RESEARCH JOURNAL OF TRAUMA AND DISABILITY STUDIES

Volume: 4 Issue: 1 | Jan–2025 ISSN: 2720-6866
http://journals.academiczone.net/index.php/rjtds

The Characteristic of the Immune Status at Patient with Acute Rhinosinusitis

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Abstract: The immune status has been studied at 25 patient with ARS. The control group of comparison consisted from 14 practically healthy faces. At of patients with ARS has revealed deep infringements of the immune status, especially from the T-link of immunity and its subpopulations, and also frustration humoral an immunity link, suppression of proinflammatory cy-tokine IL-10 and increase proinflammatory IFN-γ. Under the influence of the spent treatment have not revealed certain changes from the immune status at patients. It is possible to ascertain only positive changes of maintenance IL-10 and parallel decrease IFN-γ in dynamics of treatment.

Key words: The immune status, acute rhinosinusitis, cellular immunity, humoral immunity, an immunodeficiency, cytokines.

Introduction

Acute rhinosinusitis (ARS) is a common condition characterized by the inflammation of the nasal and paranasal sinus mucosa, typically resulting from viral, bacterial, or fungal infections. This disorder significantly impacts the quality of life and poses a public health concern due to its prevalence and associated healthcare costs. The immune system plays a critical role in both the development and resolution of ARS, as it orchestrates the host defense mechanisms against invading pathogens while maintaining mucosal integrity.

Understanding the immune status of patients with acute rhinosinusitis is crucial, as the interaction between the immune system and the pathogen determines the disease progression, severity, and response to treatment. Immune dysfunction or hyperactivation can lead to prolonged inflammation, complications, or recurrence. Key components of the immune system, including innate and adaptive immune responses, cytokines, and cellular mediators, are thought to contribute significantly to the pathophysiology of ARS.

Recent studies have focused on elucidating the specific immune characteristics in ARS patients, highlighting potential biomarkers for disease severity and targets for therapeutic intervention. This paper aims to explore the immune status of patients with acute rhinosinusitis, emphasizing the dynamic changes in immune parameters during the disease course and their clinical implications.

Acute rhinosinusitis is one of the most common diseases of the upper respiratory tract, in which the cellular link of immunity is affected [1-3].

Last two decades the defining reason of a secondary immunodeficiency (SID) at children beca-me a patient which pandemic continues to accrue. Defeat of immune system at a patient has system character, being shown deep suppression T- and B-links of cellular immunity [1, 3, 4].

One of the first symptoms quite often are diseases of LOR-organs. Acute rhinosinusitis (ARS) often comes to light at patient, disease of it at children's age fluc-tuates within 60-75%, and lethality makes 0,01-0,2% from the diseased [1, 6,].

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According to a number of authors, at a patient o ARS meet more often, than at children normal immune system [1, 4, 5].

Aims *of the study* – To study parameters of the immune system at a patient with ARS.

Material and Methods

We investigated 25 children at the age from to 30 till 44 years of a patient with ARS, were on hospitalization in LOR-BRANCH of the Bukhara regional children's versatile medical centre. Men have made 56.6%, women – 43.4%. Unilateral defeat of sine was observed at 57.8%, bilateral - at 42.2%. Except inflammation signs the general anxiety, a bad dream, refusal of a chest food, headaches was marked. Besides traditional inspection (the general analysis of blood, urine, bacteriological and bio-chemical researches) all patients have passed LOR-survey, under indications - sine sounding (26.5%), X-ray additional bosoms of a nose (9.6%). In the basic group there were 25 patient with ARS pa-tients, and in a control - almost healthy 14 patient of similar age who did not have in anamnesis ARS. Patients received antiretroviral therapy, antibacterial, anti-inflammatory and local therapy in the conditions of a hospital.

Immunologic studies were carried out in conjuction with the the Institute of Immunology NA RUz (Tashkent). In researches included patients from and ARS which parents have given the informed consent to participation in the given researches (work has been executed according to the Helsinki declaration and it is approved by ethical committee of Bukhara State Medical Institute).

Phenotyping lymphocyte carried out indirect by immune fluorescent method with the help mo-noclonal antibodies to CDs-receptors «Sorbent Ltd» (Russia). Defined T-lymphocytes (total set - CD3); T-helpers (subset of Th - CD4); T-suppressors (subset of Ts - CD8); B-lymphocytes (subset CD19).

Calculated an immunoregulatory index (IRI) – the ratio of CD4/CD8. Concentration serum antibodies (Ig) A, M and G defined a method of radial immune diffusion[7]. Level cytokines (IFN-γ, IL-10) in whey of peripheral blood was studied a method of the immune enzyme analysis with use of test sys-tems by firms "Vectors-best" (Russia). Parameters of the immune status studied twice: before and 1 month after treatment.

The obtained data was exposed to statistical processing with use of computer program Micro-soft of Excel 2003 on LG-Pentium IV. Significance of differences when comparing the mean values were determined by Student´s ***t*** test. Data are presented as of M ± m. Differences were considered significant at $P<0.05$.

Results of research and their discussion

The retrospective analysis of studying of the immune status at a patient with ARS has shown that in terms before carrying out before treatment at them essential infringements have been revealed from their immune system (tab. 1). At a patient with ARS patients observed 0.7-fold fall of absolute value of leukocytes and the relative contence lymphocyte, double decrease in the absolute values of lymphocyte. Such decrease was reflected in statistically significant decrease from 2 to 3 times of absolute values of the total pool T (CD3) - and B (CD19)- lymphocyte (tab. 1).

At a patients with ARS children showed profound suppression T-cell immunity in their relative expression, namely, 0.6-fold reduction in T-cells with the phenotype (CD3), even more si-gnificant suppression T-share helpers cells - Th (CD4) – up to 13.8 ± 2.3% (in the control group 34.2 ± 1.6%; $P<0.001$), while the content of subset of T-cells - T (CD8)-cytotoxic exceeded the background va-lues in the control group moderate ($P>0.05$).

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In this connection in the given group there is an inversion an immune regulatory index (IRI) – the ratio of CD4/CD8, - that leads to serious changes in immune system of patients with HIV-infec-tion, combined with the ARS. Thus, we find out a disbalance of T-cell subset with a decrease in the proportion of helpers Th(CD4) and increase suppression parts - Ts(CD8) (tab. 1). Reduction IRI regis-tered by us at HIV-infected with ARS children testifies to functional insufficiency of cages with a phe-notype of Ts(CD8), and it is a sign of the profound immunodeficiency which has developed at patien-ts. At of patients with ARS have revealed small activation of subset of T-killers - Tk (CD16) that, possibly, is also *pathognomonic* at this pathology.

In respect of B-cell component of the immune system can be said that moderate decrease occurred, which was statistically is possible to tell that there was a moderate decrease that statistically confirmed (P>0.05). Decrease B(CD19) lymphocytes was reflected in the spectrum of serum immuno-globulin (SI) content of two classes - IgA and IgG, and quantity IgM, on the contrary, increased (tab. 1).

The data obtained by us testifies to profound infringements in the functioning of the immune sy-stem in children of patients and ARS, which were reflected a spectrum cellular and humoral immunity factors. These disorders appear to be quite possible as a fact that plays an im-portant in the pathogenesis of this mixed-pathology in children. The decrease of the relative quanti-tative propeties of Th(CD4) - this aggravating factor, and an unfavorable forecast criterion.

The spent treatment did not lead to appreciable changes of parameters of immune system at a patient with ARS. We observed a tendency in moderate increase of separate links of cellular immunity and humoral immunity, however restoration of key parameters of the immune status (tab. 1). Besides, at patients with chronic processes saved pressure of the humoral component of sys-tem of immunity remained at P>0.05. In a HIV-infected of patients with ARS have found out weak increase T(CD3) and B(CD19) in their relative and absolute values, and also moderate increase of production of Tk(CD16), Ts(CD8), the concentration of IgA (tab. 1).

Spectrum studying cytokines at a patient with ARS has shown that at them presence *of significant* differences between values of the basic group with control group was marked. So, for example, if at healthy children level IFN-γ made 23.70 ± 5.38 pg/ml, at a patient with ARS the similar parameter was in 3/5 times above and there was at level 82.84 ± 21.17 g/ml (tab. 2). So, high level IFN-γ at a patient with ARS testified to expressiveness of degree of inflammatory reaction.

It is known that as a source IFN-γ serve activated T-lymphocytes and natural killers. Among T-lymphocytes producers IFN-γ are both the cytotoxic Ts (CD8), and Th (CD4) cells, however at a differ-rentiation of the last on Th1 and Th2 ability to develop IFN-γ keep only Th1-cells. The major function IFN-γ is its participation in medium interrelations between lymphocytes and macrophages, and also in regulation of a parity cellular and humoral components of the immune response. Being the basic pro-duct Th1-клеток, IFN-γ reduces secretor activity Th2-cells. Thus, IFN-γ *enhances* the development of cellular immunity and suppresses displays humoral immunity. Hence, IFN-γ plays an important role in immune regulation, being key by the cytokine cellular immune response and inhibitor of the humoral immune response [8].

Table 1. Parameters of immune system at a patient **with ARS in dynamics of treatment.**

Indicator	**Healthy** (n=14)	**Patients** (n=25)
Leukocytes, num./mklt	6123 ± 162	4251 ± 321***
		4437± 234***
Lymphocytes, %	29.6 ± 1.7	21.4 ± 2.15**
		22.7 ± 2.4*
Lymphocytes, abs.	1812.4 ± 35.7	931.5 ± 97.2***
		1003.6 ± 47.5***

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T(CD3), %	58.3 ± 2.5	38.4 ± 3.2*** 41.2 ± 2.7***
T(CD3), abs.	1058.2 ± 72.2	362.5 ± 43.6*** 425 ± 51,4***
Th(CD4), %	34.4 ± 1.6	13.8 ± 2.3*** 12.4 ± 2.7***
Ts(CD8), %	22.7 ± 1.2	24.2 ± 2.8 26.5 ± 3.1
IRI (CD4/CD 8)	1.5 ± 0.14	0.58 ± 0.31** 0.49 ± 0,36**
Tk(CD16), %	15.4 ± 0.9	16,2 ± 2,5 18,4 ± 3,2
B(CD19), %	24.3 ± 1.22	19,62 ± 4,4 22.5 ± 2.6
CD19, abs.	351.6 ± 29.4	182.1 ± 20.5*** 228.7 ± 34.9**
IgA, mg%	129.2 ± 10.8	84.4 ± 7.8** 101.9 ± 13.6
IgM, mg%	86.7 ± 8.9	140.4 ± 13.1*** 136.3 ± 16.5**
IgG, mg%	1047.3 ± 33.4	888.7 ± 42.7** 761.4 ± 54.6***
The note: in numerator the data before treatment, in a denominator - after treatment; * - P <0.05; ** - P <0.01; *** - P <0.001 - in comparison with control group.		

Table 2. The maintenance pro- and anti-inflammatory cytokines at patient **in a combination with ARS in dynamics of treatment.**

Indicator	Control group	The basic group
IFN-γ, pg/ml	23.70 ± 5,38	82.84 ± 21.17** 21.93 ± 7.42
IL-10, pg/ml	10.95 ± 3.63	86.08 ± 19.43*** 52.04 ± 12.06**
The note: in numerator the data before treatment, in a denominator - after treatment; * - P <0.05; ** - P <0.01; *** - P <0.001 - in comparison with control group.		

Level IL-10 in group at a patient with ARS approximately in 8 times *higher* than those values of the control group. It is known that IL-10 it is described as the factor stimulating B-lymphocytes as it causes proliferation B-cells. The main producers IL-10 are Th2 cells. IL-10 inhibits functions of macrophages and secretion by them IL-1, FNO and IL-6, having thus anti-inflammatory an effect. IL-10 causes proliferation and a differentiation B - and T-lymphocytes, influences development hematopoietic cells, on macrophages, natural killers, basophiles, being the functional antagonist cytokines, produced Th1 cells. IL-10 promotes development of allergic reactions, possesses the expressed anti-inflammatory action [8].

The comparative analysis has shown that the parity IFN-γ/IL-10 (proinflammatory/anti-inflammatory cytokines or Th1/Th2) at healthy children equaled 2.2. In the presence of the expressed inflammatory process, that is at children of the basic group, this indicator made 0.96. The expressed disbalance in functioning of the core regulator cytokines which was expressed by acute lifting of level anti-

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inflammatory cytokines and suppression proinflammatory cytokines, acute inflammatory condi-tions being the basic regulators is revealed.

Thus, the patient with ARS have an expressed stimulation of production both proinflammatory, and anti-inflammatory cytokines. Such processes can as a necessary condition for protection against the infectious agent and system damaging action of high concentration proinflam-matory cytokines [8].

Conclusion

After treatment carrying out in group of a patient with ARS level IFN-γ has come nearer to control values, and level IL-10 in dynamics of treatment if decreased, but nevertheless remained at high level, in 5.5 exceeding those parameters at children of control group.

The parity IFN-γ/IL-10 in the basic group tended to even bigger to decrease, making 0.42.

Thus, at a patient *with ARS deep deficiency of most of the parameters of the immune status is observed. One of the major disorders of the immune status is a significant suppres-sion of Th (CD4)-lymphocytes and inversion of the IRI with an increase in functional activity of Ts (CD8)-lymphocytes, which is unfavorable clinical criteria. The given patients did not have positive dynamics of changes of the immune status after treatment carrying out. Under the influence of treatment there was a suppression proinflammatory of cytokine IFN-γ. However, it should highlight that the detected change in the level of IL-10 and a violation of the proportion of pro- and anti-inflammatory cyto-kines indicates the presence of preexisting immune deficiency, which, apparently, and was manifes- ted in the form of complications associated.*

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