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Characteristic of Immunological Changes in Odontogenic Cysts

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The study involved 67 patients with odontogenic cysts (OC) aged 18 to 45 years, who were divided into groups: Group 1 (n = 67) patients with OC aged 18 to 45 years, group 2 - control group, consisted of 20 healthy persons of similar age. We studied the characteristics of immune status and immunoreactivity in patients with odontogenic cysts. Condition of cellular and humoral immunity was assessed by using the methods of direct rosette developing with erythrocytes coated with monoclonal antibodies to CD3 +, CD4 +, CD8 +, CD22 +, CD4/CD8 indicators ofimmunoregulatory index and phagocytic immunity. State of nonspecific resistance was studied by determining the phagocytic activity of neutrophils and their oxygen dependent metabolism in NBT test. The concentration of cytokines (IL-6 and IL-4) in serum was determined by ELISA. During the study we found that in patients with (OC) developed significant changes in the structure of the immune response at the cellular as well as at the humoral level that makes it necessary to develop new individualized preventive measures along with existing therapies OC.

Keyword: Odontogenic Cysts, Cytokines, Immune System.

1. Introduction

Among inflammatory diseases of maxillofacial area theodontogenic cysts (OCs) constitute about 37.2% of all surgical pathology and are found in 50.0% of patients seeking surgical dental care[5,7]. Based on standardized methods of prevalence estimation of OC, we could argue that the figure in different countries is quite variable, ranging from 20.0 to 40.0%[8,9]. The high incidence of these pathological conditions is associated with high level of caries teeth damage[5,9,11]. Oral cavityis an open biotope, heterogeneous in order to various access of oxygen. Thus, we can distinguish themicrofloraof mixed saliva, dental plaque, gingival sulcus, tongue back, natural folds, crypts of tonsils, periodontal pocket, caries cavity, root canal. The last three biotopes are classified as abnormal. Colonization resistance of the oral cavity is determined by two links: microbiological, which provides control and stability ofmicrobiocenosisin relation to the growth of bacteria, viruses, fungi, protozoa and immunological, which is responsible for the operation of non-specific and implementation specific immunity. We found that the role of inflammatory mechanisms as the driving force in the development of today OC is not limited to infectious agents[9, 11].

According to several studies the patients with OC have the violations in the immune system[10,11,12]. However, their characters, the stability and influence on the development and progression of the disease have been studied insufficiently. Such studies are rare and multidirectional, justifying the need for further scientific research to individualize and improve treatment programs.

2. Purpose

To study the characteristics of immune status and immunoreactivity in patients with odontogenic cysts.

3. Materials and Methods.

The study involved 67 patients with OC aged 18 to 45 years, who were divided into groups: Group 1 (n = 67) patients OC aged 18 to 45 years, group 2 - control group, consisted of 20 healthy persons of similar age. The study was conducted at the Department of Oral and Maxillofacial Surgery and immunological laboratory of Ivano-Frankivsk Regional Hospital. Examination of patients was performed according to the protocols of diagnosis and treatments OC № 655 of 23.11.2004.

We studied cellular and humoral immunity using methods of direct rosette developing with erythrocytes coated with monoclonal antibodies to CD3 +, CD4 +, CD8 +, CD22 + (Production of Vitebsk Medical University, Belarus), CD4/CD8 values of immunoregulatory index and phagocytic immunity. State of nonspecific resistance was studied by determining the phagocytic activity of neutrophils (PA) and oxygen dependent metabolism in spontaneous NBT-test, functional reserve in terms of phagocytic cell numbers (PCN), an index of neutrophil activation in stimulated NBT test, made by the quantitative spectrophotometric method for T. Gentle i R. Thompson ("Renal", Hungary). The concentration of cytokines (IL-6 and IL-4) in serum were determined by ELISA in the machine "STAT-Fax 303 Plus" (USA) using test system of "Diaclone" (France) according to the manufacturer's instructions.

Statistical analysis of the results was performed by using standard programs for personal computers, involving software package Microsoft Excel.

4. Results and Discussion

The study found that the development and progress of OC accompanied by changes in immunological status.

Table 1: Indicators of cellular and humoral immunity, cytokine levels in the serum of patients with odontogenic cysts and healthy (M ± m)

Examined group	CD3 +,%	CD4 +,%	CD8 +,%	IRI (CD4/ CD8 +)	CD16+,%	CD22+,%	IL-6, pg / ml	IL-4 pg / ml
OC 1 (N= 67)	41,1 ± 0,44 *	29,4 ± 0,72 *	43,2 ± 0,68 *	0,87 ± 0,05 *	19,7 ± 0,22 *	52,8 ± 2,7 *	25,49 ± 1,54 *	21,21 ± 0.55 *
Healthy 2 (N = 20)	63,8 ± 0,63	45,5 ± 0,73	28,7 ± 1,09	1,98 ± 0,12	27,7 ± 0,61	21,7 ± 2,90	3,6± 0,10	11,15 ± 0.74

Notes: * - Probability of the Differences Compared with Healthy

Changes in cellular link of immunity in patients with OCmanifestated slight decrease of total content of T lymphocytes (CD3 +), which took place mainly by reducing the number of T-cells with CD8 + phenotype and with the tendency to increase of the levels of absolute and relative content of CD22 + cells in blood. Thus, the patients with OC had a significant decrease of CD4 + lymphocytes (Pn<0.05), and the level of cytotoxic suppressors is 1.4 above the rate of CD8 + (Pn<0,05)in healthy. Under these conditions it was recorded a probable reduction in regulatory index caused by the decrease in the proportion of CD4 + and CD8 + content increase (p <0,05). Reduced content of T-lymphocytes in the blood in OC may be caused by the accumulation of these cells in the mucosa of the oral cavity, which is a predictor of local inflammation[9,10,11].

Analyzing the level of lymphocyte phenotype SD16 +, the main part of which is represented by natural killer cells, in patients with OCis noted significantly lower rate relative to the control group (PN<0,05). The nature of the humoral

immune response in the patients of both groups had a common trend, but the differences were observed only in the intensity of response. In that way was noted the increase in the number of lymphocytes with the phenotype CD22: + (Pn<0.05) in patients with OC while reducing content of CD3: + (Pn<0.05), mainly due to CD8 + phenotype. Thus, one could argue about the formation of relative suppressor variant of secondary immune response in patients with OC[2,6,11,12,13].

In addition, we found that the cytokine imbalance is observed in all the patients with OC. We noted probable increase of IL-6 compared to the healthy group (Pn<0.001) while increasing serum levels of anti-inflammatory interleukin IL-4 (Pn<0.05) (Table 1). It is known that cytokines are mediators of all three types of tissue processes in inflammation - exudation, alteration and proliferation. The increase of IL-4 while increasing IL-6 in patients with OC can induce activation of cell proliferation, leading to disease progression, increasing the size of the cysts. Our data is consistent with the results of several researchers[5,6,7,8,9,11].

Thus, increased proinflammatory and elevated levels of IL-4 in the serum of patients with OC displays the initial inflammatory changes in the oral cavity, and when the mucous membrane doesn't completely loose its protective properties, there is no permanent persistent bacterial infection. An important feature of proinflammatory IL-6 is that it limits the synthesis of other proinflammatory cytokines, including TNF-α, and completes the formation of the inflammatory process. The changes of cytokine profile of serum in patients with OC may be associated primarily with long-term persistence of bacterial or viral and bacterial infections, and the elevated levels of IL-4 indicates the exhaustion of compensatory anti-inflammatory mechanisms of the immune system and lack of inflammatory response.

Patients with OC had significant changes in the phagocytic activity of neutrophils, which manifested in a low number of cells which were capable of phagocytosis and decrease their phagocytic capacity. Thus, indicators of PI and PF in the patients with OC, accounting (28,1 ± 1,1)% and (3,5 ± 0,9) conventional units, corresponding they were significantly lower than those in healthy persons (PN< 0.05) (Table 2).

Table 2: Indicators of phagocytic activity of neutrophils in the peripheral blood of patients with odontogenic cysts and healthy (M ± m)

Indicators	OC (N = 67)	Healthy (n = 20)
PI,%	28,1 ± 1,1 *	64,8 ± 1,8
PF, conv. units.	3,5 ± 0,9 *	7,5 ± 0,06
Spontaneous NBT: - AIs mind. units. - N,%	0,09 ± 0,01 *	0,15 ± 0,02
	8,0 ± 0,01 *	12,0 ± 0,07
Stimulated NBT: - AIs mind. units. - N,%	0,7 ± 0,01 *	1,2 ± 0,02
	41,3 ± 0,01 *	76,3 ± 0,5

Notes: * - probability of the differences compared to healthy (p <0,05)

That is why, in patients with OC the orientation vector of disorders of phagocytosis was shifted toward the deficit. In terms of spontaneous NBT-test revealed an insufficient degree of stimulation of phagocytic cells and their low capacity for keeling in patients with OC (PN<0,05). Thus, the

rate of IA (conv. units.) in this group, amounting to (0,09 ± 0,01) was significantly lower from that in healthy (PN<0,05).

Stimulated NBT test showed a low potential activity of phagocytic cells and completeness of phagocytosis in patients with OC in comparison with those in the healthy group (Pn<0,05). We found that oxygen dependent microbiocidal neutrophils increased in patients with OC (P <0.05), which gives reason to confirm the presenceofthe relationship between activation of blood neutrophils and the development of chronic inflammation in the oral mucosa with OC.

Summing up the results, it can be argued that in patients with OChas developed marked changes in the structure of the immune response at the cellular as well as humoral level.

5. Conclusions

1. The level of immunological changes in patients with OC can serve as a marker of systemic violations of cellular metabolism: there is a decrease in cellular link and stress regulatory component of humoral immunity.
2. In terms of spontaneous NBT-test revealed an insufficient degree of stimulation of phagocytic cells and their low capacity for keeling in patients with OC. Stimulated NBT test that characterizes the reservecapacity of nonspecific defense that shows the evidence of failure of the last one in patients with OC.
3. Exploring the role of cytokines allows getting information about the functional activity of different types of immune cells, the significance of the inflammatory process and its prognosis, of the relationship between the activation processes of T-helper cells.

6. Prospects for Further Research

Revealed changes of the immune system in patients with OC necessitate the development of new individualized preventive measures along with the existing therapy of OC.

7. References

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