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Disaggregation Properties Of Vessels With Respect To Neutrophils In Patients With Impaired Glucose Tolerance.

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ABSTRACT

Among the population of industrially developed countries, the prevalence of impaired glucose tolerance remains high. It is recognized that the high prevalence of thromboses in this pathology is associated with the weakening of the vascular functions and, in the first place, their disaggregation effects on the blood constituents. The goal is to assess the disaggregation characteristics of the vessels in relation to neutrophils in patients with arterial hypertension with impaired glucose tolerance. We examined 42 patients of the second mature age (mean age 49.6±1.7 years) with impaired glucose tolerance. 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 with impaired glucose tolerance 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 impaired glucose tolerance. The persons with impaired glucose tolerance 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, impaired glucose tolerance, vascular wall, antiaggregation.

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INTRODUCTION

Despite the improvement in the quality of medical services to the population, the prevalence of impaired glucose tolerance persists in industrially developed countries [1,2]. Very often it develops in able-bodied individuals, causing them a high incidence of vascular complications leading to disability and early mortality [3]. It was noted that a high frequency in the population of thromboses in violation of glucose tolerance is associated with a weakening of the synthetic processes in the vessels, especially their disaggregation control factors over the blood cells [4,5]. It is recognized that the intensification of their aggregation occurs necessarily in vascular dysfunctions, accompanied by activation of hemostasis and the development of thrombosis [6,7,8]. This is largely due to a decrease in synthesis in the vessels of disaggregants, including prostacyclin and nitric oxide [9,10]. In view of the high prevalence of impaired glucose tolerance and its serious significance for the micro-rheological properties of neutrophils, it was important to assess the level of vascular control over the process of aggregation of neutrophilic leukocytes in these patients [11].

The aim of the study is to evaluate the disaggregation characteristics of the vessels in relation to neutrophils in patients with impaired glucose tolerance.

MATERIALS AND METHODS

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

We examined 42 patients of the second mature age (mean age 49.6±1.7 years) with impaired glucose tolerance [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 level of vascular control over neutrophil aggregation was assessed in plasma taken after temporary venous occlusion and without it on a photoelectrocolorimeter. Inductors were the lectin of wheat germ at a concentration of 32 µg/ml, concanavalin A - 32 µg/ml and phytohemagglutinin - 32 µg/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 $p<0.05$.

RESULTS AND DISCUSSION

The patients were noted to have evident plasma LPO activation – the content of AHP in it surpassed the control value in 2.1 times, TBA-active products – in 1.4 times, being accompanied by suppression of antioxidant plasma activity in 1.25 times (Table).

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Table: Registered indicators in the surveyed

Registrated parameters	Patients, n=42, M±m	Control, n=26, M±m
acylhydroperoxides plasma, D_{233} /1ml	2.93±0.07	1.42±0.09 p<0.01
TBA-compounds, µmol /l	4.87±0.12	3.56±0.07 p<0,01
antioxidant activity plasma, %	26.2±0.16	32.9±0.12 p<0.01
biochemical parameters of neutrophils		
cholesterol of neutrophils, µmol /10^9 neutrophils	0.82±0.012	0.62±0.004 p<0.01
common phospholipids of neutrophils, µmol /10^9 neutrophils	0.38±0.006	0.51±0.003 p<0.01
acylhydroperoxides of neutrophils, D_{233}/10^9 neutrophils	3.41±0.05	2.36±0.05 p<0.01
malonic dialdehyde of neutrophils, nmol/10^9 neutrophils	1.31±0.07	0.73±0.03 p<0.01
catalase of neutrophils, ME/10^9 neutrophils	5850.0±9.75	9950.0±19.77 p<0.01
superoxidismutase of neutrophils, ME/10^9 neutrophils	1350.0±4.24	1780.0±4.21 p<0.01
aggregation of neutrophils in intact plasma		
Aggregation with lectin, %	22.1±0.17	15.6±0.07 p<0.01
Aggregation with concanavalin A, %	19.2±0.12	14.8±0.04 p<0.01
Aggregation with phytohemagglutinin, %	39.2±0.08	30.6±0.09 p<0.01
vascular control of aggregation neutrophils		
Aggregation with lectin after temporary venous occlusion, %	18.1±0.16	11.8±0.06 p<0.01
Aggregation with concanavalin A after temporary venous occlusion, %	16.2±0.09	11.0±0.07 p<0.01
Aggregation with phytohemagglutinin after temporary venous occlusion, %	36.0±0.07	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 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).

In all patients, a decrease in the disaggregation effects of the vessels with respect to neutrophils (Table).

In plasma obtained after a temporary venous occlusion, excess neutrophil aggregation was found in patients exceeding the control values with all used inducers (with lectin by 53.4%, concanavalin A by 47.3%, with phytohemagglutinin by 49.4%).

Important significance in the development of rheological disturbances and thrombophilia in persons with impaired glucose tolerance belongs to aggregation increase of regular blood elements and especially –

neutrophils [17,18]. At impaired glucose tolerance 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 found in the examined patients was largely due to the depression of synthesis in the vessel walls of compounds having disaggregation activity against the background of an increase in the number of glycoprotein receptors on leukocytes to lectins used as inducers in the study [24,25]. The intensification of lectin- and concanavalin A-induced aggregation of neutrophils in plasma after temporary venous occlusion in patients with impaired glucose tolerance is associated with an increase in the level of expression on the membranes of their neutrophils, adhesion receptors, which contain a significant number of sites containing N-acetyl-D- glucosamine, N-acetyl-neuraminic acid and mannose [26, 27]. The increase in neutrophil aggregation in response to the appearance of phytohemagglutinin in the plasma is caused by the growth in their receptors of sites of glycoproteins containing bD-galactose [28,29] under the conditions of depression of synthesis in the vascular endothelium of prostacyclin and NO patients [30,31,32].

CONCLUSION

The high frequency of occurrence in modern people of impaired glucose tolerance requires a comprehensive study of this pathology. Particular attention to neutrophils is due to the high incidence of thrombosis in this category of patients. In the study, it was found that lipid peroxidation in plasma was significantly enhanced in these patients. This contributes to the formation of vasopathy with a weakening of vascular production of physiological antiplatelet agents. This weakens their vascular control over the dramatically increasing aggregation of neutrophils. The simultaneous weakening of the disaggregation properties of blood vessels and the intensification of neutrophil aggregation disrupt trophism of tissues and make a significant contribution to the risk of thrombosis in patients with impaired glucose tolerance [33,34,35].

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] 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.

[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] 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.

[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.v6i3.552

[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] 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.

[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] Bikbulatova AA. (2018**)** 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.

[19] Bikbulatova AA. (2018) 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.

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

[21] 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 .

[22] 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. 2018; 9(3) :1417-1427.

[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] Zavalishina SYu. (2013) Vascular hemostasis in newborn calves with ferrum deficiency treated with ferroglucin. Zootekhniya. 8 : 24-26.

[27] Zavalishina SYu.(2014) State regulation-vascular interactions in newborn piglets with iron with ferroglucin and glikopin. Russian Agricultural Sciences. 1 : 57-59.

[28] Zavalishina SYu. (2013) Hemostatic activity of thrombocytes in calves during the phase of milk feeding. Agricultural Biology. 4 : 105-109.

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

[30] 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.
[31] Zavalishina SYu. (2010) Activity of blood coagulation system at healthy calves at phase of milk-vegetable feeding. Zootekhniya. 9 : 13-14.
[32] Zavalishina SYu. (2011) Fibrinolysis blood activity at calves in the first year of life. Zootekhniya. 2 : 29-31.
[33] 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.
[34] Maloletko AN, Yudina TN.(2017) (Un)Making Europe: Capitalism, Solidarities, Subjectivities. Contemporary problems of social work. 3 (3-11) : 4-5.
[35] 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.