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The State Of Aggregation Properties Of Neutrophils In Patients With Abdominal Obesity And Dyslipidemia.

Medvedev IN*.

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

ABSTRACT

Excessive caloric intake in conditions of constantly low physical activity in a significant part of the population in developed countries leads to a wide prevalence of a combination of abdominal obesity and dyslipidemia. A serious complication of this pathology is the onset of thrombosis of different localization in these patients. As a rule, this is caused by the formation of hyperaggregation of blood cells in them. The goal is to find out the level of aggregation capabilities of neutrophils in patients with abdominal obesity and dyslipidemia. We examined 41 patients of the second adult age (mean age 49.2 ± 1.8 years) with abdominal obesity with dyslipidemia. 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 abdominal obesity with dyslipidemia is closely related to the development of angiopathy against 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 conditions of abdominal obesity with dyslipidemia. It was found that people with arterial hypertension and abdominal obesity with dyslipidemia have an obvious weakening of disaggregation of the vascular effects of the vascular wall on strengthening 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, abdominal obesity, dyslipidemia, aggregation, rheology, blood.

**Corresponding author*

INTRODUCTION

The marked improvement in the quality of nutrition in a large part of the population and the disregard of the majority of the population by physical training lead to an increase in the frequency of occurrence of a combination of abdominal obesity and dyslipidemia in many developed countries of the world [1,2]. The prevalence of this pathology in the working population provides a high risk of vascular thrombosis leading to frequent disability and early death [3]. It is believed that this is based on a pronounced hyperaggregation of blood cells with abdominal obesity and dyslipidemia [4,5]. The resulting significant increase in aggregation of blood elements leads to activation of hemostasis, which forms the risk of thrombosis [6,7,8]. An important manifestation of hyperaggregation of blood cells is a decrease in their sensitivity to vascular disaggregants, the most important of which are prostacyclin and nitric oxide [9,10]. Given the high prevalence of the combination of abdominal obesity and dyslipidemia and a serious significance for microcirculation of excessive aggregation of neutrophils, it was of scientific interest to evaluate its level in this category of patients [11].

The goal is to find out the level of neutrophil aggregation in patients with abdominal obesity and dyslipidemia.

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 49.2 ± 1.8 years) with abdominal obesity and dyslipidemia [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.

Evaluation of neutrophil aggregation was performed on a photoelectrocolorimeter [16]. As inductors, lectin of wheat germs in a dose of 32 $\mu\text{g/ml}$, concanavalin A - 32 $\mu\text{g/ml}$ and phytohemagglutinin - 32 $\mu\text{g/ml}$ 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 $p < 0.05$.

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 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).

The observed patients showed an increase in neutrophil aggregation in response to all tested inductors (lectin 44.8%, concanavalin A 53.4%, phytohemagglutinin 34.6%) (Table).

Table. Registered indicators in the surveyed

Registered parameters	Patients, n=41, M±m	Control, n=26, M±m
acylhydroperoxides plasma, D ₂₃₃ /1ml	3.29±0.08	1.42±0.09 p<0.01
TBA-compounds, µmol/l	5.38±0.09	3.56±0.07 p<0,01
antioxidant activity plasma, %	21.8±0.23	32.9±0.12 p<0.01
biochemical parameters of neutrophils		
cholesterol of neutrophils, µmol/10 ⁹ neutrophils	0.85±0.016	0.62±0.004 p<0.01
common phospholipids of neutrophils, µmol /10 ⁹ neutrophils	0.36±0.005	0.51±0.003 p<0.01
acylhydroperoxides of neutrophils, D ₂₃₃ /10 ⁹ neutrophils	3.73±0.08	2.36±0.05 p<0.01
malonic dialdehyde of neutrophils, nmol/10 ⁹ neutrophils	1.57±0.13	0.73±0.03 p<0.01
catalase of neutrophils, ME/10 ⁹ neutrophils	5250.0±15.26	9950.0±19.77 p<0.01
superoxidismutase of neutrophils, ME/10 ⁹ neutrophils	1280.0±3.17	1780.0±4.21 p<0.01
aggregation of neutrophils		
Aggregation with lectin, %	22.6±0.15	15.6±0.07 p<0.01
Aggregation with concanavalin A, %	22.7±0.12	14.8±0.04 p<0.01
Aggregation with phytohemagglutinin, %	41.2±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.

Important significance in the development of rheological disturbances and thrombophilia in persons with abdominal obesity and dyslipidemia belongs to aggregation increase of regular blood elements and especially – neutrophils [17,18]. At combination of 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. At the same time, the ability to disaggregate in platelets was reduced, which could be explained by receptor changes [21,22,23].

The increase in neutrophil aggregation in the patients examined in the study was associated with an increase in the activity of glycoprotein receptors of leukocytes with respect to lectins capable of inducing neutrophil aggregation [24,25]. The intensification of lectin and concanavalin in the A-induced aggregation of neutrophils in plasma of patients with abdominal obesity and dyslipidemia is associated with an increase in expression on the neutrophil receptor membranes of the adhesion receptors, which include many sites 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 the conditions of their sensitivity to prostacyclin and NO [30,31,32].

CONCLUSION

Preservation of the widespread prevalence in the world of a combination of abdominal obesity and dyslipidemia requires detailed and comprehensive further 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 a pronounced hyperaggregation of neutrophils, associated with a weakening of their sensitivity to antiaggregants and an increase in sensitivity to lectins. Increased neutrophil aggregation can weaken tissue trophism and create a serious risk of thrombosis in patients with abdominal obesity and dyslipidemia [33,34,35].

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