



PERIOTESTOMETRY IN ASSESSING THE STABILITY OF DENTAL IMPLANTS USING OSTEOTROPIC MATERIAL INSTALLED IN THE DISTAL PARTS OF THE UPPER JAW.

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Annotation

Dental implantation has been increasingly used in practical dentistry in recent years. Unfortunately, the spread of dental implantation is accompanied by numerous complications that reduce the service life of orthopedic structures supported by dental implants. The main complications usually include inflammatory processes in periodontal tissues and bone, which lead to disruption of the functional activity of osteoclasts and osteoblasts, which entail changes in the physiological mechanisms of osteogenesis. At the same time, patients usually have reduced non-specific resistance of the body, including in the oral cavity, which leads to a decrease in bone density and is an additional risk factor. All this requires correction of these disorders. If earlier one of the most effective ways to eliminate the incompatibility of implants was the use of noble or rare earth elements (gold, platinum, niobium, etc.) or coating of implants with inert materials made of various alloys and polymers. Recently, there have been studies that propose influencing not the implant material, but the body, in particular, its reactivity, the ability of the tissues surrounding the implant to react to the implant as a related element, i.e. stimulating the processes of osseointegration in the body, in particular, around the implant.

Relevance

Implantation methods and approaches to prosthetics are constantly being improved. Currently, the approval of a treatment plan is based on clinical, instrumental, radiological, mainly visual examination and involves modeling the outcome of treatment in the final orthopedic design of the prosthesis supported by implants

Objective of the study: Optimization of osseointegration conditions in dental implantation by introducing calcium-based bone tissue regeneration stimulants into the body to improve the effectiveness of treatment of patients with dental defects

Research material

Clinical material. We examined 40 patients who underwent implantological treatment for adentia of the lateral group of teeth on the upper jaw in the period 2023-2025 at the clinical base of the Department of Surgical Dentistry and Dental Implantology of TGSI. The patients were aged from 44 to 59 years, without severe somatic pathologies: men - 56 (58%), women - 40 (42 %). Based on the results of the clinical examination, the patients were divided into the following three groups:

Group I - CONTROL GROUP - 10 patients with secondary adentia, without odontogenic-inflammatory pathology of the oral cavity;

Group II (observation group) – 10 patients with adentia, not accompanied by pathological changes in the maxillary sinus. Treatment of sinusitis in patients of this group was not carried out. In this group of patients, the drug Calcium, phytin and vitamin D3 were used to prevent complications.

Group III (comparison group) – 10 patients with edentia and changes in the maxillary sinus, who, prior to implant treatment, underwent surgical sanitation of the sinus according to the following indications: diffuse (total/subtotal) hyperplasia of the mucosa, acute and chronic sinusitis in the acute phase.

The applied research methods: clinical examination of patients, radiological diagnostic methods, surgical sanitation of the maxillary sinus. The main clinical research was conducted using traditional methods: questioning, examination, percussion, palpation, and probing.

The condition of the periodontium was assessed using the following indices: periodontal index (PI) according to Russel, capillary marginal index (PMA) as modified by Parma (1960), bleeding index (BI) [Mulhlemann H.R., 1971], simplified hygiene index (SIH) according to Green-Vermelion (1964).

All patients were advised to use oral hygiene practices, including regular brushing and flossing, to improve the effectiveness of treatment.

Then, oral cavity sanitation was performed. It included therapeutic, surgical and orthopedic measures.

The removal of roots of decayed teeth, removal of dental plaque, plaque, replacement of old fillings, treatment of cavities and complicated caries, grinding of sharp edges of teeth, replacement of low-quality dentures were carried out.

Preliminary sanitation. Patients of all groups were prescribed traditional treatment, which included the removal of supra- and subgingival dental deposits, as well as the removal of soft dental plaque, curettage of periodontal pockets. The choice of the type of implant for the operation was determined by the clinical and radiographic situation, the thickness and height of the alveolar process. Screw implants were installed endosseously, the edges of the mucous membrane were adapted to the neck of the implant. When installing two-stage screw implants after fixing the intraosseous elements, the second stage of the operation - installation of the supporting heads of the implants for the orthopedic structure - was performed after 3 months on the lower jaw and after 6 months on the upper jaw. After the final installation of the implant, Calmecin Advance was prescribed.

Before the implantation operation, the patient's complaints and anamnesis were clarified: the width of the attached gum and the level of the attached gum in all areas, the level of attachment of the frenulum of the lip, tongue and strands of the transitional fold, the integrity of the dental arches, the type of bite, the position of the teeth in the dental arch, the presence of diastemas were noted. The dental formula was filled in.

Results and discussion

After conducting a comprehensive examination, we selected 10 patients from each group for immediate loading implantation in the lateral jaws. 24 implants were installed:

on the upper jaw in the amount of 17 units (d=4.5 mm), on the lower jaw 13 units (d=4.0 mm).

Table 1. Results of periostestometry on the upper jaw

	Immediately after installation	Through 1 month.	Through 3 months	Through 1 year
Periotest indicator	-2.8±0.5	-1.6±0.8	-2.6±0.7	-3.0±0.4

As shown in Table 1, Periotest values for immediately loaded implants in the upper jaw increase during the first month, with subsequent recovery of values by the end of the first year.

With immediate loading of implants in the lateral part of the upper jaw in the second group, whose patients took the drug Calcemin-Advance, a tendency towards a slight increase in indicators was observed

periotestometry by the end of 1 month after prosthetics, with subsequent reduction and restoration of initial values in

during the year. Before the implantation, patients underwent a bone density study in the area of the planned operation. Measurements were made using cone-beam computed tomography (CBCT) on 2 mm sections.

The range of density indicators for immediate loading of implants in the lateral part of the upper jaw in the second group

Table 2

	Immediately after installation	Through 1 month.	Through 3 months	Through 1 year
Periotest indicator	-3.2±0.95	-1.8±1.1	-2.7±0.9	-3.3±0.7

The range of bone density indicators in the upper jaw was 100-450 HF units, in the lower jaw - from 230 to 470 HF units (Table 3).

Table 3

Range of bone density values in the upper jaw

Bone density (in HF units)	Upper jaw (n= 17)	Lower jaw (n=13)
Periotest indicator	250±120	320±80

The normal value of the density of the spongy bone tissue layer varies from 200 to 500 HF units, the values for the cortical layer are more than 1000 HF units. The bone density indicator from 100 to 200 HF units indicates reduced mineralization of the spongy layer; values close to 500 HF units indicate the close location of the cortical plates to the implant installation zone.

During the study, the periotestometry indices in implants installed in the area of bone tissue with different density had similar dynamic changes. The change in Periotest data over the observation period is presented for an implant installed in the area of the missing tooth

3.6, with a bone density index in the range of 300-400 HF units. With an initially high implant stability index, an increase in the PM index was observed in the first month of observation. Subsequently, the Periotest data decreased and by the end of 12 months were -4.1, indicating an increase in implant stability. We assumed that such changes in the periotestometry data are due to the bicortical location of the implant in this area, as evidenced by fairly high bone density indices.

The presented changes in the Periotest data of the implant installed in the area of tooth 2.6. The bone density index before the implant installation was 120 HF units.

The implant installed in the area of bone tissue with reduced density had a high initial periotestometric value, which continued to grow during the study period. By the end of the first year, the Periotest value for this implant exceeded 10 units, as a result of which a decision was made to remove the implant. During the observations, we identified three main variants of changes in periotestometric values. In the first group, the Periotest values by the end of the observation period (1 year) decreased relative to the initial values (by an average of -25%), which indicates an increase in the stability of the implant. In the second group, the periotestometric data retained their initial values. In the third, there was a slight increase in the Periotest value, by an average of 15%, while maintaining sufficient stability of the implant.

CLINICAL EXAMPLE. Patient A. complained of missing tooth 3.6. Implantation was performed using the Astra intraosseous implant. Tech Implant System (Dentsply Sirona Implants, Sweden) with a diameter of 4.0 mm in the area of the missing tooth.

The primary stability index of the implant according to periotestometry data was -5.3, which indicates its high stability.

Impressions were taken to make orthopedic structures, and a gum former was installed

On the 14th day after the surgical stage of treatment, an individual abutment was installed. A study of the stability of the implant was conducted using the Periotest device. The device readings were -5.1.

During the same visit, a metal-ceramic crown supported by an implant was installed and fixed.

Two weeks after the installation of the orthopedic structure, a repeat study of the implant stability was performed using the Periotest device. The indicator was -5.0, which corresponds to a high level of implant stability in the bone.

Resume

Based on the results of our study, we can conclude that the periotestometry method makes it possible to measure the primary stability of the implant, which is important in achieving early rehabilitation of patients with missing teeth. The use of the Periotest device is an important "tool" for choosing the tactics of immediate loading of implants in the lateral parts of the jaws. The periotestometry method in combination with bone density measurement on CBCT allows us to predict the results of treating patients with the method of immediate loading of implants.

Immediate loading of dental implants is increasingly used as a method for successful treatment of edentulous patients. The use of periotestometry allows us to evaluate the primary stability of implants and predict the clinical effectiveness of this method. The combined use of the Periotest device and bone density measurements using CBCT can serve as a criterion for choosing the use of the immediate loading method for implants.

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