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EVALUATION OF BIOCHEMICAL MARKERS OF BONE TISSUE METABOLISM WHEN USING OSTEOTROPIC MATERIAL IN DENTAL IMPLANTATION.

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Abstract:
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

Keywords: Dental Implantation, Dental Defects

RELEVANCE

Dental implants are currently successfully used for long-term restoration of the function and aesthetics of the dentition . The relationship between the implant and the surrounding tissue is a continuous and dynamic process, also called " osseointegration ". The process of osseointegration is a permanent and dynamic connection between the implant and the surrounding tissue, culminating in the establishment of bone-implant contact, the final outcome of which is clinically asymptomatic fixation under conditions of functional stress. Integration of the implant into the bone is clinically important already in the initial healing period; which is associated with clinically asymptomatic fixation . The quality of osseointegration of dental implants is determined by various, usually unrelated factors: surgical and orthopedic (surgical technique, type of prosthetic load, level of rehabilitation) Bosshardt and .implant-related factors (material, design and surface) and patient factors (bone volume and quality in the implant area and host response . Research in recent years has been aimed at improving surgical and orthopedic implantation methods and implant characteristics. New implants and threads have been created that increase stabilization of the Bechara implant S.2017 To enhance osteogenic differentiation of bone marrow stromal cells and stimulate osteoblast activity and osseointegration , implants with micro- and nanotopographic surface treatment have been developed. Despite all the innovations and the reduction in the list of high-risk installation protocols, It is necessary to acknowledge the presence of dental implant failures.

Chronologically, "early dental implant failures" (EDIF) and "late dental implant failures" (LDIF) are classified. EDIFs arise from failed osseointegration , indicating impaired bone healing, whereas LDIFs arise from loss of osseointegration . EDIF and LDIF appear to have different etiologies. Late failures (LDIF) are associated with infection (peri-implantitis), occlusal overload, and implant design failure.

Early failures (EDIF) are due to violations of surgical and orthopaedic protocols, surgical complications, a decrease in the volume and quality of bone at the recipient site, as well as bad habits and systemic health disorders. Early failures caused by osseointegration disorders are the most important problem of modern implantology . They occur in certain categories of patients and are determined by the patient's systemic health condition. Establishing systemic risk factors determines the risk of failure of dental implantation.

PURPOSE 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

METHODS OF EXAMINING PATIENTS

General clinical instrumental and laboratory examination of all patients included blood and urine tests (determination of urea, creatinine, osmolarity, cholesterol, ALT, AST, LDH, CPK, bilirubin, blood plasma glucose (the studies were conducted "in vitro" in the clinical and biochemical laboratory of the TGSI clinic). Based on the anamnesis data, the presence of general risk factors (smoking, physical inactivity, obesity, arterial hypertension, psychoemotional overload, hyperlipidemia, diabetes mellitus, duration and nature of coronary heart disease, stage of hypertension, severity of chronic heart failure, previous operations) the

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degree of anesthetic risk (possible intra- and post-implantation complications) was assessed.

RESULTS OF THE STUDY OF CALCIUM-PHOSPHORUS INDICATORS EXCHANGE.

In studying the state of phosphorus-calcium metabolism in connection with the successful engraftment of dental implants in patients with partial edentia, the levels of ionized calcium, inorganic phosphate and alkaline phosphatase activity were studied . The data obtained are presented in Table 1.

Table 1
Indicators of phosphorus-calcium metabolism in patients requiring dental implantation (n=_96)

Indicator	Results	Laboratory norm
Ca (mmol/l)	2.39±0.11	2.15-2.58
Ca (mmol/l)	1.26±0.05	1.12-1.32
P (mmol/l)	1.09±0.17	0.86-1.45
ALP (IU/L)	179±44	98-280

The total plasma calcium content in patients requiring dental implantation ranged from 2.08 to 2.61 mmol/L, with an average of 2.39 ± 0.11 mmol/L; the amount of ionized calcium ranged from 1.18 to 1.33 mmol/L, with an average of 1.26 ± 0.05 mmol/L.

The level of inorganic phosphate in the plasma of patients requiring dental implantation ranged from 0.86 to 1.44 mmol/L, with an average of 1.09 ± 0.17 mmol/L; alkaline phosphatase activity ranged from 121 to 354 U /L, with an average of 179 ± 44 U/L, and exceeded the physiological norm in only 2 patients.

Results of correlation analysis of the amount of osseointegration of dental implants and mineral metabolism indices

The results of the comparison of phosphorus-calcium metabolism indices in the preoperative period and with the success of dental implant engraftment in patients with partial edentia are presented in Table 2.

Table 2
Characteristics of patient groups by case rejection of dental implants

Indicator	Group I (n= 30)	II (n=64)	III (n=32)	R
Ca (mmol/l)	2.3 2 ±0.13	2.36±0.13	2.38±0.11	0.6
Ca (mmol/l)	1.2 2 ±0.05	1.25±0.05	1.28±0.04*	0,001
P (mmol/l)	1, 09 ±0.16	1.12±0.16	1.07±0.16	0.09
ALP (U)	17 6 ±31	174±31	183±33	0.9

Analysis of the parameters of phosphorus-calcium metabolism in different groups showed that the level of total calcium was comparable in both groups regardless of the success of DI engraftment and ranged from 2.17 to 2.54 mmol/l in patients without DI rejection and from 2.08 to 2.54 mmol/l in patients with dental implant rejection (p <0.01), lower than the

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parameters obtained in the second group, where the level of Ca2+ ranged from 1.19 to 1.33 mmol/l.

In individuals with successful DI engraftment, the inorganic phosphorus content in the blood plasma ranged from 0.85 to 1.33 mmol/L. In the second group, phosphate level fluctuations were in the same range from 0.9 to 1.33 mmol/L. There was no statistically significant difference between the groups in the level of inorganic phosphate.

Determination of alkaline phosphatase activity in the groups of subjects showed that in patients of the first group it ranged from 121 to 247 IU/l. In the second group, the enzyme activity was somewhat higher and ranged from 140 to 354 U /l. At the same time, the average values of ALP from statistically significant did not differ between the groups.

Thus, in the group of patients with unsuccessful engraftment of dental implants, higher levels of free ionized calcium were determined with comparable levels of total calcium, inorganic phosphate, at the same time, it should be noted that the activity of alkaline phosphatase in the group of patients with an unfavorable outcome of dental implantation statistically significant differences were not revealed, in patients with rejection of dental implants it was higher.

To establish the relationship between the frequency of DI rejection and mineral metabolism indices, a correlation analysis was performed. The results are presented in Table 3 .

Table 3

Results of the correlation analysis of the amount of integration of DI and indicators of mineral metabolism .

Analyzed indicators	Correlation coefficient r (Spearman)	R =
ASF	0.5	0.002
Ca^{2+}	0.4	0.003

Thus, a positive linear correlation was found between the level of alkaline phosphatase activity (r = 0.5) and the content of ionized calcium in blood plasma (r = 0.4) and the number of failed dental implants.

No statistically significant correlations were found between other parameters and cases of early rejection of dental implants.

Evaluation of the effectiveness of rehabilitation after the application of the proposed method of using the drug calcium, phytin and vitamin D-3 in patients with defects of the distal parts of the upper jaw.

Based on our own results at the next stage of the work, assessing the state of phosphorus-calcium metabolism of patients, we identified a group of people with a presumably increased risk of rejection of dental implants, tried to improve the osseointegration of DI with the help of Calcium, phytin and vitamin D3 . The choice of the drug was due to the fact that Calcium, phytin and vitamin D3 have a dual effect on bone metabolism: anabolic due to the activation of osteoblasts and anticatabolic due to the suppression of osteoclast function. The organic component Calcium, phytin and vitamin D3 contains a number of proteins, usually synthesized by bone cells (transforming growth factor beta, insulin-like growth factors I and II, osteocalcin , collagen type I) and which have a regulatory effect on bone tissue formation and resorption. Transforming growth factor beta stimulates osteoblast activity, increases their number, promotes collagen production, and inhibits the formation of osteoclast precursors and, consequently, osteoclasts themselves. Insulin-like growth factors stimulate the synthesis of collagen and osteocalcin .

The drug was used for a month after the dental implant surgery at a daily dose of _50_ mg .

The selection criteria for the group prescribed the drug Calcium, Phytin and Vitamin D3 (hereinafter referred to as the CG) were ionized calcium levels greater than or equal to 1.25 mmol / L and alkaline phosphatase activity greater than 180 IU / L. Thus, based on the above criteria, the CG included _96_ subjects, _40_ women and _56_ men aged _17_ to _45_ years, who required surgical intervention to establish DI.

The control group (CG) consisted of 20__ subjects, 10__ women and _10_ men, who also required installation of dental implants, but did not receive drugs affecting bone metabolism in the postoperative period. The observation period was 12 months.

The obtained data are presented in Table 4.

Table 4

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Indicator	Group KG (n=20)	SG Group (n=96)	R
Age (years)	35.6±0.02	38.6±0.06	0.05
Total number of installed DIs	28	115	0.05
Number of DIs installed on the upper jaw	17	115	0.05
Number of lost DIs	4	2	0.23
Ca (mmol/l)	2.38±0.12	2.39±0.11	0.6
Ca (mmol/l)	1.27±0.02	1.25±0.04	0.04
R_n (mmol/l)	1.08±0.14	1.11±0.19	0.4
ALP (IU/L)	207±42	148±14	0.003

The average age of patients receiving Calcium, Phytin and Vitamin D3 was 38.5 ± 0.06 years. The average age of patients in the control group was 35.6 ± 0.02 years and had no statistically significant differences compared to the CG group.

RESUME

Thus, during the observation period, in patients who underwent traditional open sinus lifting without using Calcium, Phytin and Vitamin D3 and had no motivation for proper care of the oral cavity and installed implants, the hygiene level had a clear tendency to deteriorate after 12 months and was assessed as unsatisfactory. At the same time, in patients who used Calcium, Phytin and Vitamin D3, a satisfactory hygiene level was determined in the IPS area, which had a reliable difference in comparison with the control group. The total calcium content in the blood plasma in patients requiring dental implantation ranged from 2.08 to 2.61 mmol / l, an average of 2.39 ± 0.11 mmol / l, the amount of ionized calcium in the range from 1.18 to 1.33 mmol / l, an average of 1.26 ± 0.05 mmol / l.

The level of inorganic phosphate in the plasma of patients requiring dental implantation ranged from 0.86 to 1.44 mmol/L, with an average of 1.09 ± 0.17 mmol/L; alkaline phosphatase activity ranged from 121 to 354 U /L, with an average of 179 ± 44 U/L, and exceeded the physiological norm in only 2 patients.

Thus, in the group of patients with unsuccessful engraftment of dental implants, higher levels of free ionized calcium were determined with comparable levels of total calcium, inorganic phosphate, at the same time, it should be noted that the activity of alkaline phosphatase in the group of patients with an unfavorable outcome of dental implantation statistically significant differences were not revealed, in patients with rejection of dental implants it was higher.

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