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DOI 10.25789/YMJ.2025.91.12

UDC 616.31-08-039.71

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THE METHOD OF SPLINTING MOBILE TEETH IN COMPLEX TREATMENT OF CHRONIC PERIODONTITIS

Nowadays, the prevalence of inflammatory periodontal diseases in the population remains at a high level. Meanwhile, periodontal diseases are chronic foci of oral infection, which often cause the development of focal-related diseases. In addition, tooth loss due to complications of chronic periodontitis leads to dysfunction of the dental alveolar system and mandibular joint. In this regard, the study of these aspects is an urgent general medical problem, including clinical dentistry. Thus, a comprehensive study of chronic periodontitis was carried out in the population living in the North, and on the basis of the obtained results, a method for splinting teeth in periodontitis was developed. To carry out the developed method in periodontological practice, a double silicone cast of the upper and/or lower jaw is first taken with further personalized planning of the splinter apparatus on a plaster model of the jaws, further, a splinting structure for immobilisation of movable teeth is made from colourless plastic and titanium woven wire, and the ready combined splint is additionally fixed from lingual or palatal sides of teeth with light hardening composite material on upper and/or lower jaw; splinting is performed with duration from 1 to 3 months. Depending on the complexity of the clinical situation, patchwork operations are performed to reduce the size of the periodontal pockets and create conditions for the formation of a new tight attachment of the gum to the teeth, followed by orthopedic treatment. The results of clinical-functional analysis of developed method application in complex treatment of chronic periodontitis of moderate severity confirm its clinical efficiency, connected with fixation of vestibular, oral sides of movable teeth and additionally composite filling material, which contribute to improvement of biomechanics and functional properties of dental alveolar system, and also aesthetic qualities of

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splinting apparatus. In this regard, the proposed method of splinting teeth in periodontitis can be successfully applied in periodontal practice as an alternative method.

Keywords: periodontal tissues, periodontal diseases, anatomical and topographic features, gingival hyperemia, gingival bleeding, tooth mobility, temporary dental splinting, treatment, prevention, medical and social rehabilitation.

For citation: Ushnitsky I.D., Unusyan O.S., Semenov A.D., Ivanov A.V., Unusyan L.S. The method of splinting mobile teeth in complex treatment of chronic periodontitis. Yakut Medical Journal, 2025; 91(3): 45-49. https://doi.org/10.25789/YMJ.2025.91.12

Introduction. Today, the prevalence of inflammatory periodontal diseases in the population remains at a high level, which often leads to tooth loss, leading to disorders of the dental alveolar system and the mandibular joint [2, 4, 9, 12]. Inflammatory periodontal diseases contribute to the formation of a periodontal pocket, where there is a microbiota, and as a chronic focus of oral infection, it causes sensitization of the body with the subsequent development of focal-related diseases [3, 6, 7, 8]. One of the main symptoms of the inflammatory-destructive process of periodontal tissues is the mobility of teeth having a periodontal pocket. In this regard, when carrying out complex medical and preventive measures, special attention is paid to eliminating the mobility of teeth located in the foci of the inflammatory process. For this, there are quite a few different methods and means that do not completely solve the problem of tooth mobility and require further research [1, 5, 10].

In general, the study of these aspects is an urgent general medical problem, including clinical dentistry [2, 11, 12]. A comprehensive study of topical issues of chronic periodontitis in the population living in the North was carried out to improve periodontal care.

Purpose of the research is to develop a method for splinting mobile teeth in the complex treatment of chronic periodontitis and practical recommendations.

Material and research methods. The study of the clinical effectiveness of the method of splinting movable teeth in the complex treatment of chronic periodontitis of moderate severity was carried out on the basis of the dental clinic of the " M.K. Ammosov North-Eastern Federal University" as well as in the dental clinics "Form" and "Adenta" (Yakutsk). In carrying out the research work, the prevalence and intensity of periodontal diseases were determined, where the classification of Grudyanov A.I. et al. (2001), CPI indices (WHO), Russell's PI (1956), PMA (1957) and gingival sulcus IC (1986) were used, and tooth mobility and the microcirculation index were also studied. In addition, a method for splinting teeth in case of periodontitis has been developed. (application No. 2024128912 dated 30.09.2024, a positive decision on patent granting for the invention from 20.01.2025). The developed method was used in 101 male and female patients in the age group from 35 to 65 years old (main group) underwent professional hygiene, anti-inflammatory and antimicrobial therapy were carried out, including the introduction of the medicinal paste "Yagel" with the birch bark extract "Betulin" of the following composition into the periodontal pocket, in wt. %: dry residue "Yagel" - 10-11, birch bark extract "Betulin" - 10-11, zinc oxide - 49-50, oil solution of vitamin "A" - 28-31, a course of 10 procedures (patent No. 2751809, published on July 19, 2021). At the beginning, a double silicone cast of the upper and/or lower jaws was taken with further individual planning of the splinting structure on a working plaster model of the jaws. After that splinter apparatus for immobilization of movable teeth of jaws was manufactured from colorless plastic and titanium woven wire, where it was additionally fixed from oral side of teeth with composite material of light hardening on upper and/or lower jaws, splinting is performed with duration from 1 to 3 months. Further, in the presence of clinical indications, flap operations were performed aimed at reducing the size of the periodontal pockets and creating conditions for the formation of a new tight attachment of the gum to the teeth, followed by orthopedic treatment. For comparative analysis, a control group (n = 36) aged 35-65 years old was formed, where similar therapy was carried out using the medicinal paste "Vitadont", a course of 10 procedures, splinting was carried out using a lingual wire stand.

In the practical application of the developed method, its clinical efficacy was evaluated in the main and control groups based on the obtained data on the research of microcirculation of periodontal tissues using laser Doppler flowmetry (LDF) on the apparatus of the LAKK-O2 laser blood flow analyzer (NLP Lazma, Moscow) with two radiators for probing tissue in the infrared region of the radiation spectrum, power 1 mW. In addition, the degree of tooth mobility in chronic periodontitis was determined using the Periotest-S device (Germany). Periodontal pocket depth (PC), periodontal index (PI), Russell index (Russell A., 1956), pappillary marginal alveolar index (PMA) percentage (Parma C., 1960) and bleeding index (IR) (Muchlemann H.P., Son S., 1971)

Statistical processing of the obtained research results was carried out using the Microsoft Excel 2020 software package (USA). The results obtained were grouped according to the set of identical study patterns.

Research results. The analysis of the prevalence and intensity of periodontal diseases in the examined population is characterized as an unfavorable clinical situation. Thus, CPI prevalence rates in the age groups of 15 years, 20-34 years, 35-44 years, 45-54 years and 65-74 years range from 68.59 ± 0.71% to 97.24 ± 0.11% ($p < 0.05$), where the average value was 89.14 ± 0.13%. At the same time, there is a certain pattern associated with a decrease in показатели распространенности CPI prevalence rates with age in the components "bleeding," "tartar" and "healthy," and in the data of the "periodontal pocket" indicator, on the contrary, an increase in the trend line was detected ($p < 0.05$). In addition, the examined age groups of elderly people have a pronounced decrease in the pathological processes of periodontal tissues 68.59 ± 0.71% ($p < 0.05$). This clinical and epidemiological situation is associated with the presence of complete secondary adentia on the upper or lower jaw, removed teeth in sextants, which create the prerequisites for an increase in the frequency of severe chronic periodontitis with age. Accordingly, a similar situation is determined in the data on the intensity of periodontal diseases, where the indicators "healthy," "bleeding," "supra- and subgingival stones" ranged from 0.62 ± 0.07 to 0.04 ± 0.01, from 2.39 ± 0.07 to 0.21 ± 0.09 and from 2.93 ± 0.07 to 0.59 ± 0.09, determining their decrease with age ($p < 0.05$). Periodontal pocket and unaccounted-for sectants tended to increase with age and ranged from 0.41 ± 0.09 to 3.23 ± 0.08, 0.04 ± 0.01 to 2.37 ± 0.05, respectively ($p < 0.05$). Such a clinical situation of the intensity of periodontal tissue damage determines the severity of

the clinical course of chronic periodontitis with age.

One of the main symptoms of the chronic inflammatory process of periodontal tissues is tooth mobility, which determines the severity of the course of the pathological process. In this regard, when conducting complex therapy, an important criterion is the early detection and timely treatment of tooth mobility, which will contribute to the preservation of teeth, as well as a significant improvement in the prognosis of chronic periodontitis and the patient's quality of life. Taking into account the above, a clinical assessment of the use of the developed method of splinting teeth in periodontitis was carried out. Presence of support-retaining components of plastic splint and fixation of titanium woven wire with composite material from oral side of movable teeth makes it possible to restore full-fledged biomechanics of dental alveolar system, where wire ligature is in stressed state, which performs shock-absorbing function at teeth closure. The developed method is atraumatic for movable teeth, since it does not require preparation of hard tooth tissues.

Case report. Patient A., 56 years old, visited dental clinic of the "M.K. Ammosov North-Eastern Federal University" for professional oral hygiene. Complaints: mobility of the front lower teeth, pain when biting when taking hot and cold food, bleeding when eating and brushing teeth. Anamnesis morbi: two years ago, the patient underwent a course of therapy for mild chronic periodontitis, where a pronounced improvement was observed. She calmed down and did not visit dentists over the past years.

External examination: the face configuration is unchanged, the skin is clean. Regional lymph nodes are not palpable. Mouth opening is free. Lip border unchanged. In the oral cavity, the mucosa is unchanged.

Objectively: dental crowns 3.2, 3.1, 4.1 and 4.2 are not destroyed, where grade 2 mobility is determined. The probing is painless. Bleeding of the marginal gingiva is determined when the probe is touched. The reaction to temperature stimuli is positive without aftereffect. Percussion is slightly painful. The mucous membrane of the marginal, interdental and partially alveolar gums in the area of these teeth is slightly hyperemic, palpation is slightly painful. Diastema and tremas are determined between teeth 3.2, 3.1, 4.1 and 4.2. Degree II tooth mobility is determined. In the area of 1.1 and 2.1 teeth, there is a gingival recession by 1/3, there is no mobility. A CT scan dated 10.01.2025 showed osteoporosis in the lower incisors and a decrease in the bone tissue of the alveolar process to a ½ height with destruction of its cortical plate, and in the 1.1 and 2.1 teeth by 1/3.

Fig. 1. Double silicone functional impression of the mandible

Fig. 2. Individual layout of splinting structure on mandibular plaster model

Fig. 3. Tire is made of a combination of colorless plastic and titanium woven wire for immobilizing movable teeth

Fig. 4. A view of the combined mandibular splint from the vestibular side

Fig. 5. A combined colorless plastic and titanium woven wire splint for immobilizing movable teeth from the oral side

Diagnosis: K05.31 - chronic periodontitis. Generalized.

Treatment: based on the analysis of clinical data, it was decided to carry out splinting of mobile teeth from the vestibular and oral surfaces with chronic periodontitis of moderate severity using colorless plastic, titanium woven orthodontic wire and composite filling material. A double silicone functional impression was taken on the lower jaw with chronic generalized periodontitis of moderate severity (Fig. 1). Next, an individual layout of the splinting structure was made on a gypsum model of the lower jaw (Fig. 2). At the same time, a splint made of colorless plastic and titanium woven wire was made to immobilize the movable teeth of the lower jaw with moderate periodontitis (Fig. 3), after which the made combined splint was fixed to the lower jaw from the vestibular and oral sides, where additional fixation was made from the oral side of the teeth with a composite light hardening filling material (Fig. 4 and 5). Splinting is carried out with a duration of up to one and a half months, where after the therapeutic and preventive measures, the patient underwent a flap operation aimed at reducing the size of periodontal pockets and creating conditions for the formation of a new dense attachment of the gum to the teeth. 3 months after surgery, soft tissue volume will be evaluated and a non-removable metal-free prosthesis will be made on the lower jaw with the appropriate volume.

Distinctive features of the developed method is efficiency treatment increase of chronic periodontitis due to fixation of movable teeth from vestibular and oral sides with application of colourless plastic, titanium woven wire and composite filling material. And this, in turn, provides reliable fixation of mobile teeth from the vestibular and oral sides without disrupt-

Clinical and functional characteristics of dental splinting using a combined splint made of colorless plastic and titanium woven wire for moderate periodontitis

Indicators /timelines	Before treatment	Main group			Control group		
		7 день	14 день	28 день	7 день	14 день	28 день
Depth of pockets (mm)	4.81± 0.06	4.75± 0.06	4.39± 0.07**	3.92± 0.08***	4.79± 0.12	4.49± 0.13**	4.38 ± 0.14]***
PI index (point)	3.92± 0.08	1.91± 0.12*	1.43± 0.12**	1.29± 0.13***	2.34± 0.22*	1.54± 0.25**	1.38± 0.26***
PMA (%)	44.91± 1.08	22.64± 1.52*	6.72± 1.83**	4.56± 1.88***	34.23± 2.58*	11.64± 3.47**	9.11± 3.57***
FMBS (point)	2.44± 0.01	1.72± 0.02*	0.63± 0.04**	0.45± 0.05***	2.11± 0.03*	1.34± 0.06**	1.29± 0.06***
Tooth mobility (c.u.)	+22.73± 0.01	+10.25± 0.38*	+8.84± 0.41**	+7.91± 0.43***	+13.24± 0.65*	+12.65± 0.68**	+11.24± 0.73***
Microcirculation indicator (M), (p.u.)	23.22± 0.39	33.54± 0.18*	37.31± 0.11**	41.86± 0.02***	29.24± 0.54*	35.11± 0.31**	40.46± 0.09***

Note: * = significance of differences before and after 7 th day of treatment; * * = significance of differences before and after 14th day of treatment; * * * = significance of differences before and after 28th day of treatment.

ing their function, without dissecting hard dental tissues, which contributes to the restoration of full-fledged biomechanics of the dental alveolar system and is characterized by pronounced aesthetics due to colorless plastic, where the wire ligature performs a shock-absorbing function when closing teeth. The above positive clinical properties confirm the prospects of the developed method and can be practically used in medical institutions by dentists.

The results of immobilization of mobile teeth in the complex treatment of chronic periodontitis using the developed method were evaluated by clinical, functional and diagnostic methods of research and were considered over time according to the studied parameters in a group of 35-65 years old (Table 1). Thus, the assessment of periodontal inflammation at the stages of treatment of chronic periodontitis characterizes that before treatment, the intensity of the inflammatory process according to the PMA index was 44.91 ± 1.08%, which is interpreted as average severity. At the end of the first month of complex treatment, the mean rate in the main and control groups was on average 6.83 ± 2.72% ($p < 0.05$), characterizing a mild degree. The mean pre-treatment Russell periodontal index (PI) score in the core and control groups was 3.92 ± 0.08 points, which decreases to 1.33 ± 0.19 points on day 28 ($p < 0.05$). At the stages of dynamic control, changes in the depth of the periodontal pocket are determined, where before treatment in the groups the average depth was 4.81 ± 0.06 mm, and at the end of the month it was 4.15 ± 0.11 mm ($p < 0.05$). Analysis of the bleeding index indicators characterizes that before treatment, the average indicator in the studied groups (main and control) was 2.44 ± 0.01 points, and after 28 days - 0.87 ± 0.05 points ($p < 0.05$). The study of dental mobility in chronic periodontitis of moderate severity using the Periotest-S apparatus determines that before treatment in groups, the average dental mobility index is + 22.73 ± 0.01 conv. units, and by the end of the first month of medical and preventive measures - + 9.57 ± 0.58 conv. units ($p < 0.05$), which determines the positive dynamics of changes in indicators at the stages of complex treatment. The analysis of periodontal tissue microcirculation disorders showed that the average value in the groups was 23.22 ± 0.39 p.u. before treatment, and by the end of dynamic observation amounted to 41.16 ± 0.05 p.u ($p < 0.05$).

Thus, results of clinical-functional analysis of complex treatment of chronic periodontitis of moderate severity with application of method of teeth splinting confirm its clinical efficiency associated with fixation of vestibular, oral sides of movable teeth and additionally composite filling materials, which contribute to improvement of biomechanics and functional properties of dental alveolar system, and also aesthetic qualities of splinting apparatus. The data obtained to some extent indicate that the proposed method of dental splinting in chronic periodontitis has the prospect of successful application in periodontological practice as an alternative method.

The authors declare that there are no conflicts of interest.

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DOI 10.25789/YMJ.2025.91.13

UDC 616.021.3:616-006.66-092.9

THE INFLUENCE OF TUMOR SAMPLING TOPOLOGY ON THE EFFECTIVENESS OF THE XENOTRANSPLANTATION PROCEDURE IN THE CREATION OF A PDX MODEL OF GASTRIC CANCER

As indicated in the extant literature, numerous research groups encounter challenges in creating PDX models of gastric cancer, which is associated with a low level of engraftment of tumor samples. Consequently, in the pursuit of enhancing and refining the conventional implantation technique, we have recognized the significance of the tumor sample collection site. It was hypothesized that cells located on the tumor periphery and forming the invasion front may have a more pronounced potential for malignant growth and, consequently, the ability to grow as xenografts. To this end, ten gastric tumor samples were obtained from each patient: five from the tumor edges and five more from areas more than 5 mm from the visible tumor edge. All samples were implanted subcutaneously on the right side of Balb/C Nude mice. A subsequent analysis of the results indicated that, upon the collection of biological material concurrent with the capture of the visible tumor edge, the formation of tumor nodules occurred in three out of five recipient animals. Consequently, the xenotransplantation efficiency in this instance was determined to be 84%. Conversely, when tissue samples were obtained from areas distant from the tumor edge, the formation of tumor nodules in recipient animals was observed in only one procedure out of five. Consequently, the xenotransplantation efficiency was 20%. The histological examination conducted as part of this study revealed that the heterotopic PDXs accurately reproduced the histotype of the corresponding donor tumors, confirming their adenocarcinoma status. We also conducted an IHC study, which demonstrated that the level of Ki-67 expression in the tumor edges forming the invasion front was significantly higher, with an average value of 70 [60; 80]%. Conversely, in samples extracted from non-marginal regions of the same tumor, Ki-67 expression levels were notably lower, with an average of 15% [5; 25%] ($p<0.05$). The obtained data suggest that the higher proliferative potential characterizing the marginal areas of tumors may contribute to more effective xenotransplantation of such tumor samples compared to samples obtained from areas of the tumor remote from the visible edge and characterized by a lower proliferative potential.

Keywords: gastric cancer, heterotopic model, PDX models, mouse models

For citation: Kamlyk D.V., Kolesnikov E.N., Gurova S.V., Galina A.V., Golovinov I.V., Khodakova D.V., Shulga A.A. The influence of tumor sampling topology on the effectiveness of the xenotransplantation procedure in the creation of a PDX model of gastric cancer. Yakut Medical Journal, 2025; 91(3): 49-51. https://doi.org/10.25789/YMJ.2025.91.13

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Introduction. Gastric cancer (GC) is an oncological disease that ranks fifth in prevalence and is also the fourth cause of cancer death worldwide [7]. The etiology of this disease is multifaceted. Its development is influenced by a multitude of both intrinsic and extrinsic factors, including, but not limited to, genetic susceptibility, infectious diseases, and dietary habits [1,13]. Patients with early-stage gastric cancer undergo surgical resection followed by chemotherapy, and the postoperative 5-year survival rate can reach 90% [1]. However, the detection rate of gastric cancer at the first stage is low, which is associated with the absence of pronounced clinical signs. Therefore, the majority of patients (>70%) are diagnosed with the disease at late stages [10]. Despite considerable progress in radiation, immune, and chemotherapy treatments, surgical resection remains the only radical method for treating gastric cancer [2,11]. Consequently, there is