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Research Article

**COMPARATIVE ASSESSMENT OF THE IMMUNE  
STATUS AT ORTHOPEDIC PATIENTS AT PROSTHETICS BY  
VARIOUS FIXED DESIGNS WITH THE SUPPORT ON DENTAL  
IMPLANTS**<sup>1</sup>Zhad'ko S.I., <sup>2</sup>Sevbitov A.V., <sup>1</sup>Kushnir K.G., <sup>2</sup>Kamenskov P.E., <sup>2</sup>Emelina E.S.<sup>1</sup>V. I. Vernadsky Crimean Federal University, Medical Academy named after S. I. Georgievsky, <sup>2</sup>I.M. Sechenov First Moscow State Medical University (Sechenov University)**Abstract:**

*For this present moment some authors show that implantation can cause certain shifts in a condition of the immune system, however implants consist of biologically inert material which does not induce a specific immune response. Our research is devoted to study some parameters of immunity of orthopedic patients with different types of fixed prostheses based on titanic implants. In 3 months after an orthopedic stage of treatment the analysis of results of a research showed signs of an immunodeficiency at patients with ceramic-metal fixed prostheses based. However immune parameters at patients with ceramic constructs met standard. The obtained data said about the best biocompatibility of the system "ceramic denture – titanium implant" and the fact that it is necessary to adjust treatment of patients with ceramic-metal prostheses based.*

**Key words:** *fixed prostheses; dental implants; immunity.***Corresponding author:****Sevbitov Andrey,**

Head of Department of Propedeutics of Dental Diseases in Sechenov University

Email: [avsevbitov@mail.ru](mailto:avsevbitov@mail.ru).

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## INTRODUCTION:

Modern methods of treatment of partial and complete absence of teeth using implants can improve the quality of life of patients, provides adequate functioning of the dental system and a high aesthetic effect. It is known that medical materials, which are in contact with body fluids and tissues for a long time, can have negative effects on various mechanisms [1-5].

It is considered that from all metals used for dental implantation the titan, having optimum technical characteristics, has the smallest sensitizing power, however, according to a number of researchers, it was noted, as to its reactions of intolerance are possible. According to researchers at most of patients, implantation can cause certain shifts in a condition of the immune system though implants consist of biologically inert material which is not inducing a specific immune response [6-8].

Based on the above, still current problem of recovery medicine is studying of reserve and adaptive opportunities of an organism when performing orthopedic treatment with use of dental implantation [9-10].

The purpose of our research was studying of the immune status of patients after performing dental implantation and the subsequent prosthetics by ceramic-metal and ceramic fixed prostheses.

## MATERIALS AND METHODS:

This work was done at Sechenov University with supported by the "Russian Academic Excellence Project 5-100". For carrying out a research 27 orthopedic patients aged 28 to 40 years with defects in the dentition were examined, for the replacement of which dental implantation was performed. All patients considered themselves healthy and did not have any chronic diseases.

Dental implantation was carried out by a two-stage technique by screw endosseous titanium implants of Conmet which conform to the international standards (Grade 4) and are allowed for production by Committee on new medical equipment of the Russian Ministry of Health. Patients were divided into two groups: further prosthetics was carried out in 1 group (14 people) – ceramic-metal fixed artificial limbs on the basis of cobalt-chrome Ducer alloy C alloy, in the 2nd group (13 patients) – ceramic fixed designs (on the basis of press ceramics of the IPS Empress system). According to the instruction of producer (DeguDent a Dentsply International Company), Ducer alloy C alloy does not contain nickel and beryllium, is stable in a mouth, does not change the

color, biologically compatible has no negative impact on fabrics, has high resistance to corrosion. Cobalt-chrome Ducer alloy C alloy meets the requirements of the EN ISO 9693 standard. Composition of alloy: Co – 59.4%, Cr – 24.5%, W - 10.0%, Nb – 2.0%, Si – 1.0%, Mo of-1.0%, Fe – 0.1%.

In clinical practice, as a rule, the conclusion about a condition of immunity at the specific patient is given on the basis of studying of the main populations of immunocompetent cells, the immunoregulatory index (IRI) – CD4/CD8 ratio is also considered.

Before the orthopedic stage and at 3 months of follow-up, an immunological study was carried out in both groups of observations, which included the study of the number of CD3+, CD4+, CD8+ - lymphocytes of venous blood, the index of blast transformation of lymphocytes (rbtl), the calculation of the immunoregulatory index CD4+/CD8+ (helper/suppressor ratio).

Venous blood sampling in the amount of 1-2 ml for the study was carried out from the ulnar vein, in the morning, strictly on an empty stomach, placing in a vacuum system to the mark indicated on the tube. K2EDTA was used as an anticoagulant. After taking the sample, the vial was slowly turned over 8-10 times to mix the blood with the anticoagulant. Storage and transportation were carried out strictly at 18-23°C in a vertical position no more than 24 hours. Immunophenotyping of lymphocytes was performed by flow laser cytometry on flow cytometry.

The reaction of lymphocyte blast transformation was carried out after isolation of mononuclear leukocytes from peripheral blood by gradient centrifugation, cultivation in the presence of phytohemagglutinin (PHA) for 72 hours. The results of the reaction were morphologically taken into account: smears were prepared from cell culture, fixed in methanol and stained according to Romanovsky-Gimza. The percentage of blasts relative to the total number of lymphocytes was determined in a light microscope with an immersion system. The result was expressed as a stimulation index, which is the ratio of the percentage of transformed cells in the experiment to the percentage of transformed cells in the control (culture without PHA).

Statistical processing of the obtained data was carried out using the methods of variation statistics with the assessment of the reliability of changes using the student's t-test. The difference of average values at  $p < 0.05$  was taken as reliable.

### RESULTS AND DISCUSSION:

In group 1, where orthopedic treatment was carried out with metal-ceramic fixed prostheses, 3 months after the installation of fixed prostheses on implants, there were signs of secondary immunodeficiency, namely: T-lymphopenia, an imbalance in the subpopulation composition of T-lymphocytes, mainly with a decrease in circulating T-helpers/inducers (CD4+) and immunoregulatory index (CD4+/ CD8+), a decrease in the rate of RBTL with PHA, which testified to reduction of functional activity of t-cells. Immunological parameters of both groups before the orthopedic stage were statistically comparable and corresponded to the norm data.

In 3 months after the orthopedic stage in group 1 (the use of metal-ceramic prostheses) immunological study showed a decrease in the absolute number of T – lymphocytes, indicating a lack of cellular

immunity-CD3 + index corresponded to  $56.6 \pm 1.4$  %, which was lower by 16.5% of the data before prosthetics. Also, the reduced t-helper (CD4 +) content at a value of  $24.2 \pm 1.2$ % testified to the manifestation of T-cell immunodeficiency. There was a virtually unchanged level of T-suppressor content (CD8+)  $-21.1 \pm 0.7$ %. Analysis of immunoregulatory index showed a shift in the ratio of T-helpers and T-suppressors (CD4/CD8) to the left —  $1.38 \pm 0.05$ . Such immunoregulatory index (below 1.5) is usually characteristic of immunodeficiency States. It is known that the indicator of RBTL reflects the degree of readiness of the immune system to the immune response, so in group 1 we observed a decrease in this indicator  $-40.2 \pm 2.1$ %, which indicated the suppression of the immune system of this group of patients close to the critical level (Table 1).

**Table 1: Immunological parameters of orthopedic patients with various fixed structures, based on implants (%)**

Immunological indicators (%)	Indicators before prosthetics (n = 27)	Indicators of patients of group 1 with metal-ceramic prostheses in 3 months after prosthetics (n=14)	Indicators of patients 2 groups with ceramic prostheses 3 months after prosthetics (n= 13)
CD3+	$73,1 \pm 1,36$	$56,6 \pm 1,4$ P < 0,05	$68,5 \pm 1,5$ p < 0,05
CD4+	$34,4 \pm 0,6$	$24,2 \pm 1,2$ p < 0,05	$34,7 \pm 1,1$ p < 0,05
CD8+	$21,55 \pm 0,72$	$21,1 \pm 0,7$ p < 0,05	$22,3 \pm 0,8$ p < 0,05
IRI	$1,54 \pm 0,06$	$1,38 \pm 0,05$ p < 0,05	$2,01 \pm 0,06$ p < 0,05
RBTL	$52,5 \pm 2,2$	$40,2 \pm 2,1$ p < 0,05	$53,1 \pm 2,0$ p < 0,05

**Note:** p-reliability with respect to data prior to prosthetics.

At the same time, the data obtained at 3 months of observations in the 2nd group of orthopedic patients (treatment with ceramic fixed prostheses) had values close to the corresponding indicators before prosthetics: CD3+  $-66,5 \pm 1,5$ %, CD4+  $-34,7 \pm 1,1$ %, CD8+  $-22,3 \pm 0,85$ %, the ratio of T-helpers and T-suppressors (CD4/ CD8)  $-2,01 \pm 0,06$ , RBTL  $-53,1 \pm 2,0$ %. All of the above indicates the normal functioning of cellular immunity in orthopedic patients with ceramic fixed structures.

### CONCLUSIONS:

The use of ceramic fixed prostheses supported by titanium implants did not cause changes in the immune status in orthopedic patients of group 2 and is predominant in terms of biocompatibility. While the treatment with metal-ceramic fixed prostheses based on cobalt-chromium alloy, installed on the implants, caused signs of immunodeficiency and required appropriate correction of treatment.

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