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Aggregational Activity Of Neutrophils In Patients With Hypertension With Hyperuricemia.

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ABSTRACT

Excessive psycho-emotional loads and excessive nutrition leads in modern society to a wide spread in the industrially developed countries to a high frequency of the combination of arterial hypertension and hyperuricemia. It is noticed that in this category of patients the frequency of thrombosis of different localization is high. This is caused by their violations of the functions of blood cells, primarily their aggregation capabilities. The aim is to evaluate the aggregation properties of neutrophils in patients with hypertension with hyperuricemia. We examined 55 patients of the second adult age (mean age 54,4 ± 2,4 years) with arterial hypertension 1 degree 2 degrees, with hyperuricemia. The control group consisted of 26 clinically healthy people of the same age. All the examined persons gave written informed consent to participate in the study. Biochemical, hematological and statistical methods of investigation were used. Weakening of the antioxidant protection of the plasma with activation of lipid peroxidation processes in it led to a change in the aggregation properties of neutrophils, which was noted in conditions of a combination of arterial hypertension with hyperuricemia. It was found that people with arterial hypertension and hyperuricemia have an obvious increase in the aggregative ability of neutrophils to be very significant for microcirculation. As a result, patients have a sharply increased risk of thrombosis of any location, which can lead to disability and death.

Keywords: neutrophils, arterial hypertension, hyperuricemia, pathology, antiaggregation.

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INTRODUCTION

Consumption of salt, meat and excessive stress leads to a high incidence of combination of arterial hypertension (AH) and hyperuricemia among the majority of the population of developed countries [1,2]. Very often, a combination of this pathology occurs in persons of working age, causing them to have a higher incidence of thrombosis of the vessels. This leads them to disability and early death [3]. It was noted that a high incidence of thrombosis in persons with AH and hyperuricemia with activation of blood cell aggregation [4,5]. It is known that excessive aggregation of blood elements develops largely due to vascular dysfunction, accompanied by activation of hemostasis and risk of thrombosis [6,7,8]. This process is ensured by a decrease in their sensitivity to disaggregants, primarily to prostacyclin and nitrogen oxide [9,10]. The frequent occurrence in the population of a combination of hypertension with hyperuricemia and serious significance for microcirculation of the aggregation capacity of neutrophils, it was important to assess its status in this category of patients [11].

The aim of the study is to evaluate the aggregation properties of neutrophils in hypertensive 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 41 patients of the second mature age (mean age 54.4±2.4 years) with AH of the 1^{st}-2^{nd} degree [12] 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. 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.

Aggregation of neutrophils was evaluated in plasma taken without temporal venous occlusion 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 2.3 times, TBA-active products – in 1.5 times, being accompanied by suppression of antioxidant plasma activity in 1.5 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).

The neutrophil aggregation in response to the inducers applied was more active than in the control group (lectin by 55.1%, concanavalin A by 41.9%, phytohemagglutinin by 37.9%) (Table).

Important significance in the development of rheological disturbances and thrombophilia in persons with AH and hyperuricemia belongs to aggregation increase of regular blood elements and especially – neutrophils [17,18]. At combination of AH and 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 their disaggregating abilities decreases in platelets [21,22,23].

Table. Registered indicators in the surveyed

Registrated parameters	Patients, n=41, M±m	Control, n=26, M±m
acylhydroperoxides plasma, D_{233} /1ml	3.27±0.08	1.42±0.09 p<0.01
TBA-compounds, mcmol / l	5.38±0.12	3.56±0.07 p<0,01
antioxidant activity plasma, %	22.2±0.17	32.9±0.12 p<0.01
biochemical parameters of neutrophils		
cholesterol of neutrophils, mkmol/10^9 neutrophils	0.85±0.012	0.62±0.004 p<0.01
common phospholipids of neutrophils, mkmol/10^9 neutrophils	0.34±0.006	0.51±0.003 p<0.01
acylhydroperoxides of neutrophils, D_{233}/10^9 neutrophils	3.68±0.08	2.36±0.05 p<0.01
malonic dialdehyde of neutrophils, nmol/10^9 neutrophils	1.53±0.09	0.73±0.03 p<0.01
catalase of neutrophils, ME/10^9 neutrophils	5300.0±21.85	9950.0±19.77 p<0.01
superoxidismutase of neutrophils, ME/10^9 neutrophils	1250.0±4.17	1780.0±4.21 p<0.01
aggregation of neutrophils		
Aggregation with lectin, %	24.2±0.15	15.6±0.07 p<0.01
Aggregation with concanavalin A, %	21.0±0.12	14.8±0.04 p<0.01
Aggregation with phytohemagglutinin, %	42.2±0.08	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 enrolled in the study is strongly associated with the weakening of the sensitivity of these cells to the synthesis of disaggregants in the wall of vessels, 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 hypertensive 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 their sensitivity to prostacyclin and NO [30,31,32].

CONCLUSION

The high frequency of occurrence in a modern society of a combination of arterial hypertension with 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 pathology of blood cells with a weakening of their sensitivity in vascular antiaggregants. This leads to an increase in neutrophil aggregation in patients. The weakening of their disaggregation capabilities and the intensification of their aggregation reduces the trophism of tissues and increases the risk of thrombosis in hypertensive patients with hyperuricemia.

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