ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Disaggregation Control Of Blood Vessels Over Erythrocytes In Patients With Abdominal Obesity.

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ABSTRACT

It is noticed that in persons with abdominal obesity the phenomena of vasopathy are often recorded. Due to the high frequency in the developed countries of abdominal obesity, it is very important for science and practice to assess the level of the condition with this pathology of the level of vascular control over the process of erythrocyte aggregation. The aim of the work is to find out at this abdominal obesity the disaggregation capacity of blood vessels in relation to erythrocytes. 46 patients with abdominal obesity of the second adulthood were examined. The control group is represented by 26 clinically healthy persons of the second adulthood. Biochemical, hematological and statistical methods of investigation were used in the work. In the patients examined, an increase in the amount of cholesterol in erythrocyte membranes, a reduction in the level of total phospholipids in them, and an increase in the processes of lipid peroxidation were found. In patients, excessive activity of spontaneous aggregation of erythrocytes was found. This was accompanied in all patients by a decrease in vascular control over this process. The revealed weakening of disaggregating vascular control over spontaneous aggregation of erythrocytes should be considered as a consequence of metabolic abnormalities arising in abdominal obesity, increased vasospasm and increased lipid peroxidation. We can assume that the vasopathy in this contingent of patients dramatically increases their risk of thrombosis, which can lead to disability and often lethal outcome.

Keywords: abdominal obesity, vascular wall, aggregation, erythrocytes, vasopathy.

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ISSN: 0975-8585

INTRODUCTION

Improving the quality of life in modern society has led to an increase in prevalence and rejuvenation of abdominal obesity [1,2]. This pathology contributes to the frequent development of thrombophilia and thrombosis of the vessels in adults, which leads to widespread disability and mortality [3,4].

The high incidence of thrombosis in patients with abdominal obesity is largely due to the formation of vasopathy [5,6]. It is recognized that the blood cells are capable of aggregation. This process strongly determines the activation of hemostasis and thrombosis [7,8,9]. Aggregation of blood cells is inhibited by substances synthesized in the vessel wall and called dezagregantov. The most active of these are prostacyclin and nitric oxide [10,11]. In view of the widespread prevalence of abdominal obesity, it is of great interest to study the state of vascular control over erythrocyte aggregation in this category of patients.

The aim of the work is to find out the abnormal obesity of the disaggregation capacity of blood vessels in relation to erythrocytes.

MATERIALS 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 with abdominal obesity [12] of the second adult age (mean age 52.7 ± 2.2 years). The control group consisted of 26 clinically healthy people of the second adulthood. All the examinees gave written information consent to participate in the study according to the generally accepted procedure [13].

The intensity of the processes of lipid peroxidation (LPO) in plasma was estimated by the level of thiobarbituric acid (TBA) -active products by the Agath-Med (Russia) and acyl hydroperoxides (AHP) kit by the method. [14] The antioxidant capacity of the liquid part of the blood was determined by the method [15].

The severity of LPO processes in erythrocytes was determined by the level of malonicdialdehyde (MDA) in them and the content of AHP in them in washed and resuspended cells [14]. In washed and resuspended erythrocytes, the cholesterol content was determined by the enzymatic colorimetry method using the "Vital Diagnosticum" (Russia) kit and the total phospholipids for their phosphorus content.

The severity of the disaggregation capacity of blood vessels with respect to erythrocytes was assessed by its weakening in plasma taken after a temporary venous occlusion [16]. Spontaneous aggregation of erythrocytes in plasma intact and after temporary ischemia of the vessel wall was determined under a light microscope in Goryaev's chamber. The number of erythrocyte aggregates, the number of aggregates and erythrocytes not aggregated [17], was found out.

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 patients, activation of LPO in plasma was detected - the content of AHP in it exceeded control by 2.0 times, TBA-active products - by 1.3 times, as a result of weakening of antioxidant activity of plasma by 1.3 times (Table).

ISSN: 0975-8585

Table. Registered indicators in the surveyed

Registratedparameters	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, umol / l	4.85±0.12	3.56±0.07 p<0.01
antioxidantactivityplasma, %	25.0±0.16	32.9±0.12 p<0.01
biochemical parameters of erythrocytes		
cholesterol of erythrocytes, umol/10^{12} erythrocytes	1.24±0.005	1.04±0.004 p<0.01
common phospholipids of erythrocytes, umol/10^{12} erythrocytes	0.60±0.008	0.75±0.003 p<0.01
acylhydroperoxides of erythrocytes, D_{233}/10^{12} erythrocytes	4.15±0.14	3.08±0.10 p<0.01
malonicdialdehyde of erythrocytes, nmol/10^{12} erythrocytes	1.44±0.10	1.14±0.05 p<0.01
catalase of erythrocytes, ME/10^{12} erythrocytes	8850.0±9.6	11196.0±22.4 p<0.01
superoxidismutase of erythrocytes, ME/10^{12} erythrocytes	1750.0±1.52	1986.0±7.01 p<0.01
aggregation of erythrocytes in intact plasma		
sum of all the erythrocytes in an aggregate	58.7±0.17	41.9±0.10 p<0.01
quantity of aggregates	11.5±0.15	9.0±0.06 p<0.01
quantity of free erythrocytes	182.6±0.67	240.0±0.23 p<0.01
aggregation of erythrocytes in plasma after temporary venous occlusion		
sum of all the erythrocytes in an aggregate	49.7±0.19	32.6±0.14 p<0.01
quantity of aggregates	9.2±0.15	7.0±0.07 p<0.01
quantity of free erythrocytes	207.6±0.95	305.3±0.18 p<0.01

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

In patients, an increased content of cholesterol in the erythrocyte membranes was found with a decrease in total phospholipids in them. This was accompanied by the activation of lipid peroxidation in their erythrocytes due to the weakening of their antioxidant defense (Table).

In all examined patients showed a pronounced activation of the process of spontaneous aggregation of erythrocytes (table). It was also confirmed by the increase in their total involvement in aggregates (by 40.1%), an increase in the number of these units (27.8%) and a decrease of 31.4% nagraviroval of red blood cells.

The surveyed patients showed a decrease in the disaggregation capacity of blood vessels in relation to erythrocytes (Table). It was found that in the plasma obtained after temporary venous occlusion, the number of erythrocytes in the aggregates exceeded the control by 52.4%, the number of these aggregates was increased by 31.4%, while the number of non-aggregated red blood cells decreased by 47.1%.

Serious significance in the formation of rheological dysfunctions and the risk of thrombosis in individuals with abdominal obesity belongs to the growth of erythrocyte aggregation [18, 19]. In the presence of abdominal obesity, there is a depression of the antioxidant activity of the plasma, which ensures the growth of LPO activity in it [20]. This leads to damage to the erythrocyte membrane [21]. The development of these phenomena in combination with the lipid imbalance revealed in red blood cells leads to their hyperaggregation. At the same time, the disaggregating effects of blood vessels on erythrocytes weaken [22,23]. In the observed patients, this was judged by the growth of erythrocyte aggregation in plasma after temporary venous occlusion [24]. Apparently, the growth of erythrocyte aggregation in patients with abdominal obesity is associated with a weakening of the disaggregating properties of their vessels [25,26] and a decrease in the number of negative proteins on the erythrocyte membranes [27]. Weakening of the antioxidant properties of the plasma causes an increase in peroxidation processes in it and as a result, oxidative damage of endotheliocytes and globular plasma proteins occurs [28,29]. In the conditions of a deficiency of vascular dezagregantov, the bonds of erythrocytes are strengthened among themselves and as a result, aggregate growth [30, 31]. In addition, 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 lowers the level of cyclic adenosine monophosphate in their cytoplasm and increases Ca2 +, which also stimulates erythrocyte aggregation [34,35]. All this provides a general deterioration in the condition of patients [36-38].

CONCLUSION

There is a high incidence of thrombosis in patients with abdominal obesity. This required a survey of this contingent of patients. The work revealed that with abdominal obesity, weakened antioxidant protection of the plasma and increased in it peroxide oxidation of lipids, which damages all elements of the vascular wall. With abdominal obesity, a decrease in the disaggregating vascular properties was observed with respect to spontaneous aggregation of erythrocytes increasing under these conditions. It becomes clear that as a result of this, these patients have a dramatic increase in the risk of vascular thrombosis, which can contribute to disability and early death.

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