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KNOWLEDGE OF MODERN TEETH WHITENING METHODS: "ZOOM-4" AND "BEYOND POLUS"

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ABOUT ARTICLE

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Abstract: Infectious and inflammatory diseases are the main group of diseases most commonly found in the maxillofacial region. The relevance of prevention, diagnosis and treatment of infectious and inflammatory lesions (IVP) remains high. The treatment of patients with infectious and inflammatory diseases of the maxillofacial region at the present stage is a complex and unresolved problem both in the Republic of Uzbekistan and around the world.

INTRODUCTION

In recent years, more and more attention has been paid to the biofilm form of microorganisms. Biofilms increase resistance to antimicrobial drugs, make the disease chronic and have an atypical course. According to the latest data from the specialized literature, the frequency of biofilm infections is very high and accounts for about 80% of all cases of UTIs, including in developed countries. Changes in the immune system play an important role in the etiology and pathogenesis of inflammatory processes. Of particular importance is the understanding of the subtle mechanisms of interaction between cellular and humoral immunity in foci of acute and especially chronic inflammation. Neutrophils are one of the most important components of the complex mechanisms of innate cellular immunity. Being the largest group of leukocytes, neutrophils are the first effector cells of the immune system and are activated when invading a large number of infected foci and interacting with other cells of the immune system to manifest their antimicrobial ability . Previously, it was shown that neutrophils "attack" and penetrate biofilms (BP) formed by Staphylococcus aureus. Neutrophils have been shown

to destroy biofilms by phagocytosis, but the degree of destruction of biofilms depends on their maturity. Mature biofilms are characterized by high resistance to neutrophil "attack". All of the above indicates the importance of studying the effect of biofilm-forming microorganisms on the activity of cellular immunity. The purpose of this study was to study the phagocytic and neutrophilic activity in the reduction reaction of nitrosine tetrazolium with S. isolates. aureus from patients with infectious and inflammatory diseases of the maxillofacial region, which have the ability to form biofilms. Materials and methods A comprehensive examination of 104 patients with UTI of the maxillofacial region who received inpatient treatment at the dental department of the Vitebsk Regional Clinical Hospital in the period 2018-2021 was conducted. Criteria for inclusion of patients in the study: diagnosis - acute odontogenic VMP of the maxillofacial region and neck; age >18 years; voluntary informed consent to participate in the study. Exclusion criteria: age under 18; pregnancy; complications in the acute phase; alcohol and/or drug abuse; lack of voluntary informed consent; laboratory-confirmed diagnosis of COVID-19 infection. The study group was divided into four subgroups: subgroup 1 (26 patients) - patients with acute purulent periostitis; subgroup 2 (26 patients) - patients with acute purulent osteomyelitis of the jaw; subgroup 3 (26 patients) - patients with osteomyelitis of the jaw and odontogenic osteomyelitis complicated by abscess in the maxillofacial region; subgroup 4 (26 patients) - patients with odontogenic osteomyelitis of the jaw, complicated by sputum in the maxillofacial region. Isolation of pure cultures of microorganisms was carried out in accordance with the Instructions for Use No. 075-0210 "Microbiological methods for the study of biological material" approved by the Ministry of Health of the Russian Federation. Wells containing 150 microliters of Muller-Hinton broth without bacteria served as a negative control. The sealed tablets were incubated under aerobic conditions in a thermostatic chamber at 37 °C for 48 hours. Then the mass of the biofilm formed in the wells of the tablets was calculated to determine the biofilm-forming ability of the isolates [5]. The subjects were patients (20 people) with Staphylococcus aureus, the causative agent of infectious and inflammatory diseases of the maxillofacial region, capable of biofilm formation. The phagocytic capacity of blood neutrophils and the activity of neutrophils in the nitrosine tetrazolium reduction reaction (NSTtest) were measured. The control group consisted of 20 healthy people. To do this, venous blood was taken on an empty stomach by puncture of the ulnar vein in three cases: upon admission of the patient (test 1), on the third day of treatment (test 2) and at the end of treatment (test 3). Blood samples were centrifuged at 3000 rpm for 10 minutes and divided into sedimentary and sedimentary fractions. The serum was collected in sterile plastic tubes using a biochemical pipette. The activity of neutrophils in phagocytic activity and reduction of nitrosine tetrazolium was evaluated in reaction with a suspension of the museum strain S. aureus (ATCC 25923) and S. isolates. aureus from patients with

urinary tract stones in the maxillofacial region. The functional activity of neutrophils was assessed by their ability to absorb microorganisms, the production of reactive oxygen species (ROS) and nitric oxide (NO). The absorption capacity of neutrophils was determined by the phagocytic reaction of Staphylococcus aureus on March 13, 2010 and the subsequent preparation of stained smears. To identify various types of streptococci, Schaedler's blood agar medium was used, egg yolk salt agar was used to isolate staphylococci, Saburo medium was used for fungi, and Endo medium was used for enterobacteria. The crops were placed in an anaerobic incubator (Himedia) with GasPak EZ CO2 sachets to create capnophilic conditions and incubated overnight at 37°C. Schaedler's blood agar and HiAnaeroGasPack anaerobic bags were used to isolate displaced anaerobes, which were also placed in an anaerobic thermostatic chamber. Generally accepted algorithms were used for incubation and subsequent identification of isolated pure cultures. A set of morphological, cultural, biochemical, chemotaxonomic and other characteristics was used to identify the isolated cultures. The identification of aerobic and aerobic-anaerobic microorganisms was carried out using the automated biochemical analysis system ATV Expression of the BioMerieux company. The following strips were used for identification: rapid ID 32 STREPT for streptococci, ID 32 STAPH for staphylococci, ID 32 C for Candida and rapid ID 32 A for anaerobes. The isolated strains were transferred to an agar medium and incubated at 37 °C for 24 hours. A suspension in Muller-Hinton broth was prepared under sterile conditions using a bacteriological loop. The optical density of the suspension was 0.5 units (compared with the standard optical density of a densitometer or McFarland 0.5), which corresponded to a final concentration of 1.5 x 108 CFU/ml. 150 µl of the obtained material were inserted into the wells of polystyrene tablets and the phagocytosis index (PI) was estimated as the percentage of neutrophils that captured two or more microbial particles. The production of ROS by neutrophils was studied in basic and Staphylococcus aureus-stimulated nitrosine tetrazolium reduction reactions (NOb and NOc, respectively) and the results were evaluated under a microscope. The main (NOb) and pyogenic (7 mcg/ml) production of NO by leukemic cells in vitro (NOc) was evaluated by the accumulation of nitrite anions in the supernatant of short-term (3 h) cell cultures by photometry using the Griss reagent [6]. The laboratory and experimental part of the study was conducted at the Department of Clinical Microbiology of Vitebsk State Medical University and at the Microbiology laboratory of the Republican Scientific and Practical Center "Infection in Surgery". The statistical analysis of the research results was carried out using the STATISTICA 10.0 analytical software package (StatSoft Inc., USA) and MSExcel. Before applying the methods of descriptive statistics, the type of distribution of quantitative features was determined based on the Shapiro-Wilk criterion. The arithmetic mean (M) and standard deviation (σ) were calculated for normally distributed features. For features with abnormal distribution, the median (Me), lower quartile

(LQ) and upper 75th quartile (UQ) percentiles were calculated. The statistical significance of the differences between the indicators was determined using the Kruskal-Wallis test. The Mann-Whitney (U) test was used to assess the statistical significance between unrelated groups. The statistical significance of the differences between the indicators when measured in dynamics was determined using a rank feature test: a statistically significant difference was found in 66.7% for low and 33.3% for moderate BP-forming ability; S. viridans isolates showed low BP-forming ability in 100.0% of observations. In patients with acute odontogenic osteomyelitis complicated by maxillofacial abscess (subgroup 3), the biofilm-forming ability of S. aureus isolates was moderate in 66.7% and low in 33.3%; S. epidermidis showed low BP-forming ability in 16.7% and moderate in 83.3%; S. The isolates of viridans and P. aeruginosa had a moderate BP-forming capacity in 100.0% of the observations. In patients with acute odontogenic osteomyelitis complicated by maxillofacial phlegmon (subgroup 4), S. aureus, P. aeruginosa and S. viridans had moderate PD-forming ability in 100.0% of cases; S. isolates epidermidis had a low PD-forming capacity in 25.0% of observations and in 75.0% of observations. The Kraskell-Wallis test was used to determine the statistical significance of the differences between the indicators of the main groups (standard and autologous strains) and the control group. On the day of admission of patients before the start of treatment, the following results were obtained: the frequency of spontaneous NST was significantly lower in the control group than in the experimental group of the standard strain (p=0.017), and also significantly lower than in the experimental group of the autologous strain (p0.05); the induction of NST was significantly lower in the control group, than in the experimental group of the autologous strain (p0.05); and significantly lower (p0.05) than in the experimental group of the autologous strain. The number of phagocytes was significantly lower in the control group than in the experimental group with the standard strain (p=0.010) and significantly lower in the control group than in the experimental group with the autologous strain (p0.05). On the third day of admission and treatment, the following results were obtained: The spontaneity of HCT in the control group was significantly lower than in the experimental group when using the standard strain (p=0.0074); The HCT in the control group was also significantly lower than in the experimental group when using the autologous strain (p=0.000001); and in the experimental group when using the standard strain it was significantly lower than in the experimental group when using the autologous strain (p=0.047). The HCT induced in the control group did not significantly differ from that in the experimental group using the standard strain (p>0.05), but in the control group this indicator was significantly lower (p0.05) than in the experimental group using the autologous strain. The phagocytosis index in the control group did not significantly differ from the control group. Conclusions The studied samples of ventilator pathogens in the maxillofacial region had moderate or low BP-

forming ability, while isolates of Pseudomonas aeruginosa had the greatest BP-forming ability, and isolates of Staphylococcus aureus had the second most pronounced ability. All phagocytic indices decreased over time, being higher on the first day than on the third, and higher on the third day than before discharge, and this pattern is usually statistically significant, regardless of the method of phagocytosis induction. Intergroup comparisons of phagocytosis indicators show that phagocytosis indicators are almost always higher in the group of the autologous strain, slightly lower in the group of the standard strain and the lowest in the control group. This pattern is usually statistically significant and does not depend on the time that has elapsed since admission. According to the presented data, phagocytic activity in patients with UTI in the maxillofacial region is significantly increased compared to the control group. At the same time, this activity is directed, regardless of the severity of the biofilm-forming ability, primarily at autotrophic strains, i.e. pathogenic microorganisms that caused the disease in a particular patient, probably due to the specific activation of macrophagocytosis, which is stimulated by antigen-presenting cells, including macrophages, is associated with the specific activation of macrophages and other effector cells of the cellular link of immunity by cytokine signals coming from type 1 and type 2 T-helpers (in particular, through gamma interferon, IL-4, IL-5 and IL-13), in response to this, phagocytic activity against standard strains that macrophages encounter for the first time is expected to be low. Phagocytic activity is inversely proportional to the ability of clinical pathogen isolates to produce biofilm. This indicates that biofilm formation plays a role in suppressing the nonspecific cellular protective response of bacteria. Therefore, a more severe course of maxillofacial UTI is expected in patients in whom the disease is caused by pathogens with a pronounced ability to produce BV. At the same time, it should be borne in mind that the development of BV-producing ability reduces the sensitivity of the corresponding microorganism to antibiotics.

CONCLUSION

This creates an assumption about the insufficient effectiveness of empirical psychotropic drugs prescribed to such patients, and necessitates the direct establishment and assessment of the relationship between the effectiveness of antibiotic therapy prescribed to patients with UTI in the maxillofacial region and the development of the cellular protective response of the body.

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