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Impact of the Provisional Splinting on the Dynamics of Restoration of the Clinical-Functional Status of the Incisor Parodontium That Have Lost Their Stability to Different Extents.

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ABSTRACT

The teeth stability characterizes the level of the human dental health. In case of atrophy of the parodontium tissues the projection of the teeth supporting area reduces, their stability is also reduced. Loading of teeth that have partially lost their stability results in the disruption of the hemodynamics in parodontium and increased exudation of crevicular fluids. Achievement of the parodontium rehabilitation depends on the degree of reduction of projection of the tooth foundation area.

Keywords: parodontium, rehabilitation, teeth stability, laser Doppler flowmetry, crevicular fluids, provisional splinting.

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INTRODUCTION

Generally the parodontium diseases represent one of the most topical issues of dentistry characterized by a complex combination of the pathological manifestations [1, 2, 3, 4]. The teeth stability is one of the criteria characterizing the severity and incidence of periodontitis. As a rule, in order to evaluate the tooth stability a dentist applies multidirectional load to a teeth with tweezers determining the crown jumping distance with regard to the adjacent teeth. During the first visit on the basis of the subjective examination the conclusion about the tooth mobility is drawn. By discussing the achievements in the treatment process one may state the reduced teeth mobility and the conclusion about their increased stability is drawn. We have suggested an approach determining the tooth stability as the ratio between the resultant of the moment of force and the profile made by the lines connecting the support points by projection of the intra-alveolar part of the tooth root on the computational plane [5]. By using this approach to the teeth stability issue the possibility emerges to go beyond the general ideas based on the visual estimation of the crown displacement against the crowns of the adjacent teeth but to find other quantitative characteristics in the form of the measurable units. Determination of such values allows finding out the numerical relations between them, i. e., describing the transition from health to disease in a quantitative form which will allow performing the pathogenically reasoned treatment and objectively evaluate the results thereof.

PROCEDURE

The 58 patients undergoing the orthopedic treatment took part in the survey; in accordance with the developed plan the provisional splinting of 6 anterior teeth was performed. The patients were subjected to the tomography examination. Having somewhat simplified the developed method we determined the loss of stability of the joined teeth in the axial window of the multi-dimensional reconstruction by calculating the difference between the tooth sectional areas in the area of the cervical and clinical lines. After analysis of the tomograms on the basis of loss by the incisors of the support area projection the two groups have been formed from the patients. The first group (n=28) included persons in which there has been detected the loss of less than 10% of projection of the incisor root support. The second group was made of the patients (n=30) in which the loss of more than 10% projection of the incisor root support has been diagnosed (Table 1).

Table 1: Distribution of patients (n=58) by the groups according to the loss of the support area of the incisors roots

group (n=28)		group (n=30)	
Maxillary incisors	Mandibular incisors	Maxillary incisors	Mandibular incisors
14	14	14	16

At the following stage all the patients were subjected to the chairside tooth brushing. Three days after that on the basis of recommendations [6] in order to evaluate the loading damage of parodontium in the incisors area after 20-minutes use of 1/5 of the chewing gum package we have measured the exudation of crevicular fluids according to the method [7] with the use of the 15x4 mm filter paper strips. The measured time of getting the crevicular fluids made 3 minutes [8]. The results obtained were compared with the table data [9].

By evaluation of the clinical-functional status of the incisor parodontium the values obtained were compared with $0,433 \pm 0,08 \text{ cm}^2$, those of the mandibular incisors $0,286 \pm 0,04 \text{ cm}^2$. These values correspond to arithmetic mean area of saturation with the crevicular fluid of the standard filter paper strips obtained in the area of incisors in parodontium of which non-clinical change may be observed.

The structural-functional shifts of parodontium blood supply were estimated with the use of the laser Doppler flowmetry (LDF). The analysis of the LDF-gram was performed according to the standard procedure, the statistical averages of the tissue blood perfusion have been investigated: M – arithmetical average of the microcirculation rate (perfusion units); δ – root mean square deviation of the blow flow range from the arithmetic mean value M; K_v – variation coefficient, relation between the tissue perfusion (M) and root mean square deviation of the amplitude (δ) characterizing the vasomotor activity of micro-vessels [10]. By carrying out the LDF in the odd experiments the parodontium transducer was detected to the right of the lip frenulum, in the even cases – to the left thereof.

The next day after determination of the initial state the stability of the anterior teeth was restored by means of provisional splinting. After application of the occlusal loading the changes of the response of incisors parodontium included in the split were estimated. A month later the loading and evaluation procedure was repeated.

MAIN PART

In the first group of patients the application of the specified occlusal loading before splinting resulted in the increase in exudation of the crevicular fluid obtained in the incisors area by 42,4-57,1%. In the second group of patients the crevicular fluid exudation increased by 67,3 – 72,5%.

After provisional splinting and application of the specified occlusal loading the crevicular fluid exudation was reduced in both groups as compared with the first loading. In the first group the exudation exceeded the values that are typical for parodontium with possible non-clinical changes by 27,4 - 45,1%, in the second one the exceedance made 51,8-68,5%.The reduction of the crevicular fluid exudation increase related to the application of the specified occlusal loading proves that from the biomechanical perspective splinting shall be considered as the procedure increasing the total supporting area of the teeth included in the splint.

A month after the provisional splinting in the first group in response to the occlusal loading the amount of the crevicular fluid obtained in the area of the splinted incisors exceeded by 5,7- 6,3% the values that are typical for parodontium with possible non-clinical changes. In the second group the amount of the crevicular fluid obtained in the area of the splinted incisors exceeded the values that are typical for parodontium with possible non-clinical changes by 31,4-36,5%. The data obtained prove that splinting of teeth that lost more than 10% of projection of the supporting area does not compensate the loss of stability (Table 2).

Table 2: Impact of provisional splinting on the clinical-functional status of the parodontium of incisors that have lost their stability to different extents after application of the occlusal loading.

		Before provisional splinting		One day after provisional splinting		One month after provisional splinting	
		1 st group*	2d group	1 st group*	2d group	1 st group*	2d group
area of saturation, cm ²	maxilla	0,616±0,1 (42,4%)	0,724±0,12 (67,3%)	0,551±0,08 (27,4%)	0,657±0,12 (51,8%)	0,457±0,09 (5,7%)	0,508±0,14 (31,4%)
	mandible	0,421±0,1 (57,1%)	0,462±0,11 (72,5 %)	0,414±0,09 (45,1%)	0,481±0,11 (68,5 %)	0,284±0,09 (6,3%)	0,365±0,11 (36,5%)
M		20,68±1,3 (18,6%)	22,3±1,4 (27,9%)	19,6±1,3 (12,4%)	21,25±1,4 (21,9%)	18,88±1,3 (8,3%)	20,35±1,4 (16,7%)
δ		2,11±0,4 (23,5%)	1,96±0,5 (28,9%)	2,22±0,4 (19,5%)	2,07±0,5 (25,0%)	2,74±0,4	2,32±0,5 (15,9%)
K _v		10,2±1,9 (34,6%)	8,7±1,9 (44,2%)	11,3±1,9 (27,6%)	9,7±1,9 (37,8%)	14,5±1,9 (7,1%)	11,4±1,9 (27,0%)

* Difference of the first group as compared with the second group is statistically relevant upon error level not exceeding 5% [P<=0,05].

According to the LDF, the impact of the occlusal loading prior to the provisional splinting of the center teeth resulted in the increase in the capillary blood flow in the first group of patients by 27,9 %. At the same time the vasomotor vessel activity was reduced by 23,5% and 28,9%, respectively, which proves the presence of the venostasis in the microcirculatory blood stream of parodontium that was more pronounced in the second group of patients.

After provisional splinting and recurrent application of occlusal loading the capillary blood flow increased in the first group by 19,6%, in the second group by 21,25%. In both groups the vasomotor vessel activity was increased though it remained lower in the first group by 19,5%, in the second group – by 25,0%. Insignificant increase in the coefficient values suggests the tendency to normalization of the blood flow in the microcirculatory bed of the splinted teeth.

One month after the provisional splinting the application of the occlusal loading resulted in the increase in the capillary blood flow in the first group by 8,3%, at the same time the vasomotor vessel activity did not

undergo any significant changes. A slightly increased value of the variation coefficient suggests the adaptation of the parodontium of teeth that lost less than 10% of projection of the supporting area to the specified occlusal loading.

In the second group the capillary blood flow was increased by 20,35%, at the same time the blood flow activity as compared with the previous observation was somewhat increased though it deviated from the standard by 15,9%. The variation coefficient reduced by 27,0% suggests that the application of occlusal loading results in the venostasis in the microcirculatory stream of parodontium in the area of teeth that lost more than 10% of the supporting area.

SUMMARY

The study performed shows that the method of numerical determination of the loss (restoration) of stability by the tooth (tooth arch segment) may serve as an objective criterion by evaluation of the clinical-functional status of parodontium. The advisability of using a chewing gum for restoration of hygienic optimum of the mouth cavity after meal in patients suffering from periodontitis also causes doubts. In order to answer this question properly it is needed to carry out the comparative analysis of the degree of damage of the parodontium tissues due to the microbial and occlusal factors.

CONCLUSIONS

On the basis of the data concerning exudation of the crevicular fluid and LDF one may state that after splinting the occlusal loading of incisors that lost less than 10% of supporting area projection does not result in the significant changes in the clinical-functional indicators of the parodontium state.

The occlusal loading of incisors that lost more than 10% of the supporting area projection results in the damage of the parodontium tissues. Provisional splinting as an element of treatment aimed at the increase in stability of the incisors forming a tooth arch fragment (each of the teeth) does not compensate the 10-% loss of the supporting area.

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