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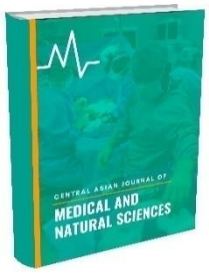

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Cortical Fixing Screws are the Method of Choice for Conservative Treatment of Mandibular Fractures

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Abstract: In recent years, the orthopedic method of treating fractures of the mandible, along with traditional methods for the purpose of interdigital fixation, has seen the introduction into practice of using cortical screws, which are orthodontic mini-implants. The advantages of using these fixing elements for maxillo-mandibular immobilization compared to dental wire splints include the absence of damaging effects on periodontal and dental tissues, improving the eating process, and facilitating proper hygiene procedures for the patient.

Keywords: fractures of the mandible, immobilization of the jaws, consolidation, antiseptic treatment of the oral cavity.

Relevance. Based on the data of various authors, as well as based on our own clinical experience, we can assert that in modern maxillofacial surgery, one of the problems remains the problem of treating victims with fractures and post-traumatic deformities of the mandible. According to statistics, there is an increase in the number of victims and an aggravation of the injury. In maxillofacial surgery, there are currently many systems and conservative and surgical methods for fixing fragments of the mandible. All of them have advantages and disadvantages, indications and contraindications. The most important factor ensuring the success of treatment of patients with mandibular fractures is adequate immobilization of fragments, which is carried out by fixing bone fragments using various devices and techniques [1.3.5.7.9.11.13.15].

At the present stage of development of surgical dentistry and maxillofacial surgery, conservative treatment of jaw fractures is carried out with dental wire splints (NPSH), various variants of parietal-chin bandages, interdigital ligature fastening, cortical fixing screws (CFV). NPS are characterized by low trauma and ease of application, cheapness of the materials used, but have a number of significant disadvantages: they are bulky, especially for urgent mouth opening in case of traumatic brain injury, inconvenient for eating and maintaining oral hygiene; lead to damage to the mucous membrane of the lips, gums, cheeks and displacement, stretching and loosening teeth at 3-4 weeks. The treatment of the vestibule of the oral cavity with wipes moistened with antiseptics is difficult, since the gauze clings to the hooks and ends of the wire ligatures. The use of intraoral dental splints leads to a negative attitude of patients towards them. During the operation of tires, their regular correction and treatment of formed pressure sores are required. All this worsens the quality of life of patients.

Along with traditional methods of treating jaw fractures, interjaw fixation using orthodontic mini-implants has recently been used, which greatly simplifies immobilization and facilitates hygienic procedures for the patient. In particular, cortical fixing screws made of pure titanium are used for jaw fractures. CPF for jaw immobilization, connecting fragments and restoring occlusion is an effective method due to direct force action on bone tissue, while immobilization with dental orthopedic structures is an indirect method of force action; first, an effect is formed on the tooth tissue, then on the tooth root, then on the ligamentous apparatus of the tooth root and through it on the bone tissue of the jaw which leads to negative side effects. Maxillo-mandibular fixation with intraoral cortical fixing screws does not have a damaging effect on the periodontium and teeth, improves the process of eating, makes the oral cavity accessible to ensure proper hygiene [2.4.6.8.10.12.14].

Taking into account the experience of specialists, reflected in many scientific literary works, we set ourselves the goal of introducing into practice the method of immobilization of bone fragments of the mandibular bone in its traumatic fractures using cortical fixing screws.

The purpose of the study It consists in studying the effectiveness of interdigital fixation in traumatic injuries of the mandible using cortical fixing screws.

Material and methods. Clinical studies were carried out on the basis of the Department of Maxillofacial surgery of the Bukhara Regional Multidisciplinary Medical Center. The observations were based on a clinical and laboratory study of 157 patients diagnosed with mandibular fracture (single, double and multiple; unilateral and bilateral), of which 121 men (77.07%) and 36 women (22.93%) aged 18 to 75 years. The control group included 30 conditionally healthy individuals.

Taking into account the nature of the fracture of the mandible and the course of the post-traumatic period, all patients were prescribed comprehensive treatment, the medicinal component of which consisted in prescribing antibiotics, taking into account the composition and sensitivity of the microflora, detoxification and desensitizing therapy. In some cases, vitamin therapy was used to enhance general and local immunity. Symptomatic treatment included analgesics and nonsteroidal anti-inflammatory drugs to reduce pain, as well as other necessary remedies, depending on the clinic of the disease.

Based on the objectives of the study, depending on the type of local treatment, 157 patients with mandibular fractures were divided into 3 groups by random sampling:

The 1st (control) group consisted of 46 patients in whom local treatment consisted of bimaxillary splinting of the jaws with Tigerstedt splints and mouth rinses with a solution of the antiseptic furacilin. For preventive purposes, antibacterial therapy was prescribed in the form of intramuscular injections of antibiotics of a number of cephalosporins - cefazolin, ceftriaxone, etc., having a bactericidal effect on gram-positive and gram-negative microorganisms. In cases of hematomas and pronounced edema of regional soft tissues, intravenous infusions of Metrogil (metronidazole, which has antibacterial and antiprotozoal effects) were used. Vitamin therapy was prescribed for the purpose of general restorative therapy and prevention of dysbiosis.

The 2nd group consisted of 54 victims, to whom applications of "Traumel-S" ointment were added to the above-mentioned local traditional medical complex;

The 3rd (main) group consisted of 57 patients who, after reposition and fixation of bone fragments of the mandible with cortical screws, included daily procedures of infrared radiation therapy (TII) and applications of Traumel-S ointment in complex local therapy. The total number of patients is 157.

"Traumel-C" is a combined preparation containing plant extracts (arnica, calendula, chamomile) and other natural substances (methylparaben, propylparaben, dimethyl sulfoxide). Its action is based on antimicrobial, anti-inflammatory, local anesthetic, regenerating and decongestant properties. The drug

improves regional blood circulation, stimulates the regeneration of soft and bone tissues and reduces edema. It is used to reduce pain, accelerate the healing of post-traumatic and postoperative wounds. The ointment contains hydrophilic and hyperosmolar bases, including water, glycerin, triglycerides and sodium chloride solution. These components ensure rapid penetration of active substances into tissues, enhance the effectiveness of the drug and act osmotically and dehydratingly, reducing swelling and promoting wound healing [15.17.19.21.23.25.27].

In this study, the effect of the drug Traumel-C on the regeneration process in mandibular fracture in combination with orthopedic treatment, antibacterial, detoxification and physiotherapy was studied. The drug was applied topically by applying and rubbing on the area of tissue integrity damage, the procedure was performed once a day until completely absorbed, usually within 1-2 weeks, depending on the healing rate.

In accordance with this scheme, local infrared therapy was used: local exposure to infrared radiation using a special device "INFRARED RADIATOR S.A. MED HOLDING OOO" manufactured in the Republic of Uzbekistan, with a wavelength of approximately 800 nm to 2500 nm and a main range in the region of 900-1000 nm, was used to improve the healing of fractures of the mandible. The radiation power varied from 20 to 200 MW/cm2, depending on the device model, and the duration of the procedure ranged from 10 to 20 minutes, depending on the patient's reaction. The procedure was performed once a day, depending on the needs and individual characteristics of the patient, and the total number of procedures depended on the severity of the fracture and the rate of tissue healing.

The clinical effectiveness of local therapy of fractures of the mandible with infrared radiation was evaluated according to various criteria, including the timing of the formation of a callus (based on the indicators of radiation research methods), the degree of pain reduction, improvement of general condition, improvement of microcirculation, reduction of edema, acceleration of tissue regeneration, reduction of the risk of complications, as well as laboratory data. However, the effectiveness of therapy depends on various factors, including the type and characteristics of the fracture, the duration and treatment regimen, as well as the individual characteristics of the patient.

During the study of local immunity factors and enzymatic activity in the oral fluid, the following laboratory parameters were evaluated: the level of cytokines, including IL-1α, IL-8, IL-1β and TNF-α (in mg/ml); IgA concentration (in mg/ml); phagocytic activity of neutrophils and others. To determine the cytokine level, oral fluid was taken before and after the orthopedic component of the complex treatment. The levels of interleukin-1α, interleukin-1β, interleukin-8 and tumor necrosis factor-α were measured by solid-phase enzyme immunoassay using double antibodies and horseradish peroxidase. To compare the results, recombinant IL-1α, IL-1β, IL-8 and TNF-α from a set of reagents from Bender medsystems, manufactured by Biochemack (Russia), were used. The results were recorded using a Multiscan*mcc-340 photometer at a wavelength of 450 nm. The concentration of IL (in mg/ml) in the samples was calculated based on the calibration curve after measuring the optical density of the solution in the wells. The content of interleukin-6 was determined using the Interleukin-6-IFA-Best reagent kit (Vector-Best CJSC, Russia), and interleukin-8 was determined using the Interleukin-8-IFA-Best kit (Vector-Best CJSC, Russia).

To identify the features of the immunological status and objectification of the clinical picture, as well as to control the results of treatment, an immunological and biochemical study of the oral fluid and venous blood of patients was carried out, which consisted in assessing the cytokine profile, antibody levels, as well as determining the activity of enzymes. Also, as part of the biochemical study, the activity of enzymes was determined, which reflect the functional state of organs and tissues, including bone tissue. For example, the level of alkaline phosphatase may reflect the activity of the processes of formation of new bone tissue.

The activity of phospholipase A2 in oral fluid was determined using a modified Zubachik V.M. (2000) method and expressed in mmol/min/ml.

Cortical screws (mainly titanium screws) were used in the main group of patients to immobilize bone fragments in PNH. The procedure for using cortical screws was carried out in the operating room in sterile conditions with strict observance of the rules of asepsis and antiseptics. After the patient rinsed the oral cavity with an antiseptic solution (0.05% chlorhexidine solution), local conduction anesthesia of the upper and lower jaws was performed [16.18.20.22.24.26.27].

When complete anesthesia was achieved, holes with a diameter of 0.2 cm were made in the area of the alveolar processes of the jaws using a physiodispenser with a tip and a boron at low speeds with water cooling. A screw with a length of at least 1.3 cm and a diameter of 2.4 mm was taken. Using a screwdriver, the screws were screwed into the intended point in each segment of the jaw, into the interdental spaces, between the roots of the central and lateral incisors, the first and second premolars, the first and second molars, while excluding contact of the screw with the roots of the teeth. To prevent injury to the mucous membrane of the upper and lower lips, the screws were screwed in such a way that in the oral cavity the screw protruded above the mucous membrane by no more than 5 mm. Next, bone fragments were repositioned and jaws were compared in occlusion, wire or rubber rings were applied to screws to create an interjaw traction.

Rehabilitation included medication, a liquid diet, physical therapy and regular consultations with specialists.

The data obtained were processed using the generally accepted method of variation statistics. For this purpose, a software package specialized for biomedical research was applied. The data were entered into specially created tables in the Microsoft Office Excel 2010 program for the Windows XP operating system, as well as in the statistical software package Stat Soft Statistica v6.0. Data analysis was carried out using descriptive statistics. Statistical processing of the obtained data included the use of nonparametric methods, such as the Mann-Whitney criterion, and correlation analysis based on the Pearson criterion. The results were presented as a median, and the significance of the differences between the averages was assessed using the Student's criterion. The principles of evidence-based medicine were taken into account when conducting and organizing the study.

Research results and their discussionIn this study, the dynamics of the clinical course of the treatment process for fractures of the mandible (mandible) was analyzed. A comprehensive assessment of the course of the treatment process in PNH was performed based on several parameters: the dynamics of clinical symptoms (assessment of changing clinical signs such as edema, pain, functional disorders and deformity); radiological data used to assess the degree of bone fragment reposition, callus formation (bone scar tissue) and fracture consolidation; laboratory indicators: (study of biochemical and immunological parameters); assessment of functionality, that is, restoration of the functions of the mandible.

The results of the study in different groups of patients are presented as follows:

After 2-3 sessions of infrared radiation therapy, patients in the main group showed a decrease in swelling, infiltration and hyperemia of regional soft tissues by improving microcirculation and lymphatic drainage, as well as a significant decrease in the intensity of pain during palpation. Due to stimulation of cellular metabolism and collagen synthesis, improvement of blood supply and delivery of nutrients to damaged tissues, a reduction in the time of consolidation of bone fragments has been achieved. Due to the above-mentioned positive properties of infrared rays, a more or less complete regression of local signs of mandibular injury (except for determining the presence of a fracture line during X-ray examination) was determined at 4-5 sessions of physiotherapy, complementing complex treatment, and on 5-6 days after the start of therapy, signs of formation of connective tissue, that is,

fibrous corns in the area of injury were noted during radiation examination the integrity of the mandibular bone (which is about a day ahead of the time of formation of such in patients of the control group). Repeated sessions of physiotherapy led to a further reduction in the time of formation of osteoid calluses in the area of localization of the fracture line. Increased collagen synthesis and activation of cellular metabolism contributed to faster regeneration of damaged tissues and formation of bone structure.

Higher effectiveness of treatment was observed in the 3rd group of patients who, along with traditional therapy, received applications of Traumel-C ointment and infrared radiation (AI) procedures as part of complex treatment after fixation of bone fragments by means of cortical screws. On 3-4 days, this combination of therapy contributed to the activation of regeneration processes, due to stimulation of tissue regeneration with Traumel-C ointment, improving blood supply and delivery of nutrients to the body, as well as ensuring stable fixation of bone fragments with cortical screws (Fig. 1, 2).

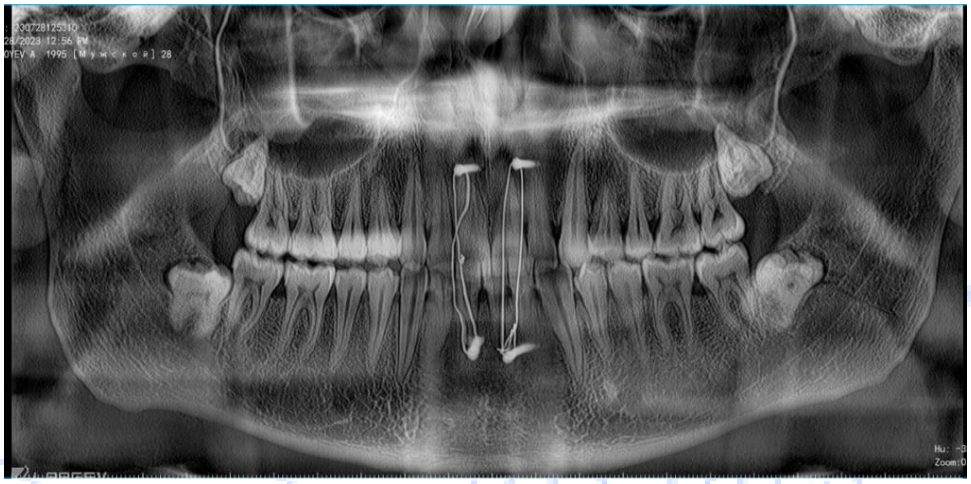


Fig. 1. Orthopantomogram of a patient with a fracture of the lower jaw in the area of the left angle without displacement with fixation of bone fragments using cortical screws.

Fig. 2. The appearance of the same patient with interdigital fixation with cortical screws.

Patients also noted a decrease in the intensity of pain and discomfort, which was associated with a decrease in edema, better fracture healing and restoration of normal tissue structure. Thus, the recommended treatment package for 3-4 days of BEAM therapy demonstrates multiple beneficial effects, contributing to effective recovery and improvement of the patient's quality of life.

The above processes in patients belonging to the first and second groups were determined later, namely on the 7-8 day of therapy. An assessment of the average length of stay of patients with PNH in the CHLH department was also carried out: patients who had "Traumel-C" ointment and infrared radiation sessions included in the treatment regimen remained in the hospital for 4-5 days, which is 2-3 days less than in the group of patients receiving traditional treatment (Table 1).

Table 1. The timing of the reverse development of clinical signs and regeneration in the study groups (day).

Research Group	Reduction of edema and hyperemia of soft tissues	Reduction of pain	Formation of a callus	Restoration of the functions of the lower jaw
Traditional therapy	5-6	7-8	21-24	28-30
Traditional therapy + Traumel-S ointment	4-5	5-6	19-20	26-27
Traditional therapy + Traumel-C ointment + Infrared radiation + the use of cortical screws	3-4	3-4	17-18	24-25

An important aspect was the correct selection of the dosage of infrared radiation. During the study, it was determined that the use of infrared radiation for 10 minutes can reduce the intensity of pain. However, in order to prevent possible negative effects associated with overdose, it is necessary to reduce the duration of exposure to 5 minutes after that. This approach allows you to achieve the desired therapeutic effects, minimizing the risks of possible re-emission.

In the course of a study aimed at analyzing the dynamics of cytokines in oral fluid in patients with HPV who received traditional therapy in conjunction with infrared radiation, the following results were obtained. After three days of treatment using infrared radiation, an average decrease in interleukin-1a content was observed by 24.8%, which was 18.2±1.3 pkg/ml compared with the baseline level of 24.2±1.75 pkg/ml. A similar dynamics was observed in the concentration of other interleukins: the content of interleukin-1β decreased to 15.9±2.31 pg/ml, which is 49.7% less than the initial value of this indicator; and the content of interleukin-6 decreased to 4.88±0.32 pg/ml, which is 1.69 times lower than the initial level when patients were admitted to the department and so on (see table 2).

Table 2. Comparative analysis of changes in cytokine content in oral fluid in patients with mandibular fractures during therapy (M±m), pg/ml

№	Indicators	Normal value	Values in patients			
			Upon admission to the department	After TT	After TT + Tramel With	After TT + Tramel With + + And + Cortical screws
1.	ИЛ-1α	4,25±0,37	24,2±1,75	18,2±1,3*	11,2±0,87*	6,31±0,24*
2.	ИЛ-1β	1,74±0,12	31,6±2,78	15,9±2,31*	6,35±0,37*	2,97±0,12*
3.	ИЛ-6	2,14±0,22	8,14±2,54	4,88±0,32*	4,12±0,14*	3,57±0,28*
4.	ИЛ-8	25,7±1,36	105,4±8,85	68,1±3,24*	50,4±2,37*	30,1±0,37*
5.	ФНО-α	5,64±0,78	110,2±6,47	64,5±0,31*	27,6±2,54*	12,5±0,2*

*Note: * – the significance of the differences is p<0.05 compared to the control group.*

The study revealed a different rate of decrease in cytokine content in oral fluid in patients with PNH who received traditional therapy and the drug Traumel-C. It was found that the level of interleukin-1a on the third day of treatment decreased by an average of 2.16 times and amounted to 11.2±0.87 pkg/ml, while before the start of treatment this indicator was 24.2±1.75 pkg/ml. A similar dynamics was observed for other interleukins, for example, the level of interleukin-1ß decreased to 6.37±0.35 pg/ml, which is a 4.96-fold decrease compared to the baseline value. Similar changes were noted for the level of interleukin-6, which decreased to 4.22±0.15 pg/ml, which is 1.97 times less than the value recorded at admission to the department.

In the third group of patients, who received additional infrared radiation treatments and Traumel-C ointment with immobilization of bone fragments by means of cortical screws, a more noticeable positive trend was observed. On the third day of treatment, the level of interleukin-1α in the oral fluid was 6.31±0.24 pg/ml, which is 3.84 times lower than the initial value. Similar changes were noted for interleukin-1ß, the content of which decreased by 10.6 times and amounted to 2.97±0.12 pcg/ml (Fig.3).

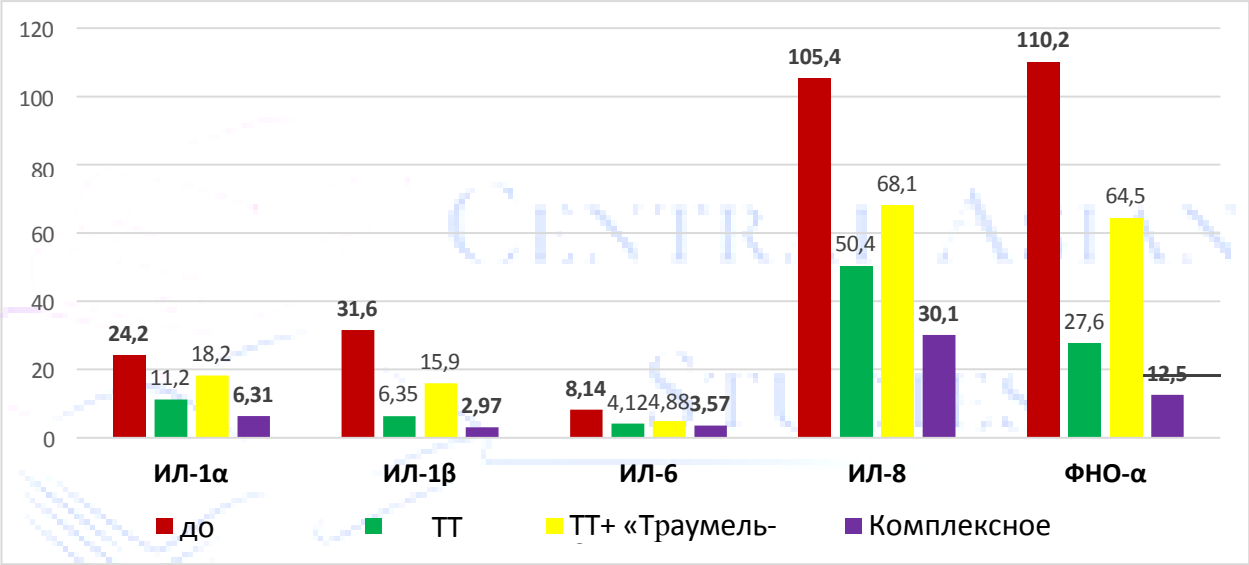


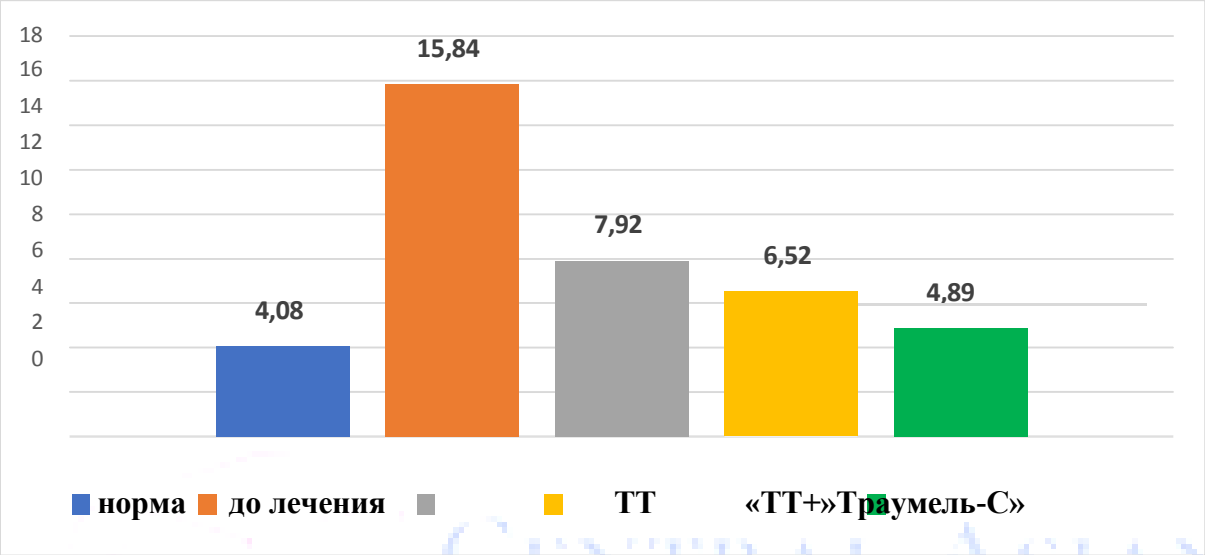
Fig. 3. Changes in the cytokine profile (pg/ml) of oral fluid in patients with mandibular fractures during therapy

A significant decrease in the content of interleukin-8 was noted in all the studied groups. However, the most pronounced decrease was observed in patients receiving complex treatment, including traditional therapy with Traumel-C ointment and local exposure to AI using cortical screws. The content of interleukin-8 in these patients decreased by 71.4% and amounted to 30.1±0.37 pg/ml. In patients receiving only traditional therapy with Traumel-C ointment, a decrease in this indicator was observed by 52.2%, and the average value was 50.4±2.37 pcg/ml. In the second group of subjects, the level of interleukin-8 was 68.1±3.24 pg/ml, which is 35.4% lower than the value recorded during hospitalization. A decrease in the content of interleukin-8 in the oral fluid on the third day of treatment in patients with PNH indicates a local decrease in the number of neutrophils in the area of post-traumatic inflammatory process (see Fig. 3).

Tumor necrosis factor-α (TNF-α), which is synthesized by monocytes and macrophages, is the primary mediator of inflammation. It initiates apoptosis (programmed cell death) and stimulates the production of interleukin-1 (IL-1), IL-6, IL-8 and interferon-gamma. TNF-α levels had similar dynamics to interleukins. The most noticeable decrease in TNF-α was observed in the third group of patients and amounted to 12.5±0.2 pg/ml, which is 8.8 times less than the initial values. In the first and second

groups of the studied patients, TNF-α levels decreased by 4 and 1.72 times, respectively, which was less pronounced compared to the group of patients receiving complex treatment.

A decrease in the intensity of the destruction process in the oral mucosa, as well as a decrease in the number of cells with destructive changes in the oral fluid, contributed to a decrease in the activity of the enzyme phospholipase A2, which is involved in lipolysis.



For example, in the first group of patients who received only traditional therapy, there was a 2-fold decrease in phospholipase-A2 activity, which was 7.92±0.82 mmol/min/ml. In the second group, there was a more pronounced decrease in enzyme activity - by 2.4 times (6.52±0.48 mmol/min/ml). The most positive shift in the indicator of enzyme activity was observed in the group of patients receiving complex treatment (traditional therapy, Traumel-C ointment, infrared radiation and fixation of fragments with cortical screws) - the value decreased by 3.2 times to 4.89±0.27 mmol/min/ml (at a norm of 4.08±0.15 mmol/min/ml) with a significance level of $p<0.05$ (see Fig. 4).

A microbiological study was conducted, including patients belonging to groups I, II and III. It included the isolation and identification of microorganisms using aerobic and anaerobic cultivation. The material collection process was carried out 1, 7, 14 and 30 days after treatment. The material was collected on an empty stomach, at the same time in the morning, before the index assessment. The material for bacteriological examination was collected from various parts of the oral cavity. A total of 157 studies were conducted. The collected material was delivered to the laboratory of the Department of Microbiology of the BGMI within 24-48 hours after sampling. For subsequent cultivation, a set of nutrient media was used, including 5% blood gemin agar, a semi-liquid medium AC (France) and a differential diagnostic medium for the determination of Enterococcus spp. The identification of isolated pure cultures was carried out by analyzing their biochemical properties using the API-20A test system (France). Anaerobic cultures were cultivated in an anaerostat with an oxygen-free gas mixture consisting of 80% N2, 10% H2 and 10% CO2.

Analyzing the dynamics of microbial colonization in the area of tire contact and oral mucosa in patients of the first comparison group, we found a decrease in quantitative indicators for certain representatives of the stabilizing microflora.

Table 3. Dynamics of microflora in patients of group I.

Type of bacteria	At the beginning of the study	14 days	30 days
Str. sanguis	4.2±0.21	5.6±0.20	5.1±0.21
Str. intermedius	4.2±0.21	3.8±0.20	3.7±0.20
Str. sahvanus	5.2±0.20	4.8±0.20	4.1±0.20
P. anaerobius	5.4±0.20	5.8±0.20	4.8±0.21
Enterococcus spp	3.9±0.20	4.1±0.21	3.8±0.19
Corynebactenum spp	3.2±0.20	4.2±0.19	3.4±0.20
Enterobactenum spp	4.2±0.20	3.8±0.21	3.6±0.20
Prevotella intermedia	3.7±0.20	3.3±0.21	2.7±0.21

Note: The values in the table are given in the format "average value ± standard deviation"

At the beginning of the study, the amount of Streptococcus sanguis in the oral cavity was 4.2±0.21. 14 days after the installation of the orthopedic structure, an increase in this type of bacteria was observed to 5.6± 0.20, and after 30 days a slight decrease was observed to 5.1±0.21. The amount of Streptococcus sahvanus after a month of traditional treatment was 5.1±0.21. On the 14th and 30th days, the quantitative indicator decreased to 4.8 ± 0.20 and 4.1±0.20, respectively. In anaerobic streptococcus Peptostreptococcus anaerobius, the number increased by the 2nd observation period from 5.4±0.20 to 5.8±0.20, and on the 30th day it decreased to 4.8±0.20. The number of corynebacteria was relatively stable and by the 30th day was 3.4±0.20. The number of Enterococcus spp. it did not change significantly during the entire observation period and did not exceed 4.1 ± 0.21.

The dynamics of aggressive microflora in the oral cavity has shown a tendency to decrease the number of species. The amount of Streptococcus intermedius at the beginning of the study was 4.2±0.21, and by the end of the observation period it decreased to 3.7±0.20. The amount of Prevotella intermedia, characteristic of pyopathogenic microflora, significantly decreased by the end of observations from 3.7±0.20 to 2.7±0.21. The detected enterobacteria had a clinically insignificant level, which also decreased after 30 days when using appropriate treatment.

Analyzing the data in Table 4, it can be noted that in patients of the second group, the number of Streptococcus sanguis bacteria increased throughout the entire follow-up period. On the first day after fixation of the orthopedic structure, the number of these bacteria was 5.8 ± 0.20. On the 7th day, it increased to 6.8 ± 0.20, and by the end of the month it reached 7.2 ± 0.20. The amount of Streptococcus salivanus after a day of orthopedic treatment was 5.4 ± 0.20. On the 7th and 14th days, the quantitative index of this species increased and on the 30th day reached 6.2 ± 0.21. For anaerobic streptococcus Peptostreptococcus anaerobius, the amount on the first day was 4.4 ± 0.20, on the 7th day - 5.4 ± 0.21, and this trend continued until the 14th day of observation, where the quantitative indicator increased to 6.1 ±0.20. The constant increase in the number of detected corynebacteria is a positive aspect in the microbiological picture in these patients. Enterococci were detected only at the initial follow-up period with an insignificant quantitative indicator (3.8±0.20).

Table 4. Dynamics of microflora in patients of group II.

Type of bacteria	At the beginning of the study	14 days	30 days
Str. sanguis	5.8±0.20	6.8±0.20	7.2±0.20
Str. intermedius	3.8±0.21	2.5±0.19	6.2±0.21
Str. sahvanus	5.4±0.20	6.1±0.21	6.1±0.20
P. anaerobius	4.4±0.20	5.4±0.21	6.1±0.21
Enterococcus spp	3.8±0.20	-	-
Corynebactenum spp	4.2±0.20	5.6±0.20	-

Enterobactenum spp	3.6±0.21	2.2±0.20	-
Prevotella intermedia	3.1±0.20	-	-

Note: The values in the table are given in the format "average value ± standard deviation".

The following trend is observed for aggressive microflora:

The amount of Streptococcus intermedius decreased to 2.5±0.19 in the second period of follow-up and completely disappeared in the last terms. The pathogenic Prevotella intermedia species was detected only in the initial follow-up period with a quantitative index of 3.1±0.20. The number of detected enterobacteria was at a clinically insignificant level (3.6±0.21). On the 14th day of observation, the relative content of enterobacteria decreased to 2.2 ± 0.20. When using standard treatment with the use of Traumel-C ointment, enterobacteria were not detected after 30 days.

When analyzing the number of bacterial species in group III patients, the following microbiological pattern was observed (Table 5):

The number of Streptococcus sanguis in the first observation was 5.7±0.21, and by the 30th day of observation it increased to 7.1±0.21. The number of Streptococcus sahvarius also increased, reaching a peak on the 14th day (5.8±0.21), and then decreased slightly by the last observation period (5.1±0.20). The relative content of anaerobic peptostreptococci increased throughout the observation period. The dynamics of the number of stabilizing bacteria, such as Corynebactenum spp., was also positive in patients of this group. The number of detected enterococci decreased significantly by the 2nd period of observation, and at the 3rd period of the study these bacteria were not detected.

Table 5. Dynamics of microflora in patients of group III.

Type of bacteria	At the beginning of the study	14 days	30 days
Str. sanguis	5.8±0.20	6.8±0.20	7.2±0.20
Str. intermedius	3.8±0.21	2.5±0.19	6.2±0.21
Str. sahvanus	5.4±0.20	6.1±0.21	6.1±0.20
P. anaerobius	4.4±0.20	5.4±0.21	6.1±0.21
Enterococcus spp	3.8±0.20	-	-
Corynebactenum spp	4.2±0.20	5.6±0.20	-
Enterobactenum spp	3.6±0.21	2.2±0.20	-
Prevotella intermedia	3.1±0.20	-	-

Note: The values in the table are given in the format "average value ± standard deviation".

The quantitative indicator for Streptococcus intermedius on the first day was 3.8±0.20. The indicator increased slightly by the 14th day and disappeared in the last terms of the study. The pathogenic Prevotella intermedia species was detected only in the initial follow-up period with a very low quantitative indicator - 2.8±0.20. The relative content of enterobacteria in the studied material in the first period after the start of treatment using Traumel-C ointment, with infrared radiation procedures and cortical screws in combination with traditional therapy was 3.2 ± 0.20. On the 14th day of observation, the indicator decreased to 2.3 ± 0.20. After 30 days, these bacteria were not detected.

The results of our research show the effectiveness of the treatment methods used in the observation groups. In addition, we note a low detection rate of pathogenic bacteria such as Prevotella intermedia, Enterobactenum spp. and Streptococcus intermedius in patients. These microorganisms completely disappeared in patients when using Traumel-C ointment, with infrared radiation procedures and cortical screws in combination with traditional therapy. This confirms the effectiveness of the chosen treatment method in the fight against these bacteria and underlines its importance in ensuring optimal oral hygiene.

Based on the data obtained related to the state of microflora, local protective factors and the ability of microbes to colonize in the oral cavity in patients with HPV, the following conclusions can be drawn. Dysbiosis is observed in the oral cavity of these patients, and the use of traditional therapy is not able to completely eliminate dysbiosis even after 30 days. However, small positive changes in terms of eliminating dysbiosis were observed in patients of the second group, in whom "Traumel-C" ointment was used in the treatment procedure with traditional therapy. In patients of the third group who received complex treatment, the state of dysbiosis was almost completely restored to control values after 14 days. These results indicate the effectiveness of a comprehensive therapeutic approach in restoring the balance of microflora in the oral cavity in patients with fractures of the mandible.

Conclusions

Comprehensive treatment of fractures of the mandible, including infrared radiation, Traumel-C ointment and an orthopedic component with cortical screws, shows high efficiency.

- This approach to the treatment of HPV reduces the duration of treatment, accelerates recovery and prevents possible complications.
- Infrared radiation improves microcirculation, prevents inflammation, promotes tissue regeneration and reduces pain in fractures of the mandible.
- Traumel-C ointment has anti-inflammatory and decongestant properties, activates reparative processes and promotes wound healing.
- The application of this comprehensive approach to the treatment of mandibular fractures leads not only to an improvement in clinical indicators, but also in the immunological status of patients. Reducing the inflammatory process and cell apoptosis contributes to a more favorable course of fracture healing and reduces the risk of complications.

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