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Vascular Control Of Erythrocytes In Patients With Hypertension With Hyperuricemia.

Medvedev IN*.

Russian State Social University, st. V. Pika, 4, Moscow, Russia, 129226

ABSTRACT

The frequent occurrence of thrombosis in hypertensive patients with hyperuricemia is strongly influenced by the presence of vasopathy. The wide prevalence in the developed countries of a combination of arterial hypertension with hyperuricemia is of great importance for the theory and practice of assessing the disaggregation properties of blood vessels in relation to the most numerous population of blood cells - red blood cells. The aim of the work is to assess the degree of disruption of the disaggregation properties of blood vessels in relation to erythrocytes in patients with arterial hypertension with hyperuricemia. 41 patients with arterial hypertension of 1-2 degree with hyperuricemia of the second adulthood were examined. The control consisted of 26 clinically healthy people of the second adulthood. In the work performed, biochemical, hematological and statistical methods of investigation were applied. The patients in the conducted study found an excess of cholesterol content in erythrocyte membranes, a decrease in the level of total phospholipids in them when lipid peroxidation processes were activated in them. In the examined patients, spontaneous aggregation of erythrocytes was found to increase. In this case, all patients found a decrease of vascular control over it. The revealed weakening of disaggregation control of blood vessels over aggregation of erythrocytes should be considered as a consequence of the effects of arterial hypertension with hyperuricemia of LPO activation, metabolic disturbances, increase of vascular spasm and changes in the ratio of biologically active substances in the blood. The presence of vasopathy in patients with hypertension with hyperuricemia dramatically increases the risk of thrombosis, often leading to persistent disability to them fatal.

Keywords: arterial hypertension, hyperuricemia, vascular wall, aggregation, erythrocytes.

**Corresponding author*

INTRODUCTION

As before, the prevalence of a combination of arterial hypertension (AH) and hyperuricemia persists in modern society [1,2]. The simultaneous presence of these two pathologies in a person increases the likelihood of thrombosis of any localization threatening invalidization and mortality in persons of mature age [3,4]. The high incidence of thrombosis in patients suffering from hypertension and hyperuricemia simultaneously is due, no doubt, to the presence of vasopathy [5,6], which is manifested by the weakening of vascular control over aggregation of blood cells. This strongly stimulates hemostasis and increases the risk of thrombosis [7,8,9]. It is known that the aggregation of blood cells is inhibited by substances by disaggregants synthesized in the vessel wall. The most active of these are prostacyclin and nitric oxide [10, 11]. The wide prevalence of the combination of hypertension with hyperuricemia retains a great interest in it for researchers, including. in relation to the condition of this category of patients with vascular control over erythrocyte aggregation. The aim of the study was to assess the degree of disruption of the disaggregation properties of blood vessels in relation to erythrocytes in hypertensive 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).

41 patients with AH of 1-2 degrees, risk 4 [12] with hyperuricemia of the second adulthood (mean age $54,4 \pm 2,4$ 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 state 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 number of acyl hydroperoxides (AGP). [14] The level of antioxidant capacity of plasma was determined by the method of [15].

The activity of LPO in erythrocytes was determined by the level of malonicdialdehyde (MDA) in them and the content of AGP in them after washing and resuspension. [14] Also in washed and resuspended erythrocytes, the amount of cholesterol was determined by enzymatic colorimetry Vital Diagnosticum (Russia) and general phospholipids in their phosphorus content by a conventional method The level of disaggregation of blood vessels over erythrocytes was assessed by the weakening of their aggregation in plasma taken after temporary venous occlusion.¹⁶ The level of spontaneous aggregation of erythrocytes in plasma with intact and the vessel walls obtained after temporary ischemia were recorded under a light microscope in Goryaev's chamber, taking into account the values of the number of erythrocyte aggregates, the number of aggregates and those not aggregated egatsiyu erythrocytes [17].

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 $p < 0.05$.

RESULTS AND DISCUSSION

In the examined patients, activation of LPO in plasma was found - the amount of AHP in it exceeded the control by 2.3 times, the concentration of TBA-active products - by 1.5 times, as a result of attenuation of the antioxidant activity of plasma by 1.5 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 an increase in the level of their total involvement in aggregates (by 62.7%), an increase in the number of these aggregates (by 50.0%) and a decrease of 59.2% in non-aggregated erythrocytes. In this case, all patients showed a decrease in the disaggregation effects of blood vessels on erythrocytes (Table). Thus, in the plasma

of patients received after temporary venous occlusion, the number of erythrocytes in aggregates exceeded the control by 74.5%, the number of these aggregates was increased by 47.1%, with a decrease in the number of non-aggregated red blood cells by 64.7%.

Table: Registered indicators in the surveyed

Registered 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, umol / 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 erythrocytes		
cholesterol of erythrocytes, umol/10 ¹² erythrocytes	1.34±0.008	1.04±0.004 p<0.01
common phospholipids of erythrocytes, umol/10 ¹² erythrocytes	0.5±0.010	0.75±0.003 p<0.01
acylhydroperoxides of erythrocytes, D ₂₃₃ /10 ¹² erythrocytes	4.70±0.13	3.08±0.10 p<0.01
malonic dialdehyde of erythrocytes, nmol/10 ¹² erythrocytes	1.65±0.07	1.14±0.05 p<0.01
catalase of erythrocytes, ME/10 ¹² erythrocytes	7450.0±14.0	11196.0±22.4 p<0.01
superoxidismutase of erythrocytes, ME/10 ¹² erythrocytes	1650.1±2.00	1986.0±7.01 p<0.01
aggregation of erythrocytes in intact plasma		
sum of all the erythrocytes in an aggregate	68.2±0.15	41.9±0.10 p<0.01
quantity of aggregates	13.5±0.16	9.0±0.06 p<0.01
quantity of free erythrocytes	150.7±1.02	240.0±0.23 p<0.01
aggregation of erythrocytes in plasma after temporary venous occlusion		
sum of all the erythrocytes in an aggregate	56.9±0.17	32.6±0.14 p<0.01
quantity of aggregates	10.3±0.15	7.0±0.07 p<0.01
quantity of free erythrocytes	185.7±1.20	305.3±0.18 p<0.01

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

Great importance in the development of rheological disorders and the formation of a risk of thrombosis in patients with AH and hyperuricemia has an increase in erythrocyte aggregation [18, 19]. In patients with a combination of hypertension and hyperuricemia, the antioxidant activity of plasma decreases, which causes an increase in the activity of LPO in it [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 effects of blood vessels on erythrocytes weakens [22,23]. The combination of these processes forms the growth of erythrocyte aggregation in the plasma taken after temporary venous occlusion in the patients observed [24]. The increase in erythrocyte aggregation in hypertensive patients with hyperuricemia is largely due to the weakening of the disaggregating effects of their vessels [25,26] and to a decrease in the number of negative-charge proteins on the erythrocyte membranes [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]. In conditions of a persistent deficit of vascular dezagregantov, the strengthening of erythrocyte communication among themselves increases, leading to an increase in the number of their aggregates [30, 31]. At the same time, the depression of synthesis in the vessels of prostacyclin and nitric oxide forms an imbalance in the erythrocytes of the activity of adenylatecyclase and phosphodiesterase [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 Ca^{2+} , which additionally strongly stimulates the aggregation of erythrocytes [34, 35].

CONCLUSION

It is noted that patients with arterial hypertension and hyperuricemia are characterized by a high incidence of thrombosis. This was an important reason for the survey of this contingent of patients. During the study, it was revealed that when the arterial hypertension is combined with hyperuricemia, the level of antioxidant protection of the plasma decreases and the processes of lipid peroxidation, which adversely affects all layers of the vascular wall, increase in it. It was found that in patients with arterial hypertension and hyperuricemia, weakened disaggregation properties of the vessels with respect to excessive spontaneous aggregation of erythrocytes. The emerging situation in the aggregation-disaggregation relationship between blood cells and blood vessels creates the basis for the development of vascular complications in the future.

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