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Severity Of Aggregation Properties Of Neutrophils In Patients With Hyperuricemia

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ABSTRACT

Overeating, which is very common in modern society, leads a large number of people to develop metabolic disorders, including hyperuricemia. At the same time, thromboses of different localization are often noted in this category of patients. This is caused in these patients by hyperaggregation of their blood cells. The goal is to assess the level of aggregation activity of neutrophils in patients with hyperuricemia. We examined 32 patients of the second adulthood (mean age 51.3 ± 2.3 years) with hyperuricemia. The control group consisted of 26 clinically healthy people of the same age. All examined persons gave written informed consent to participate in the study. Biochemical, hematological and statistical methods of investigation were used. The frequency of high thrombosis of various localizations in hyperuricemia is closely related to the development of angiopathy on their background. Weakening of antioxidant protection of the plasma with activation of the processes of lipid peroxidation in it, leading to a change in the vascular wall, is noted in hyperuricemia. It was found that persons with hyperuricemia have an obvious weakening of disaggregation of vascular lesions of the vascular wall with an increase in the aggregative capacity of neutrophils. As a result, patients receive a sharply increased risk of thrombosis of any location, which can lead to disability and death.

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

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INTRODUCTION

Regular overeating of high-calorie meat foods very often leads to the development of hyperuricemia very common in developed countries [1,2]. Very often, hyperuricemia in persons of working age is registered with thrombosis of the vessels, contributing to disability and early death [3]. It was noted that a high incidence of thrombosis in persons with hyperuricemia is caused by activation of the aggregation properties of blood cells [4,5]. It is known that their excessive aggregation leads to the activation of hemostasis and the development of a risk of thrombosis [6,7,8]. This is due to the depression of the sensitivity of blood cells to prostacyclin and nitrogen oxide [9,10]. The frequent occurrence of hyperuricemia in the population and its serious significance for the aggregation capacity of neutrophils, it was important to evaluate the aggregation properties of these cells in this category of patients [11].

The goal is to evaluate the level of aggregation activity of neutrophils 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).

We examined 32 patients of the second mature age (mean age 51.3±2.3 years) with hyperuricemia [12]. The control group was composed of 26 clinically healthy people of the same age. All the examined persons gave written informed consent on participation in the research. All participants in the study gave their written consent to participate in it [13].

Intensity of lipids' peroxidation (LPO) processes in plasma was estimated according to the content of thiobarbituric acid (TBA)-active products by a kit "Agat-Med" and acylhydroperoxides (AHP) [14]. Antioxidant abilities of liquid part of blood were determined according to the level of its antioxidant activity [15].

LPO activity in studied regular blood elements was determined according to the quantity of malon dialdehyde (MDA) in reduction reaction of thiobarbituric acid in washed and resuspended cells and the content of AHP in them [14]. In studied washed and resuspended regular blood elements we estimated the levels of cholesterol by enzymatic colorimetric method with the help of a kit "Vital Diagnostikum" and total phospholipids according to the content of phosphorus in them.

Aggregation of neutrophils was assessed on a photoelectrocolorimeter [16]. Inductors were used lectin wheat germ at a dose of 32 μg/ml, concanavalin A - 32 μg/ml and phytohemagglutinin - 32 μg/ml.

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

RESEARCH RESULTS AND DISCUSSION

The patients were noted to have evident plasma LPO activation – the content of AHP in it surpassed the control value in 2.1 times, TBA-active products – in 1.4 times, being accompanied by suppression of antioxidant plasma activity in 1.3 times (Table).

The observed patients were noted to have increased cholesterol content in neutrophils membranes which was accompanied by the decrease of total phospholipids in them and LPO activation on behalf of weakening of their antioxidant protection (Table).

Aggregation of neutrophils was assessed on a photoelectrocolorimeter [16]. Inductors were used lectin wheat germ at a dose of 32 μg/ml, concanavalin A - 32 μg/ml and phytohemagglutinin - 32 μg/ml.

Important significance in the development of rheological disturbances and thrombophilia in persons with hyperuricemia belongs to aggregation increase of regular blood elements and especially – neutrophils [17,18]. At hyperuricemia the depression of plasma antioxidant activity is formed which provides the increase

of LPO activity in it [19]. The increase of freely radical processes in liquid part of blood inevitably promotes the damage of neutrophils' membranes [20]. The development of these manifestations in combination with found in these patients' neutrophils lipid imbalance leads to their hyperaggregability. At the same time, the level of disaggregating properties in platelets decreases [21,22,23].

Table. Registered indicators in the surveyed

Registrated 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 neutrophils		
cholesterol of neutrophils, µmol /10^9 neutrophils	0.78±0.014	0.62±0.004 p<0.01
common phospholipids of neutrophils, µmol/10^9 neutrophils	0.39±0.002	0.51±0.003 p<0.01
acylhydroperoxides of neutrophils, D_{233}/10^9 neutrophils	3.35±0.07	2.36±0.05 p<0.01
malonic dialdehyde of neutrophils, nmol/10^9 neutrophils	1.28±0.08	0.73±0.03 p<0.01
catalase of neutrophils, ME/10^9 neutrophils	6500.0±17.91	9950.0±19.77 p<0.01
superoxidismutase of neutrophils, ME/10^9 neutrophils	1380.0±5.26	1780.0±4.21 p<0.01
aggregation of neutrophils		
Aggregation with lectin, %	21.8±0.12	15.6±0.07 p<0.01
Aggregation with concanavalin A, %	19.7±0.16	14.8±0.04 p<0.01
Aggregation with phytohemagglutinin, %	40.8±0.05	30.6±0.09 p<0.01

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

The increase in neutrophil aggregation in patients studied in the study is strongly associated with the weakening of their sensitivity to vascular disaggregants, while the activity of glycoprotein receptors on the surface of leukocytes increases with respect to lectins used as inducers [24,25]. The amplification caused by lectin and concanavalin A of neutrophil aggregation in plasma taken against a background of temporary venous occlusion in patients with hyperuricemia is associated with an increase in the expression on the membrane of neutrophil receptors, which include in their composition many sites including N-acetyl-D-glucosamine, N-acetyl-neuraminic acid and mannose [26, 27]. Redundancy of neutrophil aggregation in response to phytohemagglutinin is associated with an increase in the portion of their receptors containing bD-galactose [28,29] with a decrease in receptor sensitivity to prostacyclin and NO [30,31,32].

CONCLUSION

The wide prevalence among the population of hyperuricemia requires a detailed study of this pathology. Great attention to it is caused by a high incidence of thrombosis in this category of patients. In the

conducted research it was established that in these patients in the plasma lipid peroxidation processes were intensified. Apparently, it is they that cause the development of hyperaggregation of blood cells. This leads to increased neutrophil aggregation. The weakening of their disaggregation capabilities reduces tissue trophism and increases the risk of thrombosis in patients with hyperuricemia [33,34,35].

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