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Intensity Of Neutrophil Aggregation In Patients With Abdominal Obesity.

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ABSTRACT

Neglect of regular physical exertion and excessive food lead in the population of developed countries to a very wide prevalence of abdominal obesity. This condition is very threatening the development of vascular thrombosis. Apparently, with abdominal obesity in the blood aggregation processes intensify. The goal is to evaluate the aggregation of neutrophils in patients with abdominal obesity. We examined 46 patients of the second adulthood (mean age 52.7 ± 2.2 years) with abdominal obesity. The control group consisted of 26 clinically healthy people of the same age. All the patients in the study of the person gave written informed consent to participate in it. Biochemical, hematological and statistical methods of investigation were used. It became clear that the high incidence of thrombosis of various localizations in abdominal obesity is closely related to the development of neutrophil hyperaggregation. This situation is formed in conditions of abdominal obesity in many respects due to the weakening of antioxidant protection of the plasma with activation of the processes of lipid peroxidation in it. It was found that people with abdominal obesity have an obvious weakening of neutrophil disaggregation. 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, vascular wall, antiaggregation.

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INTRODUCTION

Increased consumption of food in society with low physical activity always leads among the population of industrially developed countries to the widespread prevalence of abdominal obesity [1,2]. Very often it occurs in the working population, causing a high incidence of vascular complications leading to disability and early mortality [3]. High frequency in the population of thromboses in abdominal obesity is associated with increased aggregation of blood elements [4,5]. It is noted that strengthening of aggregation of blood elements is necessarily accompanied by activation of hemostasis and development of thrombosis risk [6,7,8]. This process is ensured by a decrease in the sensitivity of blood cells to disaggregants, the most important of which are prostacyclin and nitric oxide [9,10]. Given the widespread prevalence of abdominal obesity and serious significance for microcirculation of neutrophil aggregation [11], it was decided to conduct their study in these patients.

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MATERIAL AND METHODS

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

We examined 46 patients of the second mature age (mean age 52.7 ± 2.2 years) with abdominal obesity [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 the total phospholipids according to the content of phosphorus in them.

Aggregation of neutrophils was determined on a photoelectrocolorimeter [16]. Inductors were used lectin wheat germ at a dose of $32 \mu\text{g/ml}$, concanavalin A - $32 \mu\text{g/ml}$ and phytohemagglutinin - $32 \mu\text{g/ml}$.

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 2.0 times, TBA-active products – in 1.3 times, being accompanied by suppression of antioxidant plasma activity in 1.34 times (Table).

The observed patients were noted to have increased CS 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).

In the patients under observation, neutrophil aggregation in intact plasma in response to the tested inductors appeared earlier than in the control (with lectin 35.2%, concanavalin A 21.6%, phytohemagglutinin 27.8%) (Table 2).

Table. Registered indicators in the surveyed

Registered parameters	Patients, n=46, M±m	Control, n=26, M±m
acylhydroperoxides plasma, D ₂₃₃ /1ml	2.92±0.08	1.42±0.09 p<0.01
TBA-compounds, mcmol / l	4.85±0.12	3.56±0.07 p<0,01
antioxidant activity plasma, %	25.0±0.16	32.9±0.12 p<0.01
biochemical parameters of neutrophils		
cholesterol of neutrophils, mkmol/10 ⁹ neutrophils	0.78±0.008	0.62±0.004 p<0.01
common phospholipids of neutrophils, mkmol/10 ⁹ neutrophils	0.39±0.006	0.51±0.003 p<0.01
acylhydroperoxides of neutrophils, D ₂₃₃ /10 ⁹ neutrophils	3.25±0.10	2.36±0.05 p<0.01
malonic dialdehyde of neutrophils, nmol/10 ⁹ neutrophils	1.14±0.05	0.73±0.03 p<0.01
catalase of neutrophils, ME/10 ⁹ neutrophils	6750.0±14.27	9950.0±19.77 p<0.01
superoxidismutase of neutrophils, ME/10 ⁹ neutrophils	1360.0±2.81	1780.0±4.21 p<0.01
aggregation of neutrophils		
Aggregation with lectin, %	21.1±0.10	15.6±0.07 p<0.01
Aggregation with concanavalin A, %	18.0±0.07	14.8±0.04 p<0.01
Aggregation with phytohemagglutinin, %	39.1±0.06	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 belongs to aggregation increase of regular blood elements and especially – neutrophils [17,18]. At of abdominal obesity 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. Simultaneously, there was a decrease in the ability of platelets to disaggregate effects from the vascular wall [21,22,23].

The increase in neutrophil aggregation in the patients observed in this study is largely due to the weakening of their sensitivity to physiological disaggregants against the background of an increase in the activity of glycoprotein receptors of leukocytes with respect to lectins used as inducers in the study [24,25]. Increased lectin and concanavalin A-induced neutrophil aggregation in plasma after temporary venous occlusion in patients with abdominal obesity is associated with an increase in expression on the membrane of neutrophils of adhesion receptors, which include a large number of sites containing N-acetyl-D-glucosamine, N-acetyl-neuraminic acid and mannose [26, 27]. The activity of neutrophil aggregation in response to phytohemagglutinin is caused by an increase in their receptors of glycoproteins containing bD-galactose [28,29] on the background of a weakening of synthesis in the vessels of prostacyclin and NO [30,31,32]. The emerging situation is very dangerous for the loss of a significant part of the patients' health [33,34,35].

CONCLUSION

The frequent occurrence in modern society of abdominal obesity requires a comprehensive study of this pathology. Particular attention to it is caused by a high frequency of thrombosis on its background. In the study, it was found that lipid peroxidation in plasma was significantly enhanced in these patients. Apparently, they cause an increase in neutrophil aggregation. The weakening of the disaggregation properties of neutrophils and the increase in their ability to aggregate worsens trophism of tissues and makes a significant contribution to the risk of thrombosis in patients with abdominal obesity.

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