

Lacrimal activity and immunological performance in children with enterovirus uveitis

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The control group consisted of 50 healthy people. The study was conducted among 150 children aged from 3 months to 14 years old with uveitis caused by enterovirus uveitis (EVU) in the population of Azerbaijan. They were divided into three groups depending on the etiology of the disease. The first group included 82 children with viral eye diseases; the second group included 42 children with viral-bacterial diseases; the third group included 26 children with viral-allergic eye diseases. One of the factors for the alternative activation of the complement system is considered to be the increase in the level of immunoglobulins of class A that leads to increased vascular permeability and the development of edema, which in turn has chemotoxic and devastating effects. In children with allergic eye changes, the IgE level increases on average by 2.2 times ($p<0.05$), which indicates an increase in the chemotaxis of eosinophils with eye age. As shown by the survey data, when comparing with healthy children, there is a 3.2-fold increase in the index of intoxication and aggravation of the inflammatory process in 26 sick children ($p<0.05$), while in 42 children allergy index is on average 2 times higher, increases are observed ($p<0.05$). At this time, the rise in the leukocyte intoxication index is associated with a decrease in the percentage of nuclear white blood cells and a decrease in the number of lymphocytes. The formation of young and immature forms of neutrophils in the blood of examined children with pronounced eye allergies indicates the strain of compensatory processes providing detoxification. Analysis of the data found that the tear concentration and fibrinogen levels in both groups of patients differed from and between control values indicating an increase in local hemostatic potential. At this time the dynamics of the coagulation activity of lacrimal liquid and the amount of fibrinogen in this pathology indicate the presence of hemocirculatory disorders in the retinal vessels and choroidea, which indicates the importance of the study of hemostasis in inflammatory and allergic processes.

Keywords: Enteroviral uveitis, etiology, immune status, enteroviral infection, coagulation activity, lacrimal fluid, children

INTRODUCTION

Children's health is a global health priority. Visual protection, prevention and treatment of eye diseases and injuries, prevention of blindness and impairment, reduction of disability are considered as one of the main links in the struggle for children's health, which is of great socio-economic importance.

In modern times, a dominant increase in

allergic diseases among children is spread. In Western countries, the number of persons suffering from allergic diseases is on average 20% of the total population, in some regions reaching 40-50% (Heydarova, 2014; Mammadova, 2015). In this case, 80-90% of all allergies are diagnosed with eye lesions.

Over the last 30 years, new, severe forms of enterovirus infection have appeared - acute hemorrhagic conjunctivitis caused by enterovirus

70 and polio-like diseases caused by enterovirus 71, enterovirus infection manifesting via uveitis, retinal diseases caused by the enterovirus Koksacki B4 (Xiao et al., 2014; Jacob, 2014). The emergence of relatively new etiological factors underlying pathological conjunctival changes plays a major role in changing and increasing the structure of the disease. In the medical literature, a lot of research is devoted to the role of various allergens in eye diseases. There are also national features of the clinical course of allergic eye diseases in children, the study of which is of great practical importance. Tears consist of a poly-component metabolic active biological system in which various metabolic, immunological, regulatory, protective and many biochemical processes are actively developed (Schwartzman, 2016).

The purpose of the study was to learn the coagulation activity of tears and immunological indicators in children with enterovirus uveitis.

MATERIALS AND METHODS

The study was conducted among 150 children aged 3 months to 14 years old with uveitis caused by an enterovirus infection in the population of Azerbaijan. The control group consisted of 50 healthy people.

All children were examined for hematological indicators, for which they calculated: leukocyte intoxication index (LII), allergy index (AI) - this was done by G.N.Chistyakov et al. (2005). We have studied determining the ratio of cells to the total amount in the blood (Mammadova, 2015). The concentration of C-reactive protein was studied by the IFA method, using the sets of the company «Monolind» and «Immunodiagnosics», presented by the company «BioKsimMc». Immunoglobulin concentrations of classes G, M and A were studied by immune analysis (IFA). The sets of companies «NIMAN», «Monolind» and

«Immundagnostic» (Russia) presented by BioKsimmak company were used and the results were expressed in BV/ml. The state of the local hemostatic potential was determined on the basis of a study of the coagulatory activity of the tear, which was estimated on the basis of the difference in the time of the clot formation with and without the addition of observed tears to the serum of donor blood (Schwartzman, 2016). The quantity of fibrinogen was determined by means of sets «Nemostat». The statistical processing of the obtained results was carried out by determining the mathematical mean number (M) and the error index (t) according to the known method of variation statistics.

RESULTS AND DISCUSSION

Children with EWN were divided into three groups depending on the etiology of the disease. The first group included 82 children with viral eye diseases; the second group included 42 children with viral-bacterial diseases; and the third group included 26 children with viral-allergic eye diseases. The control group consisted of 50 healthy children under the age of 14 years old without clinical-functional and laboratory signs of viral and allergic eye diseases. The criteria for exclusion in all groups were: taking antihistamines and hormonal drugs. All children were given standard ophthalmological examinations. The tears were collected from the lower conjunctival arch of the eye into a dry, sealed vial of 0.5 ml through a microcannula for examination.

One of the factors for the alternative activation of the complement system is considered to be the increase in the level of immunoglobulins of class A that leads to increased vascular permeability and the development of edema which in turn has chemotoxic and devastating effects (Table 1).

Table 1. Tear rates (SG) in patients with allergic eye diseases

Parameters	Control group (n=50)	1 st group (n=82)	2 nd group (n=42)	3 rd group (n=26)
sIgA, g/l	0.32 ±0.01	0.14±0.01*	0.19±0.01*	0.27±0.01*
IgA amount, g/l	1.04±0.12	1.21±0.04	1.32±0.07	0.72±0.06
IgM amount, g/l	0.018±0.01	0.015±0.05	0.017±0.04	0.042±0.02*
IgG amount, g/l	0.28±0.02	0.42±0.04*	0.51±0.03*	0.81±0.08*
IgE amount, BV/ml	12.6±1.04	18.7±1.14*	19.4±1.12*	26.8±2.14

Note: *-valid differences from the control group ($p < 0.05$)

Table 2. Tear rates in patients with viral-allergic eye uveitis

Parameters	Control group (n=50)	1st group (n=82)	2nd group (n=42)	3rd group (n=26)
Leukocyte intoxication index	0.36 ±0.02	1.16±0.02*	1.22±0.08*	0.08±0.02*
Allergization index	0.96±0.11	0.52±0.06	0.71±0.06	1.65±0.24
S-reactive protein, µg/ml	5.48±0.76	112.5±12.6	94.6±11.9	55.8±4.96*
Coagulation activity (sec)	32.75±2.34	65.72±4.28*	0.51±0.03*	0.81±0.08*
Fibrinogen (ng/dl)	237.8±9.12	256.8±8.25*	262.2±9.3*	327.4±12.6

Note: *-valid differences from the control group

In children with allergic eye diseases associated with infectious changes, secretory immunoglobulin A decreased on average by 24.0% ($p < 0.05$), while in the group with allergic changes the level of sIgA in the eyes was 21.0% ($p < 0.05$). In this type of reaction, children who have been diagnosed with eye infection may develop antibodies to the eye tissue, mainly Ig and IgM class antibodies. Analysis of the obtained survey data shows an increase in the level of antibodies M-class 2.3 times and antibodies G-class 3.6 times ($p < 0.05$).

These antibodies are called precipitators because of their ability to form sediment when combined with the corresponding antigen. An acute type of allergic reaction is associated with the formation of IgE class antibodies - they are fixed in barrier cells and histamine, heparin, etc. create conditions for secretion. The increase in eosinophils in both groups was probably determined by the presence of histamines and Heparinoids in these cells - they neutralize biogenic amines and heparin. In turn, it should be noted that histamine is chemotoxic.

The acute hypersensitivity reaction during their activation and degranulation causes the release of biologically active mediators from granule barrier cells into the conjunctiva due to the high level of IgE class antibodies. In children with allergic eye changes, the IgE level increases on average by 2.2 times ($p < 0.05$), which indicates an increase in the chemotaxis of eosinophils with eye age. However, among the children examined with eye infections, the study exceeded the baseline by 43 percent ($p < 0.05$). Using hematologic indicators, we decided to approach the understanding of some aspects of etiopathogenesis of allergic eye diseases in

children and conditionally divided the affected children into 2 groups: with infectious changes and with allergic changes.

As shown by the survey data (Table 2), when comparing with healthy children, there is a 3.2-fold increase in the index of intoxication and aggravation of the inflammatory process in 26 sick children ($p < 0.05$), while in 42 children, IA is on average 2 times higher, increases are observed ($p < 0.05$).

At this time the rise in LII is associated with a decrease in the percentage of nuclear white blood cells and a decrease in the number of lymphocytes. The formation of young and immature forms of neutrophils in the blood of examined children with pronounced eye allergies indicates the strain of compensatory processes providing detoxification. In children with infectious changes, the opposite clinical picture was observed, as in children with infectious changes, LII indicators increased by 3.3 times compared with the benchmarks ($p < 0.05$) and 17.3 times compared with children who have got allergic eyes ($p < 0.01$). In the 1-st group of children inflammatory process activation was also assumed by the amount of S-reactive protein - its level was 30 times higher than the initial value in the group with infectious changes while the level of S-reactive protein in the group associated with allergic changes only 10 times higher than the reference group ($p < 0.05$). So, in the eye age, we proved the nature of allergic eye diseases associated with infection and allergies by studying the integral hematological indicators and the level of S-reactive protein.

As it is known, local hemostatic potentials play an important role in this pathology. Therefore, we decided to assess the

informativeness of the study of tear-coagulation activity in this pathology. Thus, the coagulation activity of the tears increased reliably depending on the indicators of the reference group ($p < 0.05$). In children with infectious changes, these indicators were significantly reduced and differed from those with allergic changes (82.6 ± 7.01 against 62.8 ± 4.5 , $p < 0.05$). The amount of fibrinogen tended to increase in both groups compared to the control group ($p < 0.05$). The highest rates were recorded in children with allergic changes (264.6 ± 8.51 ng/dl versus 331.2 ± 11.02 ng/dl $p < 0.05$).

CONCLUSIONS

1. Analysis of the data found that the tear concentration and fibrinogen levels in both groups of patients differed from and between control values, indicating an increase in local hemostatic potential. At this time, the dynamics of the coagulation activity of GH and the amount of fibrinogen in this pathology indicate the presence of hemocirculatory disorders in the retinal vessels and choroidea, which indicates the importance of the study of hemostasis in inflammatory and allergic processes.

2. In children with allergic eye diseases associated with allergic changes, there is a noticeable increase in the amount of the allergenic index and IgE against the background of a decrease in the level of S-reactive protein and the amount of IgM and G per eye age. Based on the examination of hematologic indicators in children

with infectious changes, an allergic lesion of slow-type hypersensitivity eyes was found, which was accompanied by an increase in LII, S-reactive protein and IgG in the eye age.

REFERENCES

- Foster C.S.** (2014) Diagnosis and treatment of uveitis. Philadelphia: W.B. Saunders Company, 900 p.
- Heydarova N.F.** (2014) Assessment of the impact of enterovirus infection on the condition of newborns. Scientific Journal "Fundamental Research" (Moscow), **No 4 (part 1):**72-75 (in Russian)
- Jacob C.O.** (2014) Studies on the role of tumor necrosis factor in murine and human autoimmunity. *J. Autoimmun.*, **5(12):** 133-143.
- Mammadova M.N.** (2015) Results of epidemiological surveillance of enteroviral gastroenteritis in Azerbaijan at the socio-ecosystem, cellular and subcellular levels. Russian Medical Journal (Moscow), **XXI (2):**36-39. (in Russian)
- Schwartzman S.** (2016) Advancements in the management of uveitis. *Best Pract. Res. ClinRheumatol.*, **30(2):** 304-315.
- Xiao H., Huang K., Li L., Wu X., Zheng L., Wan C., Zhao W., Ke C., Zhang B.** (2014) Complete genome sequence analysis of human echovirus 30 isolated during a large outbreak in Guangdong Province of China, in 2012. *Arch.Virol.*, **159(2):**379-383.

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