

Comparative Assessment of Patient's Acceptability between Hawley and Vacuum-Formed Retainer in Patients Treated with Fixed Orthodontics Appliance

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ABSTRACT

Objective: To compare the acceptability of Vacuum-formed Retainers and Hawley Retainers in two groups of fixed orthodontics patients over three months.

Study Design: Quasi-experimental study.

Place and Duration of Study: Armed Forces Institute of Dentistry, Rawalpindi Pakistan, from Jan 2019 to Mar 2020.

Methodology: Eighty-two Patients treated with fixed orthodontics appliances in the department of orthodontics of Armed Forces Institute of Dentistry, who met the inclusion and exclusion criteria were recruited for the study. Patient acceptance was evaluated through a ten-question questionnaire regarding biting, fitting, hygiene, speech, swallowing, appearance, self-confidence, gingival irritation, durability and comfort. Patients were evaluated on a 10cm long Visual analogue scale over three months in the post-orthodontics retention phase, after one week (T1), one month (T2) and three months (T3) of follow-up.

Results: The vacuumed-formed retainer was significantly better in terms of speech ($p<0.01$), appearance ($p<0.001$), durability ($p<0.001$), gingival irritation ($p<0.001$), swallowing ($p<0.001$), self-confidence, and comfort ($p<0.001$). There was no significant difference in terms of fitting, hygiene and biting.

Conclusion: The vacuumed-formed retainer was significantly better accepted in terms of speech, swallowing, appearance, self-confidence, durability, gingival irritation and comfort.

Keywords: Malaligned teeth, Relapse, Retainers, Retention.

How to Cite This Article: Bibi K, Jan A, Hameed M, Afgan N, Alamzeb H, Malik S. Comparative Assessment of Patients' Acceptability between Hawley and Vacuum-formed retainer in Patients treated with Fixed Orthodontics Appliance. *Pak Armed Forces Med J* 2023; 73(3): 682-685. DOI: <https://doi.org/10.51253/pafmj.v73i3.6349>

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INTRODUCTION

Orthodontics therapy of malaligned teeth involves the correction of malocclusion and the maintenance of achieved results after the orthodontic appliances have been removed.¹ After moving teeth to the new corrected position, the supporting structures are remodelled. Periodontal and gingival fibres take six months to one year to remodel.^{2,3}

To avoid undesirable changes in the position of teeth (relapse) in the post-treatment period, retainers are administered. Retention is the most critical phase, as post-treatment changes are almost inevitable.⁴ Different types of retainers in use are broadly categorized into removable and fixed retainers.⁵ The two most commonly prescribed removable retainers are Hawley Retainers (HRs) and Vacuum Formed Retainer (VFRs).⁶ Multiple factors are involved regarding the decision on the type of retainer, including clinician preference, patient's preference and compliance and cost.⁷ Multiple studies have evaluated patients' overall compliance and suggested that patients' socioeconomic status, level of education, doctorpatient relationship,

type of treatment and parental influence can affect patients' compliance.^{8,9}

Some studies considered it associated with factors like age, gender, education, time since fixed braces have been removed, and the type of retainer used. However, only some studies evaluate the effect of the type of retainer on compliance and acceptability.¹⁰ However, both appliances were the same regarding biting, hygiene and fitting. Therefore, patient compliance can greatly be improved by giving a more acceptable retainer appliance. Considering the lack of studies in our country, this study aimed to compare patients' perceptions and acceptance of VFRs and HRs.

METHODOLOGY

The quasi-experimental study was conducted at the Orthodontics Department, Armed Forces Institute of Dentistry, Rawalpindi Pakistan, from January 2019 to March 2020. This study was approved by the ERC (905/Trg-ABP1k2). The sample size was calculated using the WHO calculator.

Inclusion Criteria: Patients treated with fixed appliances only were included in the study.

Exclusion Criteria: Patients with craniofacial deformities, patients treated with orthognathic surgeries or

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Received: 25 Feb 2021; revision received: 15 Jun 2021; accepted: 08 Jul 2021

patients treated with growth modification appliances were excluded. Informed consent was taken from all the patients and the legal guardians. Patients who completed their treatment and were debonded in the Orthodontics Department, AFID, during the study period were recruited for the study.

Forty-one patients were allocated to each of the VFR or HR Groups. Two trained technicians were recruited for laboratory fabrication of both types of retainers. The same technicians in the orthodontics laboratory of AFID fabricated all the retainers used in the study. The HR was introduced in 1919 and is composed of an acrylic baseplate and wire parts made of 0.7, 0.8 or 0.9 mm stainless steel wire.⁵ The wire part included a labial bow and Adam’s clasp. Labial bow passing through labial surfaces incisors (four anterior teeth) or incisors and canines (six anterior teeth) forming a U-loop in canine or first premolar region then goes through embrasures to be embedded into a base plate made up of self-cure methyl metha-crylate. Adam’s clasps are placed on molar teeth and serve the purpose of retaining the appliance in place.

This study used 0.8mm wire, a labial bow covering six anterior teeth and a 2.5mm thick base plate. The vacuumed form retainer was first introduced by Ponitz in 1971. It is commercially known as Essex retainer and is made of transparent thermoplastic material. It is vacuumed and formed to adapt to all contours of the teeth on their buccal, occlusal and lingual surfaces and is trimmed 2mm off the gingival level.⁵ In this study, VFR was made to include all the teeth up to the second molars.

For all patients, maxillary VFRs or HRs was manufactured according to standard criteria and were given lower fixed 3-3 retainer. Both removable retainers were given to patients 24-hours after debonding and oral hygiene provision. Retainers were well-checked for their perfect fit and adaptation. Written and verbal instruction regarding handling and oral hygiene maintenance was given to all participants. The acceptability of retainers by the patients was evaluated by a 10cm long visual analogue scale (VAS). Retainer acceptance was evaluated objectively based on ten questions regarding the fitting of the appliance, speech, appearance, oral hygiene, gingival irritation, biting (not swallowing but closing teeth with retainer), durability, swallowing, comfort, and self-confidence. The patient filled out the questionnaire on their scheduled appointments under the supervision of the treating doctor. Appointments were scheduled 1-week

after retainer placement (T1), 1-month (T2) and 3-months (T3). Patients were well explained regarding filling out the questionnaire; each question had a 10cm long VAS, which 0 being the most uncomfortable and ten being the most comfortable. Patients were asked to make a vertical line between 0-10 according to their perception. Data were collected by the doctor conducting the research using the same Vernier calliper and light source for all questionnaires.

SPSS ver 25 was used for the data analysis. To check the normal distribution of data Shapiro-Wilk test was performed, and to detect any significant difference regarding gender chi-square test was used. The difference between the two groups at each assessment time was calculated using Independent-sample t-test. The *p*-value ≤ 0.05 was considered as significant.

RESULTS

The final results were analyzed using 80 participants. The mean age of the participants was calculated as 19.5±2.4 years.

Table-I: Changes between Hawley and Vacuum formed Retainers After one Week of Post Appliance Insertion (T1) (n=80)

Variables	Mean±SD	<i>p</i> -value
Biting		
Hawley Retainer	4.88±0.89	0.21
Vacuum-Formed Retainer	5.14±0.76	
Fitting		
Hawley Retainer	6.54±1.11	0.35
Vacuum-Formed Retainer	6.87±1.13	
Speech		
Hawley Retainer	3.75±0.71	<0.001
Vacuum-Formed Retainer	5.55±0.6	
Appearance		
Hawley Retainer	4.16±0.76	<0.001
Vacuum-Formed Retainer	7.3±0.57	
Hygiene		
Hawley Retainer	5.95±0.6	<0.001
Vacuum-Formed Retainer	7.15±0.5	
Durability		
Hawley Retainer	7.15±0.48	0.14
Vacuum-Formed Retainer	7.45±0.51	
Gingival Irritation		
Hawley Retainer	4.66±0.88	<0.001
Vacuum-Formed Retainer	7.15±0.48	
Swallowing		
Hawley Retainer	4.85±0.93	<0.001
Vacuum-Formed Retainer	5.7±0.65	
Confidence		
Hawley Retainer	5.7±0.65	<0.001
Vacuum-Formed Retainer	7.95±0.6	
Comfort		
Hawley Retainer	5.9±0.64	<0.001
Vacuum-Formed Retainer	7.95±0.6	

In the above mentioned Table-I, descriptive analysis after one week of follow-up (T1) shows a

significant difference between the two groups in speech ($p<0.001$), appearance ($p<0.001$), gingival irritation ($p<0.001$), swallowing ($p<0.001$), self-confidence ($p<0.001$) and comfort ($p<0.001$) of the appliance. After one month of follow-up (T2), the acceptability of both appliances gradually increased except for durability, which decreased the HR group ($p<0.45$) but not significantly (Table-II).

Table-II: Changes between Hawley and Vacuum Formed Retainers after one Month of Post Appliance Insertion (T2) (n=80)

Variables	Mean±SD	p-value
Biting		
Hawley Retainer	5.21±0.71	0.67
Vacuum-Formed Retainer	5.31±0.91	
Fitting		
Hawley Retainer	6.7±0.89	0.91
Vacuum-Formed Retainer	6.67±0.79	
Speech		
Hawley Retainer	5.9±0.71	<0.001
Vacuum-Formed Retainer	7.3±0.57	
Appearance		
Hawley Retainer	5.2±0.76	<0.001
Vacuum-Formed Retainer	7.9±0.64	
Hygiene		
Hawley Retainer	7.15±0.57	<0.001
Vacuum-Formed Retainer	7.45±0.61	
Durability		
Hawley Retainer	7.1±0.67	0.45
Vacuum-Formed Retainer	7.3±0.57	
Gingival Irritation		
Hawley Retainer	5.55±0.6	<0.001
Vacuum-Formed Retainer	7.45±0.51	
Swallowing		
Hawley Retainer	6.65±0.65	<0.03
Vacuum-Formed Retainer	6±1.12	
Confidence		
Hawley Retainer	6.25±1.06	<0.001
Vacuum-Formed Retainer	7.3±0.57	
Comfort		
Hawley Retainer	6.35±1.13	<0.02
Vacuum-Formed Retainer	8.61±0.46	

After three months of follow-up (T3), VFR was better accepted in terms of all variables except hygiene ($p<0.12$), biting ($p<0.32$), and fitting ($p<0.72$). Acceptability of VFR gradually increased over three months. There was a significant difference between the two groups in speech ($p<0.01$), appearance ($p<0.001$), gingival irritation ($p<0.001$), durability ($p<0.001$), swallowing ($p<0.02$), confidence ($p<0.001$) and comfort ($p<0.001$) of the appliance (Table-III). A gradual increase in acceptability of the HR group was also noted, especially regarding speech and gingival irritation;

however, its durability decreased significantly ($p<0.001$) over three months.

Table-III: Changes between Hawley and Vacuum Formed Retainers in three Months Post Appliance Insertion (T3) (n=80)

Variables	Mean±SD	p-value
Biting		
Hawley Retainer	6.29±1.29	0.32
Vacuum-Formed Retainer	6.7±1.31	
Fitting		
Hawley Retainer	6.95±1.04	0.72
Vacuum-Formed Retainer	6.84±0.82	
Speech		
Hawley Retainer	7.45±0.51	<0.01
Vacuum-Formed Retainer	7.95±0.79	
Appearance		
Hawley Retainer	5.55±0.6	<0.001
Vacuum-Formed Retainer	8.4±0.5	
Hygiene		
Hawley Retainer	7.15±0.67	0.12
Vacuum-Formed Retainer	7.45±0.51	
Durability		
Hawley Retainer	5.95±0.68	<0.001
Vacuum-Formed Retainer	7.9±0.64	
Gingival Irritation		
Hawley Retainer	5.95±0.68	<0.001
Vacuum-Formed Retainer	7.25±0.63	
Swallowing		
Hawley Retainer	7.25±0.55	<0.02
Vacuum-Formed Retainer	7.75±0.56	
Confidence		
Hawley Retainer	7.2±0.52	<0.001
Vacuum-Formed Retainer	8.65±0.48	
Comfort		
Hawley Retainer	7.15±0.58	<0.001
Vacuum-Formed Retainer	8.65±0.48	

DISCUSSION

This study evaluated which of the two retainers is better excepted by the patients in the retention phase. Questionnaire-based assessment of patient acceptance and satisfaction was successfully used in multiple studies.^{11,12} This study used a questionnaire to evaluate the acceptability of HR and VFR retainers using 10cm long VAS. Inclusion criteria were carefully selected as patients with cleft lip and palate, hypodontia, and patients treated with orthographic surgery were excluded because such cases might need special retention protocols. HR and VFR were evaluated for maxillary arch only because VFR is better at retaining lower labial segments.^{13,14} A lower 3-3 bonded retainer was used in all patients included in this study. The results of this study are inconsistent and comparable to previous studies.^{3,6} Regarding ease of speaking (speech), VFR was significantly better than HR. This can be attributed to minimal palatal coverage by VFR; however, speech with HR improved in second (T2) and

third (T3) follow-up visits in agreement with previous studies.^{15,16} Hygiene maintenance of the VFR was significantly better in T1 and T2. This could be due to visibility through VFR and more palatal coverage by HR, but after three months of follow-up, there was no significant ($p < 0.1$) difference between the two retainers in terms of hygiene. Patients reported difficulty in cleaning VFR because of deep grooves over three months. This endorsed the results of Saleh *et al.*⁶ In contrast to previous studies, HR scored less in terms of durability, and multiple breakages were reported at the wire acrylic interface over three months. This is because of manufacturing differences in the case of our study.

VFR was significantly better in appearance, in agreement with previous studies.¹⁷ Esthetics was one of the major reasons for VFR's acceptance over HR. In addition, overall self-confidence is significantly better for VFR. This could be attributed to its better aesthetics and comfort. In agreement with previous studies, VFR was significantly more comfortable than HR. Comfort is the most important variable to assess acceptability because it is the main reason not to wear a retainer. Chagas *et al.* found no difference in comfort between the two retainers.⁵ Most maxillary retainers are removable, which is patient-dependent, so the retainer should be comfortable enough for successful retention. In the literature, there needs to be more support regarding the clinical choice of retainer over others. According to Muslemzadeh *et al.* the degree of relapse is not affected by the type of retainer.¹⁸ Factors affecting the choice of retainer are patient's preference and acceptance, cost and clinician's preference.¹⁹

CONCLUSION

Objective assessment of the patient's perception regarding the type of retainer over three months of VFR was significantly better accepted regarding speech, swallowing, appearance, self-confidence, durability, gingival irritation and comfort. Acceptability gradually increased over time for both types of retainers.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

KB & AJ: Conception, study design, drafting the manuscript, approval of the final version to be published.

MH & NA: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

HA & SM: Critical review, drafting the manuscript, interpretation of data, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work appropriately are investigated & resolved.

REFERENCES

1. Al-Moghrabi D, Colonio Salazar FB, Johal A. Factors influencing adherence to vacuum-formed retainer wear: A qualitative study. *J Orthod* 2019; 46(3): 212-219. doi: 10.1177 /1465312519851196.
2. Al Rahma WJ, Kaklamanos EG. Performance of Hawley-type retainers: a systematic review of randomized clinical trials. *Eur J Orthod* 2018; 40(2): 115-125. doi: 10.1093/ejo/316351/cjx036.
3. Hichens L, Rowland H, Williams A, Hollinghurst S, Ewings P, Clark S, et al. Cost-effectiveness and patient satisfaction: Hawley and vacuum-formed retainers. *Eur J Orthod* 2007; 29(4): 372-378. doi: 10.1093/ejo/cjm039.
4. Asiry MA. Biological aspects of orthodontic tooth movement: A review of literature. *Saudi J Biol Sci* 2018; 25(6): 1027-1032. doi: 10.1016/j.sjbs.2018.03.008.
5. Chagas AS, Freitas KMS, Cançado RH, Valarelli FP, Canuto LFG, Oliveira RCG, et al. Level of satisfaction in the use of the wraparound Hawley and thermoplastic maxillary retainers. *Angle Orthod* 2020; 90(1): 63-68. doi: 10.2319/031319-197.1.
6. Saleh M, Hajeer MY, Muessig D. Acceptability comparison between Hawley retainers and vacuum-formed retainers in orthodontic adult patients: a single-centre, randomized controlled trial. *Eur J Orthod* 2017; 39(4): 453-461. doi: 10.1093/ejo/cjx016453124.
7. Al-Moghrabi D, Pandis N, Fleming PS. The effects of fixed and removable orthodontic retainers: a systematic review. *Prog Orthod* 2016; 17(1): 24. doi: 10.1186/s40510-016-0137-x.
8. Pratt MC, Klumper GT. Patient compliance with orthodontic retainers in the postretention phase. *Am J Orthod Dentofacial Orthop* 2011; 140(2): 196-201. doi: 10.1016/j.ajodo.2010.02.035.
9. Schott TC, Meyer-Gutknecht H, Mayer N, Weber J, Weimer K. A comparison between indirect and objective wear-time assessment of removable orthodontic appliances. *Eur J Orthod* 2017; 39(2): 170-175. doi: 10.1093/ejo/cjw026.
10. Vagdouti G, Karvouni E, Bitsanis E, Koletsi D. Objective evaluation of compliance after orthodontic treatment using Hawley or vacuum-formed retainers: A 2-center randomized controlled trial over a 3-month period. *Am J Orthod Dentofacial Orthop* 2019; 156(6): 717-726.e2. doi: 10.1016/j.ajodo.2019.07.008.
11. Lo Giudice A, Isola G, Rustico L, Ronsivalle V, Portelli M, Nucera R, et al. The efficacy of retention appliances after fixed orthodontic treatment: A systematic review and meta analysis. *Appl Sci* 2020; 10(9): 3107. doi:10.3390/app10093107.
12. Mai W, He J, Meng H. Comparison of vacuum-formed and Hawley retainers: a systematic review. *Am J Orthod Dentofacial Orthop* 2014; 145(6): 720-727. doi: 10.1016/j.ajodo.2014.01.019.
13. Kaklamanos EG, Kourakou M, Kloukos D, Doulis I, Kavvadia S. Performance of clear vacuum-formed thermoplastic retainers depending on retention protocol: a systematic review. *Odon-tology* 2017; 105(2): 237-247. doi: 10.1007/s10266-016-0254-5.
14. Ngan P, Kess B, Wilson S. Perception of discomfort by patients undergoing orthodontic treatment. *Am J Orthod Dentofacial Orthop* 1989; 96(1): 47-53. doi: 10.1016/0889-5406(89)90228-x.
15. Manzon L, Fratto G, Rossi E, Buccheri A. Periodontal health and compliance: A comparison between Essix and Hawley retainers. *Am J Orthod Dentofacial Orthop* 2018; 153(6): 852-860.
16. Mirzakouchaki B, Shirazi S, Sharghi R, Shirazi S. Assessment of factors affecting adolescent patients' compliance with hawley and vacuum formed retainers. *J Clin Diagn Res* 2016; 10(6): ZC24-27. doi: 10.7860/JCDR/2016/18539.7897.
17. Atik E, Esen Aydinli F, Kulak Kayikçi ME, Ciger S. Comparing the effects of Essix and Hawley retainers on the acoustics of speech. *Eur J Orthod* 2017; 39(4): 440-445.
18. Moslemzadeh SH, Sohrabi A. Comparison of stability of the results of orthodontic treatment and gingival health between hawley and vacuum-formed retainers. *J Contemp Dent Pract* 2018; 19(4): 443-449.
19. Kirshenblatt S. Accuracy of thermosensitive microsensors intended to monitor patient use of removable oral appliances. *J Can Dent Assoc* 2018; 84(2): 1488-2149.