Correlation relationships between myocardial oxygen demand and blood parameters during burn toxemia, depending on age

Muhitdinova Hura Nuritdinovna

Doctor of Medical Sciences, Full Professor

Center for the Development of Professional Qualifications of Medical Workers, Doctor of Medical Sciences

Hamraeva Gulchehra Shahobovna

Head of Department

Center for the Development of Professional Qualifications of Medical Workers, Associate Professor

Yuldasheva Saida Anvarovna

Candidate of Medical Sciences, Head of Division

City Clinical Children's Hospital №1

Abdusalieva Tursunoy Mutanovna

Candidate of Medical Sciences, Anesthesiologist-resuscitator

City Clinical Children's Hospital №1

Alauatdinova Gulhan Inyatdinovna

Assistant

Center for the Development of Professional Qualifications of Medical Workers

Abstract

A statistically significant difference in the mesor of the circadian rhythm MVP was revealed only between subgroup 3 of group 1 and indicators of patients in group 6 in 1 (by 22%), 2 (19%), 7 (13%), 8 (22%), 10 (17%) day. With a comparatively larger burn surface and deeper damage to the skin, a less pronounced stress increase in myocardial oxygen demand was found in group 6. Decrease in MVP, subject to an increase in erythrocyte, hemoglobin and blood hematocrit in subgroups 1 and 3 of group 1, in all patients in groups 2,3,4. While the feedback MVP and dynamics of the red part of the blood in 5.6 groups disappeared. An increase in MVP was revealed under the condition of an increase in leukocytosis, that is, an inflammatory reaction in

patients aged 41-60 years. In the first 10 days of the toxemia period, laboratory signs of acute pancreatitis, liver failure with a predominance of cytolytic syndrome were revealed. In senior school age, the lack of anticoagulant therapy was revealed (it was performed in all patients with thermal burns), as well as an undesirable tendency to an increase in TT in subgroup 1 of group 1, children in groups 2 and 3, in groups 4 and 6 of patients.

Keywords: myocardial oxygen demand, blood, burn toxemia, age.

Relevance. Despite the short period of time that elapsed from the onset of skin and respiratory tract burns to the death of the victims, changes in the heart were constantly observed. Very often the heart muscle even looked altered macroscopically. So, almost always there was a sharp plethora of the heart, the presence of small hemorrhages under the epicardium, in some cases - turbid swelling of the myocardium. Histological changes were expressed primarily in vascular disorders. Even in persons who died a few minutes later due to severe burns, carbon monoxide poisoning and suffocation with smoke, as a rule, hyperemia of the heart vessels, stasis in the arterioles, minor hemorrhages in the thickness of the myocardium and under the epicardium were observed. Focal fragmentation can also take place before the onset of agony, and apparently occurs due to dystrophic changes in muscle fibers [1-4]. During the period of shock and toxemia in severe burn injury, there is a decrease in the pumping function of the myocardium and deterioration of peripheral circulation with a significant increase in myocardial oxygen demand [5]. However, due to insufficient information on changes in myocardial oxygen demand depending on age, we tried to evaluate and study the impact of laboratory test changes on MVP.

Purpose of the work. To assess the correlations between myocardial oxygen demand and blood parameters during toxemia, depending on age.

Material and research methods. The studies were carried out in the following age groups: group 1 - 6 months - 3 years, group 2 - 3.1-7 years old, group 3 - 7.1-18 years old, group 4 - 18.1-40 years old, group 5 - 41- 60 years old, group 6 - 61-85 years old.

Table 1

Groups	men	women	age	Height, cm	Weight, kg	total burn area,%	area of 3B degree burn,%	IF, units	days in hospital
1	15	7.0	18.1±7.5months	77.2±5.1	10.7±1.4	33.6±10.1	9.0±6.5	42.1±16.6	22.2±9.6
2	11	9	4.8±1.0*years	106.2±9.3*	21.6±10.8	50.8±14.9	25.8±11.6	88.7±36.8	46.3±18.4
3	14	4	12.1±3.0*yea	147.5±14.5	38.2±10.	50.7±12.7	11.7±6.5	76.3±19.1	34.3±18.2

			rs	*	8*				
4	13	2	27.1±4.8*years	173.5±6.3*	70.7±7.3*	58.2±14.1	20.2±12.0	112.3±35.6*	48.0±19.6
5	5	3	49.4±7.2*years	164.6±5.9*	72.0±12.8*	53.8±15.0	13.3±8.1	90.0±25.0*	26.5±13.4
6	5	3	70.1±6.4*years	169.0±10.0*	73.5±6.8*	35.7±10.6	20.5±7.8	77.3±30.2	41.6±19.3

*-deviation is significant relative to the indicator in group 1

As shown in Table 1, there were 63 male patients, 28 female patients. Age, anthropometric differences were significant in the absence of significant differences in age groups in the total area of the burn, deep damage of grade 3B and the duration of inpatient treatment. A significant predominance of IF in groups 4 and 5 was found, due to the aggravation of the condition by concomitant factors, such as combined trauma, carbon monoxide poisoning, concomitant ischemic heart disease, burns of the upper respiratory tract.

The research data were processed by the method of variation statistics using the Excel program by calculating the arithmetic mean values (M) and mean errors (m). To assess the significance of the differences between the two values, the parametric Student's test (t) was used. The interrelation of the dynamics of the studied indicators was determined by the method of paired correlations. In this case, the critical level of significance was taken equal to 0.05. Intensive therapy from the moment of admission was aimed at removing burn shock, adequate anesthesia and intravenous administration of crystalloids, volemic solutions under the control of hemodynamics, volume of urine output, correction of deviations in homeostasis indicators.

Results and discussion.

As shown in table 2, a statistically significant difference in the mesor of the circadian rhythm MVP was found only between subgroup 3 of group 1 and indicators of patients in group 6 in 1 (by 22%), 2 (19%), 7 (13%), 8 (22%), 10 (17%) days.

Table 2.

Changes in the mesor of the circadian rhythm of myocardial oxygen demand during burn toxemia, depending on age

	Group 1			Group 2			Age group 3			19-40 years	41-60 years	61-78 years
	6 month-3 years			3.1-7 years			7.1-18 years					
Days	Subgroup 1	Subgroup 2	Subgroup 3	Subgroup 1	Subgroup 2	Subgroup 3	Subgroup 1	Subgroup 2	Subgroup 3	Group 4	Group 5	Group 6
1	135±17	145±23	140±18	117±6	126±4	137±9	121±4	111±6	133±8	119±4	124±11	108±6*
2	135±17	139±15	142±18	116±2	124±4	132±3	125±2	114±5	136±5	119±3	1062	114±3*
3	133±11	137±13	122±11	112±2	124±2	138±4	125±2	113±4	142±4	121±3	106±3	112±5
4	135±12	138±8	137±18	114±2	122±3	138±3	127±4	120±4	140±2	132±2	122±3	111±4
5	139±9	139±12	134±15	116±2	126±3	141±3	126±3	129±3	144±4	130±3	125±4	113±6
6	143±12	142±14	131±9	122±3	124±4	141±3	128±2	132±8	148±4	133±3	127±5	111±4
7	146±12	142±15	131±6	119±5	130±5	133±2	134±3	130±4	143±3	142±4	121±3	114±5*
8	146±10	137±10	141±12	124±2	126±3	139±3	143±6	130±5	147±3	141±5	118±4	109±4*
9	148±6	135±7	137±19	124±3	129±4	144±3	173±10	147±7	143±4	141±4	117±2	117±7

10		137±11	138±12		129±3	146±3		134±7	154±4	137±4	112±2	115±7*

*-significant difference from the indicator in the 3rd subgroup of the 1st group.

The revealed difference is most likely due to the age-related anatomical and functional differences of the indicated age groups, when with a relatively larger burn surface and deeper skin damage in group 6 (grade 3B 20.5 ± 7.8%, IF 77.3 ± 30.2 units) less pronounced stress increase in myocardial oxygen demand (108 ± 6%), which was due to less significant adaptive deviations in myocardial function and myocardial oxygen demand in conditions of age-related mitochondrial insufficiency (the indication for antiarrhythmic therapy with beta-blockers was the severity of deviation from the age norm of the heart rate).

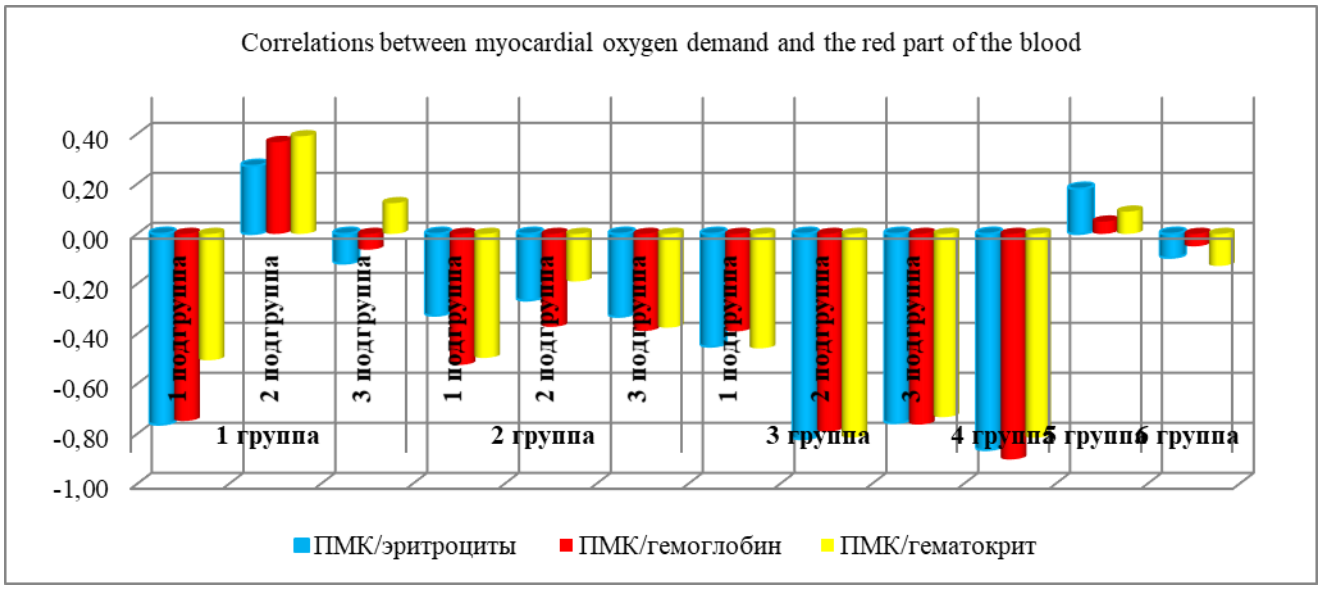

Fig.1

A negative correlation between changes in blood and MVP indicates a decrease in MVP, provided that the parameters of erythrocytes, hemoglobin and blood hematocrit increase in subgroups 1 and 3 of group 1, in all patients of groups 2,3,4. While the feedback between MVP and the dynamics of the red part of blood in 5.6 groups disappears, which can be explained by the age-related characteristics of the reaction of myocardial metabolism to stress at the age of over 61, when an increase in hemoglobin, HMT, and erythrocyte count does not decrease MVP, which is associated with limited functional adaptive capabilities of the cellular structures of the heart muscle in old age (fig. 1). Violation of the positive effect on the myocardial function of the growth of the parameters of the red part of the blood in infants of 2.3 subgroups of group 1 is possibly associated with the severity of the effect of general intoxication on tissue metabolism with burns with an area of 33.6 ± 10.1%, 3 B degree 9.0 ± 6.5%, IF -42.1 ± 16.6 units (tab. 1).

A reliably significant effect on MVP of the number of leukocytes in peripheral blood in group 4 was found, which indicates an increase in myocardial oxygen demand in conditions of an increase in leukocytosis, an inflammatory reaction in patients aged 41-60 years.

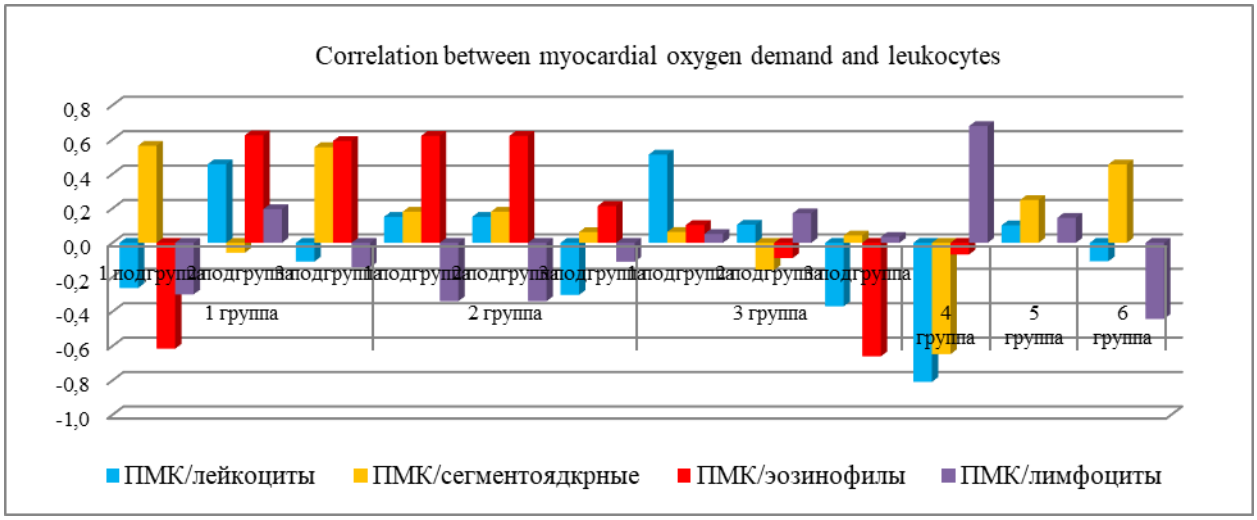

Fig.2

That is, there is a high probability of developing myocardial ischemia with ineffective anti-inflammatory therapy in this group (fig. 2). An unfavorable effect of eosinophilia on the MVP index was found in children of 2,3 subgroups in infancy, in 1,2,3 subgroups in preschool age, which characterizes a moderate likelihood of myocardial ischemia in an inflammatory reaction with predominant eosinophilia in children.

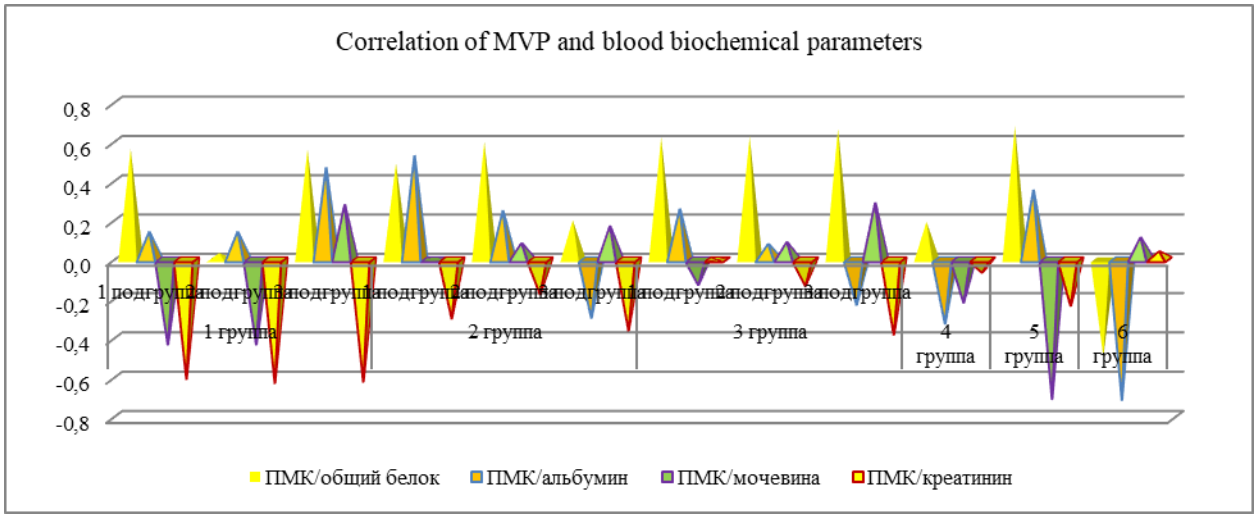

Fig.3

In the first 10 days of burn toxemia, there was some negative effect of the growth of total protein in the blood in subgroups 1 and 3 of group 1, children of groups 2 and 3, adult patients of group 4.5, when an increase in the concentration of total protein in the blood can increase myocardial oxygen demand, which leads to an increase in the likelihood of myocardial ischemia in children

with burn toxemia (fig. 3). Taking into account the fact that the decrease in blood urea is more often due to the alimentary factor, one can understand the high probability of an increase in MVP and the development of coronary insufficiency in toxemia in persons over 61 years of age. A negative effect on the metabolism of the myocardium of the energy-deficient state in elderly patients during the period of toxemia was stated.

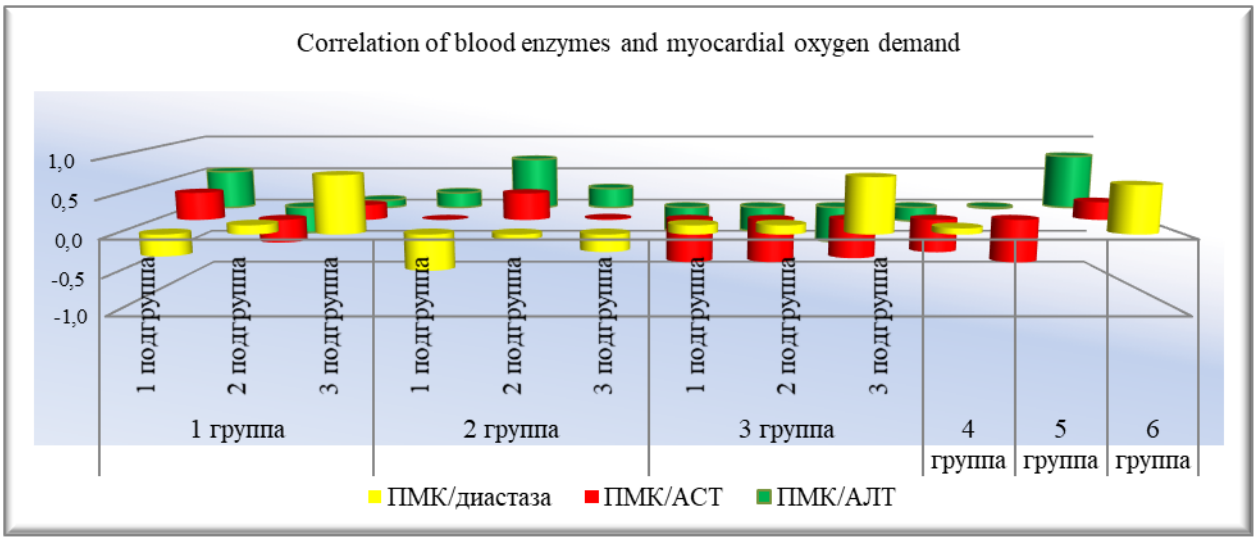

Fig.4

The increase in MVP is due to an increase in blood diastase in subgroup 3 of group 1, subgroup 3 of group 3, group 6 of severe burn patients in the first 10 days of toxemia. A direct correlation between ALT and MVP was also found in subgroup 2 of group 2, group 5, when acute cytolytic syndrome directly increases myocardial oxygen demand. Thus, in the first 10 days of the toxemia period, there are signs of acute pancreatitis, liver failure with a predominance of cytolytic syndrome, which in order to improve the efficiency of timely correction of homeostasis disorders determines the expediency of more effective membranotropic, hepatotropic therapy, the introduction of inhibitors of proteolytic blood enzymes (fig. 4).

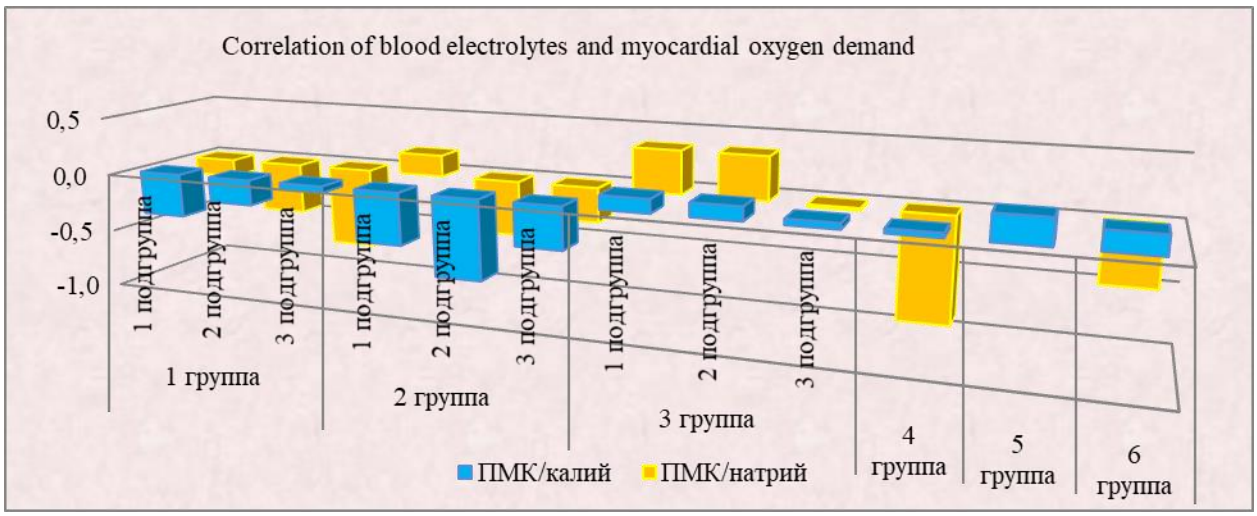

Fig.5

All patients underwent timely correction of deviations of blood electrolytes under the control of laboratory parameters. It is possible that the revealed insignificant correlations between MVP and plasma potassium and sodium indices were an indicator of the effectiveness of the correction performed (fig. 5).

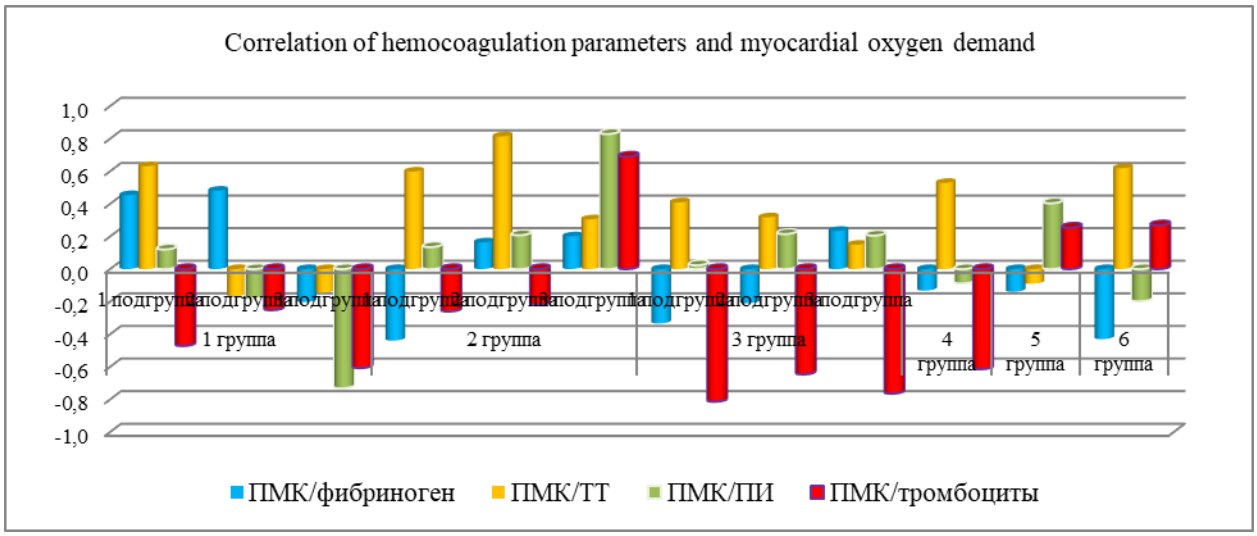

Fig.6

A direct reliably significant effect of PI, platelet count on MVP was found only in subgroup 3 of group 3, that is, a tendency to hypercoagulability in the second phase of blood coagulation can cause myocardial ischemia in severe burns in older school children with an area of 50.7 ± 12.7%, 3B degree 11.7 ± 6.5%. IF 76.3 ± 19.1 units. That is, in this subgroup, a lack of anticoagulant therapy was revealed (it was performed in all patients with thermal burns), as well as an undesirable tendency to an increase in TT in subgroup 1 of group 1, children in groups 2 and 3,

in groups 4 and 6 when an increase in the propensity to hypercoagulation (increase indicator TT) has the likelihood of causing myocardial hypoxia.

Conclusion. A statistically significant difference in the mesor of the circadian rhythm MVP was revealed only between subgroup 3 of group 1 and indicators of patients in group 6 in 1 (by 22%), 2 (19%), 7 (13%), 8 (22%), 10 (17%) day. With a comparatively larger burn surface and deeper damage to the skin, a less pronounced stress increase in myocardial oxygen demand was found in group 6. A decrease in MVP was found under the condition of an increase in the parameters of erythrocytes, hemoglobin and blood hematocrit in subgroups 1 and 3 of group 1, in all patients of groups 2,3,4. While the feedback MVP and dynamics of the red part of the blood in 5.6 groups disappeared. An increase in MVP was revealed under the condition of an increase in leukocytosis, that is, an inflammatory reaction in patients aged 41-60 years. In the first 10 days of the toxemia period, laboratory signs of acute pancreatitis, liver failure with a predominance of cytolytic syndrome were revealed. In senior school age, the lack of anticoagulant therapy was revealed (it was performed in all patients with thermal burns), as well as an undesirable tendency to an increase in TT in subgroup 1 of group 1, children in groups 2 and 3, in groups 4 and 6 of patients.

References:

1) http://www.medicus.ru/pediatry/patient/kriterii-arterialnoj-gipertenzii-u-detej-i-podrostkov-28563.phtml
2) https://cardiograf.com/napor/vidy/srednee-arterialnoe-davlenie.html
3) https://www.bsmu.by/downloads/kafedri/k_poli_ter/stud/15.pdf
4) https://www.forens-med.ru/book.php?id=1288
5) http://www.sibmedport.ru/article/10673-intensivnaja-terapija-ozhogovoy-travmy/