and clinical circumstances.³⁰ In most of the clinical scenarios, the patients are reviewed for a year after the end of active orthodontic treatment. However, the idea of providing indefinite retention and taking an informed consent from the patient before beginning the treatment about the possibility of relapse on not wearing/maintaining retainers is gaining widespread acceptance.³⁰

Conclusion

Braces are temporary, but retention is forever. This notion should be explained to the patient clearly before commencing the orthodontic treatment if they wish to maintain their beautiful smile. We as an orthodontist should begin with the end in mind. The type of retainer, the technique of fabrication, different material to bond, and retention protocol should be carefully considered at the beginning of orthodontic treatment. This will ensure an excellent long-term stability and retention for the treatment. Irrespective of the appliance, the patients should be prepared for indefinite retention following orthodontic treatment. Removable retainers are normally worn part-time and should be comfortable, well fitting, routinely reviewed and replaced as required.

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