Assessment of Morphometric Size and Profile of Peripheral Blood Platelets in Children with Hemolytic Uremic Syndrome

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Background

- Hemolytic uremic syndrome (HUS) is the main reason of acute renal injury in children before 5 years of age
- HUS is characterized by the triad of microangiopathic hemolytic anemia with red blood cell fragmentation, thrombocytopenia, and acute kidney injury
- Microvascular thrombosis as a result of platelet activation and consumption is a key aspect of the pathogenesis of HUS
- Platelets have exclusive heterogeneity reflecting in their morphology
- Relevant is the study of platelet shapes, geometric and optical parameters in children with HUS

Aim

- To assess the morphological composition and opticogeometric parameters of circulating platelets in children with HUS using computer morphometry

Patients and Methods

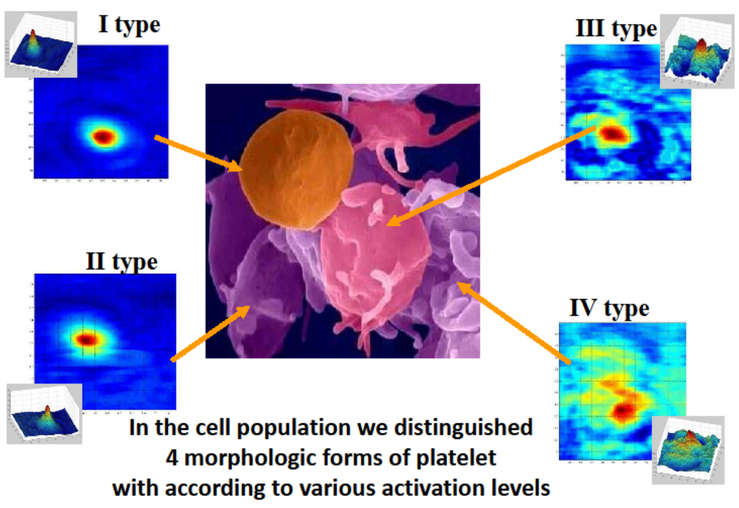
- Vital computer morphometry of platelets with computer phase-interference microscope "Cytoscan"
- Clinical blood analysis
- Coagulation analysis

Point 1 → Phase of oligo/anuria
Point 2 → Recovery of diuresis
Point 3 → Normal diuresis

Control group 14 healthy children (mean age 2,4±1,6 years) 35 patients with HUS (mean age 2,37±1,4 years)

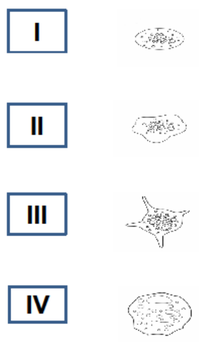
Results

Fig. 1 Morphologic types of platelets



In the cell population we distinguished 4 morphologic forms of platelet with according to various activation levels

Fig.2 Ratio of platelets forms in control group, %



I — 48% 'resting' platelets

II — 36% platelets with low level of activation

III — 14% platelets with high level of activation

IV — 2% degenerative forms

Fig.3 Changing of platelet count (x10⁹/l) and platelet form's ratio (%) in study groups

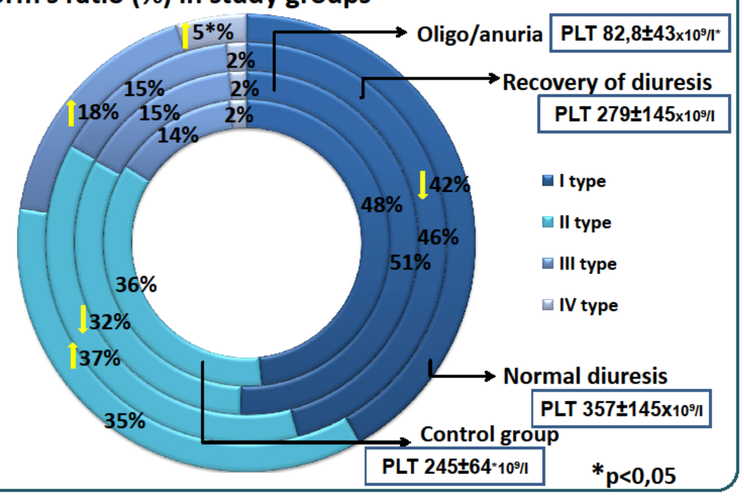
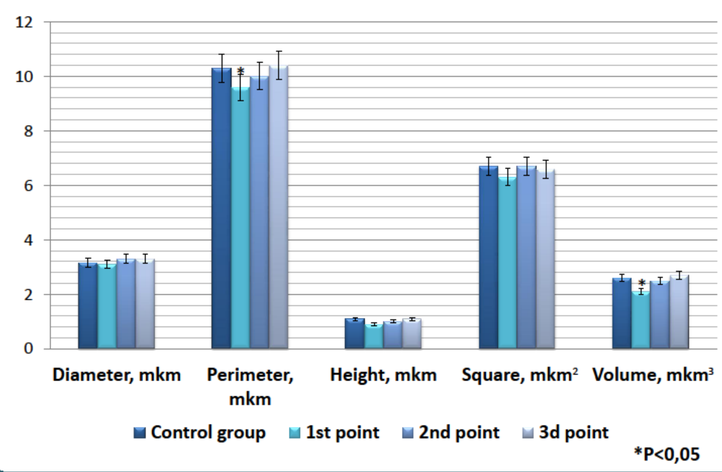


Table 2. Platelet count and platelet indices in study groups

	PLT, x10⁹/l	MPV, mkm³	PDW, %	PCT, l/l
Normal range	180-320	7,8-12,6	10-15	0,15-0,35
1t point	82,8±43,1*	11,1±1,92*	14,3±4,8	0,1±0,04*
2nd point	279±145	8,5±0,75	14,8±6,25	0,2±0,07
3d point	357±145	8,2±0,73	14,3±2,37	0,3±0,08

*p<0,05

Fig. 4 Morphometric parameters of platelets in study groups and control



*P<0,05

Table 3. Results of coagulation analysis in study groups

	Fibrinogen g/l	ACT	TT	FT	D-dimer, ng/ml
Normal range	2-4	23"-36"	13,2"	5'-12'	до 250
1t point	3±1,1	38"±25"	23,2"±23,8"	30,8'±22,2' *	2767±2438 *
2nd point	2,4±2,2	25"±6"	14,8"±2,5"	16,1'±14,4'	250±120
3d point	2,8±2,2	28"±5"	13,2"±0,2"	6'±4'	125±115

*P<0,01

Outcomes of HUS

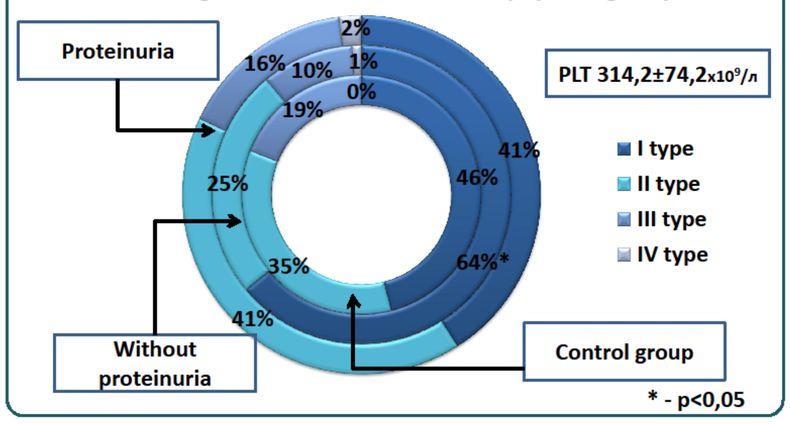
1 group
- 4,4±2,9 months after acute episode of HUS
- N=16
- Mean age 2,3±1,3 years

2 group
- 7,9±5,2 years after acute episode of HUS
- n=20
- Mean age 10,2±1,6 years

Table 4. Characteristics of nephropathy after acute episode of HUS

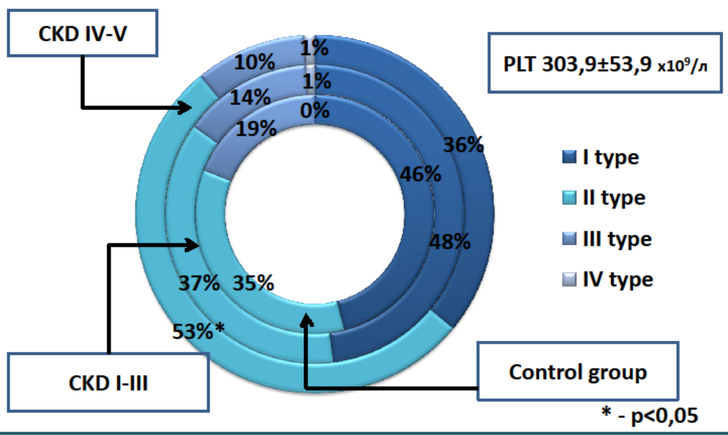
	1 group (n=16) n (%)	2 group (n=20) n (%)
CKD I stage	5(31,3)	5(25)
CKD II stage	8(50)	7(35)
CKD III stage	3(18,7)	4(20)
CKD IV stage	0	1(5)
ESRF	0	3(15)
PD		3(15)
HD		0
Hypertension	3(18,7)	5(25)
Proteinuria	7(44)	10(50)

Fig. 5 Platelet form's ratio (%) in 1 group



* - p<0,05

Fig. 6 Platelet form's ratio (%) in 2 group



* - p<0,05

Conclusions

- Changing of morphofunctional parameters of circulating platelets serves as an reliable parameter for assessment of platelet hemostasis in HUS
- Vital computer morphometry should be used as a supplement method in evaluation of platelet hemostasis
- Lack of recovery of platelet morphofunctional and dimensional change in the peripheral blood when renal function has restored indicates the stress adaptation processes of platelet hemostasis despite the normalization of hemostasis
- Patients with proteinuria are needed in renoprotective therapy and antiplatelet agents
- Platelet activation in CKD IV-V may be due to uremia

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