ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Expression Of Spontaneous Aggregation Of Erythrocytes In Patients With Arterial Hypertension With Hyperuricemia.

Medvedev IN*.

Russian State Social University, st. V. Pika, 4, Moscow, Russia, 129226.

ABSTRACT

The very wide prevalence of thrombosis in hypertensive patients with hyperuricemia is largely associated with dysfunction of their blood cells. The situation is aggravated by the high frequency of occurrence in the developed countries of a combination of arterial hypertension with hyperuricemia. In view of the largest abundance in the blood of red blood cells, the state of their aggregation is most significant for providing an aggregate state of blood. The aim of the work is to assess the degree of disruption of aggregation properties of erythrocytes in patients with hypertension with hyperuricemia. 41 patients with arterial hypertension of 1-2 degree with hyperuricemia of the second adulthood were examined. The control consisted of 26 clinically healthy people of the second adulthood. Biochemical, hematological and statistical methods of investigation were used. In patients, an excess of cholesterol in erythrocyte membranes was found in the study, a decrease in the level of total phospholipids in them and activation of lipid peroxidation in them. In patients, an excess of spontaneous aggregation of erythrocytes was found. This should be considered as a consequence of the lipid peroxidation, metabolic disturbances, increased spasm of blood vessels and changes in the ratio of biologically active substances in the blood of hypertensive hyperuricemia. The presence of hyperaggregation of erythrocytes in patients with arterial hypertension with hyperuricemia dramatically increases the risk of thrombosis, which can lead to a permanent disability they are fatal.

Keywords: arterial hypertension, hyperuricemia, pathology, aggregation, erythrocytes.

Corresponding author

ISSN: 0975-8585

INTRODUCTION

Until now, among the working population in developed countries, the prevalence of a combination of arterial hypertension (AH) and hyperuricemia persists [1,2]. The simultaneous presence of these two pathologies in a person greatly increases the probability of developing a thrombosis of any localization threatening disability and death [3,4].

The high incidence of thrombosis in patients suffering from hypertension and hyperuricemia simultaneously is due, undoubtedly, to the presence of hyperaggregation of blood cells in them [5,6], which is manifested by worsening of blood rheology. This situation strongly stimulates hemostasis and increases the risk of thrombosis [7,8,9]. It is known that the aggregation of blood cells is inhibited by substances by disaggregants synthesized in the vessel wall. Apparently, in this situation, the sensitivity of blood cells to disaggregants (prostacyclin and nitrogen oxide) decreases [10,11]. The wide prevalence of the combination of hypertension with hyperuricemia is of great interest to her, including the state of spontaneous aggregation of erythrocytes in this category of patients.

The aim of the work is to assess the degree of disruption of aggregation properties of erythrocytes in hypertensive patients with hyperuricemia.

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 AH of 1-2 degrees, risk 4 [12] with hyperuricemia of the second adulthood (mean age 54.4±2.4 years) were examined. The control group included 26 clinically healthy people of the second adulthood. All persons involved in the study gave written information consent to participate in it, according to the generally accepted procedure [13].

The state of lipid peroxidation (LPO) in plasma was determined by the level of thiobarbituric acid (TBA) - active products by the Agat-Med kit (Russia) and the number of acyl hydroperoxides (AGP). [14] The level of antioxidant capacity of plasma was determined by the method of [15].

The activity of LPO in erythrocytes was determined by the level of malonic dialdehyde (MDA) in them and the content of AGP in them after washing and resuspension [14]. Also, in the washed and resuspended red blood cells, the amount of cholesterol was determined by the enzymatic colorimetry method by the kit of the company Vital Diagnosticum (Russia) and the total phospholipids by the phosphorus content in them by the conventional method.

The level of spontaneous aggregation of erythrocytes in a plasma obtained without superimposing a tourniquet was recorded under a light microscope in Goryaev's chamber [16]. The values of the number of erythrocyte aggregates, the number of aggregates and erythrocytes not aggregated [17] were taken into account.

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 AHP in it exceeded the control by 2.3 times, the concentration of TBA-active products - by 1.5 times, as a result of attenuation of the antioxidant activity of plasma by 1.5 times (Table).

The examined patients showed an increase in the content of cholesterol in the erythrocyte membranes with a decrease in total phospholipids in them. At the same time, in red blood cells, LPO was enhanced due to the weakening of their antioxidant defense (Table).

ISSN: 0975-8585

Spontaneous aggregation of erythrocytes was increased in all patients (Table). This was judged by an increase in the level of their total involvement in aggregates (by 62.7%), an increase in the number of these aggregates (by 50.0%) and a decrease of 59.2% in non-aggregated red blood cells.

Table. Registered indicators in the surveyed

Registrated parameters	Patients, n=41, M±m	Control, n=26, M±m
acylhydroperoxides plasma, D_{233} /1ml	3.27±0.08	1.42±0.09 p<0.01
TBA-compounds, umol / l	5.38±0.12	3.56±0.07 p<0.01
antioxidant activity plasma, %	22.2±0.17	32.9±0.12 p<0.01
biochemical parameters of erythrocytes		
cholesterol of erythrocytes, umol/10^{12} erythrocytes	1.34±0.008	1.04±0.004 p<0.01
common phospholipids of erythrocytes, umol/10^{12} erythrocytes	0.5±0.010	0.75±0.003 p<0.01
acylhydroperoxides of erythrocytes, D_{233}/10^{12} erythrocytes	4.70±0.13	3.08±0.10 p<0.01
malonic dialdehyde of erythrocytes, nmol/10^{12} erythrocytes	1.65±0.07	1.14±0.05 p<0.01
catalase of erythrocytes, ME/10^{12} erythrocytes	7450.0±14.0	11196.0±22.4 p<0.01
superoxidismutase of erythrocytes, ME/10^{12} erythrocytes	1650.1±2.00	1986.0±7.01 p<0.01
aggregation of erythrocytes		
sum of all the erythrocytes in an aggregate	68.2±0.15	41.9±0.10 p<0.01
quantity of aggregates	13.5±0.16	9.0±0.06 p<0.01
quantity of free erythrocytes	150.7±1.02	240.0±0.23 p<0.01

Legend: 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 thrombosis in patients with AH and hyperuricemia has an increase in erythrocyte aggregation [18, 19]. In patients with a combination of hypertension and hyperuricemia, the antioxidant activity of plasma decreases, which causes an increase in the activity of LPO in it [20]. This strongly damages the erythrocyte membranes [21] and is burdened by the development in the erythrocytes of these patients of the lipid imbalance that promotes their hyperaggregation. At the same time, the ability of red blood cells to disaggregate weakens [22,23]. The combination of these processes forms the growth of erythrocyte aggregation in the observed patients [24]. The increase in erythrocyte aggregation in hypertensive patients with hyperuricemia is largely due to the weakening of their disaggregating mechanisms [25,26] and to a decrease in the number of negative proteins on the erythrocyte membranes [27]. The onset of depression of the antioxidant properties of the plasma forms an intensification of peroxidation processes in it and as a result of it pronounced oxidative damages of endotheliocytes and globular plasma proteins arise [28,29]. In the prevailing conditions, the strengthening of erythrocyte communication among themselves is increasing, leading to an increase in the number of their aggregates [30, 31]. In this case, the depression of the sensitivity of erythrocytes to prostacyclin and nitrogen oxide forms an imbalance in the erythrocytes of the activity of adenylate cyclase and phosphodiesterase [32,33]. This contributes to a decrease in the level of cyclic adenosine monophosphate in their cytoplasm and

an increase in the amount of free Ca^{2+}, which additionally strongly stimulates the aggregation of erythrocytes [34, 35].

CONCLUSION

For patients with arterial hypertension and hyperuricemia, a high incidence of thrombosis is characteristic. This circumstance was an important reason for examining this contingent of patients. During the research, it was revealed that in patients with arterial hypertension and hyperuricemia, the level of antioxidant protection of plasma decreases and the processes of lipid peroxidation, which negatively affects erythrocyte aggregation, increase in it. It was found that in patients with arterial hypertension and hyperuricemia, a reduction in the disaggregation capacity of erythrocytes was found. The emerging situation of increasing aggregation of erythrocytes forms a risk of future vascular complications.

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] 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.v6i3.553

[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] 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.

[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) 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
[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. (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.
[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**.** 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] 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.
[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, 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
[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] 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.
[25] Maloletko AN, Yudina TN.(2017) (Un)Making Europe: Capitalism, Solidarities, Subjectivities. Contemporary problems of social work. 3 (3-11) : 4-5.
[26] 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.
[27] 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
[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] 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.
[31] Zavalishina SYu. (2010) Activity of blood coagulation system at healthy calves at phase of milk-vegetable feeding. Zootekhniya. 9 : 13-14.
[32] Cuspidi C, Sala C, Zanchetti A. (2008) Metabolic syndrome and target organ damage: role of blood pressure. Expert Rev Cardiovasc Ther. 6(5) : 731-743.
[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] Vorobyeva N.V., Skripleva E.V., Makurina O.N., Mal G.S. Physiological Reaction of The Ability of Erythrocytes to Aggregate to Cessation of Prolonged Hypodynamia. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2018; 9(2) : 389-395.
[35] Zavalishina SYu. (2011) Fibrinolysis blood activity at calves in the first year of life. Zootekhniya. 2 : 29-31.