

ATTRITION IN EVERYDAY DENTAL CLINICAL PRACTICE

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ABSTRACT

Introduction: Attrition, its prevention and therapy is a complex problem, with a multifactorial etiology. The aim of this paper is to examine the treatment of attrition in everyday dental clinical practice with the help of soft inserts.

Material and method: In this study, 30 patients were included, divided into two groups of 15 patients, the study and the control group. The examined patients had first degree of attrition diagnosed according to the Bardsley index, after which the condition was noted in four intervals: the initial situation, after 2, 4 and 6 months from the first visit. The research data were processed in Statistica for Windows 7.0 and SPSS version 20, and the same were presented graphically.

Results: In the study group with I degree of attrition, for $p > 0.05$, no statistically significant difference was determined in the range of the Bardsley index between the four measurement times (Friedman Test: $N=15$; Chi-Square=7,200; $df=3$; $p=0.0658$). In the control group, for $p < 0.05$, a significant difference was determined in the range of the Bardsley index between the four measured times (Friedman Test: $N=15$; Chi-Square=15.180; $df=3$; $p=0.0017$) with a significantly high value after 6 months.

Discussion: From the results obtained when comparing the study group in patients with I degree of attrition and the control group, a negative change from the parafunction bruxism was observed in 20% of the test group and 47% of the control group. The results of our research indicated that in patients with the first degree of attrition from the study group, soft dental inserts give significantly better results than untreated patients in the control group. This correlates with the research of Khayat N. et al.

Conclusions: From the results of the subjects in the group with I degree of attrition, we can conclude that the soft inserts has great efficiency as a means of management of this parafunction and therefore its application in daily therapy is recommended.

Keywords: attrition, prevention, therapy, soft inserts, application

INTRODUCTION

The term occlusal parafunction is defined as any oral activity that does not belong to the physiological functions of the oral cavity, such as: chewing, swallowing, breathing and speaking, and in which the occlusal surfaces of the teeth participate [1].

The occlusal parafunctions can be stimulated by the psyche - from neurological origin, stimulated by stress - normal but exaggerated reactions to stress, habitual - professional habits. Furthermore, endogenous parafunctions develop - due to systemic diseases, such as epilepsy, meningitis and others, compensatory parafunctions, unconscious and involuntary reactions to obstacles and disorders of occlusal balance of various kinds [2].

As with muscles and joints, dentition undergoes changes from oral parafunctions. Among the changes that occur on teeth we find attrition and increased mobility of the tooth and pulpitis [3].

Sometimes attrition developed from the occlusal parafunctions can be associated with abrasion and erosion of the teeth. Abrasion is a non-carious defect of the dental substance caused by mechanical action of a foreign body [4].

Erosion, however, also represents a non-carious dental defect that can occur, resulting from the dissolving of the hard dental substance from acids from non-bacterial origin [5].

Tooth loss due to attrition is a growing problem today, with an incidence rate of 80% in children and 43% in adults [6].

Adolescents are also under great risk of attrition. The current rate is of 30% among eleven-year-old examinees and at 44% among fifteen-year-olds [7].

In terms of gender, men are more susceptible to this parafunction, as well as people with a low socio-economic background [8].

The most common complication that occurs because of occlusal parafunctions is the wear of the tooth surfaces during physiological and non-physiological contacts of the teeth, known as attrition, the habits of clenching and grinding the teeth [9, 10].

Treatment of this condition can be conservative, prosthetic or preventive, with aids, such as soft inserts. Soft inserts, as the most effective

aids, are also one of the most applied in everyday dental clinical practice [11].

According to the material of manufacture, dental inserts are divided into hard and soft inserts [12].

Elastic inserts are a soft means for occlusal therapy with which tooth surfaces are protected from the harmful effects of occlusal parafunctions. They are manufactured of flexible material and can be used on the maxillary or mandibular dental arch [13].

In practice, they are more often adapted to the maxillary arch. They do not treat grinding or clenching with the teeth. Their value in the management of parafunctions is the protection of the surfaces of the teeth from further damage and attrition [14].

If these inserts are properly manufactured and worn, the success of wearing them can be noticed after 6 weeks. After a period of 6-8 weeks, the elastic inserts lose their flexibility and should be replaced with new ones [15].

Based on the literature from this area, and wanting to contribute to the development in it we have set the goals of this study:

To note the condition of the natural teeth with presence of lesions from the type of attrition without damaging of the dentin, first (I) degree according to the index for attrition by Bardsley et al.;

To note the success of prevention and management of the teeth after manufacturing the soft inserts;

To note whether the attrition will equally affect all the patient's examined teeth;

To note the condition of the protected teeth in the jaw in which they are located;

To quantify prevalence and lesions and their progression according to the location in the jaw (frontal and lateral).

MATERIAL AND METHODS

In our study, 30 subjects over the age of 18 years, were included. There was no restriction in gender distribution. In order to realize the goals of this study, research was carried out in PHO "Ultradent" - Kumanovo, as well as in the clinic for fixed prosthetics, at the PHO University Dental Clinical Center - "St. Panteleimon" - Skopje.

The patients who participated in this study signed consent form for participation prior to being considered. The study was approved by the Ethics Committee at the Faculty of Dentistry in Skopje. The research data were processed in Statistica for Windows 7.0 and SPSS version 20, and the same were presented graphically.

Criteria for inclusion in the study, apart from age, were the presence of attrition of at least 4 teeth in the maxilla or mandible, teeth with attrition not having been previously dentally treated, and satisfactory oral hygiene of the patients.

The patients in whom the following factors were observed were excluded from the study: patients with periodontal diseases, patients with removable prosthetic devices, patients in whom the antagonists of the affected teeth with attrition are fixed-prosthetic products, patients in whom the degree of attrition is not uniform, i.e. there is the presence of different degrees according to the index.

The following clinical examinations were performed on the examinees:

- anamnesis;
- intraoral examination;
- analysis of panoramic images;

The degree of attrition was noted according to the criteria set by Bardsley et al, and we included patients with grade I attrition in our study (Figure 1).



Figure 1. *Intraoral view of frontal teeth in the mandible with I degree of attrition*

The information was recorded on a dental chart for each individual patient. The patient's sex and age, date of examination, number of teeth, location of the teeth in relation to the region (frontal, lateral) as well as in relation to the jaw (maxilla or mandible) were registered in the charts.

Soft inserts were designed individually for every patient (figure 2), where we had a chance to follow the treatment plan.



Figure 2. *Individually designed soft inserter intraoral view*

RESULTS

Our research represented a prospective randomized clinical study, which was conducted in the period from 2020-2021 at the PHO "Ultradent" - Kumanovo, as well as at the Clinic for fixed prosthetics, at the PHI University Dental Clinical Center "St. Panteleimon", Skopje.

General characteristics

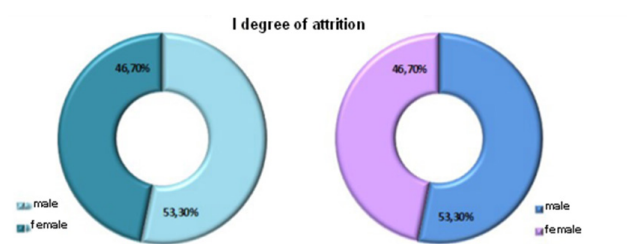
According to the degree of attrition using the Bardsley index, the examinees of the research with the I degree of attrition in total 30 (100%) were divided into 2 groups, the study group (SG), 15 patients for which soft inserts were manufactured and the control group (CG), consisting of 15 patients for whom soft inserts were not manufactured.

Among the patients with I degree of attrition according to the Bardsley index: in the SG – 15 (100%) and CG – 15 (100%) patients with attrition of teeth without dentin damage were included. SG patients with grade I attrition were treated with soft inserts.

Along with the analysis of the demographic characteristics, the gender and age of the patients were included according to the four degrees of occlusion according to the Bardsley index.

GENDER - our analysis according to gender indicated that the distribution of men and women (graph 1) respectively amounts to:

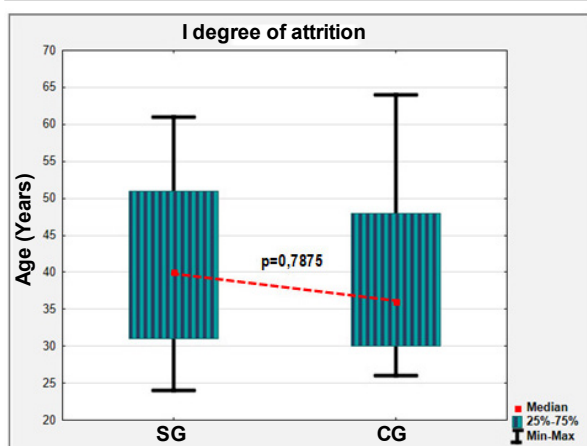
I degree of attrition in both SG and CG - 8 (53.3%) vs 7 (46.7%) with a gender ratio of 1.1:1;



Graph 1. Analysis of groups with different degree of attrition (SG/CG) in accordance with gender

AGE - The average and median values for the age of the examinees with the first degree of attrition are:

I degree of attrition - 40.93 ± 11.83 [95% CI (34.35 – 47.51)] years with a min/max age of 24/61 years in SG, and 40.13 ± 12.74 [95 % CI (33.07 – 47.19)] with a min/max age of 26/64 years in CG. The analysis indicated that 50% of the examinees in the SG or CG were younger than 40 years respectively for Median (IQR)= 40 (31-51), that is, from 36 years for Median (IQR)= 36 (30-48). For $p > 0.05$, the analysis did not indicate a statistically significant difference between SG/CG with I degree of attrition in relation to age (Mann-Whitney U Test: $Z=0.269$; $p=0.7875$) (graph 2).

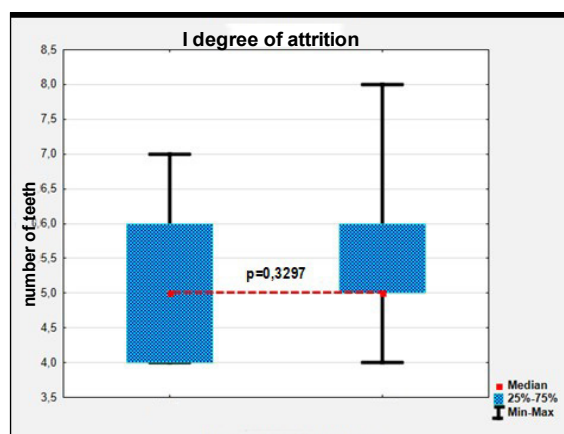


Graph 2. Analysis of groups with different degree of attrition (SG/CG) according to age in years

NUMBER OF TEETH

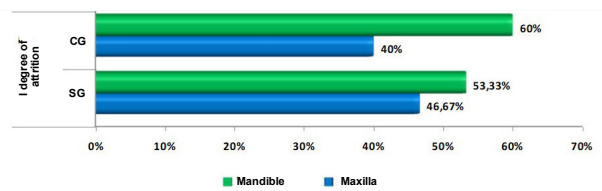
Frequency analysis of the number of teeth of the examinees in the entire sample indicated an irregular distribution for Shapiro-Wilk $W=0.9064$; $p=0.00004$. According to the established distribution of frequencies, appropriate tests were used in the further analysis.

Number of teeth in the examinees with I degree of attrition – in this degree of attrition, the average number of teeth in the SG or CG was consistently 5.07 ± 1.03 with a min/max of 4/7 teeth vs 5.53 ± 1.19 with a min/max of 4/8 teeth (graph 3). In both groups (SG and CG), in 50% of the subjects the number of teeth was less than 5, respectively Median (IQR)= 5 (4-6) vs Median (IQR)= 5 (5-6).



Graph 3. Analysis of groups with different degree of attrition (SG/CG) according to number of teeth

REGION – in this part of the research, each group with different degrees of attrition (SG/CG) was analyzed in terms of the location of the teeth with attrition according to the region (frontal, lateral and circular) (graph 4). In patients with I degree of attrition, in the SG or CG with a frontal location, there were an equal number of teeth in both groups, 6 each (40%), lateral location had consequently 9 (60%) vs. 5 (33.33%) of teeth with attrition and circular location had only 4 (26.67%) teeth in the CG and none in the SG.



Graph 4. Analysis of groups with different degree of attrition (SG/CG) according to the location regarding the region in the jaw (maxilla/mandibula)

I degree of attrition at four different periods

Examinees with I degree of attrition according to the Bardsley index, were patients with tooth attrition without dentin damage and were divided into SG – 15 (100%) and CG – 15

(100%). SG patients with grade I attrition were treated with soft inserts, while those in CG did not receive intervention. The clinical condition of the patients was monitored in 4 periods (zero, 2 months, 4 months and 6 months).

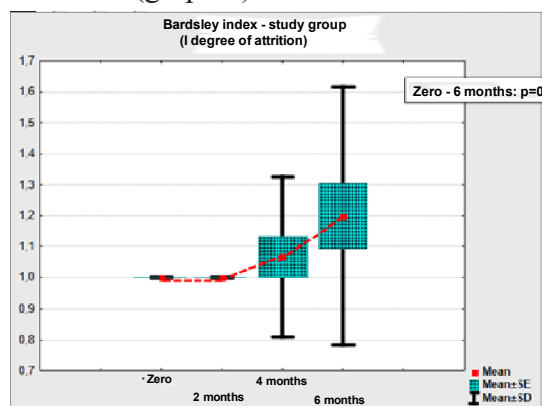
Intergroup comparison - Grade I attrition

This area of our research concerns itself with the individual analysis of each group (SG/CG) with I degree of attrition in relation to the state of the teeth according to the Bardsley index at the four follow-up times.

Study group - the analysis in the SG with attrition grade I at the four follow-up periods (zero, 2 months, 4 months and 6 months after treatment with soft inserts) indicated that the mean value of the Bardsley index at zero time and 2 months was 1 (that is, it was unchanged) among all examinees in the SG.

An increase in the mean value of Bardsley's index in the SG with grade I attrition was registered after 4 months - 1.07 ± 0.26 followed by the progression of an increase and after 6 months - 1.20 ± 0.41 . In 50% of the subjects, during these two periods, the Bardsley index was 1 for Median (IQR)=1 (1-1). The minimum and maximum values of the Bardsley index were the same at 4 and 6 months after the therapeutic intervention and were min/max=1/2.

In the SG with I degree of attrition, for $p > 0.05$, no statistically significant difference was determined in the range of the Bardsley index between the four periods (Friedman Test: $N=15$ hi- Square=7,200; $df=3$; $p=0.0658$). In the follow-up period after therapeutic intervention with soft inserts, the average value of the Bardsley index in the SG showed a slight non-significant increase at 4 and 6 months compared to zero and 2 months (graph 5).



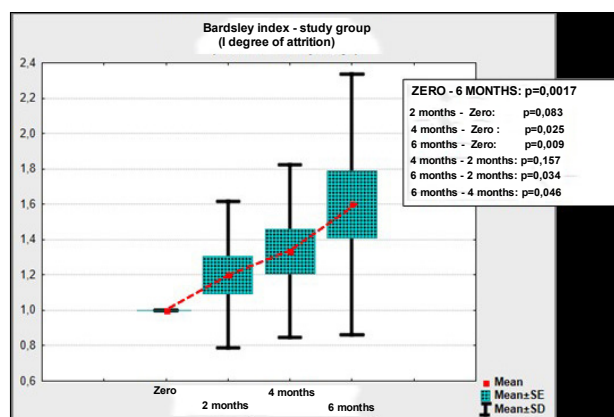
Graph 5. Analysis of the Bardsley index in SG with I

Degree attrition in four time periods

THE CONTROL group – In this group with I degree of attrition, where there no therapeutic intervention was performed, the analysis indicated that the average value of the Bardsley index began to rise after 2 months - 1.20 ± 0.41 , followed by its continuous increase after 4 months - 1.33 ± 0.49 and reaching the highest value after 6 months - 1.60 ± 0.74 .

At the clinical follow-up after 2, 4 and 6 months, in 50% of subjects from the CONTROL group, the Bardsley index was 1 for Median (IQR)=1 (1-1) after 2 months and Median (IQR)=1 (1-2) after 4 months or after 6 months. The minimum and maximum values of the Bardsley index after 2 and 4 months were min/max=1/2, and after 6 months due to its increase, they were min/max=1/3.

In the CONTROL group, for $p < 0.05$, a significant difference was determined in the height of the Bardsley index between the four measurement times (Friedman Test: $N=15$; Chi-Square=15.180; $df=3$; $p=0.0017$) with a significantly highest value after 6 months (graph 6).



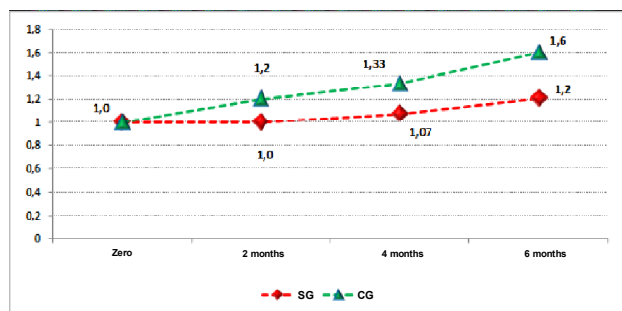
Graph 6. Analysis of the Bardsley index in the CG with I degree attrition in four time periods

Intergroup comparison - I grade of attrition

A comparison was conducted between the range of values of the Bardsley's index between the STUDY and the CONTROL group with I degree of attrition in all four period times of clinical follow-up (zero, 2 months, 4 months and 6 months).

For $p > 0.05$, no significant difference was determined in any of the comparisons for consequent Mann-Whitney U Test: $Z=0.000$; $p=1.000$ at zero time, $Z=-0.933$; $p=0.3507$ at 2 months,

$Z=-1.244$; $p=0.2134$ at 4 months and $Z=-1.369$; $p=0.1711$ at 6 months. In the three times of clinical control (2, 4, and 6 months), a non-significantly higher average value of the Bardsley index was determined in the CG (with worsening of the condition) compared to the SG where therapeutic intervention with soft inserts was performed. The average values of the Bardsley index in the SG/CG were consistently: 1.00 ± 0.00 vs 1.20 ± 0.41 – 2 months; 1.07 ± 0.26 vs 1.33 ± 0.49 – 4 months; and 1.20 ± 0.41 vs 1.60 ± 0.74 – 6 months (graph 7).



Graph 7. Bardsley index value range comparison between SG/CG with I degree of attrition in four time periods

Change of the Bardsley index - I degree of attrition

Within the framework of the research, in each of the two groups (SG/CG) with I degree of attrition the change in the Bardsley index at each subsequent time in relation to the previous one was monitored (2 months - zero; 4 months - 2 months, and 6 months - 4 months). In doing so, the possible changes of the Bardsley index were categorized in three time combinations (graph 8):

- negative change (reduction in the Bardsley index, improvement of the condition, compared to the previous time);
- positive change (increase in the Bardsley index, deterioration of the condition, compared to the previous time);
- no change (equal Bardsley index, the situation remains the same, in the two consecutive times).

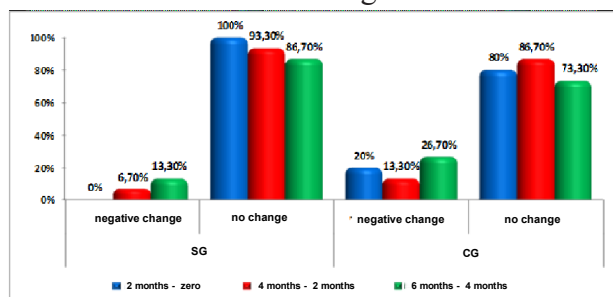
POSITIVE CHANGE - reduction in the Bardsley index: the analysis of both groups (SG/CG) indicated that in none of the three period comparisons (2 months - zero; 4 months - 2 months, and 6 months - 4 months) an improvement of the state (regression) of the already established I degree of attrition was determined (graph 8).

NEGATIVE CHANGE – an increase in the Bardsley index was observed during clinical examination after:

- 2 months compared to zero - no one in the SG vs. 3 (30%) people in the CG registered a deterioration of the condition from I to II degree of attrition;
- 4 months compared to 2 months - in 1 (6.7%) person in the SG vs 2 (13.3%) people in the CG where in both groups there was deterioration from I to II degree of attrition;
- 6 months compared to 4 months - in 2 (13.3%) persons in the SG there was a worsening of the condition from I to II degree of attrition vs 4 (26.7%) people in the CG of which in 2 (50%) there was a deterioration of the condition from I to II degree of attrition, and in 2 (50%) there was deterioration from II to III degree of attrition.

NO CHANGE - equal Bardsley index: a total of 12 (80%) subjects in the SG and only 8 (53.3%) in the CG maintained grade I attrition status during all 6 months of follow-up.

During the entire follow-up period of 6 months, no subject in the SG where therapeutic intervention with soft inserts was performed had deterioration from I to II degree of attrition.



Graph 8. Change of the Bardsley index in SG/CG with I grade attrition in three time combinations

DISCUSSION

Because attrition, like other types of tooth loss, is more and more often present in everyday dental clinical practice, its multifactorial etiology and complexity in the formulation of a restorative dental plan, is the subject of extensive and enormous available literature. Sangeeta Y. et al. observe that the prevalence of attrition is represented in childhood, with 80%, in adolescents with 43% as well as in adult patients, where an incidence of 44% was noted [16].

One of the main reasons for the presence of attrition is the presence of the parafunctional habit bruxism, as stated in the research from Kapusevska [1].

It is precisely this complexity in therapy that we have used to focus on one specific aspect in the prevention and management of attrition, specifically on individually made soft inserts. Soft inserts are one of the most used aids in the fight against attrition, especially in terms of prevention from further damaging of the dental substance.

As we noted earlier, and according to our results, the prevalence of attrition is at a worrying level. The values after analysis of the data collected during the examination show us that men, at 52%, show an insignificantly higher representation compared to women, a fact that leads us to conclude that the gender of the examinees is not a relevant factor in this research. When examining the prevalence of dental attrition in 222 subjects, Seligman DA et al. analyzed the data according to age, sex, bruxism, orthodontic class, maxillomandibular relationship, and TMD, finding similar results to our research [17].

Considering the complexity of this condition, the prevalence and extensive literature, our task to give an answer to a small part of this extensive problem – soft inserts as a means of preventive therapy of attrition.

The key factor for the success of the management of a group of examinees with the first degree of attrition was the progression of attrition, specifically the fact whether the examinees during the research period changed to one of the more advanced degrees of attrition, or remained unchanged during the six-month period while this research was performed.

The obtained results show that the number of teeth for $p > 0.05$, the analysis did not indicate a statistically significant difference between SG/CG with I degree of attrition in relation to the number of teeth (Mann-Whitney U Test: $Z = -0.975$; $p = 0.3297$). When analyzing the results, in terms of the jaw, where we noted the loss of dental substance, we can observe a significantly higher representation of attrition in the mandible, at 61%, when compared to the maxilla, where we observed a representation of 39%. These results are related to the research from Kapusevska et al. [1]

After processing the noted results in relation to the region in which attrition was noted, we saw frontal loss in 39% of subjects, 51% in the lateral region and 10% of subjects had loss in both zones. In this study the number of teeth for $p < 0.05$ showed no statistical significance according to the number of teeth examined, which is agrees with research from Ramfjord and Ash, who have evaluated the occlusion in their examinees [2].

In the studied group with I degree of attrition, for $p > 0.05$, no statistically significant difference was determined in the range of the values of the Bardsley index between the four measurement period of times (Friedman Test: $N = 15$; Chi-Square = 7,200; $df = 3$; $p = 0.0658$).

In the follow-up period after the therapeutic intervention with soft inserts, the average value of the Bardsley index in the studied group recorded a slight insignificant increase at 4 and 6 months compared to zero and 2 months, proving the usefulness of the soft inserts. Our research is agreement with the research of Khayat N., who used soft inserts in his preliminary prospective study, proving their efficacy in the prevention for further attrition [18].

The realization that attrition is a condition that needs to be diagnosed, differentially diagnosed and treated is of great importance for us as practitioners in the everyday dental clinical practice, correlating with the study of Luis et al. [19]

From the results we have obtained it has been proven that patients with I degree of attrition protect their teeth from further damaging, compared to the control group where there was a progression in the deterioration of the dental substance.

As therapists, we are obliged to raise awareness that even the slightest amount of dental wear can prograde if preventive measurements are not taken into account on time.

CONCLUSIONS

After a complete analysis of the results, related to the factors gender, number of teeth, the location of the attrition in relation to the region (frontal, lateral or circular) and jaw (maxilla and mandible), applying the degree of attrition according to the Bardsley index, we came to the following conclusions:

1. Regarding the progression of attrition during the study, gender again proved to be an insignificant factor, having an even distribution in both sexes.

2. The number of teeth showed insignificant results between the study group and the control group.

3. Analyzing the maxilla and mandible we can conclude that patients with attrition are more susceptible to loss of tooth mass in the mandible.

4. The region in which attrition was noted, the lateral zone is the most affected compared to the frontal zone.

5. From the results in subjects with I degree of attrition, we can conclude that soft inserts are a means of management of this parafunction and have great efficiency. When comparing the study group and the control group, we see a negative change of 20% in the study group and 47% in the control group, a fact that leads us to conclusion, that soft inserts should be used as a means for prevention of the condition attrition to improve the patients' quality of life.

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Резиме

АТРИЦИЈА ВО СЕКОЈДНЕВНАТА СТОМАТОЛОШКА КЛИНИЧКА ПРАКТИКА

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Вовед: Атрицијата, нејзина превенција и терапија, е комплексен проблем, со мултифакторијална етиологија. Целта на овој труд е да се испита третманот на атрицијата во секојдневната стоматолошка клиничка практика со помош на меки вметнувачи.

Материјал и метод: Во истражувањето беа опфатени 30 пациенти, поделени во две групи од по 15 пациенти, студијата и контролната група. На прегледаните пациенти им бил дијагностициран прв степен на атриција според индексот по Bardsley, по што состојбата била нотирана во четири интервали: почетната состојба, по 2, 4 и 6 месеци од првата посета. Податоците од истражувањето беа обработени во Statistica за Windows 7.0 и SPSS верзија 20, кои беа графички претставени.

Резултати: Во испитуваната група со I степен на атриција, за $p > 0,05$, не беше утврдена статистички значајна разлика во опсегот на индексот по Bardsley меѓу четирите времиња на мерење (Friedman Test: $N = 15$; Chi-Square = 7,200; $df = 3$; $p = 0,0658$). Во контролната група, за $p < 0,05$, беше утврдена значајна разлика во опсегот на индекс по Bardsley меѓу четирите измерени времиња (Friedman Test: $N = 15$; Chi-Square = 15,180; $df = 3$; $p = 0,0017$), со значително највисока вредност по 6 месеци.

Дискусија: Од добиените резултати при споредбата на испитуваната група кај пациентите со I степен на атриција и контролната група, забележана е негативна промена од парафункционалната навика бруксизам кај 20 % од испитуваната група и 47 % од контролната група. Резултатите од нашето истражување покажаа дека кај пациентите со прв степен на атриција од испитуваната група, меките дентални вметнувачи даваат значително подобри резултати од нетретираниите пациенти во контролната група, што е во корелација со истражувањето на Khayat N. et al.

Заклучоци: Од резултатите на испитаниците од групата со I степен на атриција, можеме да заклучиме дека меките вметнувачи како средство за менаџирање со оваа парафункција имаат голема ефикасност и затоа се препорачува нивна примена во секојдневната терапија.

Клучни зборови: чкрипење, превенција, терапија, меки вметнувачи, апликација

