

## CLINICAL ASPECTS OF APPLYING METHODS FOR DENTAL ALVEOLUS PREPARATION BEFORE IMPLANTATION

**Shevela Tatiana Leonidovna**

*Doctor of Medical Sciences, Professor, Professor  
Belarusian State Medical University  
Minsk, Republic of Belarus*

**Bely Maxim Grigorievich**

*Graduate Student  
Belarusian State Medical University  
Minsk, Republic of Belarus*

**Annotation.** *The paper presents the results of a molecular genetic study of dental alveoli prior to direct dental implantation. Methods of preparing jaw bone tissue in the implantation zone are considered and a comparative analysis of their effectiveness is conducted. It is established that the use of laser exposure in the area of dental alveoli on foci of odontogenic infection after the extraction of teeth with granulomas and cystogranulomas contributes to the optimization of bone tissue reparative regeneration processes by reducing the content of periodontopathogenic microorganisms.*

**Keywords:** *dental implantation, bone tissue preparation, dental alveoli, opportunistic microflora, periodontopathogenic microflora.*

### Introduction

According to specialized literature, scientific research positively substantiates the method of direct dental implantation with immediate loading; a number of authors have conducted a medical and biological substantiation of immediate dental implantation, the advantages of which are currently considered to be:

- preservation of the volume and architecture of the bone in the area of extracted teeth, 60.0%-90.0% of the volume of the alveolar bone tissue is preserved. While without implantation, after tooth extraction, due to resorption and atrophy of bone tissue after 12 months, the height of the alveolar process decreases by 3.0-7.0 mm and is approximately 40.0%-50.0% of the previous volume;

- preserving the contour of the alveolar bone and creating the prerequisites for achieving an aesthetic treatment result;
- minimizing the number of operations and, as a result, minimizing both the traumatic impact on tissues and the negative psychological background for patients;
- significant reduction in treatment duration by at least 3-6 months [2,5].

At the present stage, this method is popular, a one-stage surgical protocol allows to implement the patient's chewing and aesthetic task in the shortest possible time. Optimal recovery paths of this method, unfortunately, are also accompanied by the development of inflammatory-destructive complications in the bone tissue surrounding the dental implant [1,3].

In the works of T.G. Robustova (2001) it was proven that the healing of bone tissue is affected by the trauma of the operation, preservation of the integrity of the periosteum and local blood supply, which ensure the functioning of osteoblasts. However, histological and morphometric results of experimental studies with immediate loading showed that integration is significantly affected by the anatomical localization of the intervention. A number of researchers believe that adequate morphogenesis occurs only with a single-stage surgical intervention [8].

In the dental alveolus after tooth extraction, the processes of bone tissue regeneration occur more actively than after the installation of an implant in the formed bone, due to significant changes in the structure of the jaw bone. Thus, the installation of an implant immediately in the alveolus after tooth extraction is more successful than after several months, since the cortical bone retains its density and volume. In this case, it is important to carry out curettage and instillation of the dental alveolus with antiseptics in order to remove pathological tissues, granulations, and microorganisms [4,11]. Healing of the dental alveolus and engraftment of the implant occur simultaneously, due to which the volume of surgical interventions and treatment periods are reduced, and the implant placed in the socket also prevents narrowing of the alveolus.

The stages of the operation include tooth extraction with careful syndesmotomy and subsequent treatment of the bone wound. During revision of the alveolus, tissue scraping or active curettage, removal of ingrown mucous membrane, instillation of an antiseptic or installation of a tampon soaked in an antibiotic in the dental alveolus, then osteotomy and installation of the implant are performed. However, a number of authors note a high percentage of up to 20.0% of complications after direct implantation into the alveoli of teeth with chronic foci of odontogenic infection [7]. Research on reducing inflammatory and infectious complications and optimizing the processes of osseointegration during direct dental implantation after extraction of teeth with periapical foci of infection remains relevant. The existing methods of managing the alveolus of the extracted tooth for installation of a dental implant are not sufficiently substantiated [6, 9,12]

**Purpose of the work** – to determine the effectiveness of methods for preparing jaw bone tissue for direct dental implantation.

**Materials and methods**

The study involved 120 patients (62 women, 58 men) with partial secondary edentia who underwent tooth extraction with simultaneous installation of dental implants. The average age of the patients was: 49.5 years for men and 45.6 years for women.

In order to obtain data on the composition of the microbial flora in the dental alveolus, molecular biological microbiological studies were conducted.

For the study, patients were divided into groups:

- control group (30 patients) – patients underwent sampling of material from the dental alveolus immediately after tooth extraction;

- group 1 (30 patients): material was collected after tooth extraction, while the dental alveolus was treated manually using a curettage spoon, followed by instillation with an antiseptic - 0.05% aqueous solution of chlorhexidine bigluconate;

- group 2 (30 patients) microbiological examination was carried out after treatment of the dental alveolus with a spherical tip with a diamond coating using a piezosurgical device (piezotome) and instillation of the alveolus with 0.9% isotonic sodium chloride solution

- Group 3 (30 patients) sampling for the study was carried out after tooth extraction using laser exposure to bone tissue in the area of dental implant installation.

The effectiveness of treating the walls and bottom of dental alveoli from granulations, remnants of epithelial tissue, and chronic foci of odontogenic infection was assessed using binocular optics.

**Results of the molecular genetic method of studying the contents of dental alveoli directly during tooth extraction**

The obtained results of the molecular genetic study of the contents of the dental alveoli during direct tooth extraction in patients of the control group state the following microbial composition of biotopes: aerobic opportunistic microflora was detected: Enterobacteriaceae DNA - in 100.0% of patients, Staphylococcus spp. - in 73.3% of patients, Streptococcus spp. - in 73.3% of patients, Escherichia coli - in 46.6% of patients, Enterobacter spp. - in 30.0% of patients, Klebsiella spp. in 1.0% of patients, Proteus spp. - not detected, Serratia spp. - not detected, Pseudomonas aeruginosae - not detected, Enterococcus faecalis / E. Faecium - in 3.0% of patients. A high DNA titer (more than  $1.0 \cdot 10^4$  GE/ml) was detected in 50.0% of cases observed in this group with predominant detection of DNA of Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus epidermidis.

The periodontopathogenic microflora of the dental alveoli is represented by the following composition: Prevotella intermedia - in 3.3% of patients, Trepon-

ma denticola - in 56.6% of patients, *Aggregatibacter actinomycetemcomitans* - in 3.3% of patients, *Porphyromonas gingivalis* - in 76.6% of patients, *Tannerella forsythia* - in 50.0% of patients.

In 16 (36.0%) samples of biological material from patients, the identified pathogens were present as part of a polymicrobial infection: DNA of *Staphylococcus* spp. + *Streptococcus* spp. – in 8 samples (26.6%), DNA of *Staphylococcus* spp. + *Enterobacteriaceae* were detected in 11 samples (36.6%), which gives reason to assume that they form biological communities in the form of biofilms, and therefore have a unique ability to minimize the influence of protective factors of the human body.

### **Results of molecular genetic method of studying the contents of the dental alveolus after manual curettage**

In group 1, after processing the dental alveolus with a manual instrument, surgical curettage revealed a predominant presence of opportunistic microorganisms - during a quantitative study, the content of DNA of aerobic opportunistic microflora remains high ( $\leq 1.0 \cdot 10^4$  GE/ml): DNA of *Enterobacteriaceae* - in 100.0% of patients, *Staphylococcus* spp - in 56.6% of patients, *Streptococcus* spp. - in 73.3% of patients.

After dental manipulations, qualitative studies of DNA of aerobic opportunistic pathogens demonstrated a slight decrease in the presence of *Escherichia coli* DNA - by 40.0% and *Staphylococcus aureus* DNA - by 40.0%. The remaining species composition of periodontopathogenic microflora did not change.

At the next stage, studies were conducted to determine the quantitative levels (concentrations) of DNA of opportunistic aerobic flora microorganisms in samples from the dental alveolus. It was found that in patients of the 1st main group and the comparison group, the quantitative levels of DNA of opportunistic microorganisms did not have statistically significant differences ( $p \geq 0.005$ ). At the same time, the concentration (Me (Q25/75)) of *Staphylococcus* spp. DNA was  $6.35 (4.41/9.07) \times 10^5$  copies/ml, including MSSA –  $7.29 (5.19/9.30) \times 10^3$  copies/ml, MRSA –  $7.51 (5.37/9.28) \times 10^3$  copies/ml and MRCoNS –  $8.56 (6.42/9.95) \times 10^3$  copies/ml, *Streptococcus* spp. DNA –  $5.89 (3.42/8.25) \times 10^5$  copies/ml and *Enterobacteriaceae* DNA –  $5.16 (2.91/7.22) \times 10^4$  copies/ml.

A quantitative study of the concentrations of DNA of periodontopathogenic microflora in the dental alveolus did not show a significant decrease in the number of microorganisms ( $p \geq 0.05$ ) after curettage: *Treponema denticola* in 50.0% of patients, *Porphyromonas gingivalis* in 50.0% of patients, *Tannerella forsythia* in 33.3% of patients.

At the same time, it should be noted that the capabilities of PCR diagnostics are limited by the sensitivity of test systems that are capable of detecting DNA fragments of microorganisms at their concentration in a biological sample of 103 cop-

ies/ml and higher. Thus, the molecular biological study allowed us to determine the composition of the microbial flora at diagnostically significant concentrations of these microorganisms of 103 GE/ml and higher genomic equivalents/ml. It is possible that the presence of other microorganisms in lower concentrations was not detected due to the diagnostic threshold (detection limit) of the test system.

### **Results of the molecular genetic method of studying the contents of dental alveoli after using the mechanical method**

In group 2, the dental alveolus was treated with mechanical methods, which included subgroup A - treatment of the dental alveolus with a spherical bur and a physiodispenser (in the mode: speed of 450 rpm and force of 25 N/cm<sup>2</sup>) and subgroup B - treatment of the dental alveolus with a spherical nozzle with a diamond coating using a piezosurgical device (piezotome). At the same time, before the treatment of the dental alveoli, there was no reliable difference ( $p \geq 0.05$ ) in the values of the concentration of DNA of opportunistic microflora.

After treatment of the dental alveoli in subgroup A and subgroup B, the concentrations of microorganisms significantly differed from the initial values; a decrease in the DNA content of aerobic opportunistic and periodontopathogenic microflora was observed ( $p \leq 0.05$ ).

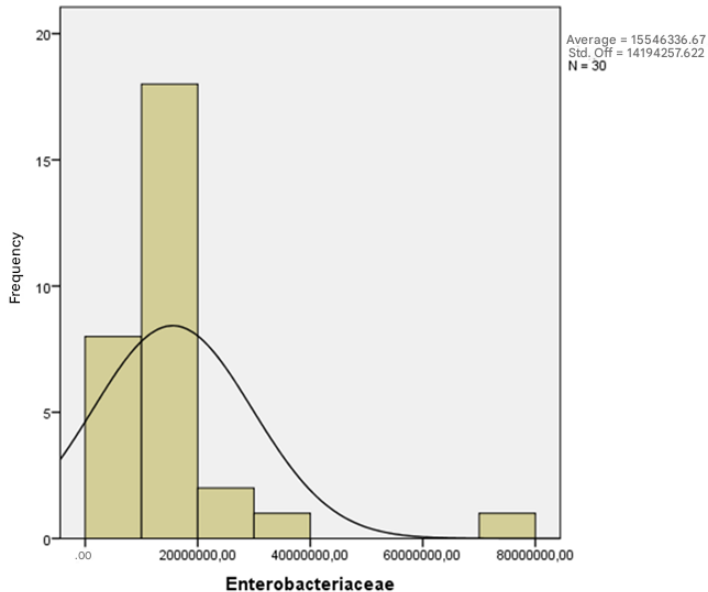
The detection of DNA of Enterobacteriaceae, Staphylococcus spp, Streptococcus spp. in group 2 decreased by 50.0%, the species-specific detection of DNA of aerobic opportunistic pathogens during qualitative PCR studies decreased by 3.3 times, which was reliably significant ( $p \leq 0.05$ ).

In this group of patients, a quantitative study of periodontopathogenic microflora in the dental alveolus showed a reliable decrease ( $p \leq 0.05$ ) in the detection of microorganisms: Treponema denticola in 30.0% of patients and Porphyromonas gingivalis in 46.6% of patients, Tannerella forsythia in 23.3% of patients. Positive results of Porphyromonas gingivalis DNA before treatment were determined in 30 patients (100%), after treatment it was detected in 46.6% of patients.

For an objective assessment of the proposed methods of dental alveolar treatment, a microbiological study was conducted in groups. The state of the microflora, especially in dynamics, can be an indicator of the effectiveness of the method used and have prognostic value. When conducting a quantitative bacteriological study, it was found that before the start of treatment, the level of contamination of the dental alveoli in patients of the control group and groups 1 and 2 varied within 105 - 107 and was the same.

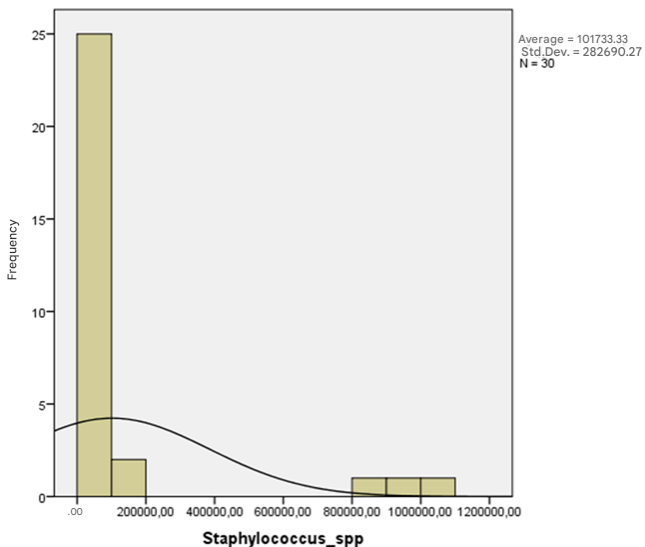
After tooth extraction, the results of quantitative detection of Enterobacteriaceae DNA (Figure 1) were found in all patients of the control group and group 1 (100.0%), a statistically significant result of reduction in contamination was observed in group 2 and amounted to 16.6%. The presence of Staphylococcus spp., Streptococcus spp. DNA (Figure 2.3) was detected in patients of the control group

(73.3%) at the time of tooth extraction, while after alveolar treatment, the DNA of these microorganisms significantly decreased by 2.5 times.

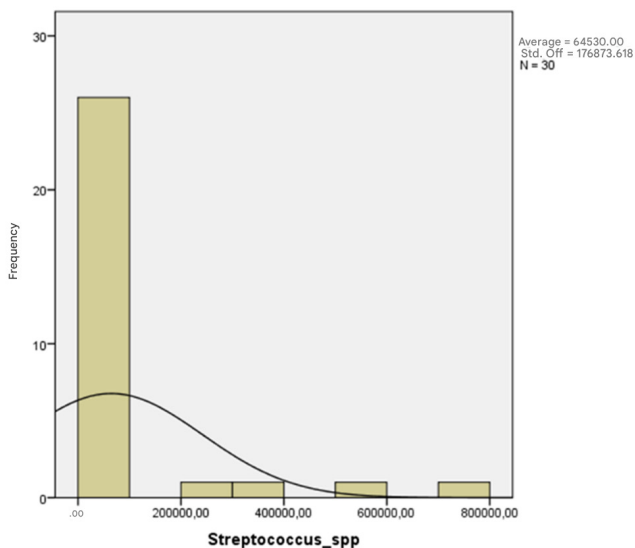


**Figure 1.** Frequency histogram of the distribution of the amount of Enterobacteriaceae DNA in patients of the control group, taking into account zero values

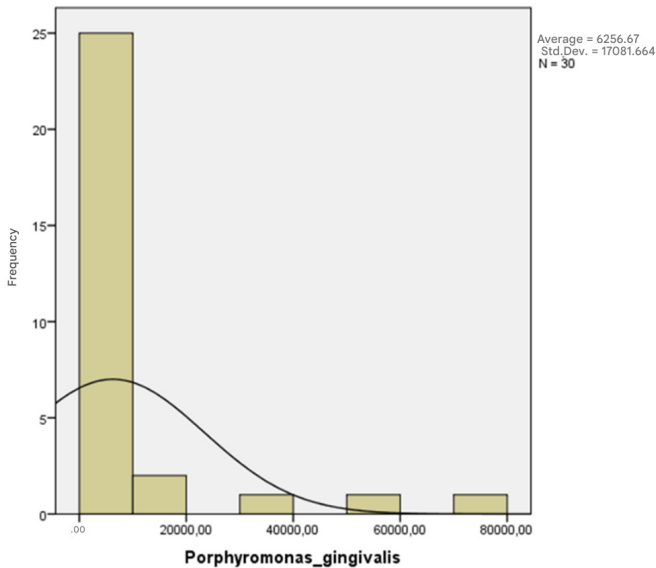
Quantitative detection of Porphyromonas gingivalis DNA (Figure 4) and Prevotella intermedia immediately after tooth extraction were determined in 100.0% of patients, after treatment of dental alveoli their numerical presence decreased by 50.0% and was detected in 15 patients. The detected Treponema denticola DNA after tooth extraction was determined in all 17 patients (56.6%), after mechanical curettage it decreased by 2 times and was detected in 9 patients.



**Figure 2.** Frequency histogram of the distribution of the amount of *Staphylococcus* spp. DNA in patients of the control group, taking into account zero values



**Figure 3.** Frequency histogram of the distribution of the amount of *Streptococcus* spp. DNA in patients of the control group, taking into account zero values



**Figure 4.** Frequency histogram of the distribution of the amount of *Porphyromonas gingivalis* DNA in patients of the control group, taking into account zero values.

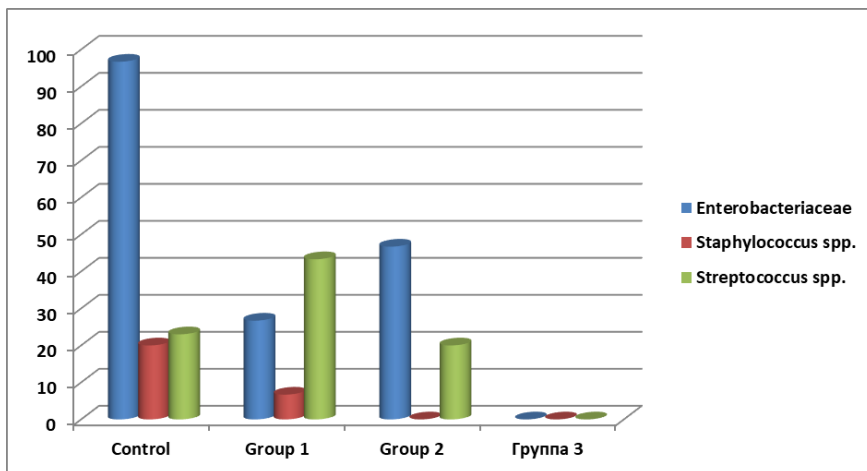
DNA of *Streptococcus* spp., *Enterobacter* spp. / *Klebsiella* spp., *Proteus* spp. and *Pseudomonas aeruginosae* was detected in 10 patients at the time of tooth extraction, after the operation the results of these 10 patients were negative. Thus, the results of the change in microflora indicate the effectiveness of the method used. Patients of group 2 showed a statistically significant decrease in the microbial contamination of the alveoli.

#### **Molecular results-genetic research method contents of the dental alveolus after laser exposure**

In patients of group 3, immediately after tooth extraction, the microbiological composition of the dental alveolus did not differ significantly from groups 1 and 2, however, after treatment of the dental alveolus using a diode laser for a duration of 10 minutes, the composition of the microflora of the dental alveolus had significant differences: *Prevotella intermedia* was not detected in patients, *Treponema denticola* - in 10.0% of patients (n = 3), *Aggregatibacter actinomycetemcomitans* was not detected, *Porphyromonas gingivalis* was not detected in 12.0% of patients (n = 4), *Tannerella forsythia* was not detected.

The results of a quantitative study of microorganisms in groups indicate reliable differences in the methods used in the treatment of dental alveoli after tooth extraction (Figure 5).

In the control group, immediately after tooth extraction, aerobic opportunistic microflora was detected in the dental alveoli: Enterobacteriaceae DNA - in 100.0% of patients (n=30), Staphylococcus spp. - in 73.3% of patients (n=30), Streptococcus spp. - in 73.3% of patients (n=30), Escherichia coli - in 46.6% of patients (n=30), Enterobacter spp. - in 30.0% of patients (n=30), Klebsiella spp. in 1.0% of patients (n=30), Proteus spp. - not detected, Serratia spp. - not detected, Pseudomonas aeruginosae - not detected, Enterococcus faecalis / E. Faecium - in 3.0% of patients (n=30). A high DNA titer of more than  $1.0 \cdot 10^4$  GE/ml was detected in 50.0% of cases observed in this group with predominant detection of DNA of Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus epidermidis.



**Figure 5.** Quantitative studies – detection of DNA of aerobic opportunistic pathogens, %

In group 2, there was no significant difference ( $p \geq 0.05$ ) in the values of the concentration of DNA of opportunistic microflora before treatment, whereas after treatment of the dental alveolus with a spherical bur and a physiodispenser (in the mode: speed of 450 rpm and force of 25 N/cm<sup>2</sup>) and a spherical tip with a diamond coating using a piezosurgical apparatus (piezotome), in patients of the main group 2, a decrease in the DNA content of aerobic opportunistic and periodontopathogenic microflora was significantly different from the comparison group ( $p \leq 0.05$ ) and the main group 1 ( $p \leq 0.05$ ).

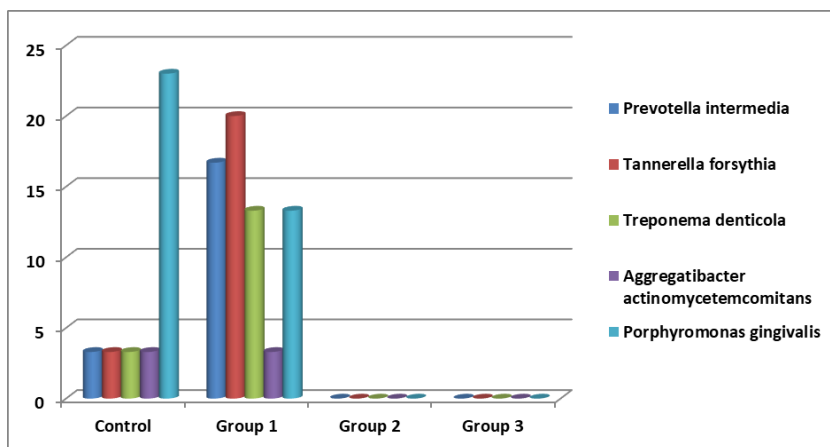
The detection of DNA of Enterobacteriaceae, Staphylococcus spp, Streptococcus spp. in the main group 2 decreased by 50.0%, the species-specific detection of DNA of aerobic opportunistic pathogens during qualitative PCR studies decreased by 3.3 times, which was reliably significant ( $p \leq 0.05$ ).

Periodontopathogenic microflora is represented by the following composition: Prevotella intermedia - in 3.3% of patients ( $n=30$ ), Treponema denticola - in 56.6% of patients ( $n=30$ ), Aggregatibacter actinomycetemcomitans - in 3.33% of patients ( $n=30$ ), Porphyromonas gingivalis - in 76.6% of patients ( $n=30$ ), Tannerella forsythia - in 50.0% of patients ( $n=30$ ).

A quantitative study of periodontopathogenic microflora in the dental alveolus showed a significant decrease in the concentrations of DNA of opportunistic microorganisms ( $p \leq 0.05$ ) in group 1 patients: Treponema denticola in 50.0% of patients ( $n=30$ ), Porphyromonas gingivalis in 50.0% of patients ( $n=30$ ), Tannerella forsythia in 33.3% of patients ( $n=30$ ).

In group 2 patients, a quantitative study of periodontopathogenic microflora in the dental alveolus showed a significant decrease ( $p \leq 0.05$ ) in the detection of microorganisms: Treponema denticola in 30.0% of patients ( $n=30$ ) and Porphyromonas gingivalis in 46.6% of patients ( $n=30$ ), Tannerella forsythia in 23.3% of patients ( $n=30$ ).

A quantitative study of periodontopathogenic microflora in the dental alveolus showed a significant decrease in DNA concentrations ( $p \leq 0.05$ ) in group 3 patients: Treponema denticola concentration decreased by 3.5 times, DNA of Prevotella intermedia, Tannerella forsythia, Aggregatibacter actinomycetemcomitans was not detected (Figure 6).

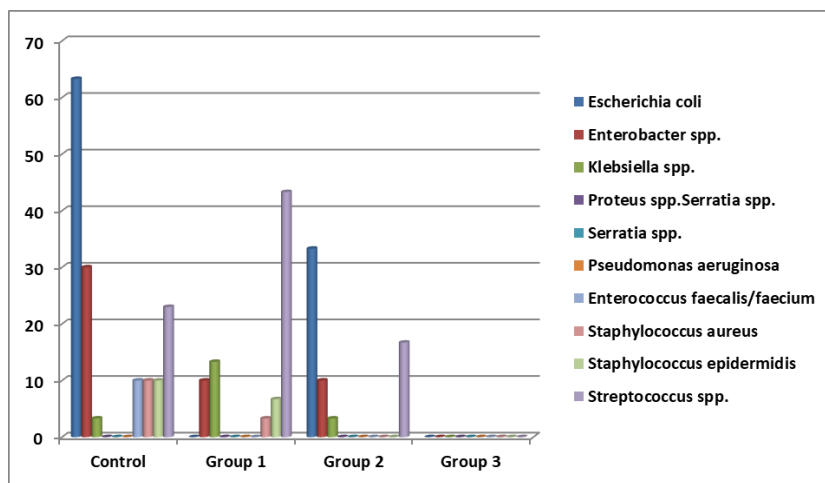


**Figure 6.** Quantitative studies – detection of DNA of periodontopathogenic pathogens (copies/ml), %

In 16 samples of biological material from patients in the comparison group, the identified pathogens were present as part of a polymicrobial infection: DNA of Staphylococcus spp. + Streptococcus spp. – in 8 samples (26.6%), DNA of Staphylococcus spp. + Enterobacteriaceae were detected in 11 samples (36.6%), which gives reason to assume that they form biological communities in the form of biofilms, and therefore have a unique ability to minimize the impact of protective factors of the human body.

In group 1, after treatment of the dental alveolus with a manual instrument and surgical curettage, a predominant presence of opportunistic microorganisms was revealed - during a quantitative study, the content of DNA of aerobic opportunistic microflora remains high ( $\leq 1.0 \times 10^4$  GE/ml): DNA of Enterobacteriaceae - in 100.0% of patients (n=30), Staphylococcus spp - in 56.6% of patients, Streptococcus spp. - in 73.3% of patients (n=30).

At the next stage, studies were conducted to determine the quantitative levels (concentrations) of DNA of opportunistic aerobic flora microorganisms in samples from the dental alveolus. It was found that in patients of group 1 and the control group, the quantitative levels of DNA of opportunistic microorganisms did not have statistically significant differences ( $p \geq 0.005$ ). At the same time, the concentration (Me (Q25/75)) of Staphylococcus spp. DNA was 6.35 (4.41/9.07)  $\times 10^5$  copies/ml, including MSSA – 7.29 (5.19/9.30)  $\times 10^3$  copies/ml, MRSA – 7.51 (5.37/9.28)  $\times 10^3$  copies/ml and MRCoNS – 8.56 (6.42/9.95)  $\times 10^3$  copies/ml, Streptococcus spp. DNA – 5.89 (3.42/8.25)  $\times 10^5$  copies/ml and Enterobacteriaceae DNA – 5.16 (2.91/7.22)  $\times 10^4$  copies/ml.



**Figure 7.** Qualitative studies – differential species-specific diagnostics of DNA of aerobic opportunistic pathogens, %

After dental manipulations, qualitative studies of DNA of aerobic opportunistic pathogens demonstrated a slight decrease in the presence of *Escherichia coli* DNA - by 40.0% and *Staphylococcus aureus* DNA - by 40.0%. The remaining species composition of the microflora did not change.

In patients of group 3 immediately after tooth extraction, the microbiological composition of the dental alveolus did not differ significantly from the control group, groups 1 and 2, however, after the treatment of the dental alveolus using a diode laser for a duration of , the composition of the microflora of the dental alveolus had reliable differences: *Prevotella intermedia* - not detected in patients (n = 0), *Treponema denticola* - in 10.0% of patients (n = 3), *Aggregatibacter actinomycetemcomitans* - not detected (n = 0), *Porphyromonas gingivalis* - in 12.0% of patients (n = 4), *Tannerella forsythia* - not detected (n = 0). The results of the microbiological study of the contents of the dental alveoli in the groups of patients using PCR diagnostics are presented in Figure 7.

A quantitative study of periodontopathogenic microflora in the dental alveolus showed a significant decrease in DNA concentrations ( $p \leq 0.05$ ) in group 3 patients: *Treponema denticola* concentration decreased by 3.5 times, DNA of *Prevotella intermedia*, *Tannerella forsythia*, *Aggregatibacter actinomycetemcomitans* was not detected.

### Conclusions.

Conducting preoperative preparation of dental alveoli will prevent the development of infectious and inflammatory processes in the area of the installed dental implant by reducing microbial contamination and removing foci of chronic odontogenic infection. In order to stop the inflammatory process in the focus of odontogenic infection, along with surgical curettage, we consider it possible to use laser exposure with a bactericidal effect.

### References

1. *Analysis of the results of dental implantation based on the survey data of dentists using the example of individual constituent entities of the Russian Federation [Electronic resource] / E. Y. Dyachkova [et al.] // Clinical Dentistry. - 2022. - V. 25, No. 3. - P. 32-37.*
2. *Hypercompression of jaw bone tissue as an etiological factor in the development of peri-implantitis: results of morphological and morphometric studies / T. L. Shevela, I. O. Pokhodenko-Chudakova, E. V. Adolf, T. P. Pavlovich // Dentistry. Aesthetics. Innovations. - 2021. - Vol. 5, No. 3. - P. 260-268.*
3. *On the assessment of the periodontal condition in the area of fixed structures supported by implants manufactured using CAD/CAM technology [Electronic resource] / L. I. Nikitina [et al.] // Bulletin of modern clinical medicine. - 2022. - V. 15, No. 5. - P. 52-57.*

4. Markin, V. A. Features of the psycho-emotional background of patients during dental orthopedic treatment with complete removable plate dentures [Text] / V. A. Markin, Z. V. Razumnaya, N. V. Rakus // Proceedings of the 19th All-Russian Dental Forum, Moscow, February 10-11, 2022. - [Published in the journal] Russian Dentistry. - 2022. - Vol. 15, No. 3. - P. 53-55.

5. Moiseeva, N. S. Clinical and laboratory analysis of the elemental composition of jaw bone tissue and osteoplastic materials according to X-ray spectral microanalysis [Text] / N. S. Moiseeva // Bulletin of new medical technologies. - 2022. - Vol. 29, No. 1. - P. 106-109.

6. Otto Zur, Mark Hürzeler "Plastic and aesthetic surgery in periodontology and implantology, 2014, p. 848.

7. Evaluation of the stability and osseointegration of dental intraosseous-extraosseous implants with through porosity in conditions of bone tissue atrophy using the Periotest S device [Electronic resource] / I. M. Bairikov [et al.] // Clinical dentistry. - 2022. - V. 25, No. 3. - P. 20-24.

8. Robustova, T. G. Dental implantation (surgical aspects) / T. G. Robustova. Moscow: Medicine, 2001. 560 p.

9. Romanenko, M. V. The influence of dental prostheses supported by dental implants made of dissimilar alloys on electrochemical processes and saliva parameters [Text] / M. V. Romanenko, O. I. Manin, A. M. Rudakova // Proceedings of the 19th All-Russian Dental Forum, Moscow, February 10-11, 2022. - [Published in the journal] Russian Dentistry. - 2022. - Vol. 15, No. 3. - P. 56-57.

10. Sveshnikov, A.A. Mechanisms of bone tissue demineralization // A.A. Sveshnikov, L.A. Smotrova, E.N. Ovchinnikov. – Genius of Orthopedics. – No. 2, 2005. – p. 95-99

11. Shevchenko, D. P. Application of various methods of bone grafting in case of atrophy of the alveolar processes in the lateral parts of the lower jaw during dental implantation in patients with partial edentia [Text] / D. P. Shevchenko, K. G. Tarkhanyan, D. A. Beglyuk // New technologies for the creation and application of bioceramics in restorative medicine: Proc. IV Int. scientific-practical. conf. (October 13-15, 2016) / Ministry of Education and Science of the Russian Federation [et al.]; editorial board: V. I. Vereshchagin [et al.]. - Tomsk, 2016. - P. 126-129.

12. Yakupov, B. A. Inflammatory complications of dental implantation [Text] / B. A. Yakupov // Orthodontics. - 2022. - No. 3. - P. 86-87.

International Science Conference

SCIENCE  
EDUCATION  
PRACTICE

Part 2

March 26, 2025. Delhi, India