

Research Article

Clinical Evaluation of Periodontal Tissue Status in Prosthodontic Treatment of Patients with Partial Tooth Loss and Generalized Periodontitis

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Abstract

The problem of selection and application of dental prostheses in periodontal disease is especially relevant in case of severe generalized periodontitis, which is accompanied by mobile tooth removal resulting in overloading the periodontium of the remaining teeth as well as the increase in tooth mobility. Therefore, in generalized periodontitis, it is important to apply the method of direct dental prosthetic rehabilitation since, in case of partial tooth loss, it will prevent the development of generalized periodontitis complications.

The objective of the research was to improve the effectiveness of combination therapy for patients with generalized periodontitis and partial tooth loss applying the developed method of direct fixed dental prosthetic rehabilitation based on the study of the periodontal status.

Materials and methods. The study included 129 patients with general periodontitis, II-III degree and partial tooth loss over the age of 45 years. According to prosthodontic treatment, all the patients were divided into three groups: Group I consisted of 42 (20 women and 22 men) patients who immediately after tooth extraction were rehabilitated with the application of direct plastic laminar immediate prosthesis and selective tooth grinding; permanent dental prosthetic rehabilitation was performed 6 weeks after tooth extraction; Group II included 43 (21 women and 22 men) patients who underwent traditional permanent dental prosthetic rehabilitation using fixed dental bridges 6 weeks after mobile tooth removal and wound healing; Group III comprised 44 (21 women and 23 men) patients who immediately after mobile tooth removal were rehabilitated with the application of direct fixed sectional dental bridge (Ukrainian patent UA 20995. 2007 Feb 15) and selective tooth grinding; permanent dental prosthetic rehabilitation was performed 6 months after tooth extraction. The control group consisted of 26 people with intact dentitions over the age of 45 years.

Results and discussion. The application of direct dental prosthetic rehabilitation method after mobile tooth removal in combination treatment of generalized periodontitis allows stabilizing degenerative and inflammatory processes in the periodontium in the initial stages, as well as increasing the resistance of the capillaries and bone mineral density of the interdental septa. The obtained data indicated that the application of the proposed direct fixed sectional dental bridge was more effective as compared to conventional prosthetics methods.

Conclusions. 1. Direct fixed prosthodontics using direct fixed sectional dental bridge is essential in combination treatment of generalized periodontitis, especially if mobile tooth extraction is needed. It allows increasing the effectiveness of treatment in comparison with direct removable prosthodontics using direct plastic laminar immediate prosthesis (Group I) and traditional treatment methods (Group II). 2. We have proved the advantages of direct fixed prosthodontics in treatment of patients with generalized periodontitis, II-III degree based on the improvement of oral hygiene indices, the gingival bleeding index, the papillary-marginal-alveolar index, the periodontal index and the depth of periodontal pockets 6-12 months after treatment.

Keywords

generalized periodontitis; direct dental prosthetic rehabilitation

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Problem statement and analysis of the recent research

According to various authors, the prevalence of periodontal diseases among the population of Ukraine is 98-100% [2]. At the current stage of prosthetic dentistry development, its main problem is the prevention and treatment of these diseases [1]. Generalized periodontitis (GP) is a chronic degenerative inflammatory disease of the polyetiological nature which is

characterized by gingival inflammation, formation of periodontal pockets, bone resorption of the alveolar process [3, 4]. In the pathogenesis of GP, neurovascular disorders in the periodontal tissues are the major factor whereas a critical role is played by vascular disorders [5]. Under the influence of etiological factors, in the periodontium, pathological changes occur which may cause a disturbed bone metabolism as well as metabolic disorders [6]. Local factors are involved as well,

primarily masticatory function [7]. Thus, in case of partial tooth loss, masticatory function leads to the increase in the deformation and specific pressure on the affected periodontal tissues which, in turn, is accompanied by a greater mobility amplitude of the remaining teeth impairing the blood supply to the periodontal tissues and resulting in significant changes in tissue metabolism. The elimination of increased deformation and pressure on the preserved periodontal tissues during mastication is a therapeutic agent and can be accomplished by means of prosthetic methods only [8]. Prosthodontic treatment becomes particularly important in partial tooth absence complicated by GP which is explained by the fact that in addition to the factor of increased deformation of the bone tissue caused by atrophy the factor of additional arrhythmic functional loads appears and the remaining teeth are expected to pick up the loss in function [7, 9]. It should be noted that not only the increased load which appears due to atrophic processes affects the preserved periodontal tissues, but also additional one - due to the increased number of masticatory movements required for chewing food in dentition defects. Rational prosthodontic treatment of dentition defects in patients with GP should be conducted considering the functional state of the microvascular system of the periodontal tissue as well as structural and functional changes in the bone tissue of the alveolar process.

The selection and application of dental prostheses in periodontal diseases are especially relevant in case of severe GP, which is accompanied by mobile tooth removal resulting in overloading the periodontium of the remaining teeth as well as the increase in tooth mobility [10]. Therefore, in GP, it is important to apply the method of direct dental prosthetic rehabilitation since, in case of partial tooth loss, it will prevent the development of GP complications.

The objective of the research was to improve the effectiveness of combination therapy for patients with GP and partial tooth loss applying the developed method of direct fixed dental prosthetic rehabilitation based on the study of the periodontal status.

1. Materials and methods

We have selected the patients whose mobile teeth were removed due to exacerbation of periodontal disease. The study included 129 patients with GP, II-III degree and partial tooth loss over the age of 45 years.

According to prosthodontic treatment, all the patients were divided into three groups: Group I consisted of 42 (20 women and 22 men) patients who immediately after tooth extraction were rehabilitated with the application of direct plastic laminar immediate prosthesis and selective tooth grinding; permanent dental prosthetic rehabilitation was performed 6 weeks after tooth extraction; Group II included 43 (21 women and 22 men) patients who underwent traditional permanent dental prosthetic rehabilitation using fixed dental bridges 6 weeks after mobile tooth removal and wound healing; Group III comprised 44 (21 women and 23 men) patients who im-

mediately after mobile tooth removal were rehabilitated with the application of direct fixed sectional dental bridge (Ukrainian patent UA 20995. 2007 Feb 15) and selective tooth grinding; permanent dental prosthetic rehabilitation was performed 6 months after tooth extraction. The control group consisted of 26 people with intact dentitions over the age of 45 years.

In addition to studying oral hygiene indices, the papillary-marginal-alveolar (PMA) index, the gingival bleeding index, the periodontal index (PI), the mobility index and the gingival recession index, the study of the periodontal status included the determination of vascular resistance of periodontal capillaries in the frontal teeth (V.I. Kulazhenko's test, 1961) and combined periodontal index (CPI) (T.V. Nikitina, 1982). Structural and functional state of the bone tissue was determined by the level of bone turnover markers. Bone mineral density of the alveolar process in the interdental septa of the remaining teeth was determined using computer tomography by means of Somatom Emotion Siemens apparatus. The examination of the periodontal tissues as well as the state of avascular resistance in the periodontium was performed before and 6 weeks after mobile tooth removal; 6 months and one year after permanent dental prosthetic rehabilitation.

2. Results and discussion

Complex study of the state of periodontal indices, functional state of periodontal vessels as well as structural and functional state of the alveolar process bone tissue allowed us to obtain the following results. In Group I, on the background of poor oral hygiene, there were observed pronounced inflammation in the periodontal tissues of the mobile teeth, gingival bleeding and periodontal pockets (Table 1). This was reflected in the indicators of vascular resistance of periodontal capillaries being accompanied by increased activity of resorption processes and decrease in bone mineral density of the interdental septa in the alveolar process. The fixation of direct immediate prosthesis after tooth removal in Group I reduced the inflammatory process in the periodontium, tooth mobility and gingival bleeding within 6 weeks. Further permanent dental prosthetic rehabilitation using fixed restorations had a positive effect on the periodontal tissues of the remaining teeth throughout the year, which was reflected in the increase in time for hematoma formation according to the method proposed by V.I. Kulazhenko and the decrease in CPI indicators (Table 1). 12 months after treatment, the gingival bleeding index improved significantly up to (1.01 ± 0.07) scores as compared to the initial values - (1.89 ± 0.06) scores. Similar dynamics was observed when analyzing oral hygiene indices and the PMA index.

Stabilization of the clinical course of periodontal disease was confirmed by a decrease in the mobility of the remaining teeth as well as the indicator of bone tissue resorption marker reflected in increased bone mineral density of the interdental septa.

In Group II, the healing process 6 weeks after tooth extraction was characterized by poor oral hygiene, further development of inflammatory and degenerative phenomena in the pe-

Table 1. Clinical state of the periodontal tissues, metabolism and bone mineral density in patients of Group I (M±m)

Indices	Patients with GP and partial tooth loss				p
	Before tooth extraction	6 weeks after tooth extraction	6 months after dental prosthetic rehabilitation	12 months after dental prosthetic rehabilitation	
HI-DI-S, points	2.48±0.04	1.73±0.04	1.82±0.05	2.03±0.06	<0.01
HI-CI-S, points	2.24±0.13	0.98±0.14	1.04±0.13	1.29±0.17	<0.01
PMA, %	58.6±0.4	46.7±0.2	32.4±0.1	35.7±0.3	<0.05
Bleeding, points	1.89±0.06	1.32±0.07	0.88±0.08	1.01±0.07	<0.05
PP depth, Mm	5.53±0.04	4.93±0.02	4.32±0.04	4.44±0.03	<0.05
Rtg recession index, mm	5.81±0.06	-	4.76±0.03	4.61±0.05	<0.05
Kulazhenko's test, sec	13.4±0.05	24.5±0.04	35.7±0.04	40.2±0.03	<0.05
CPI, points	8.21±0.02	4.82±0.03	3.38±0.04	3.81±0.01	<0.05
Mobility, points	2.16±0.03	1.51±0.04	0.83±0.05	0.88±0.04	<0.01

Notes.

HI - hygiene index; DI-S - the simplified debris index; CI-S - the simplified calculus index; PP - periodontal pocket;

p - significance of differences before tooth extraction and 12 months after dental prosthetic rehabilitation.

riodontium and the mobility of the remaining teeth, increased gingival bleeding, deep periodontal pockets, high recession index (Table 2). The swelling of the mucous membrane in the region of the remaining teeth was accompanied by a decrease in the indicators of vascular resistance - V.I. Kulazhenko's test as well as CPI. 12 months after treatment, the gingival bleeding index improved significantly up to (1.31±0.05) scores as compared to the data before treatment - (1.81±0.06) scores. Similar dynamics was observed when analyzing other indices such as the PMA, CPI, oral hygiene indices, although they were worse than those in Group I.

It should be noted that permanent dental prosthetic rehabilitation using fixed restorations stabilized the clinical course of GP, which was expressed by the decrease in tooth mobility, inflammation and gingival bleeding within 6 months.

The application of direct fixed sectional dental bridge when rehabilitating patients with GP, II-III degree in case of mobile tooth extraction was characterized by the stabilization of the inflammatory and degenerative processes in the periodontal tissues of the remaining teeth as well as the decrease in tooth mobility and gingival bleeding within 6 weeks. This was accompanied by increased resistance of capillary vessels (V.I. Kulazhenko's test) and the normalization of bone metabolism (Table 3). 12 months after treatment, the gingival bleeding index improved significantly up to (0.81±0.06) scores as compared to the initial values - (1.99±0.04) scores. The analysis of the PMA index, CPI and oral hygiene indices demonstrated similar dynamics; however, they were better than indices in Group I and Group II.

The reduction in the indicator of bone resorption marker (total deoxypyridinoline (DPD)) within 6 months improved bone mineral density of the interdental septa in the alveolar

process throughout the year. The application of direct fixed sectional dental bridge allowed stabilizing the resorptive processes that decreased the indicator of CPI (Table 3). The stabilization of the indices of the functional state of periodontal vessels as well as structural and functional state of the bone tissue in patients of Group III had a long-term effect even a year after dental prosthetic rehabilitation.

Thus, our research has shown that the removal of mobile teeth and traditional dental prosthetic rehabilitation in the remote period after damaged surface healing caused exacerbation of GP in the periodontal tissues of the remaining teeth, namely the increase in the PMA index, the gingival bleeding index, the deep of periodontal pockets as well as the decrease in the capillary resistance. The obtained data are consistent with available literature data and are explained by overloading the periodontium of the remaining teeth. Though we can observe the improvement of the periodontal status throughout the year, it occurs on the background of increased bone resorption and decreased bone mineral density that may result in further exacerbation of GP.

The application of direct dental prosthetic rehabilitation method after mobile tooth removal in combination treatment of GP allows stabilizing degenerative and inflammatory processes in the periodontium in the initial stages, as well as increasing the resistance of the capillaries and bone mineral density of the interdental septa. The obtained data indicated that the application of the proposed direct fixed sectional dental bridge was more effective as compared to conventional prosthetics methods.

Table 2. Clinical state of the periodontal tissues, metabolism and bone mineral density in patients of Group II (M±m)

Indices	Patients with GP and partial tooth loss				p
	Before tooth extraction	6 weeks after tooth extraction	6 months after dental prosthetic rehabilitation	12 months after dental prosthetic rehabilitation	
HI-DI-S, points	2.56±0.02	2.29±0.03	1.81±0.04	2.23±0.05	<0.01
HI-CI-S, points	2.31±0.12	1.18±0.14	1.05±0.14	1.19±0.16	<0.01
PMA, %	55.4±0.3	58.7±0.1	40.3±0.2	42.7±0.2	<0.05
Bleeding, points	1.81±0.06	1.84±0.06	1.28±0.04	1.31±0.05	<0.05
PP depth, Mm	5.61±0.03	5.63±0.04	4.58±0.03	4.64±0.02	<0.05
Rtg recession index, mm	5.79±0.04	-	4.88±0.06	4.91±0.04	<0.05
Kulazhenko's test, sec	11.8±0.06	10.8±0.04	29.6±0.06	34.2±0.04	<0.05
CPI, points	7.91±0.03	7.82±0.02	4.68±0.02	4.61±0.05	<0.05
Mobility, points	2.24±0.05	1.81±0.03	1.23±0.05	1.28±0.04	<0.01

Note: p – significance of differences before tooth extraction and 12 months after dental prosthetic rehabilitation.

Table 3. Clinical state of the periodontal tissues, metabolism and bone mineral density in patients of Group III (M±m)

Indices	Patients with GP and partial tooth loss				p
	Before tooth extraction	6 weeks after tooth extraction	6 months after dental prosthetic rehabilitation	12 months after dental prosthetic rehabilitation	
HI-DI-S, points	2.48±0.03	1.33±0.04	1.42±0.02	1.53±0.05	<0.01
HI-CI-S, points	2.24±0.12	0.68±0.13	0.74±0.15	0.79±0.16	<0.01
PMA, %	56.5±1.1	34.7±1.3	30.1±1.1	29.3±1.3	<0.05
Bleeding, points	1.99±0.04	0.84±0.05	0.82±0.04	0.81±0.06	<0.05
PP depth, Mm	5.42±0.03	4.03±0.02	3.72±0.05	3.74±0.04	<0.05
Rtg recession index, mm	5.77±0.06	-	4.16±0.04	4.21±0.04	<0.05
Kulazhenko's test, sec	12.4±0.03	34.8±0.06	45.6±0.04	50.2±0.03	<0.05
CPI, points	8.12±0.03	4.12±0.03	3.08±0.04	3.11±0.01	<0.05
Mobility, points	2.16±0.03	0.91±0.04	0.89±0.04	0.88±0.03	<0.01

Note: p – significance of differences before tooth extraction and 12 months after dental prosthetic rehabilitation.

3. Conclusions

1. Direct fixed prosthodontics using direct fixed sectional dental bridge is essential in combination treatment of GP, especially if mobile tooth extraction is needed. It allows increasing the effectiveness of treatment in comparison with direct removable prosthodontics using direct plastic laminar immediate prosthesis (Group I) and traditional treatment methods (Group II).
2. We have proved the advantages of direct fixed prosthodontics in treatment of patients with GP, II-III degree based on the improvement of oral hygiene indices, the gingival bleeding index, the PMA index, the PI and the depth of periodontal pockets 6-12 months after treatment.

4. Prospects for further research

The conducted research has shown the necessity of applying immediate esthetic dentures in combination treatment of patients with GP and further clinical substantiation of the proposed methods.

References

- [1] Vyshnyak GN. Generalizovannye zabolevaniya parodonta (parodontoz, parodontit). Kyiv; c1991. 216p.
- [2] Kolesova NA, Politun AM, Kolesova NV. Sravnitelnyy kliniko-rentgenologicheskiy i morfologicheskiy analiz mekhanizmov povrezhdeniya kostnoy tkani alveol-yarnogo otrostka chelyustey pri razlichnykh variantakh

razvitiya generalizovannogo parodontita. *Sovremennaya stomatologiya*. 2008;2:67-72.

- [3] Dunyazina TM, Kalinina NM, Nikifirova ID. *Sovremennyye metody diagnostiki zabolevaniy parodonta*. Saint Petersburg; c2001. 48p.
- [4] Danilevskiy NF, Borysenko AV. *Zabolevaniya parodonta*. Kyiv: Zdorovia; c2000. 461p.
- [5] Zakirov TV. K voprosu ob etiologii retsessiyi desny. *Stomatolog*. 2005;10:46-49.
- [6] Mazur IP. Porushennia kistkovoho metabolizmu u khvorykh na heneralizovanyi parodontyt ta shliakhy korektsii. *Zhurnal praktychnoho likaria*. 2005;6:14-22.
- [7] Kopeykin VN. *Ortopedicheskoe lechenie zabolevaniy parodonta: Vazhneyshie voprosy stomatologiyi*. Moscow: Triada-Kh; c1998. 184p.
- [8] Ozhohan ZR. Prychyny uskladnen pry vykorystanni neznimnykh zubnykh proteziv. *Galic'kij likars'kij visnik*. 2000;7(3):93-95.
- [9] Orekhova LYu, Prokhorova OV, Kudryavtseva TV. Vozmozhnye puti vliyaniya na reparativnyy osteogenez pri zabolevaniyakh parodonta. *Parodontologiya*. 2000;2(16):19-23.
- [10] Pavlenko AV, Mazur IP. Lechebno-reabilitatsionnye mero-priyatiya u bolnykh generalizovannym parodontitom. *Sovremennaya stomatologiya*. 2003;2:33-37.

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