

Research Journal of Pharmaceutical, Biological and Chemical Sciences

The Level Of Disaggregation Control Of Blood Vessels Over Neutrophils In Patients With Abdominal Obesity And Dyslipidemia.

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ABSTRACT

High-calorie diet against the background of low physical activity in the bulk of the population of developed countries lead to a widespread prevalence of abdominal obesity and dyslipidemia. A serious problem of this category of patients is the high frequency of thrombosis of different localization. This is caused by the formation in these patients of vasopathy with a weakening of the hemostatic properties of the vessels. The goal is to find out the level of disaggregation capacity of blood vessels in patients with abdominal obesity and dyslipidemia with respect to neutrophils. We examined 41 patients of the second mature age (mean age 49.2 ± 1.8 years) 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 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 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, abdominal obesity, dyslipidemia, vascular wall, antiaggregation.

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INTRODUCTION

The steady improvement in the quality of nutrition among the bulk of the population and the disregard of the majority of the population by regular physical loads lead to a high incidence of a combination of abdominal obesity and dyslipidemia in industrially developed countries [1,2]. High occurrence of this pathology in the working population provides a significant level of vascular complications leading to disability and early mortality [3]. It is recognized that this has a strong vasopathy in abdominal obesity and dyslipidemia. First of all, it is manifested by the weakening of disaggregation control of blood vessels over the blood shaped elements [4,5]. The resulting significant increase in aggregation of blood elements leads to activation of hemostasis and the formation of a risk of thrombosis [6,7,8]. The main manifestation of vasopathy is a decrease in the synthesis in the vessels of patients with 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 assess the level of vascular control over neutrophilic leukocyte aggregation in this category of patients [11].

The aim of the work is to find out the level of disaggregation capacity of the vessels in patients with abdominal obesity and dyslipidemia with respect to neutrophils.

MATERIALS 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 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].

The severity of vascular disaggregation control over 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, 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 $p < 0.05$.

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).

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, umol/10 ⁹ neutrophils	0.85±0.016	0.62±0.004 p<0.01
common phospholipids of neutrophils, umol/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 in intact plasma		
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
vascular control of aggregation neutrophils		
Aggregation with lectin after temporary venous occlusion, %	20.1±0.26	11.8±0.06 p<0.01
Aggregation with concanavalin A after temporary venous occlusion, %	17.5±0.07	11.0±0.07 p<0.01
Aggregation with phytohemagglutinin after temporary venous occlusion, %	38.6±0.12	24.1±0.03 p<0.01

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

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

All the patients were noted to have the decrease of vessels' disaggregative impacts on neutrophil In plasma obtained in conditions of temporary venous occlusion, the patients surveyed were diagnosed with excess neutrophil aggregation significantly exceeding the level of control with all the inducers used (lectin 86.4%, concanavalin A 80.9%, phytohemagglutinin 66.4 %).s (Table).

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. 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 found 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 abdominal obesity and dyslipidemia is associated with a lack of disaggregants in it against the background of an increase in expression on the membrane of neutrophils of adhesion receptors, which have many sites in their composition, 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 wide prevalence in the world of a combination of abdominal obesity and dyslipidemia requires a detailed 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 tissue trophism and creates a serious risk of thrombosis in patients with abdominal obesity and dyslipidemia [33,34,35].

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