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Disaggregation Control Of Vessels Over Neutrophils In Patients With Arterial Hypertension With Abdominal Obesity And Dyslipidemia.

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ABSTRACT

Excessive nutrition and low physical activity in a significant part of the population lead to a wide prevalence among their populations of a combination of arterial hypertension, abdominal obesity and dyslipidemia in many countries of the world. This category of patients attracts a high frequency of thrombosis of different localization. This circumstance is often explained by the weakening of the disaggregation properties of the vessels in these patients. The goal is to clarify the disaggregation capabilities of blood vessels in patients with arterial hypertension with abdominal obesity and dyslipidemia with respect to neutrophils. We examined 55 patients of the second mature age (mean age 51.2 ± 2.7 years) with arterial hypertension of the 1st-2nd degree, with abdominal obesity with dyslipidemia. 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 arterial hypertension with abdominal obesity with dyslipidemia 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 arterial hypertension combination with abdominal obesity with dyslipidemia. The persons with arterial hypertension and abdominal obesity with dyslipidemia 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, arterial hypertension, abdominal obesity, dyslipidemia, vascular wall, antiaggregation.

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INTRODUCTION

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

We examined 55 patients of the second mature age (mean age 51.2 ± 2.7 years) with AH of the 1st-2nd degree [12] with abdominal obesity and dyslipidemia. 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 malondialdehyde (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].

Vascular disaggregation control of neutrophils was assessed in plasma taken after temporary venous occlusion and without it, by evaluating the aggregation of these cells on a photoelectrocolorimeter. As inductors, a lectin of wheat germs in a dose of $32 \mu\text{g/ml}$, concanavalin A - $32 \mu\text{g} / \text{ml}$ and phytohemagglutinin - $32 \mu\text{g} / \text{ml}$ were used in the work.

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 2.35 times, TBA-active products – in 1.53 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).

Patients showed an increase in neutrophil aggregation in response to all tested inductors (with lectin by 58.3%, concanavalin A by 43.9%, phytohemagglutinin by 42.1%) (Table).

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

Table: Registered indicators in the surveyed

Registered parameters	Patients, n=47, M±m	Control, n=26, M±m
acylhydroperoxides plasma, D ₂₃₃ /1ml	3.34±0.09	1.42±0.09 p<0.01
TBA-compounds, mcmol / l	5.47±0.12	3.56±0.07 p<0,01
antioxidantactivityplasma, %	21.2±0.19	32.9±0.12 p<0.01
biochemical parameters of neutrophils		
cholesterol of neutrophils, mkmol/10 ⁹ neutrophils	0.87±0.012	0.62±0.004 p<0.01
common phospholipids of neutrophils, mkmol/10 ⁹ neutrophils	0.34±0.007	0.51±0.003 p<0.01
acylhydroperoxides of neutrophils, D ₂₃₃ /10 ⁹ neutrophils	3.87±0.09	2.36±0.05 p<0.01
malonicdialdehyde of neutrophils, nmol/10 ⁹ neutrophils	1.62±0.11	0.73±0.03 p<0.01
catalase of neutrophils, ME/10 ⁹ neutrophils	4900.0±16.45	9950.0±19.77 p<0.01
superoxidismutase of neutrophils, ME/10 ⁹ neutrophils	1150.0±2.92	1780.0±4.21 p<0.01
aggregation of neutrophils in intact plasma		
Aggregationwithlectin, %	24.7±0.12	15.6±0.07 p<0.01
Aggregation withconcanavalin A, %	21.3±0.11	14.8±0.04 p<0.01
Aggregationwithphytohemagglutinin, %	43.5±0.09	30.6±0.09 p<0.01
vascular control of aggregation neutrophils		
Aggregationwithlectinafter temporary venous occlusion, %	22.0±0.25	11.8±0.06 p<0.01
Aggregation withconcanavalin Aafter temporary venous occlusion, %	19.9±0.09	11.0±0.07 p<0.01
Aggregationwithphytohemagglutininafter temporary venous occlusion, %	40.1±0.17	24.1±0.03 p<0.01

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

In plasma, obtained against a background of temporary venous occlusion, the patients were diagnosed with redundancy of neutrophil aggregation exceeding the control level with all used inducers (fromlectinon86.4%, fromconcanavalin A on80.9%, fromphytohemagglutininon66.4%).

Important significance in the development of rheological disturbances and thrombophilia in persons with AH, abdominal obesity and dyslipidemia belongs to aggregation increase of regular blood elements and especially – neutrophils [17, 18]. At combination of AH, abdominal obesity and dyslipidemia 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 the examined patients revealed in the study was associated with the weakening of synthesis in the walls of the vessels of the disaggregants, while the activity of glycoprotein receptors of leukocytes increased with respect to lectins capable of inducing neutrophil aggregation [24,25]. The intensification of lectin- and concanavalin A-induced aggregation of neutrophils in plasma obtained under conditions of temporary venous occlusion in patients with AH with abdominal obesity and dyslipidemia is associated with a lack of disaggregants in it against the background of an increase in the expression on the membrane of neutrophils of adhesion receptors, , containing N-acetyl-D-glucosamine, N-acetyl-neuraminic acid and mannose [26,27]. Redundancy of neutrophil aggregation in response to phytohemagglutinin is caused by an increase in their receptors of glycoproteins containing bD-galactose [28,29] under conditions of a weakened synthesis in the vessels of these patients prostacyclin and NO [30,31,32].

CONCLUSION

The high incidence in the world of a combination of arterial hypertension with abdominal obesity and dyslipidemia requires further comprehensive study of this pathology. In the study, it was found that lipid peroxidation in plasma was significantly enhanced in these patients. This is accompanied by severe vasopathy associated with a weakened vaginal discharge in the vessels. These changes are caused by the weakening of their vascular control over the active aggregation of neutrophils. The weakening of the disaggregation capacity of the vessels and the growth of neutrophil aggregation weakens trophism of tissues and creates a serious risk of thrombosis in patients with arterial hypertension with abdominal obesity and dyslipidemia.

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