



ORIGINAL RESEARCH PAPER

Orthodontics

OCCLESS ESSIX: A MODIFIED ESSIX RETAINER

KEY WORDS: Essix, Retention, Relapse, Modification of Essix

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ABSTRACT

Objective: To evaluate the efficacy of retention and stability with a modified Essix retainer without occlusal coverage.
Materials and Methods: 20 Adolescent patients undergoing fixed appliance treatment at the department of Orthodontics of KD Dental College, were recruited for this study. 10 patients (5 women and 5 men) wore Essix retainers (Group I) while 10 (5 women and 5 men) wore modified Essix retainers (Group II) and the mean follow-up recall time for both groups was 6 months. Two qualified dental examiners evaluated the blind patient data. Lateral cephalograms were analyzed at 2 stages: Post-treatment (T0) and follow-up (T1). Means and standard deviations were next compared between the retention and stability of both appliances.
Results: Cephalometric measurements revealed minimal differences between the 2 groups, such as slightly higher protrusion of the upper incisors in the Essix group during orthodontic treatment, which was statistically non-significant.
Conclusion: The retention characteristics of both the retainers are similar. However, Occlless Essix gives better vertical stability since the initiation of post-treatment phase.

Introduction

The retention phase is vitally important in keeping teeth in a debonding position until gingival and periodontal reorganization is completed [1].

To date, several studies have been published about the effectiveness, retention protocols, occlusal contacts, survival time, and wear of retainers. However, it could be difficult to interpret the results and evidence presented in these studies because of the variety of study designs, sample sizes, and research methods. A clear retainer (Essix® retainer, thermoplastic retainer, or vacuum-formed retainer) is a removable retainer that was introduced in 1993 by Dr. John Sheridan [2] as an esthetic, comfortable, and inexpensive appliance compared with conventional fixed and removable orthodontic retainers [3].

After teeth have been orthodontically re-positioned, retention devices are used to maintain arch form and minimize the tendency of teeth to shift [4]. When teeth do shift, changes that are undesirable are considered "relapse," while changes that are desirable are called "settling." With settling, the number of occlusal contacts (once the fixed appliances are removed) increases, improving the fit of the teeth. The best retention device would be one that allows settling but prevents relapse [5]. Both removable and fixed retainers can be used to provide retention.

This study aims to compare conventional Essix retainer with Occlless Essix (Modified Essix Retainer) and discuss the fabrication, advantages and disadvantages of this clinical innovation.

Materials and Methods

20 Adolescent patients undergoing fixed appliance treatment in the department of Orthodontics, KD Dental College were recruited for this study. 10 patients (5 women and 5 men) were given Essix retainers (Group I) and 10 (5 women and 5 men) were given modified Essix retainers (Group II) to wear and the mean follow-up recall time for both groups was 6 months. Two qualified dental examiners evaluated the blind patient data.

Group I – Ten patients were given conventional Essix Retainers to serve as a control [Figure.1]

Group II – Ten patients were given modified Essix Retainers free of any occlusal coverage [Figure.2]

The procedure and aim of the study was explained to the patients and their due consent was obtained. This study has been done in

human interest and no human was harmed during experimentation.

Lateral cephalograms were analyzed at 2 stages of both the groups: At beginning of retention phase (T0) and 6 months after the retention phase (T1).

These retainers were fabricated with thermoformed sheet (Clear-Aligner CA-hard) of 1.5mm thickness with Bio Star Machine. The retainers were delivered to the patients and instructions were given as follows:

1. OE retainer has to be worn all the time except during meals.
2. It should be kept safe and do not misplace it (as it is clear retainer so tendency of misplacing it has been reported quite often).
3. If the retainer is fractured, immediately report to the clinician.

As the study is dependent on patient compliance, they were recalled for regular checkup at a period of 1 month. Means and standard deviations were next compared between the retention and stability of both appliances.

The potential movements of incisors and vertical skeletal changes were evaluated on the lateral cephalograms. Lateral cephalograms were obtained using the radiographic equipment with focus median plane distance was 152 cm with standardized exposure of 73 kV, 15 mA for 0.64 s, and the radiographic film used was Kodak MXG (18 × 24 cm²; Kodak, Tokyo, Japan). A sheet of transparent acetate was placed over the lateral cephalometric radiographs, and the anatomical structures were outlined. Overjet, overbite, and the following angular measurements - GoGnSN°, FMA°, U1SN°, IMPA°, and UL-L1° - were performed on these radiographs.



Fig.1 Conventional Essix



Fig.2 Occlless Essix

Fabrication

1. Immediately after the removal of the fixed appliances, alginate impressions were poured to obtain models of the maxillary

- and mandibular arches.
2. After obtaining a dental cast, interproximal areas and gingival borders should be distinct and excessive undercut should be blocked out with compound filling to enable the patient to remove it more easily.
 3. Essix retainers were thermoformed from 1.5mm sheets according to the manufacturer's instructions. Occlusal Essix (OE) retainers were thermoformed from 1.5mm sheets and occlusal one third was trimmed after marking (so as not to over trim). The border of the appliance should extend gingivally 3–4 mm on both facial and lingual sides. The gingival edge should be notched in the area of labial and lingual frenums. [Figure.3]
 4. The patients were instructed to wear their retainers full-time (except during meals) for a period of 1 year.

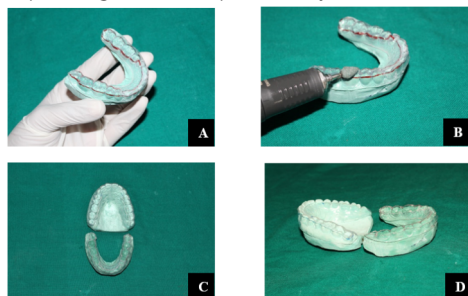


Fig. 3 (A) Marking at Incisal 1/3rd of the tooth (B) Trimming of occlusal surface with the help of acrylic bur (C) Trimmed Occlusal Essix Retainer occlusal view (D) Trimmed Occlusal Essix Retainer lateral view

Data Analysis

The differences between the Essix and Occlusal Essix groups were compared using repeated measures analysis of variance (ANOVA) to identify statistically significant differences between time intervals. Changes between T0 and T1 time points within the same group were analyzed. Changes between the 2 groups were compared using the Mann-Whitney U-test. SPSS (version 14.0; SPSS Inc., Chicago, IL, USA) was used to perform statistical analysis. *p*-values of < 0.05 were considered statistically significant.

Table 1. Cephalometric measurements at bracket removal and after 6 months of retention (T0 and T1 respectively)

Cephalometric measurements	Mean ± SD		p-value
	Essix	Occlusal Essix	
GoGnSN			
T0	36.86 ± 5.65	38.91 ± 4.98	0.296
T1	36.98 ± 6.02	38.94 ± 4.68	0.251
F-value	F = 0.91, NS	F = 0.42, NS	
FMA			
T0	30.30 ± 5.00	29.75 ± 4.17	0.782
T1	29.82 ± 6.07	29.78 ± 4.00	0.782
F-value	F = 0.60, NS	F = 0.12, NS	
U1SN			
T0	107.71 ± 6.31	103.02 ± 3.40	0.000
T1	107.92 ± 5.70	102.64 ± 3.11	0.000
F-value	F = 0.03, NS	F = 0.04, NS	
IMPA			
T0	91.05 ± 7.54	91.16 ± 3.75	0.830
T1	91.62 ± 7.76	90.11 ± 4.01	0.521
F-value	F = 2.22, NS	F = 0.95, NS	
U1L1			
T0	124.36 ± 8.87	127.58 ± 7.13	0.174
T1	123.67 ± 9.14	127.59 ± 7.04	0.074
F-value	F = 7.33a T0 – T1	F = 0.51, NS	
Overbite			
T0	2.90 ± 0.60	2.31 ± 0.76	0.001
T1	2.92 ± 0.72	2.20 ± 0.80	0.004
F-value	F = 1.04, NS	F = 2.96, NS	

Results

Tables 1 present the means and standard deviations of treatment changes and the degree of relapse at the post-treatment and post-retention stages. Cephalometric measurements revealed minimal differences between the 2 groups, such as slightly higher protrusion of the upper incisors in the Essix group during orthodontic treatment [Table 1] which was statistically non-significant.

Discussion

In any orthodontic treatment, retention following removal of fixed appliances is of paramount importance. After orthodontic treatment, an ideal retainer would be retentive, capable of achieving three-dimensional control of all teeth, able to maintain the post-treatment arch form, and allow occlusal settling [10].

According to Case [11] the art of retention will never be as accurate as the science of tooth correction, having little or no control regarding natural influences on teeth. The main factors related to failure of orthodontic retention are: Hereditary influences; Disrespect to biological limits of dental movement and the use of an inappropriate retention system among other [12].

A dental retainer is a custom- made orthodontic appliance used to keep teeth in place after fixed appliance are removed. Starting from Hawleys appliance given by Charles Hawley in 1920 till date, there has been many forms of retainers given to the patient for better patient's compliance and stability of teeth. Retainers can be removable like wraparound, tooth positioners or clear overlays or they could be fixed like bonded retainers.

Presently the most commonly used retainers are Essix retainers or the clear retainers. It was first described in 1971 by Ponitz, and consists of a thermoplastic polymer, heated in a vacuum inductor in such a way that it suits the model of the arch which will be retained.[17] Many studies were carried to compare the efficacy of Essix and Hawley retainers. One such study was done by Lindauer and Shoff [3]. They modified the design of the Essix retainer and covered only canines and incisors that might cause posterior extrusion and anterior open bite. In their study, the researchers focused on overbite, overjet, and irregularity index and compared the changes over a 6-month retention period; they found no significant differences between the 2 retainers.

To overcome the disadvantages of Essix retainers like non-settling of occlusion, TMJ dysfunction, posterior openbite and improper occlusal contacts, the modification in this study was done to remove the occlusal coverage throughout the appliance. This modification eliminated all the disadvantages of Essix retainer and inculcated immediate vertical settling of occlusion post debonding of fixed appliance. The time of wear was maintained as others retainers. Increase in posterior contacts was achieved during night time wear of modified Essix retainer where posterior occlusal contact was impasseive [13].

As noted by Reitan [14] in his study, the periodontal fibers remained with memory until 7 months after removal of fixed appliances, which would force the use of appliances, both in the upper and lower arches for 7 months at a minimum for the retention of the fixed orthodontic treatment. Although there is no universal agreement concerning retention protocols for removable appliances, many authors have advised that these appliances should be worn for at least 1 year after orthodontic treatment [15]. There is not a known usage time for using retention, it is only known that at least 232 days are necessary for periodontal fibers to reorganize into the new position [16]. There is no agreement in the literature concerning the duration of the retention period. Some authors defend periods of two to three weeks, even occurring indication of permanent retention [17].

Sauget et al [5] study compared the Hawley appliance and acetate appliance covering all elements. The Hawley retainer showed larger number of contact points, which supports our modification of Essix retainer and hence we coined the name **Occlusal Essix retainer**.

According to the cephalometric analysis [Tables 1], the major differences were seen in U1SN°, U1L1°, and overbite measurements. The U1SN° was slightly reduced in both groups but upper incisor protrusion was high in Essix group. The IMPA° was insignificantly increased in the Essix group but reduced in the OE group which was similar to a study done by Little RM et al [18] indicating no significant correlation between the long-term stability of the mandibular anterior teeth and any of the cephalometric measurements.

Conclusion

This study revealed that the retention characteristics of both Essix and OE retainers are similar. The Ocless Essix retainers were found to be more effective in maintaining the occlusal contacts during retention and the patients did not face any initial discomfort or improper bite.

Clinicians and patients should be aware of the relapse potential of malocclusions, especially crowding. Other factors such as cost, patient preference, cooperation, satisfaction, and occlusal contact patterns might influence the choice of retainer. Further clinical studies with larger randomized samples are necessary to investigate the long term efficacy of the Ocless Essix retainer.

Advantages of OE over Essix:

1. Good retention and stability of teeth.
2. Good retention and stability of the appliance
3. Helps in vertical correction (settling) full time during appliance wear as no occlusal coverage is present and large number of contact points occur benefiting the occlusion of patient.[5]
4. Helps in proper occlusion immediately after debonding of fixed appliance.
5. No Temporomandibular joint dysfunction (TMD) which can be seen in conventional Essix due to increase in bite.[6]
6. More esthetic and less visible as in conventional Essix, a black outline is always seen varying according to the thickness of Essix sheet is always visible.
7. Inexpensive.
8. Ease of fabrication.
9. More comfortable to the patient.
10. Ability to place on the day the fixed appliance is debonded.
11. Good survival time than Essix as does not wear and tear due to occlusal free surface.
12. Provides better oral hygiene than fixed retainer[7]

Disadvantages of Essix over OE:

1. Anterior open bite in patients wearing Essix retainers, probably because of the posterior disclusion caused by the anterior contact of the Essix material.[3]
2. Nonsettling of occlusion due to occlusal surface coverage of Essix [8]
3. Temporomandibular Dysfunction can be seen due to disturbance in occlusion[bite][6]
4. Prone to wear and needs replacement.
5. Fracture seen was more in Essix than in OE as Essix is more rigid appliance.
6. Easily lost due to transparency[9]



Fig.4 The Ocless Essix in mouth



Fig.5 Patient holding and wearing the OCCLESS ESSIX

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