ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Activity Of Aggregation Properties Of Neutrophils In Patients With Arterial Hypertension With Type 2 Diabetes Mellitus.

Medvedev IN*.

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

ABSTRACT

Preservation of a large number of pathologies in the population of industrially developed countries is accompanied by a wide prevalence of arterial hypertension and type 2 diabetes. This condition is very dangerous high frequency of occurrence of thromboses. It was revealed that in the basis of this, the excessive aggregation of the formed elements of the blood often lies. The aim is to assess the aggregation potential of neutrophils in patients with arterial hypertension with type 2 diabetes mellitus. We examined 42 patients of the second adult age (mean age 49.3 ± 2.9 years) with arterial hypertension of 1-2 degree with diabetes mellitus type 2. The control group consisted of 26 clinically healthy people of the same age. All examined persons gave written informed consent to participate in the study. Biochemical, hematological and statistical methods of investigation were used. The high frequency of thrombosis of various localizations in hypertension in type 2 diabetes is closely related to the development of neutrophil hyperagregulation. Weakening of antioxidant protection of plasma with activation of processes of lipid peroxidation in it, are an important basis of this disturbance. This process often occurs in conditions of a combination of arterial hypertension with diabetes mellitus type 2. It was found that in persons with arterial hypertension and type 2 diabetes mellitus an obvious weakening of neutrophil disaggregation is observed. As a result, patients receive a sharply increased risk of thrombosis of any location, which can lead to disability and death.

Keywords: neutrophils, arterial hypertension, type 2 diabetes mellitus, патология, aggregation.

Corresponding author

ISSN: 0975-8585

INTRODUCTION

The high incidence of carbohydrate metabolism disorders provides a high prevalence of type 2 diabetes, which often occurs in patients with arterial hypertension (AH) [1,2]. Often, their combination is present in the working population, leading to early vascular complications with subsequent disability and early death [3]. It is recognized that a high incidence of thrombosis, incl. with AH and type 2 diabetes mellitus is caused by a pronounced increase in the aggregation properties of blood cells [4,5]. This inevitably leads to activation of hemostasis and an increased risk of thrombosis [6,7,8]. It is believed that this process "starts" the decrease in the sensitivity of blood cells to prostacyclin and nitric oxide [9,10]. In view of the high prevalence of the combination of AH and type 2 diabetes mellitus and of great significance for the processes of microcirculation of neutrophil aggregation, it was important to clarify the features of neutrophilic leukocyte aggregation in of this contingent of patients [11].

The goal is to assess the aggregation potential of neutrophils in patients with AH with type 2 diabetes mellitus.

MATERIAL 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 49.3±2.9 years) with AH of the 1st-2nd degree [12] with type 2 diabetes mellitus. 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.

Aggregational properties of neutrophils were evaluated in plasma taken without temporal venous occlusion. Aggregation of neutrophils was recorded on a photoelectrocolorimeter. Inductors were used lectin wheat germ at a dose 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 $p<0.05$.

RESEARCH RESULTS AND DISCUSSION

The patients were noted to have evident plasma LPO activation – the content of AHP in it surpassed the control value in 2.35 times, TBA-active products – in 1.54 times, being accompanied by suppression of antioxidant plasma activity in 1.5 times (Table).

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 patients, the process of neutrophil aggregation with applied inducers occurred earlier than in control (with lectin 60.2%, with concanavalin A 43.9%, with phytohemagglutinin 43.1%) (Table).

Important significance in the development of rheological disturbances and thrombophilia in persons with AH and type 2 diabetes mellitus belongs to aggregation increase of regular blood elements and especially – neutrophils [17,18]. At combination of AH and type 2 diabetes mellitus 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. At the same time, the level of disaggregating abilities in platelets decreases [21,22,23].

Table. Registered indicators in the surveyed

Registrated parameters	**Patients, n=42, M±m**	**Control, n=26, M±m**
acylhydroperoxides plasma, D_{233} /1ml	3.34±0.09	1.42±0.09 p<0.01
TBA-compounds, µmol/l	5.47±0.16	3.56±0.07 p<0,01
antioxidant activity plasma, %	21.3±0.18	32.9±0.12 p<0.01
biochemical parameters of neutrophils		
cholesterol of neutrophils, µmol/10^9 neutrophils	0.88±0.007	0.62±0.004 p<0.01
common phospholipids of neutrophils, µmol/10^9 neutrophils	0.33±0.012	0.51±0.003 p<0.01
acylhydroperoxides of neutrophils, D_{233}/10^9 neutrophils	3.78±0.05	2.36±0.05 p<0.01
malonic dialdehyde of neutrophils, nmol/10^9 neutrophils	1.55±0.07	0.73±0.03 p<0.01
catalase of neutrophils, ME/10^9 neutrophils	5050.0±22.70	9950.0±19.77 p<0.01
superoxidismutase of neutrophils, ME/10^9 neutrophils	1110.0±4.85	1780.0±4.21 p<0.01
aggregation of neutrophils		
Aggregation with lectin, %	25.0±0.16	15.6±0.07 p<0.01
Aggregation with concanavalin A, %	21.3±0.11	14.8±0.04 p<0.01
Aggregation with phytohemagglutinin, %	43.8±0.15	30.6±0.09 p<0.01

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

The increase in neutrophil aggregation in AH with type 2 diabetes mellitus revealed in the study is largely due to the presence of this pathology in the body and an increase in the density of leukocyte receptors interacting with lectins and used as aggregation inducers [24,25]. The intensification of lectin- and concanavalin A-induced aggregation of neutrophils in plasma taken against a background of temporary venous occlusion in patients with AH with type 2 diabetes mellitus is associated with an increase in the number of adhesion receptors on neutrophils, including many sites with N-acetyl-D-glucosamine, N-acetyl-neuraminic acid and mannose [26, 27]. The growth of neutrophil aggregation with phytohemagglutinin is caused by an increase in the area of their receptors with bD galactose [28,29] with a marked decrease in the formation of prostacyclin and NO patients in the vessels [30,31,32].

CONCLUSION

High frequency of occurrence in modern people of arterial hypertension with type 2 diabetes requires further study of this pathology. The great danger of this pathology is associated with a high incidence of thrombosis on its background. In the conducted study, it was established that in these patients lipid peroxidation in plasma was sharply increased. It causes progression of amplification in these patients of excessive aggregation of neutrophils. The growth of active aggregation of neutrophils severely weakens tissue trophism and increases the risk of thrombosis in people with arterial hypertension and type 2 diabetes.

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) 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. (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

[17] 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.

[18] 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.

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

[21] 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.

[22] 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

[23] 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

[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] Zavalishina SYu. (2013) State of the system in neonatal calves in hemostasis with iron deficiency. Russian Agricultural Sciences. 3 : 43-46.

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

[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] 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.

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

[31] 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.

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