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Severity Of Erythrocyte Aggregation In Patients With Hyperuricemia.

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ABSTRACT

The wide prevalence of thrombosis among patients with hyperuricemia is largely due to the development of hyperaggregation of blood cells in them. The frequent occurrence of hyperuricemia in developed countries is a serious reason for the detailed evaluation of the aggregation of the most numerous population of blood cells, erythrocytes, in these patients. The aim of the work is to find out the disturbances in the aggregation properties of erythrocytes in patients with hyperuricemia. In this study, 32 patients with hyperuricemia of the second adulthood were examined. The control consisted of 26 clinically healthy people of the second adulthood. Biochemical, hematological and statistical methods of investigation were used. In patients, an excess of cholesterol in the membranes of erythrocytes, a decrease in their level of total phospholipids. This was accompanied by activation of processes of lipid peroxidation in their erythrocytes. In the patients examined, a marked increase in spontaneous aggregation of erythrocytes was found. The revealed enhancement of aggregation properties of erythrocytes should be considered as a consequence of activation of lipid peroxidation, metabolic disturbances and a functionally unprofitable change in the ratio of biologically active substances in the blood. The presence of hyperaggregation of erythrocytes in patients with hyperuricemia dramatically increases the risk of thrombosis, which can lead to persistent disability or death.

Keywords: thrombophilia, hyperuricemia, pathology, aggregation, erythrocytes.

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INTRODUCTION

Till now in all countries of the world the wide prevalence of a hyperuricemia is marked [1,2]. Its presence in a person greatly increases the likelihood of developing thrombosis of any localization threatening disability and early death [3,4].

The high incidence of thrombosis in patients with hyperuricemia is associated with hyperaggregation of blood cells [5,6], which is manifested by deterioration of the rheological properties of the blood. This circumstance strongly stimulates hemostasis and is an important factor in the development of thrombosis [7,8,9]. It is known that the aggregation of blood cells is also associated with an increase in their sensitivity to disaggregants synthesized in the wall of the vessel. This is due to a change in the state of blood cell receptors [10,11]. The widespread prevalence of hyperuricemia provides a great interest to her researchers, especially regarding the condition of this category of patients with erythrocyte aggregation.

The aim of the work is to find out the disturbances in the aggregation properties of erythrocytes in patients with hyperuricemia.

MATERIAL AND METHODS

The research was approved by the Ethics Committee of Russian State Social University (record №5 from 12.05.2014).

32 patients with hyperuricemia [12] of the second adulthood (mean age 51.3 ± 2.3 years) were examined. The control group included 26 clinically healthy people of the second adulthood. All persons involved in the study gave written information consent to participate in it, according to the generally accepted procedure [13].

The activity of lipid peroxidation (LPO) in plasma was determined by the level of thiobarbituric acid (TBA) -active products by the Agat-Med kit (Russia) and the amount of acyl hydroperoxides (AHP) [14]. The level of antioxidant capacity of plasma was determined by the method of [15].

The state of LPO in erythrocytes was determined by the number of malonic dialdehyde (MDA) in them and the content of AHP in them after washing and resuspension [14]. Also, in the washed and resuspended red blood cells, the amount of cholesterol was determined by the enzymatic colorimetry method by the kit of the company Vital Diagnosticum (Russia) and the total phospholipids by the phosphorus content in them by the conventional method.

The level of spontaneous aggregation of erythrocytes in plasma was recorded under a light microscope in Goryaev's chamber [16]. The values of the number of erythrocyte aggregates, the number of aggregates and erythrocytes not aggregated [17] were taken into account.

The results were processed by Student's criterion (t). Statistical processing of received information was made with the help of a programme package "Statistics for Windows v. 6.0", "MicrosoftExcel". Differences in data were considered reliable in case of $p < 0.05$.

RESEARCH RESULTS AND DISCUSSION

In the patients under observation, the activation of LPO in plasma was found - the amount of AHP in it exceeded the control by 2.1 times, the concentration of TBA-active products - 1.4 times, as a result of weakening of the antioxidant activity of the plasma by 1.3 times (Table).

The examined patients showed an increase in the content of cholesterol in the erythrocyte membranes with a decrease in total phospholipids in them. At the same time, in red blood cells, LPO was enhanced due to the weakening of their antioxidant defense (Table).

Spontaneous aggregation of erythrocytes was increased in all patients (Table). This was judged by increasing the level of their total involvement in aggregates (by 49.4%), an increase in the number of these aggregates (by 23.3%) and a decrease of 33.7% in non-aggregated erythrocytes.

Table. Registered indicators in the surveyed

Registered parameters	Patients, n=32, M±m	Control, n=26, M±m
acylhydroperoxides plasma, D ₂₃₃ /1ml	3.06±0.14	1.42±0.09 p<0.01
TBA-compounds, µmol/l	5.01±0.18	3.56±0.07 p<0.01
antioxidant activity plasma, %	24.5±0.15	32.9±0.12 p<0.01
biochemical parameters of erythrocytes		
cholesterol of erythrocytes, µmol/10 ¹² erythrocytes	1.27±0.005	1.04±0.004 p<0.01
common phospholipids of erythrocytes, umol/10 ¹² erythrocytes	0.60±0.012	0.75±0.003 p<0.01
acylhydroperoxides of erythrocytes, D ₂₃₃ /10 ¹² erythrocytes	4.42±0.16	3.08±0.10 p<0.01
malonic dialdehyde of erythrocytes, nmol/10 ¹² erythrocytes	1.53±0.03	1.14±0.05 p<0.01
catalase of erythrocytes, ME/10 ¹² erythrocytes	8600.0±12.5	11196.0±22.4 p<0.01
superoxidismutase of erythrocytes, ME/10 ¹² erythrocytes	1700.1±1.86	1986.0±7.01 p<0.01
aggregation of erythrocytes		
sum of all the erythrocytes in an aggregate	62.6±0.12	41.9±0.10 p<0.01
quantity of aggregates	11.1±0.14	9.0±0.06 p<0.01
quantity of free erythrocytes	179.5±0.95	240.0±0.23 p<0.01

Note: p - reliability of differences in the indices of a group of patients and a control group.

Serious importance in the development of violations of hemostasis and rheology of blood and the formation of a risk of thrombosis in persons with hyperuricemia has an increase in erythrocyte aggregation [18, 19]. In patients with hyperuricemia, the antioxidant activity of the plasma decreases, which causes an increase in LPO activity [20]. This strongly damages the erythrocyte membranes [21] and is burdened by the development in the erythrocytes of these patients of the lipid imbalance that promotes their hyperaggregation. At the same time, the disaggregating properties of erythrocytes weakens [22,23]. This pathology gradually strengthens the aggregation of erythrocytes in the patients observed [24]. The increased amplification of erythrocytes in patients with hyperuricemia is largely due to the weakening of their disaggregating properties [25,26] and the decrease in the number of negative proteins on them [27]. The onset of depression of the antioxidant properties of the plasma forms an intensification of peroxidation processes in it and as a result of it pronounced oxidative damages of endotheliocytes and globular plasma proteins arise [28,29]. Under these conditions, the strengthening of the connection of erythrocytes with each other increases, which leads to an increase in the blood number of their aggregates [30, 31]. At the same time, imbalance in erythrocytes of adenylate cyclase and phosphodiesterase activity is formed [32,33]. This contributes to a decrease in the level of cyclic adenosine monophosphate in their cytoplasm and an increase in the amount of free Ca²⁺, which additionally strongly stimulates the aggregation of erythrocytes [34, 35].

CONCLUSION

For patients with hyperuricemia, a high incidence of thrombosis is characteristic. This was an important reason for the survey of this contingent of patients. During the study, it was found that with hyperuricemia, there is a decrease in the level of antioxidant protection of the plasma and an increase in the processes of lipid peroxidation, which adversely affects all blood cells. It is established that for patients with hyperuricemia, spontaneous aggregation of erythrocytes is characteristic. The emerging situation creates the basis for the development of vascular complications in these patients [36,37,38].

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