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Features Of Disaggregation Effects Of Blood Vessels On Neutrophils In Patients With Hyperuricemia.

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ABSTRACT

Excessive meat nutrition of the population leads to a high incidence of hyperuricemia in a large part of the population of industrially developed countries. At the same time, thromboses of different localization are often noted in this category of patients. This is caused in these patients by violations of vascular functions, primarily their disaggregation capabilities with respect to blood cells. The aim is to assess the level of disaggregation effects of vessels on neutrophils in patients with hyperuricemia. We examined 32 patients of the second mature age (mean age 51.3±2.3 years) with hyperuricemia. 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. There were applied biochemical, hematological and statistical methods of investigation. High thromboses' frequency of various localizations at hyperuricemia is closely connected with angiopathy development against their background. Weakening of plasma antioxidant protection with activation of lipids' peroxidation processes in it leading to alteration of vascular wall, is noted in conditions of hyperuricemia. The persons with hyperuricemia are detected to have evident weakening of disaggregating vascular impacts of vascular wall on strengthening aggregative ability of neutrophils. In the result of it given patients get sharply increased risk of thromboses of any localization which can lead to invalidism and lethal outcome.

Keywords: neutrophils, vasopathy, hyperuricemia, vascular wall, antiaggregation.

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INTRODUCTION

Excessive consumption of high-calorie meat foods often leads to an increase in the prevalence among people in developed countries of hyperuricemia [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 is noted that the high incidence of thrombosis in persons with hyperuricemia is caused by depression of the disaggregation properties of the vessels [4,5]. It is known that excessive aggregation of blood cells develops largely due to vascular dysfunction, accompanied by activation of hemostasis and risk of thrombosis [6,7,8]. This is due to the depression of synthesis in the vessels primarily of prostacyclin and nitric 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 assess the state of vascular disaggregation control over these cells in this category of patients [11].

The goal is to assess the level of disaggregation effects of blood vessels on neutrophils in patients with hyperuricemia.

MATERIALS 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 CPL according to the content of phosphorus in them.

Evidence of vascular wall's control over neutrophils' aggregation was detected according to its weakening in the test with temporal venous occlusion [16].

The state of vascular monitoring over neutrophil aggregation was assessed in plasma taken under conditions of temporary venous occlusion and without it on a photoelectrocolorimeter. 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 $p<0.05$.

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 CS content in neutrophils membranes which was accompanied by the decrease of CPL in them and LPO activation on behalf of weakening of their antioxidant protection (Table).

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The neutrophil aggregation in response to the inducers used was more active than in the control group (with lectin 39.7%, concanavalin A 33.1%, phytohemagglutinin 33.3%) (Table).

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, umol/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, mkmol/10^9 neutrophils	0.78±0.014	0.62±0.004 p<0.01
common phospholipids of neutrophils, umol/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 in intact plasma		
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
vascular control of aggregation neutrophils		
Aggregation with lectin after temporary venous occlusion, %	19.0±0.12	11.8±0.06 p<0.01
Aggregation with concanavalin A after temporary venous occlusion, %	17.2±0.11	11.0±0.07 p<0.01
Aggregation with phytohemagglutinin after temporary venous occlusion, %	37.0±0.18	24.1±0.03 p<0.01

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

All the patients were noted to have the decrease of vessels' disaggregative impacts on neutrophils (Table).

In plasma, taken against a background of temporary venous occlusion, the patients showed a redundancy of neutrophil aggregation exceeding the values of the control group with all applied inducers (with lectin at 61.0%, with concanavalin A at 56.4%, with phytohemagglutinin at 53.5%).

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. The level of disaggregating impacts from the side of vascular wall [21,22] lowers simultaneously with it in respect of neutrophils [23].

The increase in neutrophil aggregation in patients studied in the study is strongly associated with the weakening of synthesis in the vascular wall of desaggregants, while the glycoprotein receptor activity 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 weakened synthesis in the vessels of prostacyclin and NO patients [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 vasopathy with a weakening of the production in the vessels of antiplatelet agents. This leads to a weakening in these patients of vascular control over the increasing aggregation of neutrophils. The weakening of the disaggregation capacity of the vessels and the increased aggregation of neutrophils reduce trophism of tissues and increase the risk of thrombosis in patients with hyperuricemia [33,34,35].

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