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Intensity Of Spontaneous Aggregation Of Erythrocytes In Patients With Abdominal Obesity And Dyslipidemia.

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ABSTRACT

Most of the pathology revealed in the adult population is due to abdominal obesity and dyslipidemia. Their appearance leads to the development of thrombosis of blood vessels. Therefore, a great practical importance was the additional examination of patients with abdominal obesity and dyslipidemia. Of particular interest was the evaluation of their aggregation of erythrocytes. The aim of the work is to clarify the aggregation properties of red blood cells in patients with abdominal obesity and dyslipidemia. 41 patients with abdominal obesity and dyslipidemia of the second adulthood were examined. Control is represented by 26 healthy volunteers of the second adult age. Biochemical, hematological and statistical methods of investigation were used. The examined patients noted an increase in the cholesterol content in erythrocyte membranes, a decrease in phospholipids in them and an increase in the processes of lipid peroxidation. In all patients, excessive spontaneous aggregation of erythrocytes was found. In the course of the study, it became clear that the increase in the aggregating properties of red blood cells is a consequence of metabolic abnormalities and excess lipid peroxidation arising from abdominal obesity and dyslipidemia. The apparent hyperaggregation of erythrocytes in this contingent of patients can greatly increase the risk of thrombosis, often leading to disability or death.

Keywords: abdominal obesity, dyslipidemia, rheology, blood, aggregation, erythrocytes.

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INTRODUCTION

The gradual increase in the standard of living of broad sections of the population in many industrialized countries is accompanied by a high prevalence rate of combination of abdominal obesity and dyslipidemia [1,2]. The combination of this pathology is accompanied by the onset of thrombosis of the vessels leading to disability and early death [3,4]. The high frequency of thrombosis in patients with abdominal obesity and dyslipidemia often involves hyperaggregation of blood cells [5,6]. The development of this condition leads to an increase in the mechanisms of hemostasis [7,8,9]. It is known that the aggregation of blood cells is normally inhibited by desaggregants of vascular origin, sensitivity to which decreases with thrombophilia [10,11]. The wide prevalence among the population of a combination of abdominal obesity and dyslipidemia is of great interest to the state of these patients in the aggregation of erythrocytes.

The goal is to clarify the aggregation properties of red blood cells 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).

41 patients with abdominal obesity and dyslipidemia IIb type [12] of the second adult age (mean age 49.2±1.8 years) were examined. The control group consisted of 26 healthy people of the second adulthood. All the people surveyed gave written information consent to participate in the study.

The degree of intensity of lipid peroxidation (LPO) in plasma was estimated by the amount of thiobarbituric acid (TBA) -active products in it, using the Agat-Med (Russia) [13] and acyl hydroperoxides (AHP) kit according to the generally accepted procedure [14]. The antioxidant characteristics of blood plasma were determined using the method of [15] .The activity of LPO in erythrocytes was evaluated by the content of malonic dialdehyde (MDA) and AGP in them after washing and resuspension [14]. Also in washed and resuspended red blood cells, the amount olesterina enzymatic colorimetric method using "Vital Diagnosticum" kit manufactured (Russia) and phospholipids by the number of phosphorus in their conventional manner.

The intensity of aggregation properties of erythrocytes was elucidated [16]. Activity of erythrocyte aggregation processes was determined with the aid of a light microscope in the Goryaev chamber. The number of erythrocyte aggregates, the number of erythrocytes that have entered and not joined in aggregation were recorded [17].

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 $p<0.05$.

RESEARCH RESULTS AND DISCUSSION

In the examined patients, activation of LPO in plasma was found - the amount of AGP in it was 2.3 times higher than the level of control, the content of TBA-active products was increased 1.5 times due to a 1.5-fold decrease in the antioxidant activity of their plasma (Table 1).

Observed patients showed an increased amount of cholesterol in the erythrocyte membranes with a decrease in the content of phospholipids. This was accompanied by the increase in their erythrocytes of LPO processes due to depression of their antioxidant defense (Table).

Also, observed patients showed a marked activation of spontaneous aggregation of erythrocytes (Table). This was indicated by an increase in their total inclusion in aggregates (by 53.5%), an increase in the number of these aggregates (by 66.7%) and a 39.0% decrease in the number of non-aggregated erythrocytes.

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Table. Registered indicators in the surveyed

Registrated 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, umol/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 erythrocytes		
cholesterol of erythrocytes, µmol/10^{12} erythrocytes	1.31±0.010	1.04±0.004 p<0.01
common phospholipids of erythrocytes, µmol/10^{12} erythrocytes	0.54±0.006	0.75±0.003 p<0.01
acylhydroperoxides of erythrocytes, D_{233}/10^{12} erythrocytes	4.50±0.12	3.08±0.10 p<0.01
malonic dialdehyde of erythrocytes, nmol/10^{12} erythrocytes	1.68±0.11	1.14±0.05 p<0.01
catalase of erythrocytes, ME/10^{12} erythrocytes	7600.0±14.7	11196.0±22.4 p<0.01
superoxidismutase of erythrocytes, ME/10^{12} erythrocytes	1580.0±3.02	1986.0±7.01 p<0.01
aggregation of erythrocytes		
sum of all the erythrocytes in an aggregate	64.3±0.12	41.9±0.10 p<0.01
quantity of aggregates	15.0±0.19	9.0±0.06 p<0.01
quantity of free erythrocytes	172.6±0.81	240.0±0.23 p<0.01

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

Great importance in the development of rheological disorders and the formation of a risk of development of thrombosis in individuals with abdominal obesity and dyslipidemia increased aggregation of erythrocytes [18, 19]. Patients with abdominal obesity and dyslipidemia develop depression of the antioxidant activity of the plasma, which causes the growth of the amount of LPO products in it [20]. This contributes to damage to erythrocyte membranes [21]. This situation is aggravated by the lipid imbalance present in these patients in the erythrocytes, which contributes to their hyperaggregation. At the same time, there is a weakening of the disaggregating effects of blood vessels on erythrocytes [22,23]. This fact was revealed in patients with increasing erythrocyte aggregation in plasma obtained in conditions of temporary venous occlusion [24]. It is clear that the growth of erythrocyte aggregation in patients with abdominal obesity and dyslipidemia is caused by a depression of their sensitivity to the disaggregating effects of their vessels [25,26] and a decrease in the number of proteins with a negative charge on the erythrocyte surface [27]. Weakening of antioxidant protection of plasma promotes the enhancement of peroxidation in it. Due to this, oxidative damage of erythrocytes and plasma globular proteins also develops [28,29]. Under these conditions, the strengthening of the connection of erythrocytes in aggregates develops [30, 31]. Depression of their sensitivity to prostacyclin and nitric oxide leads to imbalance in erythrocytes of adenylate cyclase and phosphodiesterase activity [32,33]. This greatly reduces the amount of cyclic adenosine monophosphate in their cytoplasm and significantly increases the amount of Ca^{2+}, which also leads to increased erythrocyte aggregation [34, 35].

CONCLUSION

For patients with abdominal obesity and dyslipidemia, a high incidence of thrombosis is characteristic. In this connection, it was very important to study the aggregation properties of their erythrocytes. It was revealed that with abdominal obesity and dyslipidemia, antioxidant protection of plasma is attenuated and the amount of products of lipid peroxidation is increased in it. This creates a situation leading to damage to all elements of the vascular wall. In patients with abdominal obesity and dyslipidemia, the aggregation properties of erythrocytes, estimated by their spontaneous aggregation, are weakened. As a result of the growth of aggregation properties of erythrocytes, the risk of blood vessel thrombosis sharply increases in this contingent of patients, often with a fatal outcome [36,37,38].

REFERENCES

[1] Kotseva K, Wood D, De Backer G. (2009) Euroaspre Study Group. Cardiovascular prevention quidelines in daily practice: a comparison of Euroaspre I, II, and III surveys in eiqht European countries. Lancet. 373 : 929-940.

[2] Kotova OV, Zavalishina SYu, Makurina ON, Kiperman YaV, Savchenko AP, Skoblikova TV, Skripleva EV, Zacepin VI, Skriplev AV, Andreeva VYu. (2017) Impact estimation of long regular exercise on hemostasis and blood rheological features of patients with incipient hypertension. Bali Medical Journal. 6(3): 514-520. doi:10.15562/bmj.v6i3.552

[3] Zamorano J, Edwards J.(2011) Combining antihypertensive and antihyperlipidemic agents - optimizing cardiovascular risk factor management. Integr. Blood Press Control. 4 : 55-71.

[4] Bikbulatova AA, Karplyuk AA, Parshin GN, Dzhafar-Zade DA, Serebryakov AG. (2018) Technique for Measuring Vocational Interests and Inclinations in High-School Students with Disabilities. Psikhologicheskaya nauka i obrazovanie-psychological science and education. 23(2) : 50-58.doi: 10.17759/pse.2018230206

[5] Gurevich VS. (2013) Correction of dyslipidemia with concomitant arterial hypertension from the perspective of an updated paradigm of cardiovascular risk. Systemic hypertension. 3 : 54-59.

[6] Skoryatina IA, Zavalishina SYu. (2017) Ability to aggregation of basic regular blood elements of patients with hypertension anddyslipidemia receiving non-medication andsimvastatin. Bali Medical Journal. 6(3): 514-520.doi:10.15562/bmj.v6i3.553

[7] Glagoleva TI, Zavalishina SYu, Mal GS, Makurina ON, Skorjatina IA. (2018) Physiological Features Of Hemo-coagulation In Sows During Sucking. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(4) : 29-33.

[8] Zavalishina SYu, Makurina ON, Vorobyeva NV, Mal GS, Glagoleva TI. (2018) Physiological Features Of Surface Properties Of The Erythrocyte Membrane In Newborn Piglets. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(4) : 34-38.

[9] Bikbulatova AA. (2018) The Impact of Daily Wearing of Medicinal-Prophylactic Clothes on The Evidence of Clinical Manifestations of Osteochondrosis Of The 2nd Degree and Platelet Activity in Persons Of The Second Mature Age. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(1) : 677-683.

[10] Folsom AR.(2013) Classical and novel biomarkers for cardiovascular risk prediction in the United States. J Epidemiol. 2013; 23: 158-162.

[11] Bikbulatova AA, Karplyuk AV. (2018) Professional And Labor Orientation Of Persons With Disabilities In The Resource Educational And Methodological Center Of The Russian State Social University. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(4) : 1648-1655.

[12] Diagnosis and treatment of hypertension. In the book: National Clinical Recommendations. 3rd edition. Moscow: Silicea-Polygraph, 2010: 463-500.

[13] Diagnostics and correction of lipid disorders for the prevention and treatment of atherosclerosis. Russian guidelines (V revision). Cardiovascular Therapy and Prevention. 2012; 4(1) : 31.

[14] Bikbulatova AA. (2018) Bioregulatory Effects Of The Daily Wearing Of Medical And Preventive Pants On The Body Of Pregnant Women Suffering From Habitual Miscarriages Of The Fetus. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(4) : 889-896.

[15] Volchegorskiy IA, Dolgushin II, Kolesnikov OL, Tseilikman VE. (2000) Experimental modeling and laboratory evaluation of adaptive reactions of the organism. Chelyabinsk, 167.

[16] Bikbulatova AA, Andreeva EG. (2018) Restoration Of The Profile Of Bioregulators Of Blood Plasma In People Of Second Adulthood With Osteochondrosis Of The Spine Against The Background Of Daily

Wearing Of Medical And Preventive Clothing. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(4) : 413-419.

[17] Bikbulatova AA. (2018) Formation Of Psychological Comfort In Women With Habitual Miscarriage Of Pregnancy Against The Background Of Their Daily Wearing Of Medicinal Prophylactic Trousers. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(3) :1417-1427.

[18] Zavalishina SYu. (2013) Gemostatical activity of vessels piglets vegetable nutrition. Veterinariya. 8 : 43-45.

[19] Bikbulatova AA, Pochinok NB. (2017) Professional Skills Competitions for People with Disabilities as a Mechanism for Career Guidance and Promotion of Employment in People with Special Needs. Psikhologicheskaya nauka i obrazovanie. 22(1) : 81-87.

[20] Zavalishina SYu.(2010) Anticoagulative and fibrinolitic activity of plasma of blood at calves. Veterinariya. 11: 41-43.

[21] Bikbulatova AA, Karplyuk AA, Tarasenko OV.(2017) Model of Activities of the Resource Training Center of the Russian State Social University in Terms of Professional Orientation and Employment of Persons with Disabilities. Psikhologicheskaya nauka i obrazovanie. 22(1): 26-33.

[22] Bikbulatova AA. (2018) The Impact Of Medicinal-Prophylactic Trousers' Daily Wearing On Pregnancy Course In The Third Term Of Women With Habitual Miscarriage Of Fetus. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(3) : 663-671.

[23] Bikbulatova AA.(2018) Formation Of Psychological Comfort In Women With Habitual Miscarriage Of Pregnancy Against The Background Of Their Daily Wearing Of Medicinal Prophylactic Trousers. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(3) :1417-1427.

[24] Zavalishina SYu. (2010) Activity of curtailing of blood plasma in calves of a dairy feed. Veterinariya. 8 : 49-51.

[25] Zavalishina SYu. (2010) Activity of blood coagulation system at healthy calves at phase of milk-vegetable feeding. Zootekhniya. 9 : 13-14.

[26] Vorobyeva NV, Mal GS, Skripleva EV, Skriplev AV, Skoblikova TV. (2018) The Combined Impact Of Amlodipin And Regular Physical Exercises On Platelet And Inflammatory Markers In Patients With Arterial Hypertension. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(4) : 1186-1192.

[27] Bikbulatova AA. (2018) Peculiarities of abnormalities of locomotor apparatus of children at preschool age with scoliosis of I-II degree living in Central Russia. Bali Medical Journal. 7(3): 693-697. DOI:10.15562/bmj.v7i3.738

[28] Bikbulatova AA, Andreeva EG. (2018) Achievement of psychological comfort in 5-6-Year-Old children with scoliosis against the background of daily medicinal-prophylactic clothes' wearing for half a year. Bali Medical Journal. 7(3): 706-711. DOI:10.15562/bmj.v7i3.947

[29] Zavalishina SYu. (2013) Gemostatical activity of vessels piglets vegetable nutrition. Veterinariya. 8 : 43-45.

[30] Vatnikov YuA, Zavalishina SYu, Seleznev SB, Kulikov EV, Notina EA, Rystsova EO, Petrov AK, Kochneva MV, Glagoleva TI. (2018) Orderly muscle activity in elimination of erythrocytes microrheological abnormalities in rats with experimentally developed obesity. Bali Medical Journal. 7(3): 698-705. DOI:10.15562/bmj.v7i3.739

[31] Zavalishina SYu. (2010) Activity of blood coagulation system at healthy calves at phase of milk-vegetable feeding. Zootekhniya. 9 : 13-14.

[32] Vorobyeva NV, Skripleva EV., Makurina ON, Mal GS. (2018) Physiological Reaction of The Ability of Erythrocytes to Aggregate to Cessation of Prolonged Hypodynamia. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(2) : 389-395.

[33] Skripleva EV, Vorobyeva NV, Kiperman YaV, Kotova OV, Zatsepin VI, Ukolova GB. (2018) The Effect Of Metered Exercise On Platelet Activity In Adolescents. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(3) : 1150-1154.

[34] Koniari I, Mavrilas D, Papadaki H. (2011) Structural and biochemical alterations in rabbit thoracic aorta are associated with the progression of atherosclerosis. Lipids in Health and Disease. 10: 125-134.

[35] Bikbulatova AA, Karplyuk AA, Parshin GN, Dzhafar-Zade DA, Serebryakov AG. (2018) Technique for Measuring Vocational Interests and Inclinations in High-School Students with Disabilities. Psikhologicheskaya nauka i obrazovanie-psychological science and education. 23(2) : 50-58.doi: 10.17759/pse.2018230206.

[36] Apanasyuk LA, Soldatov AA. (2017) Socio-Psychological Conditions for Optimizing Intercultural Interaction in the Educational Space of the University. Scientific Notes of Russian State Social University. 16(5-144) : 143-150. doi: 10.17922/2071-5323- 2017-16-5-143-150.

[37] Maloletko AN, Yudina TN.(2017) (Un)Making Europe: Capitalism, Solidarities, Subjectivities. Contemporary problems of social work. 3 (3-11) : 4-5.

[38] Pozdnyakova ML, Soldatov AA. (2017) The Essential and Forms of the Approaches to Control the Documents Execution. 3 (1-9): 39-46. doi: 10.17922/2412-5466-2017-3-1-39-46.