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The Level Of Disaggregation Control Of Blood Vessels Over Erythrocytes In Patients With Type 2 Diabetes Mellitus.

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ABSTRACT

It was found that in patients with type 2 diabetes mellitus, vasopathy, which forms the risk of thrombosis, is very common. The widespread prevalence in developed countries of type 2 diabetes supports the high interest of many researchers. Much attention in this pathology is given to vascular control over the aggregation of blood cells. The aim of the study was to study the state of disaggregation properties of blood vessels in relation to erythrocytes in patients with type 2 diabetes mellitus. 36 patients with diabetes mellitus of type 2 of the second adult age were examined. The control consisted of 26 healthy persons of the second adult age. The study uses biochemical, hematological and statistical methods. In patients, an increase in the cholesterol content in erythrocyte membranes, a decrease in the level of phospholipids in them, and activation of lipid peroxidation were found. In addition, they showed excessive activity of spontaneous aggregation of erythrocytes. It was accompanied in these patients by the weakening of vascular disaggregation control over them. The changes found in the examined category of patients should be considered as a consequence of metabolic disorders, expressed vasospasm and activation of lipid peroxidation.

Keywords: vasopathy, diabetes mellitus, vascular wall, aggregation, erythrocytes.

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INTRODUCTION

Conducting frequent preventive examinations and examinations and regular implementation of recreational activities in industrially developed countries have so far failed to significantly affect the widespread prevalence of type 2 diabetes in society [1,2]. It was noted that in patients with this pathology very often episodes of blood vessel thrombosis are recorded, which can lead to disability and early death [3,4]. The widespread prevalence of thrombosis in patients with type 2 diabetes mellitus is largely associated with the formation of vasopathy [5,6]. This greatly aggravates the aggregation processes in the blood of these patients. The emerging situation can strongly activate the mechanisms of hemostasis and cause thrombosis [7,8,9]. At the heart of these processes is the weakening of the synthesis of vascular dezagregantov, especially prostacyclin and nitric oxide [10,11]. Given the high risk of thrombosis in type 2 diabetes, it seemed important to assess the level of vascular control over erythrocyte aggregation in this category of patients.

The goal is to study the state of the disaggregation properties of blood vessels in relation to erythrocytes in patients with type 2 diabetes mellitus.

MATERIALS AND METHODS

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

36 patients with type 2 diabetes [12], the second adult age (mean age 47.4±2.1 years) were examined. Control consisted of 26 healthy people of the second adulthood. The examinees gave written information consent to participate in the conducted research according to the generally accepted procedure [13].

The level of lipid peroxidation (LPO) in plasma was taken into account by the level of thiobarbituric acid (TBA)-active products with the help of the Agat-Med (Russia) and acyl hydroperoxides (AGP) kit. [14] The state of antioxidant plasma protection was estimated by the method of [15].

The expression of LPO in erythrocytes was determined by the level of malonic dialdehyde (MDA) in them and the content of AHP in them after washing and resuspension [14]. In addition, in washed and resuspended red blood cells, the cholesterol content was assessed by the enzymatic colorimetric method, using the Vital Diagnosticum kit (Russia) and taking into account the total phospholipids for phosphorus content in erythrocytes.

The state of disaggregation of vascular effects on erythrocytes was assessed by its decrease in plasma taken after temporary venous occlusion [16]. The activity of spontaneous aggregation of erythrocytes in plasma obtained after temporary ischemia of the vessel wall and without it was determined with the aid of a light microscope in the Goriaev chamber. The number of erythrocyte aggregates, the number of aggregated and non-aggregated erythrocytes were taken into account [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 $p<0.05$.

RESULTS AND DISCUSSION

In the patients under observation, a pronounced activation of LPO in the plasma was found - the AGP content in it was 2.2 times higher than the control level. The quantity of TBA-active products is 1.5 times. This occurred as a result of the weakening of the antioxidant protection of the plasma by a factor of 1.4 (Table).

In the examined patients, an excess of the amount of cholesterol in the erythrocyte membranes was found, while the total phospholipids in them were reduced. At the same time, activation of LPO due to depression of their antioxidant protection was found in erythrocytes (Table).

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Table: Registered indicators in the surveyed

Registrated parameters	Patients, n=36, M±m	Control, n=26, M±m
acylhydroperoxides plasma, D_{233} /1ml	3.10±0.10	1.42±0.09 p<0.01
TBA-compounds, umol / l	5.34±0.14	3.56±0.07 p<0.01
antioxidant activity plasma, %	23.8±0.16	32.9±0.12 p<0.01
biochemical parameters of erythrocytes		
cholesterol of erythrocytes, umol/10^{12} erythrocytes	1.29±0.012	1.04±0.004 p<0.01
common phospholipids of erythrocytes, umol/10^{12} erythrocytes	0.62±0.004	0.75±0.003 p<0.01
acylhydroperoxides of erythrocytes, D_{233}/10^{12} erythrocytes	4.50±0.23	3.08±0.10 p<0.01
malonic dialdehyde of erythrocytes, nmol/10^{12} erythrocytes	1.61±0.16	1.14±0.05 p<0.01
catalase of erythrocytes, ME/10^{12} erythrocytes	8500.0±12.0	11196.0±22.4 p<0.01
superoxidismutase of erythrocytes, ME/10^{12} erythrocytes	1550.0±3.06	1986.0±7.01 p<0.01
aggregation of erythrocytes in intact plasma		
sum of all the erythrocytes in an aggregate	61.3±0.15	41.9±0.10 p<0.01
quantity of aggregates	13.0±0.20	9.0±0.06 p<0.01
quantity of free erythrocytes	178.0±0.75	240.0±0.23 p<0.01
aggregation of erythrocytes in plasma after temporary venous occlusion		
sum of all the erythrocytes in an aggregate	54.6±0.22	32.6±0.14 p<0.01
quantity of aggregates	11.2±0.14	7.0±0.07 p<0.01
quantity of free erythrocytes	209.8±0.88	305.3±0.18 p<0.01

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

The observed patients noted a strong activation of spontaneous erythrocyte aggregation (Table). This was indicated by an increase in their total inclusion in aggregates (by 46.3%), an increase in the number of these aggregates (by 44.4%) and a 34.8% decrease in non-aggregated red blood cells.

Also, patients showed a decrease in the disaggregation properties of blood vessels in relation to erythrocytes (Table). It was noted that in the plasma taken against the background of temporary venous occlusion, the number of erythrocytes in the aggregates exceeded the control by 67.4%, the number of aggregates themselves was increased by 60.0%, and the number of non-aggregated red blood cells was reduced by 45.5%.

The growth of erythrocyte aggregation plays a significant role in maintaining a high risk of thrombosis in individuals with type 2 diabetes [18, 19]. With type 2 diabetes mellitus, depression of the antioxidant

protection of plasma develops, which ensures the growth of LPO processes in it [20]. This inevitably worsens the structure and function of erythrocyte membranes [21]. All this leads to hyperaggregation of erythrocytes. The oncoming weakening of the disaggregating effects of blood vessels on erythrocytes aggravates the situation [22,23]. This was observed in the patients observed for the growth of erythrocyte aggregation in plasma after temporary venous occlusion [24]. It became clear that the growth of erythrocyte aggregation in patients with type 2 diabetes was caused by a weakening of the disaggregating properties of their vessels [25,26] and a decrease in the level of negatively charged proteins on erythrocytes [27]. Weakening of antioxidant plasma parameters promotes intensification of lipid peroxidation processes in it, and, consequently, marked oxidative damage of endotheliocytes and plasma proteins [28,29]. In conditions of deficiency of vascular dezagregantov there is an intensification of erythrocyte communication among themselves in aggregates and an increase in their number [30,31]. At the same time, a decrease in the level in the blood of prostacyclin and nitric oxide forms a functional imbalance in the erythrocytes of adenylate cyclase and phosphodiesterase [32,33]. As a result, the amount of cyclic adenosine monophosphate decreases and the level of Ca^{2+} increases, which additionally stimulates the expression of erythrocyte aggregation [34,35].

CONCLUSION

For patients with type 2 diabetes, a high platelet count is characteristic. This required a detailed examination of this contingent of patients. In the work it was revealed that in the case of type 2 diabetes mellitus, the antioxidant activity of the plasma is weakened and the peroxidation of lipids, which adversely affects the vascular wall, is enhanced in it. In addition, this group of patients found a decrease in the disaggregating properties of the vessels in relation to the spontaneous aggregation of erythrocytes increasing in them. Expressed vasopathy in this contingent of patients is a serious basis for the high risk of thrombosis of any localization seriously affecting the patient's health [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] Vatnikov YuA, Zavalishina SYu, Pliushchikov VG, Kuznetsov VI, Seleznev SB, Kubatbekov TS, Rystsova EO, Parshina VI. (2017) Early-changes diagnostics of erythrocytes microrheological features in the model of dyslipidemia development in rats at the late stages of ontogenesis. Bali Medical Journal. 6(1) : 216-222.doi: 10.15562/bmj.v6i1.483

[5] 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.

[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] Zavalishina SYu, Vatnikov YuA, Kulikov EV, Yagnikov SA, Karamyan AS, Sturov NV, Byakhova VM, Kochneva MV, Petryaeva AV. (2017) Diagnostics of erythrocytes' microrheological features and early abnormalities of rats in the model of experimental hypertension development. Bali Medical Journal. 6(3): 470-475. doi:10.15562/bmj.v6i3.589

[8] Vatnikov YuA, Zavalishina SYu, Kulikov EV, Vilkovysky IF, Nikishov AA, Drukovsky SG, Krotova EA, Khomenets NG, Bolshakova MV. (2017) Correctional abilities of regular muscle activity in relation to erythrocytes' microrheological features of rats with experimentally developed hypertension. Bali Medical Journal. 6(3): 449-456. doi:10.15562/bmj.v6i3.586

[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] Zavalishina SYu. (2012) Dynamics of hemostasis system at newborn calves with iron deficiency by use ferroglucin and glicopin. Zootekhniya. 7 : 14-16.
[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] Zavalishina SYu. (2012) Platelet activity in newborn calves with iron deficiency anemia. Veterinariya. 2 : 51-52.
[15] Volchegorskiy IA, Dolgushin II, Kolesnikov OL, Tseilikman VE. (2000) Experimental modeling and laboratory evaluation of adaptive reactions of the organism. Chelyabinsk, 167.
[16] Zavalishina SYu.(2012) Vascular hemostasis at calves in milk-and-vegetable phase of feeding. Zootekhniya. 2 : 21.
[17] Zavalishina SYu, Nagibina EV.(2012) Dynamics of microrheology characteristics of erythrocyte in children 7-8 years with scoliosis with therapeutic physical training and massage. Technologies of Living Systems. 9(4) : 29-34.
[18] Carrizzo A, Puca A, Damato A. (2013) Resveratrol improves vascular function in patients with hypertension and dyslipidemia by modulating NO metabolism. Hypertension. 62 : 359-366.
[19] Bikbulatova A.A**.** Restoration Of Microcirculatory Processes In Persons Of The Second Mature Age With Osteochondrosis Of Lumbar Spine In The Course Of Daily Wearing Of Medicinal Prophylactic Clothes For Half A Year. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018; 9(2) : 620-630.
[20] Zavalishina SYu.(2010) Anticoagulative and fibrinolitic activity of plasma of blood at calves. Veterinariya. 11: 41-43.
[21] Bikbulatova A.A**.** Comparative analysis of rehabilitation efficiency in persons of the second mature age with spinal column osteochondrosis with the help of regular medicinal physical trainings and daily wearing of medicinal prophylactic clothes. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018; 9(2) : 997-1007.
[22] Zavalishina SYu. (2011) Functional condition of system of a hemostasis at newborn calves. Veterinariya. 6 : 42-45.
[23] Zavalishina SYu.(2012) Activity of a vascular hemostasis at calfs of a dairy food. Russian Agricultural Sciences. 4 : 49-51.
[24] Zavalishina S.Yu. (2012) Hemostatic activity of a vascular wall at newborn calfs. Russian Agricultural Sciences. 1 : 37-39.
[25] Zavalishina SYu. (2013) State of the system in neonatal calves in hemostasis with iron deficiency. Russian Agricultural Sciences. 3 : 43-46.
[26] 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.
[27] 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.
[28] 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.
[29] Zavalishina SYu. (2013) Gemostatical activity of vessels piglets vegetable nutrition. Veterinariya. 8 : 43-45.
[30] Zavalishina SYu. (2010) Activity of curtailing of blood plasma in calves of a dairy feed. Veterinariya. 8 : 49-51.
[31] Zavalishina SYu. (2010) Activity of blood coagulation system at healthy calves at phase of milk-vegetable feeding. Zootekhniya. 9 : 13-14.
[32] Skorjatina IA (2018) Therapeutic Possibilities Of Rosuvastatin In The Medical Complex In Relation To Disaggregation Vascular Control Over Erythrocytes In Persons With

Arterial Hypertension And Dyslipidemia. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 9(2) : 977-983.

[33] Epel ES, Lin J, Wilhelm FH. (2006) Cell aging in relation to stress arousal and cardiovascular disease risk factors. Psychoneuroendocrinology. 31(3) : 277-287.

[34] 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.

[35] Zavalishina SYu. (2011) Fibrinolysis blood activity at calves in the first year of life. Zootekhniya. 2 : 29-31.

[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.