STRUCTURAL AND FUNCTIONAL CHANGES IN HEMOGRAMS OF PATIENTS WITH TUBULOPATHY ASSOCIATED WITH ARTERIAL HYPERTENSION

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It is shown tubulopathy associated with arterial hypertension are characterized by disorders in leukocytes and platelets relationship. It is supposed that development and progression of arterial hypertensia associated with tubulopathy, can be caused by considerable influence of mechanisms of interstitial defeats of kidneys on dynamics of leukocytes and platelets parameters.
Keywords: arterial hypertensia, tubulopathy, leukocytes, platelets, blood

Urgency

Developing and progress of the arterial hypertension (AH) is realized through the several mechanisms such as kidney function disorders by hematology homeostasis irregulation. Due to this point, the arterial hypertension developing up against tubulointerstitial pathology can be named as secondary. Essential hypertension is developed as primary and dependence from hematology homeostasis regulation not so visible. But progressive form of AH can neutralize clinical differences between its secondary and essential forms such as arterial hypertension associated with damage of target organs leads to vascular changes. To a lesser degree these risks are studied for combination of tubulointerstitial defeats and AH.

Aims: to study of the structural and functional parameters of leukocytes and platelets in blood of patients with arterial hypertension associated with tubulopathy.

Patients and methods: 43 patients (29 females and 14 males, age 17-52 years) were examined; they divided in to three groups. In first group are patients with tubulopathy (TP) like chronic pyelonephritis in remission (without urinal infection) and patients with interstitial kidney pathology against toxic factors (such as alcohol, metabolic disorders, drug intoxication, saluric diathesis) without AH. Second group includes patients with essential arterial hypertension (AH), which diagnosis was exposed on the basis of complex clinical-and-tool and laboratory research after exception of diseases which complication is AH; third group consists from patients with tubulopathy associated with AH (TP + AH).

The object of investigation was venal blood of patients with TP, EH and with combination of these two pathologies. The investigations were made by using of hematology analyzer BC-3200, Mindray. It was detected number of White Blood Cells (WBC), Lymphocytes (Lymph), Granulocytes (Gran), quantity of middle sizes cells (Mid), quantity of platelets (PLT), Mean Platelet Volume (MPV), Platelet Distribution Width (PDW), Platelet Grit (PCT).

The statistical analysis of the received data was used of a package of applied programs STATISTICA version 7.0 taking into account the computing methods recommended for biology and medicine. The analysis of the received data included calculation of average arithmetic of variation number (M) and its errors (m). For revealing of relationship between parameters and its power have been calculated a Pirson coefficient of pair correlation (r).

Results and discussion

WBC fraction data was shown on table 1. According to our data on table 1 was fixed reduction of leukocytes number at patients with EH in relatively comparing with other groups of patients and control healthy group also. So, the percentage of leukocytes content correlates with preference data.

Table 1. WBC poll data in blood of patients with tubulopathy, essential arterial hypertension and tubulopathy associated with AH

Patient groups	WBC $\cdot 10^9$/л	Lymph $\cdot 10^9$/л	Mid $\cdot 10^9$/л	Gran $\cdot 10^9$/л	Lymph %	Mid %	Gran %
Refer-ence data	4,5–10,0	0,8-4,0	0,1-0,9	2,0-7,0	20-40	3,0-9,0	50-70
TP (n=23)	6,24±1,2	2,04±0,52	0,49±0,12	3,71±0,25	34±2,8	8±1,3	58±3,2
AH (n=10)	3,00±0,9	0,90±0,1	0,27±0,05	1,83±0,1	30,25±4,1	9,10±2,8	60,64±5,3
TP+AH (n=10)	7,81±1,5	2,42±0,2	0,56±0,3	4,83±0,5	33±2,1	7±1,4	60±1,9

Analysis of the relative quantity of leukocytes fraction in blood was shown maximal increasing of lymphocytes in patient's blood with TP+AH, but the relative level of middle sizes cells (sum of monocytes, basophiles and eosinophils fraction) and granulocytes was maximal in blood of patients with AH. However authentic distinction between data of its groups was not observed.

Platelets parameters in observed groups was done on table 2.

Table 2. Platelets indicators in blood of patients with tubulopathy, essential arterial hypertension and tubulopathy associated with AH.

Patient groups	PLT $\cdot 10^9$/л	MPV fl	PCT %	PDW
Reference data	100-300	7-11	0,108-0,282	15-17
TP (n=23)	86,91±8,51	8,95±0,1	0,07±0,007	16,35±0,35
AH (n=10)	58,67±2,35	9,47±0,2	0,06±0,002	16,60±0,5
TP+AH (n=10)	171,44±13,10	8,86±0,1	0,15±0,01	16,01±0,9

In blood of patients with TP and patients with AH decreasing both absolute and relative platelets quantity are observed. Thus, in blood of patients with TP associated with AH, these parameters are same with normal data. The given fact can be explained as infringement of a parity of platelets rate formation and destruction and change of it's membranes characteristics that can lead to change of cell electric characteristics and consequently to bring an error in measurement. MPV was fixed maximally in blood of patients with AH (9,47±0,2 fl). PDW data as factor of trombocytes heterogeneity was fixed maximally in this group also. Authentic character of differences has been revealed only between data of second group and two others. Differences between groups TP and TP+AH were minimum and did not carry authentic character. Thus, differences of volume parametres and heterogeneity of platelets in different patients groups are revealed. For study of relationship of investigated data the pair correlation analysis with definition of size and importance of correlation has been carried out.

Results of this analysis was shown on the table 3 to patients with TP.

Due to these data, we have found out a linear dependence between quantity of leukocytes and granulocytes relative content and inverse relationship between quantity of leukocytes and lymphocytes relative content. Thus between the lymphocytes relative content and the granulocytes relative content the

inverse correlation (with 0,99 coefficient) also has been revealed (at p<0,05).The quantity of middle sizes cells has not given significant correlations among indicators of leukocytes, but average correlation (r = 0,46) between the relative level of middle sizes cell and width-wise of platelets distribution on volume has been revealed. Such of this relationship demands search of mechanisms of middle sizes cells influence (monocytes, basophiles and eosinophyles fraction) on platelets volume parameters.

Table 3. Pirson coefficient of pair correlation for leukocytes and platelets at blood of patients with TP

Parameters	WBC	Lymph %	Mid %	Gran %	PLT	MPV	PCT	PDW
WBC		-0,48		0,46				
Lymph %	-0,48			-0,99				
Mid %								0,46
Gran %	0,46	-0,99						
PLT							0,99	-0,62
MPV								0,67
PCT					0,99			-0,57
PDW			0,46		-0,62	0,67	-0,57	

It is important to notice that the fact of dynamic interference of cellular elements is found out at tubulopathy. Obviously, tubulointerstitial defeats are mediated through physical and chemical mechanisms also and creating new conditions for regulation of aggregate blood condition.

Correlations between platelets characteristics in patients with TP have been more expressed. Revealed direct dependence between platelets quantity and plateletcytocrite and between platelets quantity and PDW are inverse relationship (r =-0,62). Also correlations between PDW data and MPV data and PCT (r = 0,67 and -0,57, accordingly) have been established.

Results of the correlation analysis of leukocytes and platelets data in hemograms of patients with AH are presented in table 4. Analyses of correlation coefficient of leukocytes and platelets indicators in patients with AH has shown reverse correlation (r =-0,89) between relative lymphocytes and granulocytes levels. In other pairs of leukocytes indicators the significant correlations was not observed.

Table 4. Pirson coefficient of pair correlation for leukocytes and platelets in blood of patients with AH

Parameters	WBC	Lymph %	Mid %	Gran %	PLT	MPV	PCT	PDW
WBC								
Lymph %				-0,89				
Mid %								
Gran %		-0,89						
PLT						-0,96	1,00	-0,91
MPV					-0,96		-0,94	
PCT					1,00	-0,94		-0,90
PDW					-0,91		-0,90	

Correlations between platelets indicators at patients with AH were as expressed, as well as in patients with TP. Strict dependence between PLT and PCT indicators (r =

1,00 is noted at p <0,05) and strong correlation binds between PDW with PLT and PCT indicators (r =-0,91 and-0,90 accordingly) was marked. Also inverse relationship between platelets volume and PLT and PCT data (r =-0,96 and-0,94 accordingly) is revealed.

So, by results of the analysis of correlation data of leukocytes and platelets at patients TP and patients with AH, the strong relationship between platelets fraction was established. In first group presumable dependence between the middle sizes cells relative level and platelets heterogeneity is revealed.

Results of the correlation between leukocytes and platelets indicators in hemogram of patients with combination TP and AH are presented in table 5.

Table 5. Pirson coefficient of pair correlation for leukocytes and platelets in hemogram of patients with combination TP and AH

Parameters	WBC	Lymph %	Mid %	Gran %	PLT	MPV	PCT	PDW
WBC								
Lymph %			-0,89	-1,00				
Mid %		-0,89						
Gran %		-1,00						
PLT							0,99	
MPV								
PCT					0,99			
PDW								

Analysis of correlation coefficient between leukocytes and platelets in third group of patients has shown practically a total absence of correlations between platelets indicators. The significant coefficient has been revealed only between PLT and PCT data since the absolute platelets quantity is entered into the calculation of plateletcytocrite. In fraction of leukocytes strict inverse relationship (r =-1,00) between the relative lymphocytes and granulocytes levels and strong inverse relationship (r =-0,89) between relative lymphocyte level and middle sizes cell has been revealed also.

So, study has shown that tubulopathy with AH combination are characterized by disorders in leukocytes and platelets relationship. Thus hemogram indicators defined in clinic, was not overlook a control data. It is possible to assume that development and progression of arterial hypertensia associated with TP, can be caused by considerable influence of mechanisms of interstitial defeats of kidneys on dynamics of leukocytes and platelets parameters. It might be as to reflect changes of active cycles of cells as to define a number of essential changes in life cycle of blood cellular elements. Obviously, it may have matter for biologically active substances production which its causing a change of vascular and tissue reactions, and finally it important for arterial hypertension progression.