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Immunocorrection of Post-Traumatic Inflammatory Complications in Patients with Fractures of the Lower Jaw

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Abstract

At present, there is no consensus on the mechanism of post-traumatic osteomyelitis. In the 60s of the twentieth century A. Nerobeev through experiments, he proved that to a large extent the occurrence of post-traumatic osteomyelitis is facilitated by the sensitization of the body. Moreover, various microorganisms located in odontogenic foci play an important role in the development of this post-traumatic complication. With the development of the pathogenesis of post-traumatic osteomyelitis of the lower jaw (PTOLJ), microorganisms located in the oral cavity enter the fracture fracture through the torn mucous membrane of the alveolar process. Subsequently, they are fixed in a hematoma in the area of primary bone necrosis and in soft tissues. With the destruction of the hematoma, an infection of this focus occurs. Since destruction processes are more pronounced in soft tissues, the greatest activity of the pathological course of the process is observed at the lower edge of the lower jaw, since it is there that the main muscle mass is localized. From odontogenic foci, microorganisms begin their penetration into the damaged area of the bone, and in the future there is an expansion of the necrosis zone. In the study of microorganisms found in the pathological focus in patients (PTOLJ), staphylococci, streptococci, protea and E. coli, which could be in association, were most often found. Less commonly, microflora was composed of bacteroids, fusobacteria, veilonella, pepto streptococcus and other anaerobes. Among the complications of

Keywords: Post-traumatic osteomyelitis of the lower jaw (PTOLJ), odontogenic hearth pathogenic microflora, Staphylococcus aureus (S. Aureus), immunostimulants, nonspecific resistance of the organism (NSRO), bacterial lysates, phagocytosis, immunocompetent cells, reparative osteogenesis.

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fractures of the lower jaw, post-traumatic osteomyelitis occurs from 9 to 30%. Naturally, the quality of life in such patients is reduced.	

INTRODUCTION

Preparations containing bacterial lysates attract the interest of many specialists in various fields of medicine. A long study of the properties and mechanism of action confirms their immunotropic effect and indicates the absence of the formation of persistent protective immunity, which allows them to be attributed to immunostimulating drugs.

Lysates are fragments of destroyed bacterial cells that have lost their viability (and therefore cannot cause infectious diseases), but retained the ability to activate immunity.

Lysates stimulate both innate immunity (through an increase in the activity of dendritic cells, macrophages, natural killers, the synthesis of interferons, etc.) and acquired immunity (by increasing the activation of antibody production, increasing the activity of lymphocytes).

In the 1970s, the first works were published proving the effectiveness of the use of bacterial lysates to reduce the frequency and severity of respiratory infections. In the same years, lysates of nonspecific action were developed, however, the first representatives of this group (pyrogenal and prodigiosan) had pronounced side effects. Second-generation drugs have been more successful in terms of efficacy and safety. Among them are Broncho-Munal, Ismigen, Imudon.

The use of the drug Imudon causes a number of cascading immune actions in the body.

In Peyer's intestinal plaques, dendritic cells are activated, which begin to capture and destroy any pathogens. In this case, dendritic cells represent antigens of pathogenic microorganisms to lymphocytes. The production of interferons (IFN) α and β with virostatic activity occurs. The synthesis of antibodies involved in antibacterial protection is increasing.

Especially often, fractures of the lower jaw lead to (PTOLJ) in patients with improper reposition of fragments of the jaw, in the presence of bruxism, as well as in patients with various concomitant diseases - diabetes, tuberculosis, alcoholism, etc. All these diseases are accompanied by immunodeficiency, and this is very likely to become a trigger in development (PTOLJ).

Various studies have found that immunostimulants increase the nonspecific resistance of the body (NSRO) as well as humoral and cellular immune responses.

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The innate immunity system recruits the cells of the immune system to the pathogen pathway by producing specific chemical mediators, such as cytokines. In this case, the activation of the components of the complement system occurs, which contributes to the detection and removal of foreign bodies by leukocytes. In the future, the acquired immunity system is activated during the presentation of the antigen.

Thus, innate immunity directly exerts its effect on acquired immunity and on the body's resistance to various pathogenic microorganisms.

The resistance of the body is not a constant, but depends on various conditions. For example, the body's resistance is greatly weakened by severe hypothermia, malnutrition, physical overwork, and the presence of concomitant diseases.

Thus, in the treatment of patients with (PTOLJ), increasing their immune status is given great importance.

The purpose of the study. Study of the effect of local immunocorrective therapy on pathogenic microflora in patients with post-traumatic osteomyelitis (PTOLJ).

MATERIALS AND RESEARCH METHODS

One of the main problems facing specialists in surgical dentistry in the field of treatment of fractures of the lower jaw (FLJ) is a comparative assessment of the microbial landscape of acute and chronic osteomyelitis in the formation of (PTOLJ).

In this regard, pathogenesis, diagnosis, treatment tactics and rehabilitation of patients with various types of osteomyelitis are inextricably linked to the etiology of the disease.

At the same time, the microbiological aspects of osteomyelitis, such as the occurrence of various etiological agents, the exchange of pathogenic microorganisms in the dynamics of transition, the state of microorganisms in the transition from acute to chronic pathological processes, etc. require close attention in the study of pathogenesis (PTOLJ).

Studies conducted by Ergashev V.A. with 380 adults and 68 children diagnosed with acute and chronic osteomyelitis showed the following.

Adult patients 375 (98.7 ± 0.6%) received conservative treatment, and 179 of them (47.2 ± 2.6%) received both conservative and surgical treatment. A group of children (100.0%, n = 68) received conservative treatment after hospitalization, and 23 of them (33.8 ± 5.7%) underwent surgical treatment in addition to conservative treatment.

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In this case, radiological signs were revealed that are characteristic of the pathogenesis of the formation and development of the disease in acute and chronic osteomyelitis. Age-related differences of these signs in patients have not been determined in practice.

All indicators were specific for the pathogenesis of the disease, along with the identification of classical radiological signs in the studied patients. Radiological signs did not differ depending on the age of the patients, and specific changes in the manifestations of the disease practically did not differ from the data presented in interpreted scientific sources.

In the acute form of the disease, the spectrum of pathogenic microorganisms (strains of 4 species) was significantly lower than in the chronic form (strains of 10 species), all positive bacteriological results isolated pathogens in the form of monoculture. The monoculture leader was *S. aureus*, followed by *P. aeruginosa*.[11]

In various experimental studies, a causal relationship between the microbiological aspects of the formation of acute and chronic post-traumatic lower jaw osteomyelitis was determined. The leading causative agents of osteomyelitis were identified, and despite the presence of age-related differences, the microbial landscape was essentially an association of gram-positive cocci (*S. aureus* and *S. epidermidis*) in leading positions, which coincides with the literature on osteomyelitis and is consistent with the general the trend in the occurrence of pathogens of osteomyelitis.

It was noted that the part of patients of different age groups taking immunocorrective drugs had a small number of various complications, including the transition of the phase of acute osteomyelitis to a chronic form.

Immunostimulants contribute to the neutrophilic and lymphocytic response of the body to antigens contained in the preparations. In acute inflammations and infections, a neutrophilic response always precedes a more specific lymphocytic one. In chronic inflammation and infections, the role of neutrophils is insignificant and the lymphocytic response predominates (infiltration of the focus of inflammation by lymphocytes).

An increase in the number of neutrophils in the blood, the very first response to bacterial and many other infections, including those observed with (PTOLJ). For example, an analysis of the phagocytic activity of neutrophils showed that during an exacerbation, the level of phagocytosis decreased significantly, both in the group of rarely ill children and in the group of frequently ill children (54.5 ± 1.2% versus 50.7 ± 1.1 %, $p < 0.05$ and 48.3 ± 1.2 against 43.6 ± 0.9%, $p < 0.05$). An increase in speed was observed in the content of b-cells ($P < 0.05$).[12]

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Neutrophils die after a phagocytosis process, and a large number of biologically active substances are released that damage pathogenic microorganisms. This leads to chemotaxis of immune cells into the focus of inflammation, which indicates that immunostimulating drugs increase the body's defenses.

Based on the data of various experimental studies in the field of the study of acute and chronic osteomyelitis, we conducted a study using the immunocorrecting drug Imudon. The study was conducted on the basis of the Department of Maxillofacial Surgery of the Bukhara Regional Multidisciplinary Medical Center.

Inpatient treatment was 93 patients with VLF (from 17 to 62 years old), 57 patients with a diagnosis of unilateral fracture, 36 patients with bilateral fracture (FLJ). The age of the subjects ranged from 17 to 62 years. Most of them were represented by men - 61 people (65%), women - 32 (35.0%). Patients were divided into 2 groups: group 1 - 42 people who underwent traditional therapy, group 2 –51 patients who were additionally given the immunocorrecting drug Imudon.

Non-specific resistance indices (complement components C3 and ceruloplasmin) were evaluated by the immunochemical method, the level of circulating immune complexes (CIC), average molecular peptides (AMP) in the blood, complement C3 , phagocytic neutrophil activity, and ceruloplasmin concentration.

The Results of The Study

Complex treatment with the use of the local immunocorrecting drug Imudon allowed to reduce the concentration of average molecular peptides AMP (from 0.58 ± 0.06 conventional units to 0.28 ± 0.02 conventional units, $p < 0.05$), the level of circulating immune complexes CIC (with 78.1 ± 5.12 conventional units to 34.8 ± 3.12 conventional units, $p < 0.05$), ceruloplasmin concentration (from 39.6 ± 0.52 mg / dl to 25.2 ± 0.22 mg / dl). The level of complement C3 after treatment significantly increased compared to the initial one (from 68.8 ± 2.15 mg / dl - 101.6 ± 5.62 mg / dl, $p < 0.05$).

For 5 years, 93 patients with (FLJ) aged 17 to 62 years old, 67 men and 26 women, were hospitalized. Persons of a young age prevailed, only 8 men were over the age of 50. 57 patients had unilateral (FLJ), 36 had bilateral.

The control group consisted of 31 practically healthy people.

Among the observed patients, 68.3% of patients were admitted to the hospital on the first day of the disease, up to three days - 24.5%, the rest - later than 3 days. Due to the late immobilization of fragments of the lower jaw, a purulent-inflammatory process developed in the fracture gap. The

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source of purulent infection was a tooth with necrotic pulp or a pathological process in the periapical tissues. In cases of rapid elimination of the focus of infection, adequate antimicrobial therapy and reliable fixation of fragments, the inflammatory process was stopped. With a delay in tooth extraction and the absence of reliable immobilization of bone fragments, the transition of acute traumatic osteomyelitis into a purulent-destructive process was noted.

Traditionally, orthopedic immobilization was carried out using various modifications, individually curved wire or standard tape tires with hook loops. Drug therapy included antibacterial (ceftriaxone, sulfa drugs), desensitizing, painkillers.

All patients were divided into 2 groups: group 1 - 42 patients who underwent traditional therapy, group 2 –51 patients who were additionally given the immunocorrecting drug Imudon (before surgery).

Non-specific resistance indices (complement components C3 and ceruloplasmin) were evaluated by the immunochemical method, the level of circulating immune complexes (CIC), and average molecular peptides (AMP) in the blood according to the method of A. Gabrielyan (1981), phagocytic activity of neutrophils (FAN).

The results are presented in table 1.

Table 1: Dynamics of non-specific resistance indices in patients with (FLJ).

Index	Control	1 group		2 group	
		Initially	14 days	Initially	14 days
AMP(con. unit)	0.28 ± 0.06	0.58 ± 0.06 *	0.58 ± 0.06 *	0.58 ± 0.06 *	0.28 ± 0.02 **
CIC (con. unit)	39.2 ± 2.4	78.1 ± 5.11 *	8.1 ± 5.12 *	78.1 ± 5.12 *	34.8 ± 3.12 **
Complement C3 (mg/dl)	124.7 ± 8.9	68.9 ± 2.13 *	8.8 ± 2.15 *	68.8 ± 2.15 *	101.9 ± 5.64 *
Ceruloplasmin (mg/dl)	24.6 ± 0.41	39.6 ± 0.51 *	39.6 ± 0.52 *	39.6 ± 0.52 *	25.2 ± 0.22
FAN (%)	27.7 ± 0.61	38.4 ± 1.38 *	38.6 ± 1.37 *	38.6 ± 1.37 *	28.8 ± 0.5

* - significance of differences compared with control, $p < 0.05$

** - significance of differences compared with the initial value in the same group, $p < 0.05$

Initially, all the studied parameters in both groups significantly differed from the control. High values of the level of (AMP) in patients with (FLJ) indicated an unfavorable clinical course of the inflammatory process, since they have toxicity and thereby reduce local resistance. The phagocytic activity of neutrophils (FAN) in the observed patients was statistically significantly (1.4 times)

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higher than in healthy individuals and practically did not change in dynamics in the 1st group. The level of (CIC) was initially more than 2 times higher; under their influence, lysosomal enzymes are released from neutrophils, this leads to the activation of mediator carrier cells, which in turn induces an acute inflammatory process.

There was a decrease in the level of complement C3 in patients with (FLJ) by almost 2 times compared with the control, which, apparently, was due to "increased consumption" of the (CIC) against a purulent-inflammatory process. Low values of complement C3, which is responsible for immune adhesion of the (CIC) and chemotaxis, contribute to exocytosis of neutrophil granules and secretion of lysosomal hydrolases. Alteration of tissues with cell breakdown during inflammation leads to an increase in ceruloplasmin, which enhances the activation of the lysosomal neutrophil complex.

After a course of therapy for 14 days, the level of all the studied parameters in the 1st group did not change compared to the initial one and significantly exceeded the similar indicators in the control group.

In group 2, complex treatment with the use of the immunocorrecting drug Imudon significantly and significantly reduced the concentration of AMP (2 times), the level of the CIC - 2.3 times.

After the therapy, these indicators approached the values in the control group. The level of complement C3 increased after treatment, however, it remained below the control values (101.6 + 5.62 mg / dl, in the control 124.7 ± 8.9 mg / dl, $p < 0.05$).

The concentration of ceruloplasmin after treatment decreased by 64%. Both indicators - ceruloplasmin and FAN - after treatment in the 2nd group did not differ from the control.

We associated all the results with the immunostimulating effect of the drug Imudon, which contains a mixture of bacterial lysates. The multivalent antigenic complex of the drug Imudon corresponds to pathogens that most often cause inflammatory processes in the oral cavity.

Bacterial lysates have a number of specific properties at all stages of the immune response, due to which the effectiveness of their use is much higher. The mechanism of action consists in stimulating the processes of phagocytosis and antigen presentation, enhancing the production of anti-inflammatory cytokines (interleukin-4, interleukin-10, TGF), and the development of an adjuvant effect. Moreover, this mechanism is the most physiological, since bacterial lysates stimulate the body's own reactions to antigen exposure and do not cause unnecessary additional effects. Along with the production of specific antibodies to the pathogens included in the preparations, they also stimulate nonspecific immunity - the production of secretory IgA,

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interleukin-1 and α- interferon, cytokines, NK cells, macrophage-phagocytic system cells, etc. increase.[13,14]

The main property of any adjuvants is their ability to adsorb antigens on their surface and to store them in the body for a long time. This helps to increase the duration of the effect of antigens / bacterial lysates on the body's immune system. The most powerful adjuvants contain microorganisms of attenuated strains, or substances extracted from them, this also applies to bacterial lysates. Thus, these components are stimulators of innate immunity cells, such as macrophages and other antigen-presenting cells.

CONCLUSIONS

Taking the drug Imudon activates antibacterial immunity, helps to reduce the risk of bacterial complications, thereby reducing the need for antibiotics.

Imudon activates phagocytosis, increases the number of immunocompetent cells, increases the production of lysozyme and interferon, and IgA in saliva. All this favors a sharp decrease in the incidence rate (PTOLJ) in patients with fractures of the lower jaw, or softens the course of post-traumatic osteomyelitis in patients with severe immunodeficiency.

However, despite the successes achieved with treatment (PTOLJ) and other bone injuries, it is often not possible to minimize the possibility of complications.

Currently, scientific studies have proved that most pathologies occur due to immunological disorders that contribute to the appearance of complications or the transition of the process to a chronic course.

Clinicians are now faced with tasks on how to mobilize the body’s resources after surgery. In this, an undoubted role is played by various immunostimulating drugs that have a directed effect on the immune system.

Immunostimulants can increase the body's natural resistance to various pathogens, as evidenced by evidence from scientific experiments.

The analysis of scientific works of domestic and foreign authors shows that immunostimulants have a positive effect on bone tissue regeneration. As you know, the regeneration of the mandibular bone has three stages. The first stage, cell-fibrous, ends about a week after the fracture.

The second chondroid expires after 2 weeks. And finally, the last primary bone regeneration occurs after 4 weeks.

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Scientific studies have shown that the use of immunostimulants during the postoperative period activates and accelerates reparative osteogenesis , which contributes to the consolidation of bone tissue.

With injuries of any genesis, including bone injuries, an immunodeficiency state occurs. In the study (PTOLJ), there is a clear correlation between the influence of the immune system on the reparative processes occurring in the soft and bone tissues of the maxillofacial apparatus.

The introduction of Imudon in dental practice can help to recognize pathogenic antigens that cause (PTOLJ), as well as the proliferation and differentiation of immunocompetent cells. The use of immunostimulants eliminates the immune imbalance that is disturbed during trauma to the maxillofacial apparatus, which in turn will significantly reduce the recovery time of bone and muscle tissue of patients.

Fractures of the lower jaw in patients with concomitant diseases create unfavorable conditions for the consolidation of the fracture, which in turn leads to the risk of occurrence (PTOLJ).

Osteosynthesis in patients with concomitant diseases is reduced, there is a large percentage of postoperative infectious complications due to immunodeficiency.

Attention should be paid to the treatment of fractures of the lower jaw based on the immunological reactivity of patients.

In this regard, the participation of the immune system in reparative osteogenesis is of particular importance. With bone fractures, there is a decrease in cellular and humoral immunity. During the period of injury, the functional activity of T- and B-lymphocytes, phagocytes is disturbed, and against the background of excessive intake of tissue antigens, this can lead to the development of purulent complications, including post-traumatic osteomyelitis of the lower jaw.

Thus, the prevention and treatment of inflammatory complications in the postoperative period with the help of immunostimulating drugs and evaluating their clinical effectiveness in dental practice is of considerable importance.

REFERENCES

1. Agarkov N.M., Gontarev S.N., Zelensky V.A., Domenyuk D.A., Makkonen K.F., Afanasova E.P., Ivanov A.V., Subbotina T.I. Mathematical prediction of the development of phlegmon in acute odontogenic osteomyelitis of the jaw in terms of blood and systemic immunity / Medical Bulletin of the North Caucasus, 2018; 1: 62-65.

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http://journals.academiczone.net/index.php/rjtds

2. Belovolova R.A., Novosyadlaya N.V., Novgorodsky S.V. Features of the immune status and the possibility of immunocorrection in post-traumatic inflammatory complications in patients with open fractures of the lower jaw // Immunology, 2002; 5S: 287-293.
3. Ivanushko T. P., Gankovskaya L. V., Shamanaev S. V., Svich O. A., Kartashov D. D., Grechenko V. V., Balykin R. A. Study of the content of defensins in patients with purulent -inflammatory diseases of the maxillofacial region // Dentistry, 2014; 93: 2. - S. 23-26.
4. Matrosov V. I. EHF-therapy in the complex treatment of acute purulent-inflammatory diseases of the maxillofacial region // dissertation for the degree of candidate of medical sciences / Vladivostok State Medical University. Vladivostok, 2002.
5. Nikitin A.A., Lapshin V.P., Kosyakov M.N., Stuchilov V.A., Malychenko N.V. Modern methods of diagnosis and treatment of odontogenic mediastinitis / Russian otorhinolaryngology, 2004; 5: 15-18.
6. Robustova T.G. New trends during odontogenic osteomyelitis of the jaw / Russian Dental Journal, 2006; 5: 32-34.
7. Rakhimov Z.K. “Purulent - inflammatory complications of fractures of the lower jaw” monograph, 2019.
8. Zokir K. Rakhimov Characterization of the sensitivity of microbes to certain drugs in vitro!, Journal of Natural Remedies Vol. 22, No. 1(1), (2021) 123-127.
9. Olawale O. Adamson, Olalekan M. Gbotolorun, Olalekan Odeniyi, Oyinlola O. Oduyebo, Wasiu L. Adeyemo . Assessment of predictors of treatment outcome among patients with bacterial odontogenic infection / Saudi Dent J., Oct., 2018; 30(4): 337–341.
10. Rishi Kumar Bali, Parveen Sharma, Shivani Gaba, Avneet Kaur, Priya Ghanghas. A review of complications of odontogenic infections / Natl J Maxillofac Surg, Jul-Dec., 2015; 6(2): 136–143.
11. “Changes in the dynamics of transmission of the disease by the causative agents of osteomyelitis” Nuraliev N.A., Ergashev V.A. “Journal of Theoretical and Clinical Medicine” Tashkent, 2018; 2: 68-71.
12. Sagdullayeva G.U., Nazarov J.-S.E., Suleymanov S.F., Olimova N.I. “Comparative analysis of the immune system at often and rarely ill children depending on the stage of disease” // Academicia, December, 2019; 12: 22-25. ISSN: 2249 -7137: 9 DOI Number: 10.5958 / 2249-7137.2019.00118.6

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http://journals.academiczone.net/index.php/rjtds

13. Malakhov A.B., Kolosova N.G., Khabibulina E.V. Bacterial lysates in programs for the prevention of respiratory infections in children // Practical Pulmonology, 2015; 4: 16-19.
14. Del-Rio-Navarro BE, Espinosa Rosales F., Flenady V., SienraMonge JJL Immunostimulants for preventing respiratory tract infection in children // Cochrane Database Syst. Rev., 2996; 4: CD004974.