ECRONICON OPEN ACCESS

EC DENTAL SCIENCE
Review Article

Orthodontics Retainers

Nabeel Hussein Almarzooq[1]*, Shaza Jamil Ashqar[2], Jassem Abdullah Al Mubarak[2], Sarah Hassan Almobarak[2], Abeer Habib Al-Mousa[2], Mawia Abdulaziz Alhazmi[3], Ahdab Alizain A Alahdal[3], Samirah Hashim Jabir[3], Yara Ahmed Saeedi[4], Medrar Hamza Alsisi[4], Bayan Hassan Al Othman[5], Wala'a Fuad Al-Mubarak[6] and Ziad Ali Alghamdi[7]

[1]Care and Beauty Medical Complex, Saudi Arabia

[2]Ministry of Health, Saudi Arabia

[3]Batterjee Medical College, Saudi Arabia

[4]Ibn Sina College, Saudi Arabia

[5]Al Farabi College in Riyadh, Saudi Arabia

[6]Hussain Alali Hospital, Saudi Arabia

[7]King Abdulaziz University, Saudi Arabia

***Corresponding Author**: Nabeel Hussein Almarzooq, Care and Beauty Medical Complex, Saudi Arabia.

Received: January 04, 2020; **Published:** January 22, 2020

Abstract

Introduction: Retention is one of the most important phases of orthodontic treatment. The lack of a retention phase post orthodontic treatment will cause the teeth to move back to their original maloccluded position (Relapse). Some form of retention is always accompanied in orthodontically treated cases cased on the severity of the malocclusion.

Aim of the Work: The review aimed to assess the knowledge and practices regarding the importance and efficacy of orthodontic retainers.

Methodology: The review is a comprehensive research of PUBMED from the year 1919 - 2019.

Conclusion: The choice of orthodontic retainer selected for each individual case should be carefully chosen. Each individual will have its own set of indications and contraindications. Hence Good knowledge regarding the advantages of choosing the correct type of retainer will reduce unwanted complications. Even though orthodontic retention is a topic of serious debate between removable and fixed retainers and between vacuum formed and Hawley's retainers, the efficacy of all in maintaining the treatment results are comparable. It is of extreme importance that patients are educated and motivated well about the use of retainers and to maintain good oral hygiene practices during the retention phase. Patients should also be motivated for regular dental check-ups during the same.

Keywords: *Orthodontic Retainers; Types of Retainers; Relapse of Retainers; Stabilization of Retainers*

Introduction

Orthodontic retainers are appliances that are used in the mouth after the completion of the orthodontic treatment. Orthodontic retention has been a topic of debate since the 18th century. Norman Kingsley stated in as early as 1908 that retaining the tooth from the mal-aligned position is more challenging than the correction itself. The goals of retention must be established early in the process of active orthodontic treatment for the best results.

Angle mentioned that the mechanical support by the surrounding tissues is required after the teeth have been moved into their desired position [1]. Therefore it is of utmost importance that the teeth which were previously malaligned are held in the new position for a certain period till the supporting tissues have adapted to their new positions [2].

To maintain the long-term stable result of the orthodontic treatment outcome is challenging. Literature shows a tendency toward relapse is seen even in the presence of a well-functioning occlusion [2].

Numerous factors can be responsible for the relapse of the results attained by orthodontic treatment [2].

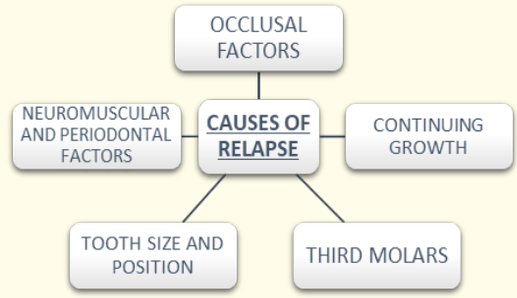


Figure 1: *Factors responsible for the relapse [2].*

Orthodontic retainers have seen a vast evolution in terms of material and size of the appliances. They can range from being removable to fixed, active to passive, and even by the duration of wear. The periodontal the support the teeth take about an average of 232 days to re-model into its new position, but tendency towards relapse may still persist after this duration [3]. Usually in growing patients, removable appliances are preferred since modified functional appliance can be used as retainers [3].

Adjunctive procedures such as interproximal stripping, reshaping teeth, or circumferential supracrestal fiberotomy can be used on teeth and surrounding periodontium to assist the retention process [3].

Methodology

A comprehensive and systematic search was conducted regarding orthodontic retainers using PubMed search engine (http://www.ncbi.nlm.nih.gov/) and Google Scholar search engine (https://scholar.google.com) were the mainly used database. All relevant available and accessible articles were reviewed and included.

The terms used in search were: orthodontic retainers, types of retainers, relapse of retainers, stabilization of retainers.

Factors while choosing retainers

Since the causes of relapse are many, the retention protocol must be chosen after the consideration of the following factors [2].

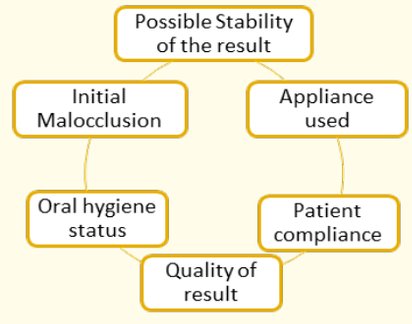


Figure 2: *Factors to be considered for retention protocol [2].*

Types

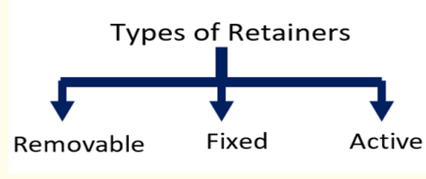


Figure 3: *Types of retainers.*

Removable retainers

Hawley's retainer

This retainer was designed by Charles Hawley in 1919, has been popular for a century, and has become the most widely used removable retention appliance. It includes clasps on molars and an outer labial bow with adjustment loops, spanning from canine to canine. Because it covers the palate, it automatically provides a potential bite plane to control overbite. One of the disadvantages of this retainer is that it wedges distal to the canine and tends to open the extraction spaces. A modification where the labial bow is soldered to the bridge of Adam's clasp helps to keep the extraction spaces closed. Many such modifications where a long labial bow is used, wire extending across the canine for better control of the tooth, a wraparound bow soldered to a C-Clasp can be seen with Hawley's retainer. This retainer can be used both for the maxilla and mandible [4,5].

Begg wrap around retainer

This retainer uses an outer labial bow spanning through the entire arch and turning around the last erupted molar. Since a longer span of wire is used, deformation may be seen often.

Modification of a Begg wrap-around retainer uses a single arrowhead distal to the molar, which engages in the distal undercut area to improve retention [6].

Figure 4: *Begg wrap-around retainer with a single arrow head [6].*

Maxillary circumferential retainers

These retainers are used in for the maxilla; the labial wire contains keeper wires between the canines and lateral incisors for additional stability. They also contain recurves loops, which helps to adjust the tension of the labial bow. The acrylic portion of the retainer should extend distally to the second molar to hold it in position [7].

The van der linden retainer

This retainer is used to control the anterior teeth of the maxillary with firm fixation due to the clasps on the canines. A continuous labial arch with 0.028" wire and three quarters molar clasps with 0.032" inch wire is used. Unless the premolars and molars have clasps, they are free of acrylic. Occlusal interference is less with this retainer. This helps the surrounding tissues and muscles to adapt to their balanced positions [8].

The anterior adaptation of the archwire with closed loops acts as clasps on the canines.

However, the drawbacks of this appliance include the inability to retain mesiodistal angulation changes and extrusive changes of the incisors. A small composite placed cervical to the labial bow can overcome the latter shortcoming [8].

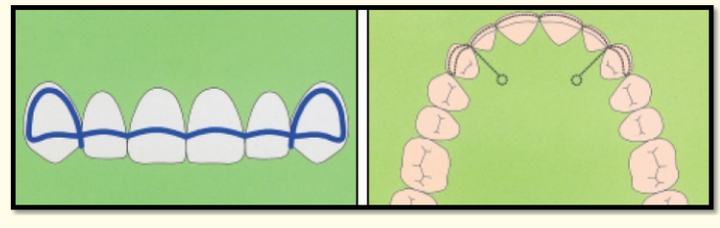


Figure 5: *Closed loops are seen on the bow, cervical section providing clasp like action [8].*

Removable wrap around retainer

It's also known as the clip-on retainer. This retainer consists of a plastic bar covering the labial and lingual teeth surfaces, usually reinforced by a wire. It is aesthetic but more uncomfortable than a Hawley's retainer. In patients with periodontal breakdown, who require splinting of teeth together, a full arch wrap-around retainer helps to hold the teeth in place. In the lower incisor area, a canine to canine clip-on retainer is commonly used. Any mild irregularity that may have resulted post debonding near the incisor region can be corrected with this retainer [4].

Clear vacuum form retainers/Essix retainers

In the 1970s, an aesthetic comfortable alternative to Hawley's retainer was designed, and it was called clear vacuum form retainers. The advantages included durability, ease of cleaning, lesser cost, smaller size, and inconspicuousness [9].

The Essix removable appliance became popular in orthodontics since they could retain both anterior and posterior teeth. When it was introduced in 1993, The Essix retainer was made by thermoforming from plastic, copolyester Essix material, which was available as sheets. They were trimmed to make it fit from canine to canine [9].

Since there is posterior disocclusion, which is seen with the usage of Essix retainers because of the material thickness, practitioners commonly report cases of anterior open bite that is seen in patients who wear these retainers. There also seems to be a higher percentage of patients who lose their Essix retainers as compared to Hawleys due to its transparency and smaller size. This problem can be resolved by adding a colored stripe on the lingual part of the appliance [9].

Transarch stabilizing wire for Essix retainers

The trans arch stability can occasionally be inadequate in Essix retainers because of their minimal thickness and U-Shaped configuration. Incorporation of a metal strut into the appliance during the process of thermoforming can improve the stability of the appliance. A thick round wire 0.032" is recommended, which is adapted to the lingual surface on the patient's cast below the cervical margin. A plastic sheet of appropriate thickness is adapted over the teeth, which will completely encapsulate the wire and makes it an integral part of the retainer [10].

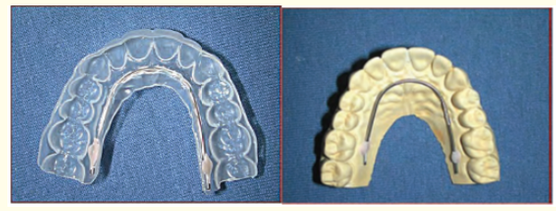


Figure 6: *Incorporation of a metal strut for transarch stability [10].*

Essix vs. Hawley's

Studies show that the Essix retainer can maintain the orthodontic corrections as efficiently as a Hawley retainer [11]. There is no difference in retentive characteristics between the Hawley's and Essix [12].

Figure 7: *The disocclusion seen with the Essix retainer worn correctly [11].*

Hawleys vs. vacuum formed retainer

Literature and evidence suggest the choice of using Hawley's retainer is preferred over VFR if the patient presents with a lateral open bite before debonding. This is attributed to the fact that Hawley's will allow more vertical settling of the teeth as opposed to a VFR.

There is nonconclusive literature on the duration of wear of the removable appliances. The difference in relapse rates with part-time or full time with Hawley's or vacuum-formed retainers have little evidence [13,14].

Positioners as retainers

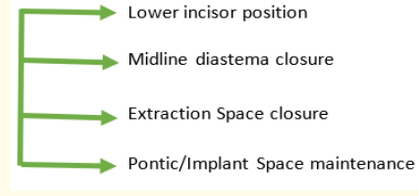
Positioners are removable appliances that are used during the end of treatment as a finishing device. Positioners can be extended in its usage and continued as retainers. The major advantage of using this as a retainer is its ability to maintain occlusal relationships and the intra-arch tooth positions.

However, drawbacks include the bulkiness of the appliance, tendency of overbite increase and inability to retain incisor irregularities and rotations as well as conventional retainers [4].

Fixed retainers

Fixed retainers are those that are bonded to the teeth surface and cannot be removed by the patient. Fixed retainers in the lower anterior segment tend to cause lesser relapse as opposed to removable retainers [15].

Fixed retainers are majorly used to maintain:



Figure

Fixed retainers are an indication in stabilizing the labial segment in cases with reduced periodontal support or cases which require long term retention like midline diastema [4].

In patients with poor periodontal support, the flexible spiral wires allow minute differential tooth movement [16]. Though these retainers require minimal patient compliance and are discrete; they are associated with fragility with failure rates of up to 47%, especially when there is contact to the lingual portion of the upper incisors due to deep overbite [17].

Oral hygiene maintenance can be problematic due to greater plaque and calculus deposition as compared to removable retainers. A precise bonding technique is required in fixed retainers [20].

The recommended usage of wire dimensions ranges from 0.0215-inch multi-strand wire or 0.030 - 0.032 inches sandblasted round stainless steel wire [16,18,19].

However, 0.0215-inch 5-stranded wires have the least failure rates seen during follow up [20].

Figure 8: *Bonded retainer from right to left lateral incisor [20].*

An alternative in the form of resin fiberglass bands was introduced with smaller size and better esthetics. But it didn't gain popularity as the choice of bonded retainer because they were unable to allow any physiological tooth movements and their long-term failure rates [21].

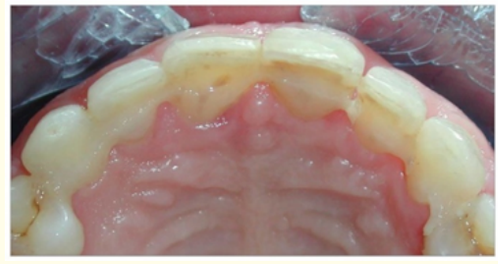


Figure 9: *Resin fiber retainer bonded from right to left first premolar [21].*

Off late CAD-CAM Technology is being used for manufacturing bonded retainers. These retainers are made by bending the wires with the handle of the machine. The Memotain retainer (CA-Digital, Mettmann, Germany) uses nickel-titanium wires (0.014 × 0.014-inch thickness) with this technique [22].

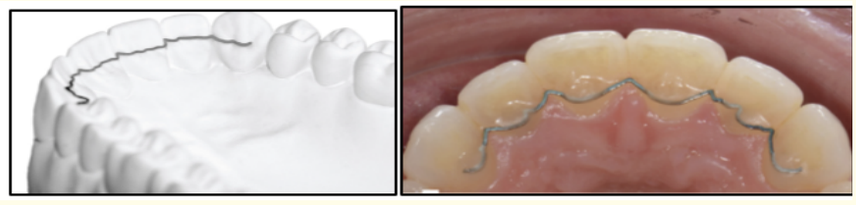


Figure 10: *Memotain CAD/CAM Niti wire with precision fit and bonded [22].*

Active retainers

After the completion of orthodontic treatment, some amount of continuing growth or relapse can cause changes in the results achieved. Few retainers can cause some amount of movement of the relapsed teeth, and they are called as active retainers. An activated Hawley's retainer can be used to close minor spaces [4].

Late lower incisor crowding that develops can be corrected by some amount of slenderization of the anterior tooth followed by realigning them canine-to canine clip-on retainers called spring aligners [4].

Conclusion

The choice of an ideal retainer is mostly case-specific. One should keep in mind the detrimental effects on oral health including dental caries and periodontal problems. However, information on the extent of damage that can be caused in inconclusive.

With fixed retainers, problems like increased plaque, gingival bleeding and calculus, and even unwanted tooth movement can compromise periodontal support. Hence frequent reviews are important by the orthodontist. The patient should be educated about the long-term maintenance of retainers.

Bibliography

1. Rossouw PE and Malik S. "The retention protocol". *In Seminars in Orthodontics* 23.2 (2017): 237-248.

2. Simon J., *et al*. "Worthington - Orthodontic retention: A systematic review". *Journal of Orthodontics* 33 (2006): 205-212.

3. William R Proffit., *et al*. "Contemporary Orthodontics". Fifth Edition (2013).

4. Hawley CA. "A removable retainer". *International Journal of Orthodontia and Oral Surgery* 5.6 (1919): 291-305.

5. Sahoo KC and Pattanaik S. "Modified Wrap-Around Retainer: A Quick Tip to Enhance the Retention of the Appliance". *Journal of Clinical and Diagnostic Research* 10.7 (2016): ZH01.

6. Graber LW., *et al*. "Orthodontics-E-Book: current principles and techniques". Elsevier Health Sciences (2016).

7. Frans PGM., *et al*. "The Van der Linden Retainer". *Journal of Clinical Orthodontics* 4 (2003).

8. Sheridan JJ., *et al*. "Essix retainers: fabrication and supervision for permanent retention". *Journal of Clinical Orthodontics* 27.1 (1993): 37-45.

9. Chudasama D and Sheridan JJ. "Transarch stabilizing wire for Essix retainers". *Journal of Clinical Orthodontics* 44.8 (2010): 498.

10. Lindauer SJ. "Comparison of Essix and Hawley retainers". *Journal of Clinical Orthodontics* 32 (1998): 95-97.

11. Demir A., *et al*. "Comparison of retention characteristics of Essix and Hawley retainers". *The Korean Journal of Orthodontics* 42.5 (2012): 255-262.

12. Sauget E., *et al*. "Comparison of occlusal contacts with use of Hawley and clear overlay retainers". *The Angle Orthodontist* 67.3 (1997): 223-230.

13. Lustig JR. "Short-Term Evaluation of Post-Orthodontic Occlusion with a Wrap-Around and Clear Overlay Retainer". Texas, United States (2001).

14. Littlewood SJ. "Evidence-based retention: Where are we now?". *Seminars in Orthodontics* 23.2 (2017): 229-236.

15. Heier EE., *et al*. "Periodontal implications of bonded versus removable retainers". *American Journal of Orthodontics and Dentofacial Orthopedics* 112.6 (1997): 607-616.

16. Bearn DR. "Bonded orthodontic retainers: a review". *American Journal of Orthodontics and Dentofacial Orthopedics* 108.2 (1995): 207-213.

17. Zachrisson BJ. "Third-generation mandibular bonded lingual 3-3 retainer". *Journal of clinical orthodontics* 29.1 (1995): 39-48.

18. Frederick A., *et al*. "Twenty-year follow-up of patients with permanently bonded mandibular canine-to-canine retainers". *American Journal of Orthodontics and Dentofacial Orthopaedics* 133 (2008): 70-76.

19. Zachrisson BU. "Multistranded wire bonded retainers: from start to success". *American Journal of Orthodontics and Dentofacial Orthopedics* 148.5 (2015): 724-727.

20. Kartal Y and Kaya B. "Fixed Orthodontic Retainers: A Review". *Turkish Journal of Orthodontics* 32.2 (2019): 110.

21. Kravitz ND., *et al*. "A CAD/CAM nickel-titanium lingual retainer". *American Journal of Orthodontics and Dentofacial Orthopaedics* 151.4 (2017): 812-815.

Volume 19 Issue 2 February 2020