

Hygiene assessment of essix retainers via a patient questionnaire

Essix retansiyon apareylerinin hasta anketleri ile hijyen deęerlendirmesi

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SUMMARY

Aim: The aim of this study was to investigate the hygiene habits and cleaning methods of patients who are wearing Essix plates for retention, by a face to face applied questionnaire.

Material and Methods: 120 patients (72 females, 48 males) using Essix Plates in post-treatment retention period were enrolled for this study. Subjects were aged 18-40 years. All of the subjects were conducted a questionnaire by the same experienced clinician. The questionnaire investigated the genders of subjects, ages of subjects, and methods and frequency of cleaning plates.

Results: Half of the subjects clean their plates whenever they remove it. There is a difference between median ages according to the frequency of clearing the plates ($p < 0.001$). There is no difference between the ages about; how the plates are cleaned, what they use to clean, the difficulty in cleaning, and the belief about the plates are clean enough (p values are 0.833, 0.178, 0.120 and 0.251, respectively). The belief that plates are sufficiently clean does not differ according to sex ($p = 0.871$). According to age distribution, there was a statistically significant correlation the frequency of clearing the age groups and plates, the way of clearing the plates, the agent to be used to clean the plates and the belief of cleanliness of the plates ($p < 0.05$).

Conclusions: There is not a common method of cleaning the Essix plates amongst patients. Patients refer various materials to clean their Essix plates. The frequencies of cleaning their plates also differ amongst patients. Various hygiene habits were present in different age groups.

Keywords: Orthodontic Retainer, Essix Plates, Hygiene, Disinfection.

ÖZET

Amaç: Bu çalışmanın amacı ortodontik tedavi sonrası retansiyon döneminde Essix plak taşıyan hastaların hijyen alışkanlıklarının anketler aracılığı ile deęerlendirilmesidir.

Gereç ve Yöntem: Çalışmaya ortodontik tedavisi bitmiş ve retansiyon amacı ile Essix plak kullanan, 18-40 yaş aralığındaki 120 hasta (72 kadın, 48 erkek) dahil edilmiştir. Hastaların hepsine klinik tecrübesi olan aynı ortodontist tarafından anketler uygulanmıştır. Anket hastaların yaşlarını, cinsiyetlerini, hastaların plakları temizleme metodlarını ve sıklıklarını incelemiştir.

Bulgular: Hastaların yarısı, plaklarını her çıkardıklarında temizlediklerini belirtmiştir. Plakları temizleme sıklığına göre hastaların ortalama yaşı arasında farklılık bulunmaktadır ($p < 0,001$). Plakların nasıl temizlendiği, temizlemek için kullanılan ajan, temizlemede güçlük, plakların temizliği konusundaki görüş açısından ortalama yaşta farklılık yoktur (p deęerleri sırasıyla 0,833, 0,178, 0,120 ve 0,25). Plakların temizliği ile ilgili düşünce cinsiyetten bağımsızdır ($p = ,871$). Yaş dağılımına göre plakların temizleme sıklığı, nasıl temizlendiği, kullanılan temizleme ajanı temizlik hakkında görüş arasında istatistiksel olarak anlamlı farklılık bulunmaktadır ($p < 0,05$).

Sonuç: Hastalar arasında Essix plaklarının temizlenmesi açısından çeşitlilik olduğu, hastaların plaklarını temizlemek için farklı materyaller tercih ettiği anlaşılmıştır.

Anahtar kelimeler: Ortodontik Pekiştirme Apareyleri, Essix Plaklar, Hijyen, Dezenfeksiyon.

INTRODUCTION

The accurate instructions for disinfection of removable orthodontic appliances is still not defined clearly in the literature.¹

Oral environment adapts to the presence of orthodontic appliances by increasing the stimulated flow rate, buffer capacity and salivary PH to increase the anti-cariogenic potential of saliva.² In contrary to a study which reported an insignificant change in the amount of the microorganisms in oral microflora by use of orthodontic appliances³ some other studies reported that orthodontic appliances may change the oral microbiota and increase the concentration of mutans streptococci (MS) and lactobacilli in saliva and dental biofilm which can lead to dental caries and periodontal diseases.^{1,4-5} Bacterial colonization occurs on the removable appliance as a biofilm.¹ In previous studies it was presented that a removable appliances were contaminated with microorganisms just after 1 week of wearing.^{1,6} Candidal carriage risk of removable appliances was also reported in some earlier studies.⁷⁻⁹ Essix plates, removable vacuum formed thermoplastic retention appliances were first presented to the orthodontic literature by J. Jack Sheridan in 1993.¹⁰ Essix plates are frequently preferred removable retention appliances in contemporary orthodontic practice.¹¹⁻¹⁴

As being generally a full time worn retention appliance, the hygiene of the Essix plates are also so effective on oral microbiota. In the literature, there could not be found a study which is directly focused on the disinfection methods of Essix plates. This study aimed to evaluate the hygiene habits and attitudes of Essix plate wearing patients in the post-treatment retention period via a questionnaire.

MATERIALS AND METHOD

Ethical committee's approval of this study was given by research Ethics Committee with protocol number: 10840098-604.01.01-E.25322.

The power of the study was calculated using G * Power software (G*Power Ver. 3.0.10., Kiel, Germany) and was found that with 100 patients would give 80% power with a 95% confidence interval (CI).

120 patients (72 Females and 48 males) which were in post-treatment retention period and were wearing Essix plates for retention, were enrolled in this study. The selection criteria for this study were; patients over age of 18, having no systemic disease, with similar demographic characteristics, having no disabilities to clean their plates,

having no caries, had periodontology consultation for oral hygiene and having no periodontal problems. Subjects were aged from 18 to 40 years. The mean age of the patients was 29.2 ± 6.4 year.

All of the subjects were conducted a questionnaire by the same experienced clinician. A pilot testing was managed before the study,¹² patients were asked the questions and validation managed. Reliability and internal consistency value (Cronbach alfa) was 0,84.

The questionnaire examined the genders of subjects, ages of subjects, and methods and frequency of cleaning plates. The questions of the questionnaire were prepared by two researchers of this study who are both 10 years experienced clinicians in orthodontics.

Questionnaire ;

1. How often do you clean your plates?
2. How do you clean your plates?
3. What materials do you use for cleaning?
4. Is it difficult for you to clean your plates? (A. Yes, B. No)
5. Do you think that your plate is hygienic? (A. Yes, B. No)

Statistical analysis

The data was analyzed with IBM SPSS V23. Mann Whitney U test and Chi-square test were used to compare the data. Quantitative data were presented as mean, standard deviation, median, min, max, while qualitative data were presented as frequency and percentage. Significance level was taken as $p < 0.05$.

RESULTS

In a total of 120 people surveyed, 40% of the participants were male while 60% were female. The rate of clearing the plates once a day is 10%, while the rate of clearing twice a day is 40% and the rate of cleaning whenever he/she removes is 50%. The rate of cleaning the plates by brushing under running water is 10%, while the rate of cleaning with running tap water only is 90%. The proportion of users using toothpaste to clean the plates is 50.8%, the proportion of soap users is 12.5%, the proportion of users using only water is 33.3%, and the rate of users using cleaning tablets is 3.3%. The percentage of those who stated that they had difficulties while clearing the plates was 5.8% and 70% of the participants believed that the plates were clean enough (Table 1).

Table 1. Frequency and percentage of the answers.

	Frequency	%
Gender		
Male	48	40
Female	72	60
How often do you clean your plates?		
Once a day	12	10
Twice a day	48	40
Whenever i remove	60	50
How do you clean your plates?		
Brushing under water	12	10
Only with tap water	108	90
What materials do you use for cleaning?		
Toothpaste	61	50.8
Soap	15	12.5
Only water	40	33.3
Cleansing tablets	4	3.3
Is it difficult for you to clean your plates?		
Yes	7	5.8
No	113	94.2
Do you think that your plate is hygienic?		
Yes	84	70
No	36	30

There is a difference between median ages according to the frequency of clearing the plates ($p < 0.001$). The median age of the cleansers once a day was 23, the number of cleansers twice a day was 32, and the median age of the cleansers whenever removes was 28. There is a difference in the age of all cleaning cycles. There is no difference between the ages about; how the plates are cleaned, what they use to clean, the difficulty in cleaning, and the belief about the plates are clean enough (p values are 0.833, 0.178, 0.120 and 0.251, respectively). The results were shown in Table 2.

Table 2. Median (min-mak), a-c: There is no difference between groups with the same letter.

	Age	p
How often do you clean your plates?		
Once a day	23 (18 – 29) ^a	<0.001
Twice a day	32 (21 – 40) ^b	
Whenever i remove	28 (18 – 40) ^c	
How do you clean your plates?		
Brushing under water	26 (23 – 40)	0.833
Only with tap water	29 (18 – 40)	
What materials do you use to clean your plates?		
Toothpaste	28 (18 – 40)	0.178
Soap	27 (20 – 40)	
Only water	32 (18 – 40)	
Cleansing tablets	37,5 (21 – 40)	
Do you think that it is difficult to clean your plates?		
Yes	33 (26 – 39)	0.120
No	29 (18 – 40)	
Do you think that your plates are cleaned enough?		
Yes	28 (18 – 40)	0.251
No	31 (18 – 40)	

The belief that plates are sufficiently clean does not differ according to sex ($p = 0.871$). 69.4% of females and 70.8% of males believe that they are adequately cleaned. The belief that plates are sufficiently clean does not depend on the frequency of plate clearance and difficulty in clearing (p values of 0.147 and 0.350, respectively). The belief that plate is clean enough depends on how the plates are cleaned ($p = 0.017$). Whilst all of the flushers under the flowing water believe that the plates are clean enough, only 66.7% of flushers believe in it. Likewise, the belief that plates are clean enough depends on the material used for cleaning ($p = 0.035$). They believe that 82% of toothpaste users, 60% of soap users, 57.5% of water users and 50% of users of cleaning tablets are clean enough. These results were shown in Table 3.

Table 3. The relation of the thought of the cleanliness of plates with the other variables.

	Do you think that your plate is hygienic?		
	Yes	No	
Gender			
Male	34 (70,8)	14 (29,2)	0.871
Female	50 (69,4)	22 (30,6)	
How often do you clean your plates?			
Once a day	10 (83,3)	2 (16,7)	0.147
Twice a day	29 (60,4)	19 (39,6)	
Whenever i remove	45 (75)	15 (25)	
How do you clean your plates?			
Brushing under water	12 (100)	---	0.017
Only with tap water	72 (66,7)	36 (33,3)	
What materials do you use to clean your plates?			
Toothpaste	50 (82)	11 (18)	0.035
Soap	9 (60)	6 (40)	
Only water	23 (57,5)	17 (42,5)	
Cleansing tablets	2 (50)	2 (50)	
Is it difficult for you to clean your plates?			
Yes	6 (85,7)	1 (14,3)	0.350
No	78 (69)	35 (31)	

The frequency of clearing the plates depends on the sex ($p = 0.001$). 33.3% of women clean up twice a day and 62.5% clean up every time they remove, while 50% of men clean twice a day and 31.3% every time they remove. It is not sex-dependent: the method of cleaning the plates, to believe that the plates are cleaned, difficulties to clean, and the material used to clean. (Table 4)

Table 4. Frequency (Percentage) Distribution of parameters according to gender.

	Gender		
	Male	Female	
How often do you clean your plates?			
Once a day	9 (18.8)	3 (4.2)	0.001
Twice a day	24 (50)	24 (33.3)	
Whenever i remove	15 (31.3)	45 (62.5)	
How do you clean your plates?			
Brushing under water	5 (10.4)	7 (9.7)	0.901
Only with tap water	43 (89.6)	65 (90.3)	
What materials do you use to clean your plates?			
Toothpaste	29 (60.4)	32 (44.4)	0.341
Soap	4 (8.3)	11 (15.3)	
Only water	14 (29.2)	26 (36.1)	
Cleansing tablets	1 (2.1)	3 (4.2)	
Is it difficult for you to clean your plates?			
Yes	3 (6.3)	4 (5.6)	0.874
No	45 (93.8)	68 (94.4)	
Do you think that your plate is hygienic?			
Yes	34 (70.8)	50 (69.4)	0.871
No	14 (29.2)	22 (30.6)	

The results of the chi-square analysis applied to test the relationship between age groups and the provision of hygiene were shown in Table 5.

Table 5. Chi-square test results.

Variable	Significance
Gender	0.466
How often do you clean your plates?	0.016
How do you clean your plates?	0.001
What materials do you use to clean your plates?	<0.001
Do you think that it is difficult to clean your plates?	0.693
Do you think that your plates are cleaned enough?	0.027

There was a statistically significant correlation between the statistical significance of the test statistics and the frequency of clearing the age groups and plates, the way of clearing the plates, the instrument to be used to clean the plates and the cleanliness of the plates (p <0.05). Statistically significant variables were interpreted by adding cross tables.

Table 6 shows the frequency of clearing the plates and the cross table for the age groups. According to this table, 73% of individuals between the ages of 18-25 are clean their plates whenever they remove, 50% of individuals aged 26-33 are clean their plates twice a day, and 48.6% of individuals between the ages of 34-41 clean their plates once a day.

Table 6. Cross-table of age groups with frequency of clearing plates.

		How often do you clean your plates?			Total
		Once a day	Twice a day	Whenever I remove	
18-25	n	3	7	27	37
	%	8.1%	18.9%	73.0%	100.0%
26-33	n	6	24	18	48
	%	12.5%	50.0%	37.5%	100.0%
34-41	n	3	17	15	35
	%	8.6%	48.6%	42.9%	100.0%
Total	n	12	48	60	120
	%	10.0%	40.0%	50.0%	100.0%

Table 7 shows a cross-table of age groups in the form of clearing the plates. According to this table, 97.3% of individuals between the ages of 18-25, 95.8% of the individuals between the ages of 26-33 and 74.3% of the individuals between the ages of 34-41 clean the plates only with tap water.

Table 7. Cross-table of age groups by type of clearing of plates.

		How do you clean your plates?		Total
		Brushing under water	Only with tap water	
18-25	n	1	36	37
	%	2.7%	97.3%	100.0%
26-33	n	2	46	48
	%	4.2%	95.8%	100.0%
34-41	n	9	26	35
	%	25.7%	74.3%	100.0%
Total	n	12	108	120
	%	10.0%	90.0%	100.0%

Table 8 shows a cross-table of age groups with the cleaning materials of the plates. According to this table, 78.4% of individuals aged 18-25 years clean their plates with toothpaste, 52.1% of individuals aged 26-33 clean only with tap water and 54.3% of individuals aged 34-41 clean their plates with toothpaste.

Table 8. Cross-table of age groups with plates cleansing agent.

		What materials do you use to clean your plates?				Total
		Toothpaste	Soap	Only Water	Cleansing Tablets	
18-25	n	29	3	5	0	37
	%	78.4%	8.1%	13.5%	0.0%	100.0%
26-33	n	13	8	25	2	48
	%	27.1%	16.7%	52.1%	4.2%	100.0%
34-41	n	19	4	10	2	35
	%	54.3%	11.4%	28.6%	5.7%	100.0%
Total	n	61	15	40	4	120
	%	50.8%	12.5%	33.3%	3.3%	100.0%

Table 9 shows the views of the cleanliness of the plates and the cross table for the age groups. According to this table, 70.3% of the individuals between the ages of 18-25, 58.3% of the individuals between the ages of 26-33 and 85.7% of the individuals between the ages of 34-41 think that the plates can be cleaned enough.

Table 9. Cross-table of views of cleanliness and age groups.

		Do you think that your plates are cleaned enough?		Total	
		Yes	No		
Age	18-25	n	26	11	37
		%	70.3%	29.7%	100.0%
	26-33	n	28	20	48
		%	58.3%	41.7%	100.0%
	34-41	n	30	5	35
		%	85.7%	14.3%	100.0%
Total	n	84	36	120	
	%	70.0%	30.0%	100.0%	

DISCUSSION

Essix plates are one of the most preferred removable orthodontic retention appliances in daily orthodontic practice. Nevertheless, we could not find a study focusing directly on the hygiene habits and methods of Essix plate wearing patients in the literature.

Bacterial and fungal concentration in oral microflora may increase by fixed or removable orthodontic appliances.^{5,7,9} In a previous study, it was stated that there was not a way of disinfecting the removable appliances absolutely but it could be possible to disinfect them the most, in some ways.¹⁵

In the literature, there are studies investigating the mechanical, chemical and combination of both methods for disinfection of removable appliances.¹⁶ The best method of disinfecting a removable appliance was stated to be ultrasound bath and cleaning with chemicals.¹⁵

In some previous studies, it was presented that immersing appliances into water with chemical agents for a while for disinfection was usually recommended by the clinicians.^{17,18} However, Lamas et al.¹⁶ stated that mechanical cleaning was the most preferred way of cleaning appliances amongst the patients and clinicians.

Da Silva et al.¹⁹, presented in their study that 1% sodium hypochlorite, 2% glutaraldehyde, 2% chlorhexidine, 100% vinegar, and 3.8% sodium perborate were effective in disinfection of removable dentures. Peixoto et al.⁶, indicated that gold standard for the elimination of biofilm compared to other chemicals was the use of chlorhexidine. Lessa et al.¹, evaluated the effects of two different chemical agents; chlorhexidine gluconate and cetilpyridinium chloridine in the disinfection of removable appliances. Cleaning with both chemical agents were found to be effective in elimination of the microorganisms. Immersing into water with sodium hypochlorite was another practical and economical way of cleaning plates, amongst patients.¹ Although having an effective and fast antimicrobial activity, sodium hypochlorite can have serious cytotoxic side effects.^{15,16}

In previous studies, using toothbrush and toothpaste under tap water was found to be the frequent way of cleaning plates.^{15,16} These results were consistent with our

study. In our study, using toothpaste as cleansing material and brushing the plates under tap water was the most preferred way of cleaning: %51 of our subjects preferred this method to clean their Essix plates. According to age groups; the patients between 18-25 and 34-41 most preferred to use toothpaste. However, this can cause abrasion on the surface of the appliances which can lead to a harmed surface for microbial retention.¹ Some of the subjects in this study also stated that brushing with toothpaste harmed the surface smoothness of their plates which lead to a dull surface.

Washing the appliances under running tap water without any cleansing agents is another frequent preferred mechanical way of cleaning appliances in all of the age groups. However, is not found to be effective enough to remove the microorganisms on the retentive areas of the appliances. Hence, it was stated that brushing with a chemical antimicrobial agent could provide a proper appliance hygiene by the elimination of bacterial biofilm.¹⁷ In this study the method preferred by %10 of subjects in cleaning their plates was washing the plates under running tap water solely without using any chemical agents or brushes. Nevertheless %33 of subjects stated that they used only water as a cleansing material without any chemicals.

Soap or cleaning foams were the cleansing materials which were preferred by %13 of our subjects in cleaning their plates. Soaking into water with cleansing tablets was the lesser preferred way to clean plates. Only %3 of our subjects stated that they used cleansing tablets. This could be because of the costs of the such cleansing agents.

In present study %30 of the subjects stated that they did not think that their plates were hygienic. The belief of cleanliness of the plates were highest in elderly age group (34-41). Many of the patients complained about the bad smell of the plates and stated that they wanted to learn a way of deodorization of their Essix plates. Soaking into cleansing tablets periodically was offered to these patients to solve this problem.

In our study, %94 of the subjects mentioned that it was not difficult for them to clean the plates. Nevertheless, %50 of subjects said that they cleaned their plates whenever they remove it while %40 once a day and %10 twice a day, respectively. It was clinically observed that using these plates, cleaning and taking care of these plates had some difficulties for patients. The youngest group showed the highest frequency of cleaning the plates.

CONCLUSION

There is not a common method of cleaning the Essix plates amongst patients. Patients refer various materials to clean their Essix plates. The frequencies of cleaning their plates also differ amongst patients. Hygiene habits were also different according to age groups.

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