

CHARACTERISTICS OF THE LOCAL INFLAMMATORY PROCESS AND IMMUNE RESPONSE IN CASE OF ALLERGIC DISEASES OF THE EYE IN CHILDREN

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In the World Health Organization report on allergy (WHO, 2005) it was underlined that allergy morbidity is increasing in the whole world [1, 5, 15]. People suffering allergy have 80-90% damage of eyes and recently the spread of allergy grew 2-3 times. That growth corresponds with the changes both in environment and people's style of life. The progress of viral, bacterial, fungous and parasite eye infection is often complicated by allergic reaction [6, 14, 8, 13].

Keywords: allergy, immune system, children, eyes

In spite of numerous measures taken, every year number of children suffering allergic and immune inflammatory diseases is increasing. There are many reasons of that, but the result is always the same: immature immune system. As a rule, it is provoked by immature digestive system, helminthes invasion and disbacteriosis [4, 12].

Isolate laboratory data mostly do not let us evaluate the functional status of protective systems of visual organs characterized by the markers contained in lachrymal liquid and appearing in case of increased permeability of hem ophthalmic barrier. On the basis of these data it is possible to reveal the symptoms of immunologic deficiency [7, 9].

In relation with that the application of diagnostic and prognostic abilities of the calculation indexes nowadays gain significance, as certain combinations of the values of hemogram reflect integral characteristics of homeostatic systems of organism which form non-specific adaptation reactions. [2, 3, 10, 11].

All the aforesaid let us formulate the aim of this research: to study peculiarities of the local inflammatory process and immune response in children with allergic diseases of the eye.

Material and the methods of the research

76 sick children with allergic diseases of eyes aged from 3 to 5 years old were examined in the TashPMI children clinics facilities. Among them there were 53 (69,7%) boys and 23 (30,3%) girls.

The sick children with allergic diseases of eyes were divided to 2 groups. The first group included 34 children with allergic alterations on the surface of eyes and the second group – 42 sick children with infectious alterations. The control group included 12 healthy children under 6 years old without clinical-functional and laboratory symptoms of allergic diseases.

Criteria of exclusion from the research in all groups were taking of antihistamine and hormonal agents. All sick children had standard ophthalmologic examinations.

All children had analysis of hematologic values with the calculation of leukocyte index of intoxication (LII), allergization index (AI), lymphocyte and eosinophile correlation index, leukocyte shift index based on the correla-

tion of the number of blood cells proposed by Chistyakova T.N. and co-authors (2005).

The choice of the checked local and systemic immunologic and biochemical parameters was determined by the following: self-descriptiveness, availability of the research methods for blood and lachrymal liquid, and the most important – prognostic significance and differentiated approach in the study of the allergic diseases of eyes associated with an infection, allergic components and change of the infectious disease to infectious-allergic form which is hardly diagnosed causing difficulties in choosing the tactics of the therapy and care of that category of patients.

0,5 ml of lachrymal liquid for the research was taken by means of micro tube from the lower conjunctive fornix of the eye into a dry hermetic test tube.

We performed the study of the concentration of circulating immune complexes (CIC) in tears by means of the precipitation method using 7,5% solution of polyethylene glycole – 6000 on borate buffer. The research was performed on SF-16 spectro meter with the wave length 450 nm. The amount of CIC was expressed in reference units (ref.un). concentration of C-reactive protein, complement component, C₃, G₂M and A class immunoglobulin, alfa-2-macro globulin, seruplasmin and lactate dehydrogenase were checked by means of the immune enzyme analysis (IEA) using the reactant kits by «Human». The amount of immunoglobulin E in serum and immunoglobulin A in lachrymal liquid was studied by IEA method using kits by «Monolind» and «Immunodiagnostic», supplied by BioChimMac company (Russia) and the values were expressed in IU/ml.

Results of research and their discussion

Children of the 1st group with infectious alterations had noted rise of intoxication index and acuity of inflammation 3,2 times ($P < 0,05$) in comparison with the control group. The rise of LII is interrelated with the decrease of percentage of nuclear forms of leukocytes and lymphocyte number. Appearance of young and immature neutrophiles in the blood of the children proves the tension of compensatory processes providing detoxication. That group of children had double increase of leukocyte shift index (LSI) indicating activation of the inflammatory process and disorder of immunologic reactivity (Table 1).

Table 1

The values of blood and lachrymal liquid of the patients with allergic diseases of eyes

Values	Healthy individuals (control)	Patients with allergic diseases of eyes	
		Infectious alterations	Allergic alterations
Leukocyte intoxication index (LII)	0,37 ± 0,04	1,21 ± 0,12*	0,07 ± 0,01*
Leukocyte shift index (LSI)	1,12 ± 0,13	2,01 ± 0,17*	0,76 ± 0,09
Lymphocyte and eosinophiles correlation index (LECI)	23,0 ± 1,72	30,0 ± 2,01*	6,2 ± 0,56*
Allergization index	0,92 ± 0,11	0,45 ± 0,04*	1,9 ± 0,22*
C-reactant protein in LL, mkg/ml	5,45 ± 0,82	184,2 ± 11,01*	54,6 ± 4,53*
Activity of LDG in LL U/l	11,9 ± 0,92	16,4 ± 1,44*	12,6 ± 1,11

Note. * – reliable difference $p < 0,05$ in comparison with the control group; LL-lachrymal liquid.

The allergization index was decreased average 2 times. Activation of inflammatory process was also proved by 30-times increase of the level of C-reactant protein not only in blood but also in lachrymal liquid ($P < 0,05$).

Thus, on the basis of the study of integral hematologic values and the level of C-reactant protein we confirmed the nature of the allergic diseases of the eye – that is inflammatory nature.

Definition of the activity of lactate dehydrogenase (LDG) and the complement components in lachrymal liquid has great importance in the

diagnosis of inflammatory diseases. As it is seen in the achieved results, activity of LDG in LL increased 1,4 times, the level of complement component 1,8 times indicating the so-called alternative mode activation of the complement.

One of the factors of complement system alternative mode activation is increase of the level of micro organism liposaccharides and A class immunoglobulins causing increase of vascular wall permeability with developing edema, which in its turn has hemotoxic and damaging effect (Table 2).

Table 2

The values of blood and lachrymal liquid of patients with allergic diseases of the eye

Values	Healthy individuals (control)	Patients with allergic diseases of the eye	
		Infectious alterations	Allergic alterations
IgE in blood serum, IU/ml	127,6 ± 2,11	112,4 ± 4,91	342,3 ± 11,2*
SIgA in LL, g/l	0,34 ± 0,03	0,16 ± 0,01*	0,26 ± 0,01*
CIC in LL (ref.un)	13,9 ± 2,11	18,9 ± 1,71	72,6 ± 1,92*
Complement component C ₃ in LL, mol/l	0,81 ± 0,13	1,43 ± 0,14*	1,74 ± 0,15*
Amount of Ig A in LL, g/l	1,02 ± 0,13	1,18 ± 0,05	0,68 ± 0,07*
Amount of Ig M in LL, g/l	0,019 ± 0,01	0,016 ± 0,01	0,043 ± 0,002*
Amount of Ig G in LL, g/l	0,24 ± 0,03	0,41 ± 0,05*	0,85 ± 0,09*

Note: * – reliable difference $p < 0,05$ in comparison with the control group; LL-lachrymal liquid.

Thus, in case of allergic diseases of the eye with infectious alterations, on the basis of the study of hematologic indexes we can observe hyper sensitivity slow type allergic damage of eyes linked, as a rule, with bacterial and fungous infection.

In case of bacterial form allergic character a child has a lot of pus excreted at night. Most of the children complain about adhesion of lids after sleeping, strong aching in eyes, feeling of

alien substance in the eye, photophobia, hyperemia of mucous membranes.

On the aforesaid background physical factors become allergens. Allergic reactions, which can be specific and non-specific, develop as a response to allergen penetration into organism and promote production of antibodies and lymphocytes able to interact to that allergen. Since that moment the stage of mediator forming starts and the mediators (histamine, serotonin) damage tissue cells.

The children with allergic alterations (2nd group) examined by us had average 2 times growth of allergization index (AI) ($P < 0,05$), while the other integral values of blood showed decrease of the indexes such as LII (5 times), LSI (1,5 times) and LECI (3,8 times).

According to the reference data the value of LII is diminished in case of the decrease of the level of endogenic intoxication and increase of eosinophiles amount. 3.8 times diminishing of the lymphocytes and eosinophiles correlation index of the children of that group must be determined by immediate type hyper sensitivity and disorder of immunologic reactivity of organism.

Usually immediate type hyper sensitivity reactions develop within 30 minutes starting from the moment of allergen impact. Immediate conjunctive reactions are caused by releasing of biologically active mediators from the granules of mastocytes to conjunctive at the time of their activation and degranulation. The released mediators cause itching of eye-lids, photophobia, epiphora, edema and hyperemia of the mucous membrane.

Immediate type allergic reaction is interrelated with formation of IgE class antibodies which fix on mastocytes and promote secretion of histamine, heparin, etc. apparently the increase of eosinophiles in number in the checked individuals is determined by the presence of histaminose and heparinose in these cells and these substances neutralize biogenic amines and heparin. In its turn, it should be noted that histamine is hem toxic to eosinophiles.

In that type of reactions in the organisms of the children of the 2nd group there can be formed antibodies to the cells of eye tissue – mostly IgG and IgM.

The analysis of the achieved results indicated the growth of the level of M antibodies 2,3 times and G class 3,6 times ($p < 0,05$). These antibodies are called precipitating because of their ability to form precipitate by means of joining to corresponding antigen. As it is seen from the results of the research that kind of immune complexes precipitate 2,5 times exceeded the original values ($p < 0,05$). That leads to the classic mode activation of complement system and it is displayed in 1,6 times rise of complement level in lachrymal liquid ($p < 0,05$) in comparison with the control group.

New formed immune complexes are phagocytes by eosinophiles causing activation of proteolysis in the places of immune complexes accumulation. As a result there is damage of cells and tissues and subsequent activation of the local inflammation process. The latter is proved by average 10 times rise of C-reactive protein level in lachrymal liquid ($p < 0,05$).

The activation of the inflammatory process with the background activation of C₃ component leads to the increase of vascular wall permeability with development of edema and intensification of hem taxis of eosinophiles to lachrymal liquid.

Thus the children with allergic diseases of the eye associated with allergic alterations have the rise of allergization index and IgE in blood, level of C-reactive protein, CIC, C₃ complement and amount of IgM and G in lachrymal liquid. That enables us to conclude, that application of integral indexes of blood and values of immune-protection system makes it possible to differentiate the presence of inflammation and allergization process relevant to it.

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