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ЖУРНАЛ СТОМАТОЛОГИИ И КРАНИОФАЦИАЛЬНЫХ ИССЛЕДОВАНИЙ

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## JUSTIFICATION OF THE STUDY TO DEVELOP A SYSTEM OF PREDICTING OUTCOMES OF DENTAL IMPLANTS



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### ABSTRACT

In this article, thanks to the development of new implant systems and methods of reconstructive operations for atrophy of the alveolar bone tissue of the jaws, it is possible to use the method of dental implantation to replace dental defects of any localization with orthopedic structures. Prosthetics on implants helps to achieve the main goal - complete restoration of masticatory function in patients with partial or complete absence of teeth, improving the quality of life of the patient both in physiological and socio-psychological aspects.

**Key words:** occlusal relationships, prosthetics, diagnostic template, radiopaque template, orthopedic design, ZD-modeling.

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## ОБОСНОВАНИЕ ПРИМЕНЕНИЯ НАВИГАЦИОННЫХ ШАБЛОНОВ ПРИ УСТАНОВКЕ ДЕНТАЛЬНЫХ ИМПЛАНТАТОВ

### АННОТАЦИЯ

В данной статье благодаря разработке новых систем имплантатов и методик реконструктивных операций при атрофии альвеолярной костной ткани челюстей появилась возможность применения метода дентальной имплантации для замещения ортопедическими конструкциями дефектов зубных рядов любой локализации. Протезирование на имплантатах способствует достижению основной цели - полному восстановлению жевательной функции у пациентов с частичным или полным отсутствием зубов, улучшению качества жизни пациента как в физиологическом, так и в социально-психологическом аспектах.

**Ключевые слова:** окклюзионные взаимоотношения, протезирования, диагностических шаблонов, рентгеноконтрастный шаблон, ортопедический конструкция, 3Д-моделирования.

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## ДЕНТАЛ ИМПЛАНТЛАРНИ ЎРНАТИШДА НАВИГАЦИОН ШАБЛОНЛАРНИ ҚЎЛЛАШНИ АСОСЛАСШ

### АННОТАЦИЯ

Ушбу мақолада, янги имплант тизимлари ва қайта тишловчи операция усуллари ривожланиши, жағларнинг альвеоляр суяк тўқимаси атрофиясида, тиш қатори нуқсонларида ҳар қандай жойлашувида уларни ортопедик тизимлар билан то'лдирish учун реконструктив тиш имплантация усуллари қўллаш имкониятини пайдо қилади. Имплантларда протезлашнинг асосий мақсади - беморларда тишларнинг қисман ёки тўлиқ чайнаш функциясини тўлиқ тиклаш, беморнинг физиологик ва ижтимоий-психологик жихатдан ҳаёт тарзини яхшилашга ёрдам беради.

**Калит сўзлар:** окклизив муносабатлар, протезлаш, диагностика шаблонов, рентгено-контраст шаблон, ортопедик конструкция, 3Д-моделирофка.

The purpose of this work is on the ground of the result of the analysis and generalization of information contained in domestic and foreign special literature to provide a theoretical basis for researches on the development of the system for dental implantation outcomes prognostication and to determine its informative value and effectiveness on the basis of the principles of evidence-based medicine.

This review article presents an analysis of the results of experimental, clinical and laboratory studies in the preparation and conduct of dental implantation, in the process of monitoring patients in the postoperative period, during prosthetics and the use of orthopedic structures based on dental implants. This is an important theoretical basis for the development of the unified system to prognosticate the outcomes of dental implantation that will contribute to the reduction in the number of complications, increase in the terms of implants functioning and consequently improvement of dental care quality.

At the present stage, the method of dental implantation has taken its rightful place among other dental interventions and plays a leading role in the system of comprehensive rehabilitation of patients with dental defects [1, 2, 3]. Revived in the middle of the XX century, it is experiencing rapid development due to its knowledge intensity and integrative potential. Improvement of implants and methods of their placement is carried out in various directions in order to improve their quality and eliminate the shortcomings identified during clinical operation [4, 5]. This process involves the most modern achievements of scientific and technological progress in metallurgy, chemistry, physics, materials science, biology and toxicology [6, 7].

The above facts confirm that dental implantation continues to be actively implemented in the daily practice of maxillofacial surgeons and dental surgeons, which underlines the relevance of this publication.

The purpose of the work is to provide a theoretical justification for research on the development of a system for predicting the outcomes of dental implantation based on the analysis and generalization of data from domestic and foreign specialized literature.

Escalation of traditional orthopedic treatment often leads to an undesirable result – failure of restorations and loss of teeth. In this situation, an important role is played by unjustified endodontic intervention – "preventive" depulping of teeth used for supporting orthopedic structures. At the same time, implants that provide a reliable support can become an alternative to prosthetics with a limited prognosis. In addition, there is currently some progress in the implementation of complex and productive techniques to optimize the position of implants and achieve not only adequate functional, but also cosmetic results [8, 9, 10]. The vast majority of special sources of information are devoted to the surgical technique of implant placement [11, 12, 13], the characteristics of bone tissue and the requirements for the alveolar process, the jaw bone during these operations and contain, mainly, data from radiation research methods, the results of pathomorphological, less often – biochemical characteristics of osteointegration processes [14, 15, 16].

The long-term success of implantation depends on both medical factors (correct selection of patients, ensuring stable primary fixation of the implant) and design factors (optimal material, production technology, chemical activity of the implant surface, its macrostructure) [17]. Despite the high results of dental implantation, there are currently a number of unresolved

issues related to their rejection. In this regard, predicting the results of dental implantation at the present stage is very relevant.

It is known that for optimal osseointegration, the dental implant should: have clinical stability, function for at least 5 years, do not damage the adjacent tissues; do not cause negative symptoms and sensations in the patient, satisfy the patient both in functional and aesthetic aspects.

At the same time, there are a number of conditions that depend not only on the quality of implants and the technique of their placement, but also directly on the state of the patient's body, including the presence of somatic diseases [18, 19]. The level of dental implantology at the present stage, unfortunately, is limited to a very narrow range of indications for this type of rehabilitation of dental patients. In this regard, the desire of many patients to have fixed orthopedic structures or to improve the fixation of removable ones with implants very often does not coincide with the capabilities of the method. Taking data on successful treatment of 80-90% of patients, it should be remembered that this indicator was calculated in relation to persons who did not have contraindications to the use of the dental implantation method. In the same situations, when the number of contraindications decreases and the range of indications expands, the percentage of positive results inevitably decreases. Recent studies show that the use of intraosseous implants in clinical practice does not always give a stable and guaranteed result [20, 21].

A detailed analysis of the literature indicates that failures when using the method, unfortunately, are very common and occur more often than they are usually said, and even more so to take them into account when evaluating the results of treatment [22, 23]. To determine the correct approaches and provide optimal conditions for the healing, adaptation and functioning of artificial support in the oral cavity, it is necessary to synthesize modern knowledge in the field of anatomy, morphology, biology and physiology of the tissues surrounding the implant. In addition, it is of great importance to correctly determine the indications and contraindications for dental implantation, and with strict and adequate consideration of the patient's somatic health.

In most basic manuals and monographs [24, 25, 26], the absolute contraindications to dental implantation include conditions such as: pathology of the immune system and leukocyte dysfunction; diseases requiring periodic use of steroids; diseases of the bone system (congenital osteopathy, osteonecrosis, dysplasia); disorders in the blood clotting system; neoplasms that need chemotherapy; uncontrolled endocrine diseases and diabetes; disorders of the Central and peripheral nervous system (schizophrenia, paranoia, dementia, psychosis, neurosis, alcohol or drug addiction); specific-infectious diseases (syphilis, tuberculosis, actinomycosis, HIV infection). The list of relative contraindications includes poor oral hygiene; foci of chronic odontogenic infection; local inflammatory processes; abnormal bite; diseases of the temporomandibular joint; bruxism; diseases of the oral mucosa, especially facultative and obligate precancers.

However, the sources of special information contain information that even the strictest compliance with the existing system of indications and contraindications for dental implantation surgery, surgical techniques for placing implants (with high qualifications of a maxillofacial surgeon or a dental surgeon) does not make it possible to overcome complications, the number of which, according to various authors, varies from 3 to 10% [27, 28, 29]. In social terms, implantation is

contraindicated for patients who are careless about their health, as well as for people who abuse coffee, which violates the ratio of calcium and phosphorus in the blood and their absorption by bone tissue [30].

Many specialists in the field of dental implantation offer their own criteria for evaluating the results of this type of rehabilitation of patients with partial secondary adentia, which are very different, and in some cases situations and contradictory. Differences may be related to differences in the registration of osseointegration parameters in the jaw-dental implant system, differences in the tactics of patient selection and examination schemes. Many publications indicate the following range of clinical diagnostic parameters for recording and evaluating the results of dental implantation. First, these are parameters that are reflected in the patient's outpatient card: General dental status data; risk factors that may affect the final outcome of rehabilitation in the future (including General dental, aesthetic, and biomechanical factors); prognosis categories - good or satisfactory (these categories should always be made known to the patient). If dental implantation was performed for extended clinical indications, then it should be reflected what was done to improve the effectiveness of this method, measures (dental implantation for periodontal diseases, bone and soft tissue deficiency in the desired area) and ways to address these issues, as well as the doctor's assessment of risk factors for a particular patient. Secondly, during the healing period, it is necessary to register measures aimed at preventing the occurrence of inflammatory processes in the tissues surrounding the implant or performing timely radical surgical intervention in the event of a pathological process. Third, upon completion of a healing period is required register values colombianitos marginal bone loss: after defunctioning period valid values range from 1.5 to 2.4 mm with no symptoms of inflammation of the soft tissue close to the implant, as well as in the presence of dense gingival cuff around osseointegrated artificial support. Fourth, criteria for long-term treatment outcomes are needed.

According to M. D. Perova (2001), after 3 years, the positive result of intra-bone dental implantation is at least 92%, the increase in the loss of bone structures for 3 years does not exceed 0.3 mm [31]. However, it should be emphasized that neither domestic nor foreign sources and annals of specialized literature have data on a single standard for evaluating and predicting the results of dental implantation.

Despite the fact that the world practice of dental implantation over the past 60 years of development has proved its worth, some maxillofacial surgeons treat this method of rehabilitation of dental patients with great doubt. There are a number of good reasons for this, the main one being implant rejection. We often hear unsatisfactory reviews from both patients and colleagues who believe that dental implantation is a thankless task, implants are unreliable and it is hopeless to do this. Kozlov (1999) point out that currently dental implantation is an object of increased attention not only because it is quickly and widely implemented in clinical practice [27], but also because when using this method, complications arise, usually of a destructive nature and leading to loss of bone volume in the dentoalveolar region, which immediately negatively affects the General health of the patient and his social adaptation in society [32]. The condition of the patient's bone tissue is determined not only by local factors, but also by the level of his somatic health. This condition must be taken into account when selecting patients, determining indications for implantation, and predicting the results of surgery.

It is known that changes that develop as a result of primary and secondary osteoporosis due to endocrine pathology occur in all parts of the skeleton, including in the bone tissue of the jaws [33]. Violation of bone remodeling affects the intensity of periodontal tissue damage in generalized periodontitis [34, 35], contributes to the occurrence and progression of the carious process [36]. Bone density can vary significantly in different anatomical areas and even differ in the same area. Data on the state of bone tissue in the area of planned implant placement is of exceptional importance when drawing up a treatment plan. The percentage of complications and negative outcomes is higher when implants are placed in bone with very low (insufficient initial stability) or high density. The minimal thickness of the cortical plastic and the low density of the spongy bone can make it difficult to initially stabilize the implant and cast doubt on the likelihood of its osseointegration.

According to some authors, adequate contact between the implant surface and the surrounding bone tissue can be achieved even in osteoporosis [37]. However, the very fact of providing osseointegrative contact in this condition is not a guarantee of the effective functioning of the implant [38], since even the physiological load on the bone with this type of architectonics often causes a "breakdown" of its vital processes and functioning, pathological restructuring and resorption occur [39].

To ensure an adequate process of osseointegration and obtain a good "adhesion" between the implant and the bone tissue, a sufficient amount and good quality of bone is necessary. And this option can be considered almost ideal, since in such a situation, as a rule, the patient is practically healthy. However, the reality is far from ideal. In practice, it turns out that patients who apply for this type of specialized care are older people who have a certain number of somatic diseases or deviations from the norm: endocrine discorrelations, metabolic disorders, cardiovascular pathology, etc. a Larger percentage of them are women whose hormonal background naturally changes with age [40].

Regional osteoporosis of the jaws is observed in women aged 40-50 years, that is, at the age corresponding to the beginning of menopause, when the third type of bone (medium-density bone tissue) is more often detected, characterized by the fact that the preparation of the latter during surgery is performed with less effort. This type of architectonics is defined in almost 60% of women of this age [41].

With age-related "shutdown" of ovarian function, 60-80% of women may have various clinical manifestations of an estrogen-deficient condition, the so-called functional disorders, one of which is menopausal osteoporosis. In the structure of osteoporosis, it is 85% [42]. According to who experts, the incidence of osteoporosis ranks third in the world after cardiovascular disease pathology and diabetes [43]. This disease belongs to the group of heterogeneous, characterized by progressive loss of bone tissue that begins after natural or surgical menopause. These phenomena in the body entail specific approaches to all medical manipulations, including dental implantation [44].

An urgent problem in achieving long-term and stable results of dental patients' rehabilitation using implants is the lack of knowledge and experience in planning treatment and monitoring patients who have passed it. The sources of complications of any surgical intervention can be both the characteristics of the patient's body, its behavior, and the specifics and technologies of performing medical manipulations.

In this case, it is almost always not so much about the natural connections between the phenomena, but about the degree of risk of developing a particular type of complications. However, to date, there is no information in the sources of specialized literature about the existence or development of a system for predicting the results of dental implantation that takes into account all factors in the aggregate.

**Conclusion.** The presented material, including the analysis of the results of experimental and clinical laboratory studies during the preparation and conduct of dental implantation, during the monitoring of patients in the postoperative period and during the operation of implants, provides a theoretical basis for the development of a unified system for predicting the outcomes of dental implantation, which will help reduce the number of complications and improve the quality of dental care for patients.

## Literature

1. Abdullaev, F. M. Method of screw distraction (SVD) of bone tissue during intraosseous implantation / F. M. Abdullaev, A. A. Kulakov // *New in dentistry*. - 2003. - No. 6. - Pp. 92-94.
2. Malanchuk, V. A. Direct dental implantation / V. A. Malanchuk, E. A. Mammadov. - Kiev: M. CStr Kiev, 2008. - 157 P.
3. The perceived prognosis of endodontic treatment and implant therapy among dental practitioners / R. Stockhausen [et al.] // *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. - 2011. - Vol. 111, № 2. - P. 42-47.
4. A novel surgical-prosthetic approach for soft tissue dehiscence coverage around single implant / G. Zucchelli [et al.] // *Clin Oral Implants Res*. - 2013. - Vol. 24, № 9. - P. 957-62.
5. Finite element analysis of dental implant neck effects on primary stability and osseointegration in a type IV bone mandible / Y.M. Huang [et al.] // *Biomed Mater Eng*. - 2013. - Vol. 23. - P. 1459-67.
6. Chitosan coatings deliver antimicrobials from titanium implants: a preliminary study / P.A. Norowski [et al.] // *Implant Dent*. - 2011. - Vol. 20, № 1. - P. 56-67.
7. Evrard, L. Allergies to dental metals. Titanium: a new allergen / L. Evrard, D. Waroquier, D. Parent // *Rev Med Brux*. - 2010. - Vol. 31, № 1. - P. 44-49.
8. Dental implant outcome after primary implantation into double-barreled fibula osteoseptocutaneous free flap-reconstructed mandible / Y. M. Chang [et al.] // *Plast Reconstruction Surg*. - 2011. - Vol. 128, № 6. - P. 1220-28.
9. Maxillary sinus elevation in conjunction with transnasal endoscopic treatment of rhinosinusopathoses: preliminary results on 10 consecutively treated patients / G. Felisati [et al.] // *Acta Otorhinolaryngol Ital*. - 2010. - Vol. 30, № 6. - P. 289-93.
10. Treatment outcome of two adjacent implant crowns with different implant platform designs in the aesthetic zone: a 1-year randomized clinical trial / N. Tymstra [et al.] // *J Clin Periodontol*. - 2011. - Vol. 38, № 1. - P. 74-85.
11. Bukaev, M. F. Bicortical implantation. Rehabilitation of patients with a bicortical screw single-stage implant "Zhanneta" // *Implantology*. - 2005. - no. 3. - P. 127-29.
12. Fundamentals of dental implantation: guidelines / V. N. Olesova [et al.]. - M.: In-t professional development of FU "Med-bioextrem". - 2000. - 22 c.
13. Robustova, T. G. Immediate implantation when removing teeth / T. G. Robustova, A. I. Ushakov, I. V. Fedorov // *Klin. dentistry*. - 2001. - No. 1. - Pp. 42-47.
14. The role of biomechanical factors in the development of dental periimplantitis / Tlustenko V. P. [ and other] // *ROS. Vestn. dental. implatologie*. - 2005. - № 3/4 (11/12). - P. 32-36.
15. Pashkevich, L. A. Influence of acupuncture on the processes of osteointegration in the system jaw – dental implant according to morphological studies / L. A. Pashkevich, O. I. Pohodenko-Chudakova, T. L. Shevela // *Med. Sib*. - 2011. - № 3 (37). - S. 109-112.
16. Shevela, T. L. Dynamics of biochemical parameters of oral fluid in the postoperative period in patients with delayed dental implantation / T. L. Shevela, I. O. Pokhodenko-Chudakova // *Med.journal-2011*. - Vol. 35, No. 1. - Pp. 113-116.
17. Gelmiyarova, F. N. Interdisciplinary aspects of dentistry: dental perimplants: monograph V. M. Radomskaya, V. P. Tlustenko. - Samara: GOU VPO SMSU, 2005. - 262 p.
18. Gusev, A. I. Dental implant. Criteria for success / A. I. Zhusev, A. Yu. Remov. - M. Center for dental implantation, 2004. - 223 p.
19. Kulakov, A. A. monitored Implantation as a method of reducing operational and postoperative risks in patients with somatic pathology during dental implantation / A. A. Kulakov, C. B. Kuznetsov, M. S. Markina // *Dentistry*. - 2009. - № 1. - C. 38-42.
20. Glycation and oxidative stress in the failure of dental implants: a case series / D. Pietropaoli [et al.] // *BMC Res Notes*. - 2013. - Vol. 26, 6(1). - P. 296.
21. The predictors of implant failure after maxillary sinus floor augmentation and reconstruction: a retrospective study of 1045 consecutive implants / M. J. Zinser [et al.] // *Oral Surg Oral Med Oral Pathol Oral Radiol*. - 2013. - Vol. 115, № 5. -P. 571-582.
22. Combination therapy including serratiopeptidase improves outcomes of mechanical-antibiotic treatment of periimplantitis / G. Sannino [et al.] // *Int J Immunopathol Pharmacol*. - 2013. - Vol. 26, № 3. - P. 825-831.
23. Materni, A. Managing an extreme peri-implantitis / A. Materni // *Minerva Stomatol*. - 2013. - Vol. 62, no. 9. - P. 295-305.
24. Paraskevich, V. L. Dental implantology. Fundamentals of theory and practice / V. L. Paraskevich. - Minsk: Unipress, 2002. - 368 p.
25. Renoir, F. risk Factors in dental implantology. Renoir, B. Rangert. - Moscow: Azbuka, 2004. - 176 p.
26. Robustova, T. G. dental Implantation (surgical aspects) / T. G. Robustova. - M.: Medicine, 2003. - 560 p.

27. Perova, M. D. Forecasting and ways to prevent early marginal bone loss when using osteointegrated dental implants / M. D. Perova, V. A. Kozlov // *Klin. implantology and dentistry*. - 1999. - No. 1. - Pp. 31-36.
28. Structural and regulatory processes in bone tissue in inflammatory and destructive conditions of the periimplant zone / E. S. Golovina [et al.] // *Russian journal of dental implantology*. - 2010. - № 1 (21). - Pp. 86-88.
29. Rodrigo, D. Biological complications and periimplant clinical and radiographic changes at immediately placed dental implants. A prospective 5-year cohort study / D. Rodrigo, C. Martin, M. Sanz // *Clin Oral Implants Res*. - 2012. - Vol. 23 No. 10. - P. 1224-31.
30. Surov, O. N. Dental prosthetics on implants / O. N. Surov. - M.: Medicine, 1993-- - 208 p.
31. Perova, M. D. The role of the programmable surface texture of a dental implant in increasing the possibilities of reparative bone regeneration / M. D. Perova // *Klin. implantology and dentistry*. - 2001. - no. 1/2. - P. 119-21.
32. Naumovich, S. A. Orthopedic treatment of patients using dental implants: training manual / S. A. Naumovich, A. F. Khomich, V. A. Sharanda. - Minsk: BSMU, 2005-36 p.
33. Nasonov, E. L. The problem of osteoporosis: the study of biochemical markers of bone metabolism / E. L. Nasonov // *Klin. the medicine*. - 1998.- No. 5. - P 20-25.
34. Bulkina, N. In. Quality of life as criterion of choice of treatment included defects of dentition in patients with generalized periodontitis / N. In. Bulkin, E. V. Trusova, A. Y. Perunov // *Medicals Ciencias*. - 2012. - No. 7. - C. 50-53.
35. Kabak, S. L. Mediators of local bone resorption in chronic apical periodontitis / S. L. Kabak, Yu. s. Kabak // *Tell lies. dentistry*. - 2005. - No. 4. - Pp. 20-26.
36. Sorotskaya, V. N. Combination of widespread caries and reduced bone mineral density in young people / V. N. Sorotskaya, E. A. Besedina // *III Russian Symposium on osteoporosis*. - SPb., 2000. - P. 85.
37. Gunko, M. V. Osteoporosis and dental implantation / M. V. Gunko // *Dentistry*. - 2009. - Vol. 73, No. 6. - C. 73-78.
38. The wide fixture: a solution for special bone situations and a rescue for the compromised implant. Part 1 / B. Langer [et al.] // *Int J Oral Maxillofac Impl*. - 1993. - Vol. 8, No. 4. - P. 400-407.
39. Stabilisation of lower denture using mini dental implants / A. Tadić [et al.] // *Med Pregl*. - 2012. - Vol. 65, No. 9-10. - P. 405-408.
40. Nazarov, Y. V. Features of the state of mineral metabolism in the oral cavity in women with postmenopausal osteoporosis in the dynamics of dental implantation / Yu. V. Nacharov, V. A. Melnikov, V. I. Melnikov // *Biomed. journal*, 2007, Vol. 50, No. 8, Pp. 551-57.
41. Effect of epidural steroid injection on bone mineral density and markers of bone turnover in postmenopausal women / A. Al-Shoha [et al.] // *Spine*. - 2012. - Vol. 37(25), № 1. - P. 1567-71.
42. Modern approaches to the diagnosis and prevention of osteoporosis and cardiovascular disease in women with natural and surgical menopause / I. A. [and other] // *disease Prevention and health promotion*. 2006. - № 3. - C. 7-15.
43. World Health Organization: Prevention and management of osteoporosis: report of a WHO Scientific group. - WHO Technical Report Series. - № 921. - Geneva: WHO, 2003. - 164 p.
44. Osteoporosis / ed. by A. I. Volozhin, V. S. Oganov. - M.: Prakt. medicine, 2005. - 238 p.