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The effect of plasma-substitutive therapy on cytokine profile of oral fluid in children with acute odontogenic osteomyelitis

Relevance of the topic. In the generic structure of dental special-purpose units a significant number of pediatric patients with pyoinflammatory processes of maxillofacial area determine the necessity in search for the state-of-the-art advanced methods of early diagnosis and effective therapeutic approaches to prevent possible complications. And multiple nosological forms of odontogenic osteomyelitis are no exception [1, 2, 3].

This period of life is more favorable for the development of odontogenic diseases due to well-developed lymphatic net, wide lymphatic viae, high susceptibility of lymphatic system to infection, well-developed vascular system, structural pe-

culiarities of organs and tissues, and child body is particularly vulnerable to environmental harmful factors [4, 5, 6].

Each dental germ is surrounded by the ring of lymphatic plexus, which are broadly anastomosed with lymphatic vessels of bone and periosteum. Revehent lymphatic vessels, going towards the lymphatic glands are located in each part of maxillofacial area. This structural peculiarity of lymphatic apparatus of child maxillofacial area provides for high possibility of the development of inflammatory lesions of odontogenic nature in case of complicated carious teeth. Inflammatory processes are more often observed in the period of transitional dentition, since the "pick" of carious disease falls on the age of 6 – 12 years. In 65,0% of cases the cause for odontogenic lymphadenitis is deciduous molars and in 21,0% of cases the cause is permanent first molars, whereas in 14,0% of cases the cause is all the rest deciduous teeth [1,6,7].

Pathogens for the onset of odontogenic infection can be pathogenic and opportunistic pathogenic aerobes, anaerobes, but more often it can be pathogenic Staphylococcus in pure culture and rarely nonpathogenic Clostridium, fusobacteria symbiosis, Escherichia coli, anaerobic Streptococcus, as well as streptococcus in conjunction with staphylococcus. These strains are normally found on the oral mucosa, but on conditions of lowered host defense and hemodynamics impairment in the focus of inflammation, even opportunistic pathogenic microorganisms can cause pyoinflammatory processes [8, 9, 10].

Recently, the system of cytokine regulation of the host defense which presupposes the necessity of cell-cell interaction mediators formation, i.e., hormones, neuropeptides and adhesion molecules, is of great interest for the scientists [11, 12].

Cytokines, in this regard, are the most universal system, since they are biologically active both distantly, being secreted by the cell-producer, and in the direct intercellular contact in the form of membrane. They are crucial in the progression of the acute pyoinflammatory inflammation of the maxillofacial localization in children and presuppose the relevance of this scientific research.

Purpose

The paper was aimed at the study of the effect of "Rheosorbilact" plasma-substitutive medication onto cytokine profile of oral fluid in children with acute odontogenic osteomyelitis of lower jaw.

Methods and Material. The research has encompassed summary of the findings of clinical and laboratory examination of 37 children aged 7 to 12 years with acute odontogenic osteomyelitis of lower jaw. All patients underwent treatment at Surgical Unit of Children's Municipal Clinical Hospital in Poltava, which is the affiliated medical facility of the Department of Children's Oral and Maxillofacial Surgery at Higher State Educational Establishment of Ukraine "Ukrainian Medical Stomatological Academy". 20 clinically healthy children were assigned to control group.

The list of common clinical methods of examination met the requirements of the protocols. The analysis of the level of proinflammatory and antiinflammatory interleukins in the oral fluid has been carried out by the "sandwich" - variant of solid-state enzymoimmunoassay using two monoclonal antibodies with different etiotropic specificity to corresponding interleukin in compliance with the guide ("Cytokine" test system, St.-Petersburg, Russia). All parameters have been studied at the time of hospitalization and on day 7 after surgery during the comprehensive treatment.

Once *osteophlegmon* was drained under intravenous or incubatory anaesthesia a purulent site was sanitized by 0,05% chlorhexidine bigluconate water solution. Patients were assigned to two groups according to the amount and composition of infusion therapy. Children from Group I (n=20) underwent conventional treatment according to the medical care protocol, and children from Group II (n=17) have been treated with "Rheosorbilact" as a supplement to mandatory infusive therapy, conducted during 7 days. It has had positive effect in purulent surgery [13].

Statistical processing of the received digital data was performed using the Microsoft Office Excel and Statictica 6.0 software. Wilcoxon-Mann-Whitney U-test was used for comparison [14].

Results and Discussion

The analysis of statistical data has shown that 31(83,8%) from 37 patients asked for medical assistance in the first 3 days after occurrence of the first manifestations of inflammation, originated from the pain of different intensity in the area of bad tooth, followed by the swelling of soft tissues surrounded the lower jaw. The general state, sleep, appetite was getting worse, body temperature was 38,5 - 39,7˚C; patients experienced fever, sometimes nausea and indigestion.

The reason for onset of purulo-necrotic inflammation was the exacerbation of chronic periodontitis of deciduous molars, number of which was equal, i.e., 10 (27,0%) cases each. The first permanent molar with signs of acute periodontitis

caused osteomyelitis in 7 children (18,9%); exacerbation of chronic periodontitis was the precursor for the disease in 8 (21,6%) children. Exacerbation of chronic periodontitis in the second permanent molar caused osteomyelitis in 2 patients (5,4%).

Patients underwent immediate drain of focus of inflammation under intravenous anaesthesia according to conventional mode of access in 22 cases (59,5%) and under incubatory anaesthesia in 15 cases (40,5%), followed by bad teeth extraction, with the exception of one first molar with signs of acute periodontitis at the onset of the disease.

On day 7 after surgery and comprehensive treatment the general state of health of children from both groups was significantly better, with decreased pain in the area of inflammation and temperature lowering to 37,0-37,7°C, but no significant difference in general clinical symptomatology has been noted.

Summary of the results of statistical processing with regard to indices of cytokine profile of the oral fluid during hospitalization in both groups of comparison ascertained only minor differences between them. The level of proinflammatory interleukins, IL-1β, in particular, was higher by 1,3 times, IL-6 by 3,8 times, and IL-8 by 3,2 times as compared with controls. Concentration of IL-4 and IL-10 antiinflammatory interleukins was by 2,1 and 1,8 times lower, respectively (Table 1).

Examination of patients from Group I on day 7 from the beginning of comprehensive treatment has established that the level of IL-1β was decreasing as compared with initial examination; however it did not reach the control indices. At the same time levels of IL-6 and IL-8 proinflammatory interleukins remained high by 1,4 and 1, 8 times, respectively, and content of IL-4 and IL-10 antiinflammatory interleukins was rising with the difference of 1,4 time.

The content of IL-1β, IL-6, IL-8 proinflammatory interleukins and IL-4 and IL-10 antiinflammatory interleukins in children from Group II was significantly decreasing on the time of repeated examination and almost reached the indices of healthy children. Comparison of the results of average values of indices in observation groups has established that in patients, prescribed with supplementary "Rheosorbilact" the level of proinflammatory (IL-1β, IL-6, IL-8) and antiinflammatory (IL-4, IL-10) cytokines was different by 1,2; 1,6; 2,7; 1,7; 1,2 times, respectively.

Table 1

Level of proinflammatory and antiinflammatory interleukins in the oral fluid (M±σ)

Index (пг/ml)	Control group (n=10)	Patients			
		Treatment is after protocol		Treatment is with addition	
		in a time of hospitalization (n=20)	in a time of recovery (n=20)	in a time of hospitalization (n=17)	in a time of recovery (n=17)
IL-1β	142,86±7,06	195,38±10,07 p_1 <0,05	172,40±4,57 p_2<0,05 p_3>0,05	188,45±7,31 p_1 <0,05	140,38±5,97 p_2>0,05 p_3<0,05 p_4<0,05
IL-4	5,49±0,41	2,56±0,31 p_1 <0,05	3,66±0,32 p_2<0,05 p_3<0,05	2,50±0,19 p_1 <0,05	5,72±0,25 p_2>0,05 p_3<0,05 p_4<0,05
IL-6	3,16±0,68	12,28±0,87 p_1 <0,05	9,03±0,49 p_2<0,05 p_3<0,05	11,68±0,49 p_1 <0,05	3,25±0,19 p_2>0,05 p_3<0,05 p_4<0,05
IL-8	5,77±0,67	18,84±0,43 p_1 <0,05	10,43±0,53 p_2<0,05 p_3<0,05	17,93±0,42 p_1 <0,05	6,12±0,37 p_2>0,05 p_3<0,05 p_4<0,05

continuation of table 1

IL-10	2,24±0,18	1,23±0,10 p_1 <0,05	1,76±0,14 p_2<0,05 p_3<0,05	1,22±0,8 p_1 <0,05	2,15±0,09 p_2<0,05 p_3>0,05 p_4>0,05

Notes:

1. p1 - is authenticity of difference between the indexes of control group and patients in a time of hospitalization.
2. p2 - is authenticity of difference between the indexes of control group and patients in a time of recovery.
3. p3 - is authenticity of difference between indexes for patients in a time of hospitalization and in a time of recovery.
4. p4 - is authenticity of difference between indexes for patients in a time of recovery at treatment after protocol and with addition

In summary, taking into consideration that cytokines first regulate the immune status due to blood corpuscles, which perform the function of cells-regulators and ensure the degree of immunocompetence of structure tissues, we established the fact of completeness of immune response formation at the level of oral cavity in group of children, prescribed with supplementary plasma-substitutive therapy along with comprehensive treatment.

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