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Features Of Vascular-Platelet And Coagulation Hemostasis In Immune Microtrombovasculitis

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ABSTRACT

This article presents the results of the evaluation of vascular-platelet and coagulation hemostasis in patients with immune microtrombovasculitis.

KEYWORDS: Immune Microtrombovasculitis, Vascular-Platelet Hemostasis, Coagulation Hemostasis.

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INTRODUCTION

Of all the diseases that occur among the world's population, immune microtrombovasculitis (hemorrhagic vasculitis, Shenlein Genox disease) is increasing every day [5. Butenko A.]. According to the World Health data, the prevalence of these diseases corresponds to 140 cases among 1 million inhabitants, is 1st among systemic vasculitis in frequency of occurrence, 24 cases per 100,000 inhabitants per year among children in the European region, 21.1 cases in North American and Asian countries, 12.9 cases in Taiwan, 20.4 cases in the United Kingdom, as well as 19 cases in Russia [6. Sobirova, Guzal]. Hemorrhagic vasculitis is characterized by its prevalence in different populations of the population, its diversity and high development of severe hemorrhagic and thrombogemorrhagic complications leading to death, polymorphism [3. Batyan G.]. Among the pathologies of hemorrhagic vasculitis, an acquired disorder of primary hemostasis, immune microtrombovasculitis has a special place. In the population of 10 thousand, immune microtrombovasculitis occurs in 13-20 cases [4. Bulanov N.M.]. Immune microtrombovasculitis belongs to immunocomplex vasopathies acquired according to the modern classification, develops on the basis of aseptic damage to the body of immune complexes circulating the endothelium of small blood vessels, and is characterized by the development of microtrombs. Insufficient data has been cited despite advances in the study of the pathogenetic mechanisms of immune microtrombovasculitis [2. Artemova M.]. In the development and acceleration of the disease, it is important to highlight the mechanisms that lead to extensive endothelial damage, to improve their diagnosis and treatment [1. Azarenok A.].
A number of targeted scientific studies are being carried out in the world to study the molecular mechanisms of immune microtrombovasculitis and improve treatment based on them. Particular attention in this regard is paid to increasing the effectiveness of treatment using the form, severity, duration of the disease of immune microtrombovasculitis, as well as nitric oxide inducer and angiotensin specific killer enzyme inhibitor according to treatment procedures, in connection with hemostasis indicators of serum, endothelin 1, thrombomodulin, Villebrand factor, as well as soluble intercellular adgesia factor (sICAM-1). In immune microtrombovasculitis, there have been few studies on the molecular mechanisms of endothelial cell damage, their association with hemostasis indicators, the possibility of transmitting disease through Target hands of nitric oxide inducers and angiotensin-dressing enzyme inhibitors in the restoration of detected changes. For this reason, it assumes the need to carry out these scientific studies.

THE MAIN PART.

Research material and methods. Clinical studies were carried out during 2018-2021 in the Endogematology Department of the multidisciplinary clinic of the Tashkent Medical Academy. The study involved 64 men and 101 women with hemorrhagic vasculitis between the ages of 18 and 74, for a total of 165 patients (core group). As a control group, 20 healthy volunteers of approximately the same age were obtained (control group). All patients volunteered to participate in the study.

Analysis of the results of blood tests is an integral part of laboratory diagnostics and constant therapy monitoring. A total blood count MINDRAY with platelet count was conducted in a 5000 (Chinese) hematological analyzer. The use of modern automated analyzers for blood tests makes it possible to obtain sufficient clinical information about the state of the hematopoietic system and its effect on various external and internal factors. The mindrey 5000 high-tech hematological Analyzer is capable of measuring 23 parameters, 3 histograms. This analyzer uses the following measurement methods: impedance method to determine

the number of red blood cells and platelets; colorimetric method to determine hemoglobin; white blood cell count and flow lasercitometry to determine leukoformula.

The state of the coagulation phase of hemostasis is assessed according to the following parameters: active partial thromboplastin time, thrombin time, prothrombin time, prothrombin index, international normative relationship, plasma heparin tolerance, fibrinogen, hematocrit, ethanol test, and thrombotest.

Hematocrit is detected by microsentrifying or automatically using modern hematological analyzers. In our study, hematocrit MINDRAY was detected using the hematological analyzer BC5000.

All immunoferment examinations were determined by contract in the scientific laboratory "Genotechnology" at the Perinatal Center of the Republic.

Statistical processing of the material was carried out on a personal computer using a set of statistical analysis programs with the calculation of the average arithmetic measurement (m), average deviation (σ), relative values (frequency) (m). The statistical significance of the measurements obtained when comparing the average values was determined by the criterion of stylistic reliability. The R<0.5 significance level was regarded as statistically significant changes.

RESEARCH RESULTS

To study the vascular-platelet stage of hemostasis, the calculation of platelet count in the total blood count, adgesia and aggregation activities of platelets were studied. The study found that the average platelet count in Group 1 patients was 308±32.3 × 109/L,in Group 2 patients it was 346±41.5 × 109 /L, and in Group 3 and 4 patients the platelet count was significantly increased and was 396±47.7 × 109/L and 453 ± 56.109/l,respectively. In the control group, this indicator was 244 ± 38.9 x109/L.

A study of the amount of thrombocrit in a group of patients with immune microtrombovasculitis found that in Group 1 thrombocritus was 0.26±0.02%, in Group 2, the rate was 0.34±0.03%, in groups 3 and 4, thrombocritus was 0.41±0.03% and 0.45±0.02%, respectively. The amount of thrombocrit in the control group was 0.24±0.01%.

A study of platelet function found that patients in immune microtrombovasculitis major groups showed a significant increase in platelet adgesia and aggregation properties compared to the control group. A study of platelet adgesia showed that all four groups of patients with immune microtrombovasculitis showed a significant increase in this indicator. According to the study, platelet adgesia in Group 1 patients was 47.9±5.1%, 52.3±4.3% in Group 2, 64.7±5.4% in Group 3, 62.3±5.3% in Group 4, and platelet adgesia was 28.9±4.1% in the control group (Figure 1).

Platelet aggregation was studied in two solutions of the hemolysate-aggregation test: 10-2 (GAT10-2) and 10-6 (Gat 10-6). A study of aggregation properties in two platelet Solutions showed that in major groups with immune microtrombovasculitis, platelet aggregation ability increased significantly, demonstrating hypercoagulation dominance.

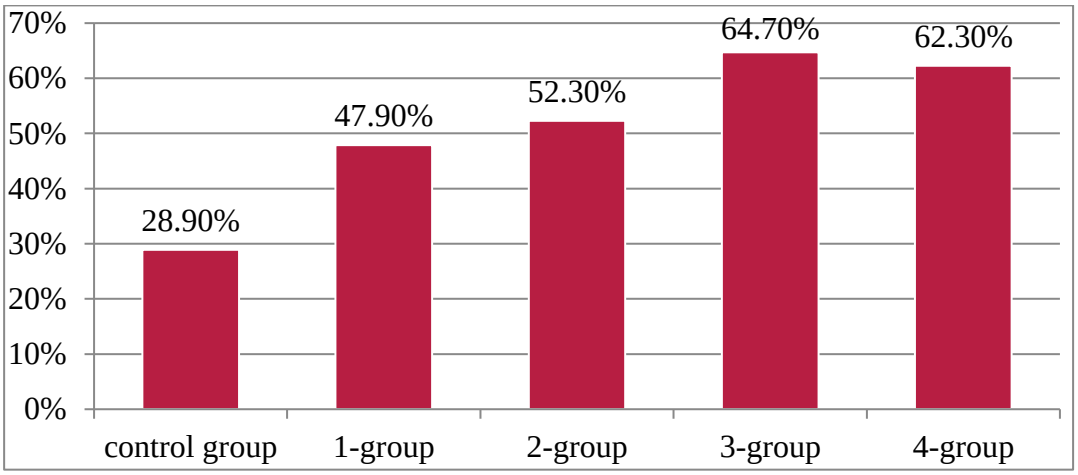


Figure 1. Platelet Adhesion in patients with immune microtrombovasculitis

In Group 1, these indicators are 12.2±1.3 sec and 23.0±1.7 sec in the first and second dilutions, respectively., The aggregation properties of platelets in Group 2 were 10.8±2.3 sec in GAT 10-2 dilution, and 16.3±2.6 sec in GAT10-6. Group 3 has undergone significant changes towards hypercoagulation according to these indicators: GAT10-2 8.9±1.3 sec, GAT10-613.1±1.6 sec. In Group 4, GAT10-2 is 8.6±1.5 sec, GAT10-613.3±1.4 sec. The parameters of the hemolysate-aggregation test in the control group were: GAT10-215.5±0.8 sec and GAT10-6 32.8±1.4 sec. (Table 1).

Table 1.
Platelet hemostasis condition in patients with immune microtrombovasculitis

Groups	GAT10^{-2}, sec.	GAT10^{-6}, sec.	Retraction
Control group (n=20)	15,5±0,8	32,8±1,4	0,32±0,02
Group 1 (n=47)	12,2±1,3*	23,0±1,7***	0,28±0,01
Group 2 (n=64)	10,8±2,3*	16,3±2,6***	0,26±0,02*
Group 3 (n=26)	8,9±1,3***	13,1±1,6***	0,24±0,02*
Group 4 (n=28)	8,6±1,2***	13,3±1,4***	0,24±0,02*

Note: * - differentiation relative to control group indicators is reliable (*- p<0.05; * * - p<0.01; * * * - p<0.001
As shown above, the results of the study showed a significant increase in platelet adgesia and aggregation capacity in the group of patients with immune microtrombovasculitis compared to the control group, indicating an increase in platelet function and a predisposition to hypercoagulation in these patients.

In addition, the determination of blood clot retraction also applies to the parameters of platelet hemostasis. A study of the timing of platelet retraction found that patients with major immune microtrombovasculitis groups had reduced initial rates of retraction, which is also characteristic of hypercoagulation. In major groups, there has been a significant increase in platelet retraction time from 0.24±0.02 seconds to 0.28±0.02 seconds, while in the control group this is 0.32±0.02 sec.

Thus, with an increase in platelet activity in patients with immune microtrombovasculitis, there is a violation of platelet functional characteristics, characterized by an increase in platelet adgesia and aggregation properties by 18.6-42.7% and a reduction in the blood clot's withdrawal time by 12.5-25.0%.

Coagulation hemostasis consists of a cascade of reactions involving plasma factors. Coagulation hemostasis has been studied in three stages of blood clotting:
1. Blood clotting time and active partial thromboplastin time (blood clotting Stage 1) according to the Moravis method.
2. Prothrombin time, prothrombin index and international normative attitude (2 stages of blood clotting).
3. Fibrinogen, thrombin time, tolerance of plasma to heparin, thrombotest (3 stages of blood clotting).
To assess the first stage of blood clotting, the timing of blood clotting and the timing of active partial thromboplastin were studied under Moravis.
In patients in the main groups of immune microtrombovasculitis, a clear reduction in blood clotting time was observed. Thus, the onset of blood clotting in Group 1 was 96.3±24.9 s, the end of coagulation was 160.3±30.7 s, and the onset of clotting in Group 2 was 73.5±16.3 s, completion was 125.8±26.7 s. In groups 3 and 4, a significant violation of blood clotting time was observed (Table 2).

Table 2
Evaluation of the first stage of blood coagulation in immune microtrombovasculitis

Groups	Blood clotting time onset, sec	Blood clotting time completion, sec	Актив қисман тромбопластин вақти, sec
Control group (n=20)	125,3±14,2	248,0±16,6	29,1±3,39
Group 1 (n=47)	96,3±24,9	160,3±30,7*	20,4±1,2*
Group 2 (n=64)	73,5±16,3**	125,8±26,7**	18,0±2,1*
Group 3 (n=26)	66,7±12,2**	115,7±18,9***	16,8±1,6**
Group 4 (n=28)	56,5±9,7***	107,2±16,8***	15,9±1,5**

Note: * - differentiation relative to control group indicators is reliable (*- p<0.05; * * - p<0.01; * * * - p<0.001

As can be seen from the table, the onset of blood clotting in Group 3 was 66.7±12.2 s, the end was 115.7±18.9 s,and in Group 4 the onset of blood clotting was 56.5±9.7 s, the end was 107.2±16.8 s. In the control group, these indicators were as follows: the onset of blood clotting is 125.3±14.2 s, the completion is 248.0±16.6 s. A reduction in blood clotting time compared to the control group in patients with immune microtrombovasculitis showed that plasma hemostasis had strong hypercoagulation.

Patients in immune microtrombovasculitis major groups have reduced plasma active partial thromboplastin time: Group 1 has active partial thromboplastin time of 20.4±1.2 s, Group 2 has 18.0±2.1 s,Group 3 has 16.8±1.6, and Group 4 has 15.9±1.5 s. In

the control group, the active partial thromboplastin time was 29.1±3.39 S. In patients with immune microtrombovasculitis, a reduction in blood clotting time relative to the control group has shown that plasma hemostasis has a pronounced hypercoagulation shift.

Severe violations of blood clotting time and partial thromboplastin time have shown that patients with immune microthrombovasculitis have a change towards hypercoagulation in the first phase of coagulation hemostasis.
To characterize the second stage of plasma hemostasis, prothrombin time, prothrombin index and international normative attitude were studied.

A study of prothrombin time showed that in patients with immune microtrombovasculitis major groups compared to the control group, the hemostasis system shifted significantly towards hypercoagulation. Thus, in Group 1, the prothrombin time was 10.0±0.9 s, in Group 2, 9.2±0.7 s was 8.7±1.9 s in Group 3, and in Group 4, this indicator was 8.4±1.9 seconds. The prothrombin time of the control group was 12.8±1.1 seconds.

The prothrombin index was calculated using a special formula and was 130.0±5.5% in 1 group, 141.3±6.2% in 2 groups, 149.0±7.3% in 3 groups and 154.8±10.3% in 4 groups. This demonstrated the presence of severe hypercoagulation in patients with immune microtrombovasculitis (Table 3).

Table 3.
Evaluation of the second stage of blood coagulation in immune microtrombovasculitis

Groups	Prothrombin time, sec	Prothrombin index,%	International normative attitude
Control group (n=20)	12,8±1,1	98,5±7,2	1,0±0,09
Group 1 (n=47)	10,0±0,9*	130,0±5,5**	0,77±0,09
Group 2 (n=64)	9,2±0,7*	141,3±6,2***	0,71±0,08*
Group 3 (n=26)	8,7±1,9*	149,0±7,3***	0,67±0,07*
Group 4 (n=28)	8,4±1,9*	154,8±10,3***	0,65±0,07**

Note: * - differentiation relative to control group indicators is reliable (*- p<0.05; * * - p<0.01; * * * - p<0.001

As can be seen from the table, in all immune microtrombovasculitis groups, the international normative attitude has decreased. The international normative relationship in Group 1 was 0.77±0.09, Group 2 was 0.71±0.08, Group 3 was 0.67±0.07, and Group 4 was 0.65±0.07. In the control group, this indicator was 1.0±0.09.

Studies of the indicators of the second stage of blood clotting have shown that in patients in the main groups of immune microtrombovasculitis, the blood shifts significantly towards hypercoagulation.

To characterize the third stage of blood clotting, the amount of fibrinogen, heparingatolerancy of plasma, thrombotest and thrombin time were determined. Fibrinogen, thrombin time, plasma heparin tolerance, thrombotest indicators are listed in Table 4.

The study of the amount of fibrinogen showed a significant increase in fibrinogen concentration, which indicated the presence of strong hypercoagulation shift (see table 3.5). The fibrinogen content in the 1 group was 455.0±30.0 mg%, 538.0±31.3 mg% in the 2 Group, 559.0±36.7 mg% in the 3 group and 530.6±36.7 mg% in the 4 group. In the control group, this indicator was 290.4±60.5 mg%.

Table 4.
Indications of the third stage of plasma hemostasis in immune microtrombovasculitis

Groups	Fibrinogen (mg%)	Thrombin time (sec)	Plasma heparin tolerance (sec)	Thrombin test
Control group (n=20)	290,4±60,5	15,7±1,0	310,0±57,6	4,8±0,41
Group 1 (n=47)	455,0±30,0*	11,6±1,2*	218,5±38,7	6,0±0,47*
Group 2 (n=64)	538,0±31,3**	11,2±1,2*	202,0±29,3	6,5±0,43*
Group 3 (n=26)	559,0±36,7**	10,7±1,4*	199,6±34,8	6,9±0,56*

Group 4 (n=28)	530,6±36,7**	10,6±1,3**	190,1±32,1	6,8±0,54*

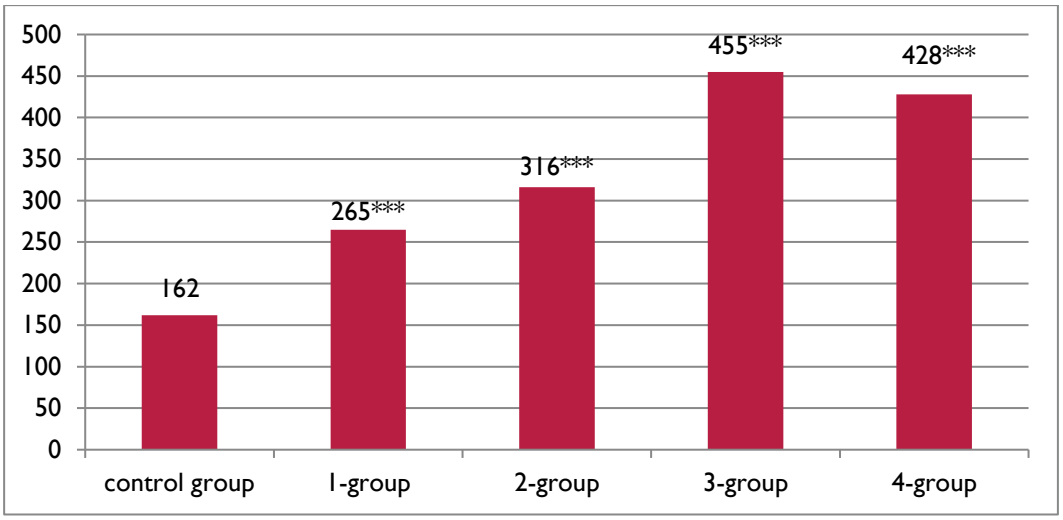
Note: * - differentiation relative to control group indicators is reliable (*- p<0.05; * * - p<0.01; * * * - p<0.001

In a study of the third step of plasma-coagulation Binding of hemostasis, patients of immune microtrombovasculitis major groups were found to have a sharp reduction in thrombin time compared to the control group. Thus, the thrombin time of Group 1 was 11.6±1.2 s, Group 2 was 11.2±1.2 s, Group 3 was 10.7±1.4, and Group 4 was 10.6±1.3. The control group's thrombin time was 15.7±1.0.

Immune microtrombovasculitis with respect to the control group was also found to increase plasma tolerance to heparin in patients in Groups 1, 2, 3 and 4. The plasma tolerance factor for heparin was 218.5±38.7 s in Group 1, 202.0±29.3 s in Group 2, 199.6±34.8 in Group 3, and 190.1±32.1 in Group 4, compared to 310.0±57.6 s in the control group.

Thrombotest was determined by the intensity of formation of fibrin clots. 3 degrees was characterized by the formation of an empty clot, 4 degrees of a clot was formed by sticking to the wall of the test tube, 5 degrees of a clot filled the entire volume of the test tube. The main proportion of thrombotest indicators was 6.0-6.8 degrees in the main group of patients with immune microtrombovasculitis.

D-dimer was a thrombus degradation product and was observed to increase in immune microtrombovasculitis. Group 1 patients had a D dimer of 265±21 ng/mL***, Group 2 had 316 ± 29 ng/mL***, Group 3 had 455 ± 38 ng/mL***, and Group 4 had 428 ± 35 ng/mL***. In the control guru, this indicator was observed to be 162 ± 14 ng/ml.



Note: * - differentiation relative to the pattern group indicator is reliable (***-p<0.001)

Figure 2. D dimer levels in patients with immune microtrombovasculitis, ng / mL.

As can be seen from the diagram, D dimer in immune microtrombovasculitis is increased by disease progression.

CONCLUSION

The study showed that in the main groups with immune microtrombovasculitis, moderate thrombocytosis was observed to increase thrombocritus, while disorders of platelet functional characteristics were found with increased platelet activity in such patients, which was manifested by decreased blood clot retraction time. Patients of major groups with immune microtrombovasculitis observed blood clotting time, active partial thromboplastin time, prothrombin time, thrombin time, contraction of the international normative relationship, prothrombin index, fibrinogen content, plasma heparin tolerance, D dimer increase. Hypercoagulation was found to be present in all three stages of coagulation hemostasis.

A study of the third stage of blood clotting showed that there is clear hypercoagulation compared to the control group from all groups with immune microtrombovasculitis.

REFERENCES

1. Azarenok A.A. The role of the influenza virus and its surface proteins in the development of endothelial cell dysfunction 03.02.02. - virology Abstract. ... cand. Biol. sciences. St. Petersburg, 2014, 29 p.
2. Artemova M.G. Genetic polymorphisms associated with the development of cryoglobulinemia in patients with chronic hepatitis C 14.01.04 – internal diseases Abstract. ... candidate of Medical Sciences. Moscow, 2017. 25 p.
3. Batyan G.M., Kozyro I.A., Sukalo A.V. Systemic vasculitis in children. –Minsk: BSMU, 2018. – 26 p.
4. Bulanov N.M. Clinical variants of kidney damage in ancaassociated vasculitis; the value of serum and urinary parameters of mcp-1, kim-1 and type IV collagen in the assessment of activity 14.01.04 – internal diseases Abstract. ... candidate of Medical Sciences. Moscow, 2017. 25p.

5. Butenko A.V. Homocysteine: influence on biochemical processes in the human body // Young Scientist. — 2016. — № 1 (105). — 78-82 pp.
6. Sobirova, Guzal & Kurbanovna, Abdullaevaumida & Shukurloevna, Nosirova & Jabborovna, Aslonova. (2021). Journal of Critical Reviews Evaluation of the gastrointestinal mucosa by the OLGA system in chronic atrophic gastritis. doi: 10.31838/jcr.07.02.80.